Generating Awareness of Ubiquitous Monitoring within The Netherlands, referencing the Chinese Social Credit Score

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Abstract

China has decreed that by 2020 they will implement a mandatory Social Credit Score (Kshetri, 2016). This Score will address the needs of China's citizens, providing them with an evaluation that financial institutes will recognize (Chorzempa, 2018; Shaofeng Zhang, 2015). Additionally, the Social Credit Score could be used to promote China's authoritarian regime, steering citizens towards their idea of an 'ideal citizen' through punishments and incentives (Wei, 2016; Backer, 2017).

The Western world has, as of yet, not seen a form of Ubiquitous Monitoring as explicit as a Social Credit Score (Moran et al. 2013). Whilst Ubiquitous Monitoring is perceived negatively by Western people, its use is on the rise (Moran et al. 2013). Therefore, it is important that the governments and public are made aware of the extent to which Ubiquitous Monitoring can be utilized. This will ensure that similar systems can be explored fully prior to their implementation, allowing drawbacks to be minimized and to ensure they embody the societies values. As such, the research question for this project attempts to address this need: How to design an installation that generates awareness of Ubiquitous Monitoring in the Netherlands, referencing the Chinese Social Credit Score?

Due to the impressionability of the public (Moran et al. 2013), an effort should be made to achieve objective awareness of Ubiquitous Monitoring. This is enabled by Critical Design, which can be leveraged in order to aid in the creation of objective awareness (J. Bardzell, S. Bardzell, 2013).

An exhibition and a discussion were chosen as the mediums with which to answer the research question. Thus, attempting to demonstrate that the exhibition and discussion can raise awareness among the attendees and facilitate the exploration of relevant ideas and viewpoints. The exhibition would ensure a minimum number of limitations were placed on displayed projects and the discussion would expand participants understanding.

By adhering to Critical Design's theories, the likelihood of generating awareness among the attendees will increase. Therefore, a methodology was deduced and followed carefully when creating the 4 exhibition projects:

- Object Recognition, detecting common objects and people, then displaying this publicly.
- A Smart Tattoo, depicting the benefits of an imagined intrusive product.
- Audio of Personas within a Social Credit Score, conveying the thoughts of 3 individuals living within a Social Credit Score.
- A Flocking Algorithm, illustrating the effect of a rating system on relationships between people.

Before and during the discussion, the exhibition was used as a prompt to direct dialog and further there was a loose structure of topics namely: the current Chinese Social Credit Score, how such a score could be implemented within the Netherlands and finally, the foreseeable issues.

From questionnaire results it is clear that this was an effective way to generate awareness. With individuals that participated in either one of the events mentioned, or both, having an increased level of awareness with regards to Ubiquitous Monitoring. However, the demographic that made up the attendees were for the most part affiliated with the University of Twente and as such is not a true representation of The Netherlands.

Acknowledgments

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Chapter 1: Introduction

1.1 Introduction

With the increase of the populous' dependency on technology, digital innovation has become ever more relevant. Through developments in hardware, complex, intricate operations can be performed that were previously too computationally expensive to realize and as such have led to aggressive progress in fields such as machine learning. This has allowed technology to spread across our daily lives, entangling itself into our work, social and private activities. Examples of this include mobile phones and the internet, the likes of which have become a necessity for most and have resulted in the generation of large amounts of data which can be leveraged to derive facts and ultimately classify individuals interests and activities. This classification allows products and services to be specifically tailored to individuals, and for statistically accurate inferences to be made. In order to acquire this data, applications monitor user's actions and through Ubiquitous Monitoring (UM), this can be achieved thoroughly, however, this form of monitoring is likely to be perceived as intrusive by the user.

Currently, many businesses operating in the Western world hide their invasions of privacy behind long drawn out terms and conditions which discourages a user's interest and as such leads to them being unaware of the data being collected and processed. The Chinese Social Credit Score (CSCS) will be used to illustrate UM, serving to educate unaware citizens on the dangers and benefits that could accompany such a system. To achieve this a cursory understanding of the CSCS and the implementation thereof needs to be realized. This should be complemented by research into what UM is and how it is perceived by users of a system that employs it. Furthermore, research into generating awareness on a subject should be conducted, with the goal of realizing a methodology that can be followed and incorporated into the design of an installation. The previously outlined objectives should be constrained to The Netherlands as the implementation of the design will be set in The Netherlands, thus allowing the inferences made during research and development to fit with the end result. Once an understanding of the background is achieved a design can be conceptualized and conceived, with tests being run on relevant stakeholders in order to analyze the results. Thus, an attempt will be made to generate awareness of UM within The Netherlands through exposing elements within the CSCS.

1.2 Research Questions

Elaborating on the outline provided above, a research question was formulated:

- *How to design an installation that generates awareness of Ubiquitous Monitoring in The Netherlands, referencing the Chinese Social Credit Score?*

To answer this question, it was broken down and sub-questions were formulated:

- *How is awareness generated?*
- *What are the current and planned developments in China with regards to Ubiquitous Monitoring?*
- *What is Ubiquitous Monitoring and how is it perceived?*

Chapter 2: State of the Art Research

An investigation into the relevant topics needed to answer the sub-questions and main research question will be conducted in this chapter. This will include the Chinese Social Credit Score, Ubiquitous Monitoring, Western examples of Ubiquitous Monitoring and finally, Critical Design.

2.1 What is the future of the Chinese Credit System and why is it needed?

China has the second largest economy in the world (The World Bank, 2017) but contrary to this lacks a sufficient and developed credit system. This is largely due to the circumstances of the Chinese citizens, "out of a population of approximately one billion adults, more than half lack the personal credit history needed to borrow formally from financial institutions to cover unexpected expenses or pay for cars and other durable goods." (p. 1) (Chorzempa, 2018). Unable to acquire loans in a formal setting, these citizens seek out other forms of acquiring loans such as "lending to each other informally" (p. 1) (Chorzempa, 2018) creating a private lending market that is estimated at $292 billion a year (Yunlin Lu, 2015).

This private lending encompassed under the blanket term shadow banking[1] is a dubious, unregulated practice and from Yunlin Lu (2015) the exact risks for both the lender and the receiver of the loan are made apparent. These include but are not limited to, private lenders losing their money to individuals who cannot return payment and receivers being forced into illegal work in order to pay off debt. Private lending only scratches the surface of the issues present with the current financial system China has in place, and as such, it is imperative that China comes to a resolution in order to better serve its citizens. The foundation for such an alteration is already in place, with preliminary tests being run on local provinces (Yunlin Lu, 2015), and private systems like Ant Financial Services Group's "Zhima Credit Management Co., Ltd" (p. 562) or "Sesame Credit" (p. 563) system gaining significant traction (Zhao, 2017).

These examples are only precursors to the planned future China wishes to realize. By 2020 every Chinese citizen will have a credit score that will convey their worth, derived from a variety of factors such as financial standing, criminal record, and social media behavior (Kshetri, 2016). It is the goal of this section to understand the current issues present in China's financial system and to investigate the proposed Chinese Credit Score through the consideration of a current innovative system, Zhima Credit, extrapolating this information in order to better understand and asses China's proposed credit system.

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[1] Shadow Banking: Financial Stability Board (2012) (as cited by Yunlin Lu, 2015) defines shadow banking as credit intermediation or lending activity that involves entities and transactions outside the regular banking system.

2.1.1 What is a Zhima Credit Score?

To understand the inner workings of Zhima Credit it will be useful to briefly outline the company which has created it. Formerly the Alipay company, Ant Financial Services Group was set up in October 2014 as part of the Alibaba group and works with over 200 financial institutions serving "nearly 10 million consumers and small companies" (p. 560) (Zhao, 2017). Expectedly, "Ant's core market is China where it has 450 million real-name users" (p. 7) (Long Chen, 2017) conveying the scale of the Ant Financial Services Group which is only one of the Alibaba Group's nine businesses (Alibaba Group, 2018).

The Zhima Credit Score, launched in January 2015, is a data-driven application using users information in order to rate them (Kshetri, 2016). This data is gathered from within the Alibaba system, from external businesses affiliated with the Alibaba Group and finally from user submitted data (Zhao, 2017). Zhao (2017) specifies what types of data are used, including court reports on debt, buying habits, rental information, and social relations to name but a few. It is undeniable that a large amount of data is being utilized, echoed by Ksherti (2016) "Alibaba is exploiting its massive amount of data" (p. 301).

This collection of data is used by an algorithm with "five credit dimensions: the users' credit history, behavior preferences, performance, identity characteristics and personal connections" (p. 563) (Zhao, 2017) in order to rate users between 350 and 900 (Hvistendahl, 2017).

As this is a voluntary service, one can naturally expect that there must be some benefit to the user in order to entice them to sign up. As a result of Alibaba's size and its connections with other companies, these benefits are vast (Zhao, 2017; Hvistendahl, 2017). Obviously, these incentives are proportionate to your rating, dwindling as your score drops and expanding with its rise (Zhao, 2017; Hvistendahl, 2017). Aside from the obvious such as access to loans or exemption from deposits, a noteworthy example of these benefits is a fast track visa to Singapore or Luxemburg when one has a score over 700 and 750 respectively (Zhao, 2017; Hvistendahl, 2017). However, using the system also has the potential for downsides such as the plethora of privacy concerns being raised; the protection of user data and the potential for abuse of power to name a few. Furthermore, through the monitoring of an individual's data, one could uncover secrets or activities that could have detrimental effects, made more likely due to the nature of Communist society where, for example, negative opinions against the regime can result in punishments such as arrest or seizing of assets (Human Rights Watch, 2016; Wei 2017).

There is no academic literature regarding how successful the system is at the time of this writing, but social media and informal articles indicate a significant user base (Hvistendahl, 2017). Furthermore, it is clear that the system is recognized and trusted as both Luxemburg and Singapore allow fast-track services for high ranking individuals requesting a visa (Zhao, 2017). However, this

service could create a dependence on Alibaba products and services as users of the 'Zhima Score' who wish to increase their score will purchase more goods and services with Alibaba such as their E-commerce platform and internet platform (Zhao, 2017).

2.1.2 Current Chinese Credit Score

China's current financial system ostracizes the majority of their population, leaving them unable to obtain official loans. An interview with Shanghai Credit Information Services Executive (as cited in Chorzempa, 2018) revealed that "about 300 million individuals have sufficient information… out of 830 million total records" (p. 1) with estimates of potential borrowers ranging up to one billion. It is the lack of a credit history that is the root of the problem, as it perpetuates the difficulty in establishing a history deemed sufficient to be granted a formal loan (Chorzempa, 2018; Shaofeng Zhang, 2015). As a result of this difficulty, Shadow Banking has become increasingly important within Chinese society as it serves public needs that are not served by the current formal system. One such need is outlined by the Household Finance Survey (as cited in Chorzempa, 2018) "50 percent of Chinese households consumed as much or more than their income" (p. 2) and further by Orlik and Chen (as cited in Chorzempa, 2018) "In addition people in middle and lower income brackets… cannot count on access to credit in an emergency"(p. 2) This conveys the need for a credit system that can cater towards these individuals, but informal credit systems involve a higher cost and greater financial risk (Zibei Chen, Minchao Jin).

Without such a system citizens are driven to illegitimate lenders, peer to peer lenders or microloan companies (Zibei Chen, 2017), and as such at the end of September 2017 "there were 8610 microloan companies and around 2000 peer-to-peer lenders in China… together holding over RMB 2 trillion in outstanding loans" (p. 6) (Chorzempa, 2018). To make matters worse, many of these practices are unregulated due to a lack of proper policing by authorities (Chorzempa, 2018) and still ultimately fail to meet the needs of the lower income class (Kshetri, 2016). Whilst this is an undeniably large amount of money, it is dwarfed by the registered outstanding off-balance-sheet total from banking institutions, recorded at RMB 39,6 trillion (in 2012), and an estimated shadow banking amount of RMB 25 trillion-30 trillion (over 40% of China's GDP) (Yunlin Lu, 2015).

These colossal sums serve to highlight not only the need for a new credit system but how ingrained informal credit is within the Chinese society. As such reducing them will not be an easy task, and the implementation of a new system that will potentially undermine these practices will be challenging. Yunlin Lu (2015) suggest integrating the shadow banking practices into traditional banking systems, but this too shall be an imposing task as it requires all practices to be recognized and then convinced that the legal path is the correct one. It is conceivable that many of these organizations would not be able to function legally due to the majority of their business coming from illegal operations or a lack of knowledge in how to proceed in the legal domain.

2.1.3 The Future of the Chinese Credit Score

With the goal of combating the previously highlighted issues within the Chinese financial system and giving the government more control over its population, a standardized, nationwide Social Credit Score (SCS) is in development. Chorzempa (2018) states that the Peoples Bank of China has tasked the National Internet Finance Association with developing the system which will score citizens based on "financial credit and their social and political behavior" (p. 65)(Shen Wei, 2017). Apparent from investigating the Zhima Credit Score, such a system is far from trivial. To understand how it will reform the current state of China'a financial credit structure, the current information regarding the system must be brought to light and evaluated. This will be done using the Zhima Score as a base example.

Larry Carta Backer (2017) defines Social Credit as being "grounded in targeted data harvesting, proprietary algorithms and coordinated incentives and punishments" (p. 10) which is concordant with what has been found regarding the current Zhima Score. This definition places an emphasis on 3 aspects that need to be accomplished in order to create a SCS.

The first, 'data harvesting', is already half fulfilled due to the digital revolution where the amount of data we produce doubles every year (Helbing et al., 2017). An example of that is in internet traffic increasing by 1100 times and mobile phone data usage increasing by 16 000 times in the last 15 years (Schulte, 2018). The challenge becomes harvesting said data, which is partly a consequence of China lacking a unified legal framework regarding data collection, processing, and sharing, but is also due to firms being unwilling to share information (Chorzempa, 2018). This is because data has become extremely valuable as seen in the Zhima Credit Score, and in addition, bigger, more public institutions must avoid being associated with the stolen data traded on the black market, typically used by smaller institutions (Chorzempa, 2018).

The second hurdle that must be overcome is the creation of an algorithm capable of evaluating Chinese citizens. Whilst the Zhime Credit Score may be geared towards Alibaba's own benefit, it portrays the creation of such an algorithm as a realistic possibility. Furthermore, Yu, Wang, Lai (2008) describe the possibility of using a machine learning technique called an artificial neural network[2] to effectively evaluate credit risk. A neural network is able to "capture abstract features and recognize patterns" (p. 91) (Miyajima, 2017) elevating the possibilities previously thought capable by machines. Together these sources convey a clear potential for such an algorithm's creation but, issues arise in the ambiguity surrounding the ethics of using sensitive data to classify individuals. Backer (2018) entails a clear set of ethical ramifications that could be present with the use of such an algorithm, an example of which is whether it is acceptable to make inferences on individuals based on

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[2] Artificial Neural Network: Simulates neural network architectures present in the human brain, making use of a series of layers, each refining the input data until the final layer is reached and an output is generated; without relying on prior data processing. This allows it to learn by example and find patterns and make inferences on large datasets.

race. This highlights the potential societal and political issues such a system could instigate as a result of using sensitive data.

Finally, the element of 'incentives and punishments' will aid the Chinese Government in controlling their citizens. It is likely that the end goal of the Chinese Credit Score is the control of its citizens as it will reward citizens who follow their finely tuned algorithm's definition of an ideal citizen and punish those who attempt to stand out or deviate from the model path (Wei, 2016; Backer, 2017). Punishments by the state are already evident, such as the public release of a 'blacklist' containing the identity of citizens who have seriously breached the law (Wei, 2017). The exact motivations and penalties that the system will deliver are unclear, but it is likely to be similar to that of the Zhima Credit Score, granting citizens the ability to gain loans at the very least. To regulate this control Backer (2017) suggests using a "meta-social credit system" which would oversee the administration of the SCS, acting as an agency that prevents abuse of power and ensures integrity. However, the question then becomes who will monitor the meta-social credit system? A better approach may be through transparency, giving the citizens more control, however, this is a democratic approach that gives power to the people and as such may conflict with the motives of the CSCS pushing their populous to become 'ideal citizens'.

2.1.4 Conclusion

The faults with the current financial system in China are irrefutable, with the majority of the population being unable to access financial loans giving rise to shadow banking, an illicit unpoliced market speculated to be worth around 40% of China's GDP. Due to this large potential market, it is understandable that a system like Zhima Credit has emerged, attempting to address these citizens needs by giving them an accountable and standardized Credit Score with which their financial standing can be adequately judged. Of course, these issues have not gone unnoticed by the Chinese government, who will be unveiling their own standardized SCS in 2020. The differences between the two are not completely clear due to the lack of information regarding China's plan. However, three evident factors that can be extrapolated based on the information available are:

1. The Zhima Credit Score is voluntary whereas the CSCS is compulsory.
2. The Zhima Score serves to promote usage of Alibaba services whereas the Chinese's Score promotes their authoritarian regime, ultimately allowing them further control over their citizens.
3. The CSCS addresses the needs of the Chinese citizens by providing them with an evaluation that financial institutes will recognize.

2.2 Ubiquitous Monitoring

2.2.1 What is Ubiquitous Monitoring?

UM has no set definition but through others work and examining the words 'Ubiquitous' and 'Monitoring' an understanding of the concept can be formed. Ubiquitous is described as "seeming to be everywhere" and Monitor is defined as "to watch and check a situation carefully for a period of time in order to discover something about it" by the Cambridge Dictionary (Cambridge University Press, 2018). From this, it is possible to interpret UM as having the ability to monitor something at any time with the purpose of discovering something about it. This is emphasized by the works of Lloret, Macias, Suarez, Lacuesta (2012) where they describe the situation of being able to observe conditions in your home at any time through the internet as UM. Furthermore, this definition is supported by the works of Zaragoza, Guixeres, Alcaniz, Cebolla, Saiz, lvarez (2013) and Oliveira, Rodrigues, Elias, Zarpelão (2014) although done so through different applications of UM. By examining products which employ UM a further concrete definition of it can be ensured. The following is a list of products that employ UM:

- Mobile phone applications.
  Applications such as mSpy allow you to remotely monitor all the activities and data present on a mobile phone with it installed. This includes phone calls, photos, messaging, GPS and internet activity (mSpy, 2018).
- Health Devices.
  Devices such as diabetes pumps monitor insulin levels constantly throughout the day. For example, the 'Medtronic MiniMed 670G with Guardian' checks and alters insulin every 5 minutes (Medtronic, 2018)
- Black Boxes in Vehicles.
  Similar to its inspiration in airplanes, the black box within vehicles is able to record data related to accidents and also on how safely an individual is driving (European Commission , 2018). This includes tracking "vehicle position and use, speeds relative to posted limits as well as other aspects of driver behavior" (European Commission , 2018).

2.2.3 How is UM perceived?

The feeling of being watched can be unnerving, and "we know from existing research that when people are observed their behavior changes and they act differently" (p. 63) (Moran, Nishida, and Nakata, 2013). Moreover, "users have been shown to become stressed, distrustful, and uncomfortable when observed" (p. 63) (Moran et al. 2013). Despite this UM is becoming increasingly present in our daily lives, likely as a result of the surveillance being less explicit or direct, a notion that is supported in the work of Moran et al. (2013).

Of course, perception is subjective and Moran et al. (2013) argue that this perception is based on several exogenous factors like past experiences and social context. There are many more elements

that influence an individual's opinion (such as social pressure or facilitating conditions) and consequently, breaking down how a collective society perceives anything becomes a daunting task. However, according to Moran et al. (2013) through the use of The Perceptions of System Attributes-Behavioural Intention (PSA-BI) model, one can achieve a prediction of user's behavior in ubiquitously monitored environments. It has been applied in numerous fields such as ubiquitous computing, persuasion and in Moran et al. (2013) is used to explore the impact of culture as an exogenous moderating variable, specifically in the Japanese culture.

To conduct this research Moran et al. (2013) devised a questionnaire to measure users salient perceptions for a specific UM device (a wearable sharing many affordances with a name badge). The PSA-BI model entails a large number of perceptions and as such Moran et al. (2013) chooses to focus on "six prominent perceptions and attitudes" (p. 59) thus highlighting the detail and dimension of the model. Through this model concrete results were obtained allowing Moran et al. (2013) to conclude "that people, when first presented with a device, think along similar lines" (p. 62) and "that choice and privacy are more important to Japanese people than first anticipated" (p. 62). Furthermore, from their work an understanding of salience in monitoring technology is achieved, Moran et al. (2013) argue that initial reactions to a technology can have lasting effects on subsequent interactions and as such "salient perceptions, attitudes, and intentions should be a consideration at the forefront of the minds of those who introduce any new technology" (p. 63) (Moran et al. 2013). Extrapolating this argumentation, it frames users as being very impressionable and as such puts a great deal of responsibility in the hands of the designer of any such salient system, as they become accountable for how that user perceives not only their system but subsequent systems that fall into a similar category. This raises questions of morality and whether designers should be obligated to project accurate portrayals of such systems, as for how a user perceives their design could potentially shape that user's perception on an entire field, thus potentially hindering or encouraging development. The model was "based on data collected primarily in the U.K." (p. 58) (Moran et al. 2013) and as such the findings can be directly correlated to The Netherlands under the assumption that there is a commonality amongst the Western world's citizens.

2.3 Western Systems

The 20th century has seen the rise of data collection and usage with more companies and products utilizing the vast amounts of data recorded both passively and actively. Walker (2014) conveys this accurately by illustrating examples such as a jet engine generating a terabyte of data on a single flight and a now outdated measure of 400 million tweets per day. He goes on to link these examples to people, where we, just like the jet engine generate large amounts of data throughout our daily lives and conveying companies' intent to monetize or utilize this data. The previously discussed example 'Zhima Credit Score' portrays the possibilities available to a business with regards to its customer's

data, but Alibaba is far from the only company leveraging data in order to serve the needs of current and potential customers. This section will outline other products and services that make use of UM.

2.3.1 Google and Facebook

Companies like Google and Facebook have used the surge of data generation in order to become some of the largest companies in the world, and among the most popular websites on the Web (Esteve, 2017). This is a result of the economic value placed on data, and with the correct usage, it can become an invaluable asset (Esteve, 2017). Dealing with user's personal information can be complicated due to the intrusion on their privacy. Outlined by Esteve (2017), it can be a limiting factor for businesses, as privacy laws and social or political pressure can hinder development and usage of data. However, Google and Facebook have walked the tightrope, balancing their use of data, and becoming the largest search engine and social network in the world. Both these companies have large amounts of data pertaining to a wide variety of intrusive aspects regarding users as evident from Esteve (2017). Yet, this does not elaborate on their level of involvement with systems that partake in UM and as such a deeper investigation into their activities is required.

In the case of Facebook, "most personal information is voluntarily given by users" (p. 39) (Esteve, 2017) but it does engage in encouraging "users to reveal information about other people" (p. 39) (Esteve, 2017) which could result in the tracking of personal information without a user's consent. Furthermore, Facebook allows 3rd party applications to be accessed through their platform, ranging from games to other full-fledged application that use Facebook to get access to user data. That being said, Facebook only collects and monitors user activity when the application is being used (Esteve, 2017) and as such the extent to which it is 'Ubiquitous' is reliant on the users themselves. Facebook undoubtedly has a large amount of personal data on its users, from messages sent to pages 'liked' but it is all contained within the confines of the application, combining what they know about you and the demographic you fall into, in order to better cater ads towards you (Esteve, 2017).

Contrasting this, Google takes data acquisition a step further and can be attributed to their diverse portfolio of products and services. Through the use of their search engine they record which websites you visit and what you search for, through YouTube they record which videos you watch, through Google Maps they record your location and means of transportation, through Gmail they record your contacts, the list goes on and through the merging of this data a comprehensive profile can be created (https://privacy.google.com/your-data.html). This can then be analyzed and compared to other user's data in order to make inferences and better cater both its products and advertisements to its users, such as YouTube recommending users videos based on what they watch and tailoring the adverts to users based on their combined data profile.

As a result of this comprehensive data acquisition, Google comes far closer to achieving 'UM'. Through Google Maps your location is tracked periodically, creating a map of where you were and how long you spent at certain locations. In addition, using the Google Assistant will stretch this

monitoring to encompass users' microphone allowing it to pick up the words 'Okay Google' at any given time and begin recording, this data can be saved regardless of whether you are online or not. Google clearly engages in UM of its user base, but does so transparently, allowing users to see what data they have curated and whether they would like Google to have access to this data. However, many of these applications require you to have an account and a digitally authorized consent. Those that don't agree to these terms could see a reduction in capabilities available. This ultimately leaves the decision in the user's hands, allowing them to decide whether the results of the application are worth the allowance of surveillance, but to access the numerous benefits offered the user must relinquish their data.

2.3.2 Healthcare

The previously mentioned examples are arguably the most prominent examples of UM within western society, but within the field of healthcare, there has been a lot of development in systems that employ UM of patients or specific conditions. One such example is portrayed in Prasad et al. (2017), where wearables and implantable body sensors are used in order to forward physiological data to hospital personnel through a cloud-based platform. This allows healthcare professionals to accumulate comprehensive records regarding their patients, without any loss of information (previously memory or perception could cloud information retrieval), and thus serve their patients better. Prasad et al. (2017) outline's a key necessity of such a system as being trust by patients in their healthcare systems and as such, they ensure their environment is secured with no data leaks and minimal threats. They conclude that their application is an exemplary architecture for hospital monitoring, conveying the benefits that a UM system can entail. Whilst, the privacy concerns are still relevant regardless of how secure they believe their system to be, a system such as this can not only aid individual patients through better diagnoses but further development of cures, vaccines, and treatments. Side effects can be more closely studied and as a result mitigated, and correlations between patients can be identified using new machine learning methods ultimately aiding the prevention and curing of illnesses or diseases.

2.4 What is Critical Design, and can it be used to generate awareness?

This project is rooted in attempting to generate awareness within The Netherlands, however, instead of attempting to target a design that specifically engages Dutch citizens by using their cultural nuances, an assumption will be made that engaging a Dutch citizen is the same as engaging another person of similar social standing. This will allow the use of concepts that have not been designed or tested in The Netherlands and as such broaden the possibilities for success, that is, it is assumed that despite historical and cultural differences, The Netherlands is a member of the Western world and as such should be treated with this likeness in mind.

With the goal of generating awareness, a natural assumption is that most citizens of The Netherlands are unaware of UM. Of course, as previously shown there are many examples already present in the daily lives of the Western Society such as Google and Fitbit. As such they cannot be completely unaware, but instead, it is likely that they are unaware of the extent to which UM can be used and how such systems could alter their current lives. With this in mind, it is clear that a design that generates awareness will inevitably transgress or disrupt social and cultural norms as it will bring to light the dangers and benefits UM carries. This is in line with the concept of Critical Design which seeks to challenge norms, inspiring the populous to criticize their everyday lives and ideologies. In addition, it urges designers to create with the goal of expanding the public's field of view, bringing light to the issues in society and triggering citizens to explore more questions rather than blindly accepting the status quo (J. Bardzell, S. Bardzell, 2013; S. Bardzell, J. Bardzell, Forlizzi, Zimmerman, Antanitis, 2012). This is exemplified through one of the founders of Critical Design, Dunne (2005):

> producing conceptual electronic products that encourage complex and meaningful reflection on inhabitation of a ubiquitous, dematerializing, and intelligent environment: a form of social research to integrate critical aesthetic experience with everyday life…. I hope in my approach I have retained the popular appeal of industrial design while using it to seduce the viewer into the world of ideas rather than objects. Industrial design locates its object in a mental space concerned with identity, desire, and fantasy and shaped by media.... Again, I hope this remains intact but is subverted to challenge the aesthetic values of both consumers and designers (p. 147).

Evident from this work and the analysis of it done by Shaowen Bardzell (2012), Critical Design suggests an alteration of the common goal largely present in current design. Changing from serving the needs of society, and thus perpetuating the dominant social classes ideology or status quo that the working class follows blindly; to challenging these needs, exposing the faults in the current system through provocation (Shaowen Bardzell, 2012; Jeffrey Bardzell, 2013). This leaves a dichotomy in which design can be categorized: affirmative design, which "conforms to cultural, social, technical and economic expectation" (Dunne & Raby, 2001), and Critical Design, which "rejects how things are now… provides a critique of the prevailing situation" (Dunne & Raby, 2001). The goals of this work clearly falls into the latter, attempting to alter the perception and knowledge the citizens of The Netherlands have achieved through exposing them to the events in China and as a consequence increase their awareness of UM.

Whilst, the goal of critical theory is clearly evident and elaborated upon, the methodology of achieving a Critical Design is not. In Dunne and Raby's (2001) work they provide numerous examples of products that can be classified as Critical Design but never propose a process or methodology to create such work. It seems as though it is not the process but the end product that

counts. Further evident in an example proposed by J. Bardzell and S. Bardzell (2013) "if a designer had all the right critical stances and attitudes but produced designs that were ultimately affirmative in spite of her best efforts, then it would seem that we couldn't call her a Critical Designer". Yet, they go on to propose and explore a possible methodological approach to Critical Design but what emerges from their work is closer to a set of justified elements present in a Critical Design:

- Viewing the world skeptically, "a suspicion that social reality is not what it seems" and embodying this within the design, "exposing these hidden forces".
- The "Marxist utopian thought" that imagines realistic, undoubtedly better societies and brings to light the contrast between the two states or conveys "concrete mechanisms of a better society".
- Through criticism, which "makes the cognitive benefits of aesthetic engagement more accessible to the public" allowing them to achieve cultural competence in the form of aesthetic sensibility, and the ability to perceive the value of cultural products.

Ultimately this boils down to "look beyond the surface", using critical theory to "read skeptically, to be suspicious of false harmonies and false pleasures" and using metacriticism to "perceive and read with unparalleled sensitivity and insight". This is summarized by J. Bardzell and S. Bardzell (2013) when they evaluate what is 'critical' about Critical Design:

> a design research project may be judged "critical" to the extents that it proposes a perspective-changing holistic account of a given phenomenon, and that this account is grounded in speculative theory, reflects a dialogical methodology, improves the public's cultural competence, and is reflexively aware of itself as an actor—with both power and constraints—within the social world it is seeking to change.

Through this insight it is possible to devise a criterion with which to follow, it must:

- Propose a change in perspective.
- Be grounded in speculative theory, such as the previously outlined aspects present in Critical Design
- Echo the depth and structure of dialogue, allowing the design and individual to 'communicate' interdependently.
- Improve cultural comprehension.
- Be aware of its impact on the public, understanding its strengths and limitations.

However, even if all these aspects are met one cannot say definitely that the product will be a Critical Design, but by adhering to these rough guidelines the probability of an impact within society is likely to increase. Furthermore, Dunne & Raby's work should be complied with as closely as possible such

as a warning from Dunne (as cited in Bardzell, 2013) with regards to creating a Critical Design "Too weird and it will be dismissed as art, too normal and it will be effortlessly assimilated".

Critical Design can serve to benefit the creation of a design that improves cultural competence within The Netherlands with regards to UM. Whilst no set methodology has been found to achieve a Critical Design, a loose framework has become apparent through the works of J. Bardzell and S. Bardzell. Using the guidelines laid out by them and adhering to the notions developed by the founders of Critical Design Dunne and Raby will increase the likelihood that the product developed will be a Critical Design or at the very least share aspects of a Critical Design. Moreover, if the design is critical it will have a definite effect on society through provocation, causing citizens to reevaluate their everyday lives and ideology, ultimately improving their cultural competence and becoming aware of UM. As such, the inclusion of the previously outlined aspects within Critical Design may not be necessary but will serve to raise the probability that awareness is achieved.

2.5 Review of State of the Art Research

The research conducted provided a knowledge base with which to ground the development of an installation with which to answer the research question. Furthermore, through the exploration of the State of the Art, a concrete understanding subject material surrounding the research question was gained. Finally, each sub-question present in section 1.3 was answered, the conclusions to which are summed up here.

The Chinese Credit Score is likely to ultimately aid the regime in controlling its citizens, and from a western perspective can be seen as oppressive. However, this and the other downsides evident, are balanced through the numerous potential benefits the system will bring forth. Furthermore, without the introduction of the SCS the current issues within the financial system will go on unaddressed and whilst it is unlikely that the introduction of this system will eradicate shadow banking and the other unregulated practices, it will definitely aid in the policing of them. Finally, it addresses a need within the Chinese society, providing access to a large proportion of the public with a means to access financial loans. It is not clear whether the proposed system will have an overtly positive or negative effect on Chinese citizens, but from the current information available it seems that it will serve to enforce Chinese ideologies and address the needs of the citizens.

UM is having the ability to survey something at any moment. The public's opinion on this is not easily defined due to the many external factors that play a role in the formation of this judgment. However, it is clear that being watched alters people's behavior and can cause them to feel stressed, distrustful, and uncomfortable. Contrasting this, UM has become increasingly prevalent due to implementations conveying their surveillance less explicitly. Furthermore, users are very impressionable and as such their opinions on a subject can be shaped by just one implementation within it. This means that it is important for designers to consider the effects of their products as they

could result in altering their user's perception of the entire industry.

Western implementations of UM are less explicit than that of the Zhima credit score, however, they are still evident, examples of which are Facebook and Google. They allow the limited use of their services without divulging personal information but require users to relinquish their data in order to gain access to further beneficial applications. Whilst this does give the user the choice, convenience, and other benefits are added once they give up their data, thus driving them to do so, effectively cornering the user. This is further illustrated through the example of healthcare systems. Doctors could request patients to use a system that employs UM to aid in their treatment, effectively giving the user the choice between personal health and relinquishing their data. The drawbacks of these systems are within the domain of privacy and it could also be argued that they are stripping away the user's autonomy through manipulation giving them the illusion of choice. The benefits are application specific, with each system providing its own benefits such as using Google's location services allowing you track your lost phone or creating a profile on Facebook allowing you to connect with friends across the world.

Critical Design provides a clear motivation to create awareness among the public, advocating the rejection of the status quo and imploring people to critique their current circumstances. It suggests that there is a split between design, with them either falling into affirmative design or Critical Design with the goals of this work falling into the latter. However, with no clear methodological approach or criteria evident, it becomes difficult to create and judge design as being critical. An attempt was made to devise a criterion, but even if this is met there is no guarantee that the result will be a Critical Design. Regardless, an attempt should be made to follow Critical Design philosophy as it will ultimately benefit the installation in generating awareness of UM.

Chapter 3: Ideation

This chapter will convey the process and inspirations used to conceptualize the ideas and how these will be presented in order to answer the research question. This will be grounded in the research conducted in chapter 2.

3.1 Brainstorm

Before an installation could be developed that would meet the requirements of the research question, said requirements needed to be analyzed to ensure a concrete understanding of them was held. This would provide direction throughout the development of the installation and minimize the potential to deviate from the intended goals. To accomplish this, a meeting was held where the client's goals and aspirations were discussed, thus ensuring they fall in line with the research question. The findings of this meeting were not explicitly conclusive, instead, they provided the overall theme the project should embody, leaving room for exploration and artistic license. It was decided that the concept of Critical Design should be represented by the project and as such should follow the research conducted on Critical Design. This means utilizing design as a tool to alter the perceptions of people and speculate about possible futures.

With a concise goal in mind and a clear theme to work with, the ideation phase could commence. In order to generate the best idea possible, a freeform brainstorm was conducted, the results of which are present in figure 1. This allowed every idea to be explored regardless of how realistic it was and as such reduced the limitations of feasibility. It was found that each idea created spurred on the generation of a new idea, either by complimenting certain aspects of it in a different way or by thinking about the idea's opposite. Ultimately the brainstorming allowed the freedom to explore the theme creatively, however, this also meant that a few of the ideas would be difficult or impossible to realize. To combat this issue a review of the ideas was done along with Frank K. and Angelika M. and in this session, the ideas were expanded upon and realized conceptually. Furthermore, the quality of an idea could be judged by their initial reaction to it. Their initial enthusiasm also allowed the ideas to be developed further or to be taken in a completely different direction, thus fortifying and broadening the list of initial ideas. By looking at the brainstorm it is evident that it strays from the traditional structure and adopts a construction in the form of a list. This was done in order to generate the ideas as quickly as possible and to ensure no time is wasted on structure.

Brainstorm results

1. City Score/Uni Score: Collective Score that rates a group rather than the individual -> segregation? Class structure, zones?
2. Game: 2D side scroller, every level is theme within CCS
3. Wearable: color dictates class
4. Virtual World where your avatar has intrusive rating system imposed on it -> VR
5. Smart Home rates how sustainable you are
6. Data Visualization: Shows worth of citizen in each city either average or a spread e.g. GDP
7. Application that allows you to input required details for a score, keeps this private and offers advice on how to improve it, financial advice etc.
8. Continued-> Can anonymously chat with others in your situation/ chat with higher ranking individuals to help improve score
9. Website with goal of improving individuals score/quality of life
Interactive application that walks you through the parameters of a score and then educates you not only on what the future of credit scores might be but how to best meet its criteria
10. LED screen at home that displays a breakdown of your current Score highlighting where you need to improve – Link to an App
11. Corral people into gates based on information the fill out: you fill out information and then a gate opens for you, you are then segregated to interact with only those of your social standing
12. Human sized screen that displays images of people with their score – interaction comes from users inputting their own
13. Browser Extension that collects data on websites visited and information on those websites and then gives the user a score.
14. Wearable that tracks your location and makes inferences based on how much time you spend in each location. If at work for long, then score is increased?
15. Fill information in app, checks using Bluetooth to check who you interact with in your life and then at the end of the day gives you anonymous list of their scores and how it affects your score
16. Trustworthiness: Allow Users to create profile and rate each other's trustworthiness
17. Video showing a future where Western world has an integrated system
18. Decision tree of choices which gradually changes a score -> maybe a web page with basic login then you are prompted with questions
19. Image or recording of person, when interacted with he/she starts speaking loudly and sharing intrusive facts/personal information about themselves (attempt to disrupt the audible area)
20. Airport? Security is a massive concern here, any installation placed here could impactful
21. Webpage that shows conflicting points, benefit and draw backs of a potential system
22. Measure biological data and then broadcasting it, relate it to average/healthy person for reference. Essentially creating Score based on biological signals
23. VR Head that acts as an AI conveying information about users

Figure 1

3.2 Choosing an Idea

After the careful consideration of each idea present and the formation of new ideas inspired by those in figure 1, a decision needed to be made on which to pursue. However, choosing one particular idea proved to be an issue as there were many that were enticing and could realize the desired result. Due to this indecisiveness, the idea was brought forward to host an exhibition displaying a few of these projects rather than focusing completely on one. Furthermore, an exhibition would allow a limitation free environment in which to present projects. Each project within the exhibition would work towards the common goal of the research question, namely generating awareness on UM using the CSCS as an example. Creating an exhibition would be complemented by a discussion allowing individuals to converse and expand their understanding as a collective. As such, it was decided to host both events on the same day and use the work from the exhibition to inspire and enrich the discussion.

To choose the projects that will be displayed, an investigation into the goals and motivations was conducted for the exhibition: Each project within the exhibition should exhibit the overall theme of generating awareness of UM and the principles of Critical Design but should also serve to focus on a particular aspect of the SCS. Focusing on one aspect will present the opportunity for greater impact both individually and as a whole. As long as each project is unified by its overall theme then differences in their focus should serve only to enhance their exploration and depiction of their individual goal. This, in turn, will intensify each project and thus serve to strengthen the overall exhibition. To satisfy this a short list was needed, containing the ideas that would be realized. The following initial ideas were chosen:

3.2.1 Object Recognition

An application capable of facial recognition and tracking those it identifies or a google glass overlay that displays the scores of people it recognizes. It was chosen to bring light to the ease at which machine learning algorithms can be implemented and how efficient object recognition has become for machines. Furthermore, it should relate to China such as conveying the expanding number of CCTV cameras China, a current 170 million across the country, with plans to add a further 400 million by 2020 (Liu, 2018). The hope is that individuals understand the potential for such systems and can relate their potential use in UM. There are benefits and drawbacks to this and the onlooker should be prompted to imagine a crimeless world where at any moment an individual's needs and wants could be identified and met through a simple gesture. In addition, this should be balanced by prompting the individual to then imagine an Orwellian nightmare, being stuck in a dystopia where every aspect of society is controlled and free will has become a pipe dream.

3.2.2 Biologically integrated technology

A chip printed on or implanted in the skin that can be implanted and can recognize other chipped people. It could generate a score with basic information and then update your score based on your interactions with other people and the locations you visit. By creating a product that employs current technologies but in a more convenient and safer way, the onlooker is shown the benefits of a system such as the SCS could have. Furthermore, as the product is theoretical it should not be limited by that which is realizable today, instead, it should include ideas that a grounded in current research and development. By using a smart tattoo as the medium a link is made between the intrusive nature of a SCS generated through the collection of user's data but also serves to make the device perfectly convenient as it can never be left behind, lost, or stolen. With the addition of perfect security, it becomes hard to find a flaw in the product and as such seeks to raise the question 'If the new technology is more convenient and safer, why wouldn't you use it?'. Furthermore, a link should be created between the development of the product and that of previous technologies such as bank cards or mobile phones, as these are both widely accepted technologies that were once met with resistance by the public. The Smart Tattoo seeks to advocate technological development, comparing it to the likes of evolution, but of course, this is a perfect implementation of a product. It is far more likely that the initial launch of such technologies will be flawed to some extent and require development until they work at similar standards to bank cards and mobile phones. As such this product should not only exemplify technological development but also convey the flaws present in current technologies and those yet to be developed. This should be accomplished through the natural contrast between itself and any real product.

3.2.3 Persona's Voices

Dialog of private conversations discussing sensitive information and broadcast this in public areas. Could create a contrast between conversations regarding sensitive information in a theoretically implemented SCS. The idea is to create a window into a world governed by a social credit system, prompting people's imagination through the examples portrayed. Everyone will be affected differently by the implementation of such a system, and through hearing other people's complaints and praises over the system, individuals can be triggered to agree or disagree with the statements being made. Thus, regardless of whether the user actively thinks about how such a score could affect them, they can unconsciously form an opinion about the comments made. This project should coax onlookers into actively thinking about their position in such a system as well as prompting them to think about the benefits and drawbacks they could incur.

3.2.4 Flocking algorithm

Create a miniature ecosystem to visualize current social structures and how these would alter with the addition of the SCS. The focus here should be on the relationships between people and how the

introduction of a rating system which takes social behavior into account will affect these connections between people. As such, although it is a flocking algorithm that will be used, it should be altered to portray human connections, not the patterns of birds flying together. Initial reactions to the algorithm could see an attachment of unfavourability to the SCS due to its potential disruption of social circles. However, upon further consideration, the onlooker should realize it is their own choice and should decide whether status or friendship is more important to them. Furthermore, the onlooker should explore and scrutinize current financial systems and how these influence relationships, comparing it to a SCS and evaluating the extent to which their own friendships would be affected. The goal of this installation seeks to prompt onlookers to question how relationships are formed and maintained both in their current system and in a proposed SCS.

As mentioned these ideas may require simplification, as they were initially conceived with the preconception that they would be a stand-alone project and thus would allow for much more time to be spent on each part. To ensure the project still meets its goals but is realizable meetings were held where the possibilities of each project were discussed. Furthermore, visual inspirations were found and created, aiding in conceptualizing the end goal of each idea.

3.2.1 Inspiration and Exploration
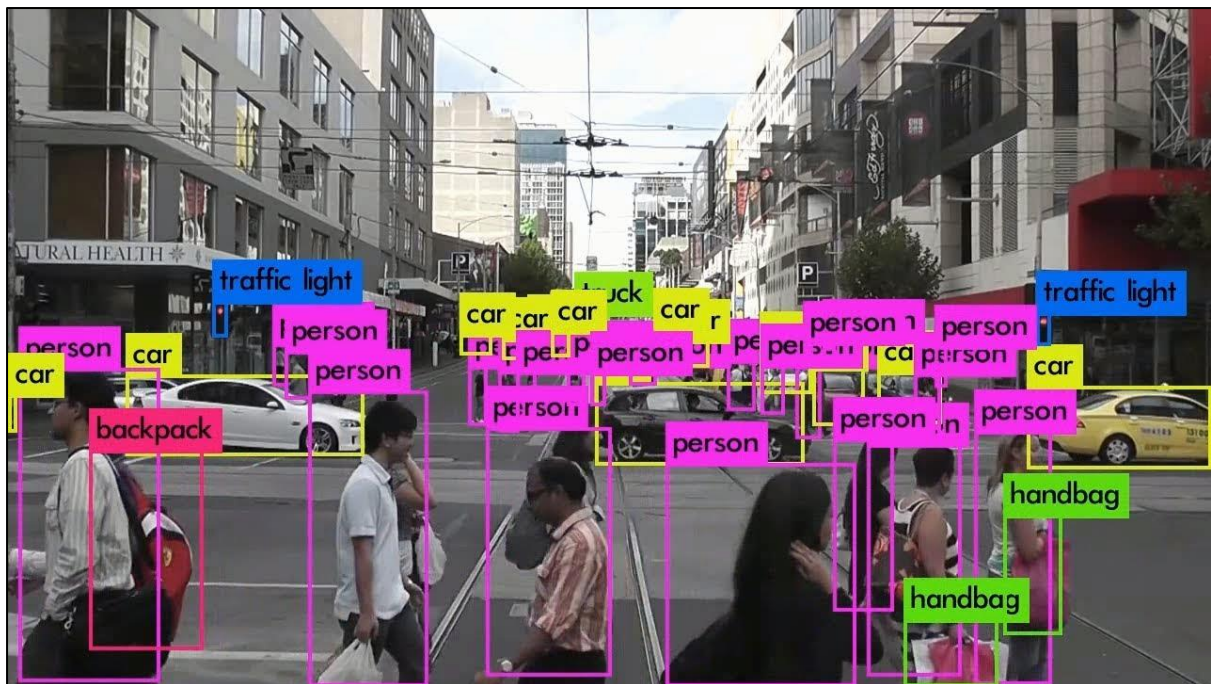
3.2.1.1 Object Recognition:

Figure 2 - Wojciech Mormul (2018)

Figure 2 - Objects that are recognized by the algorithm should be at least people, with further objects being things taken with people as seen here by "backpack" and "handbag". Furthermore, it should

have the capability to recognize street objects such as cars as it is meant to emulate a surveillance camera that would be present on the street.
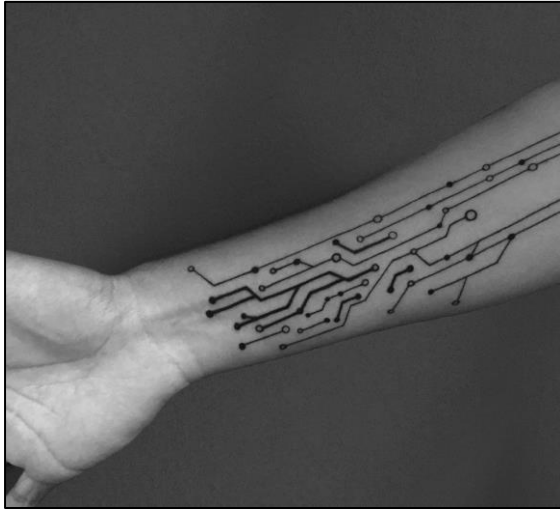
3.2.1.2 Biologically integrated product:
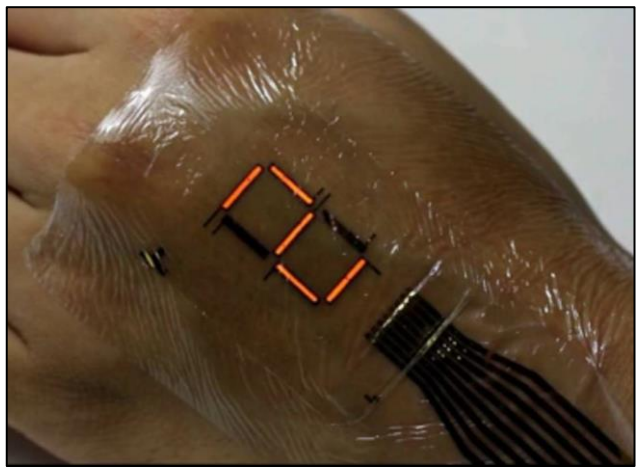

Figure 4 - Pinterest (2018)

Figure 3 - KQED SCIENCE (2018)

Figure 4 - The combinations of circles and straight lines are indicative of circuitry but are also suggestive of a futuristic design and as such should be incorporated in the design of the product. In addition, the circles or nodes convey receptors or connection points and further the emulation of circuitry.

Figure 3 - The wires converging into the center or focus should be used in the design of the product to further link it to circuitry.
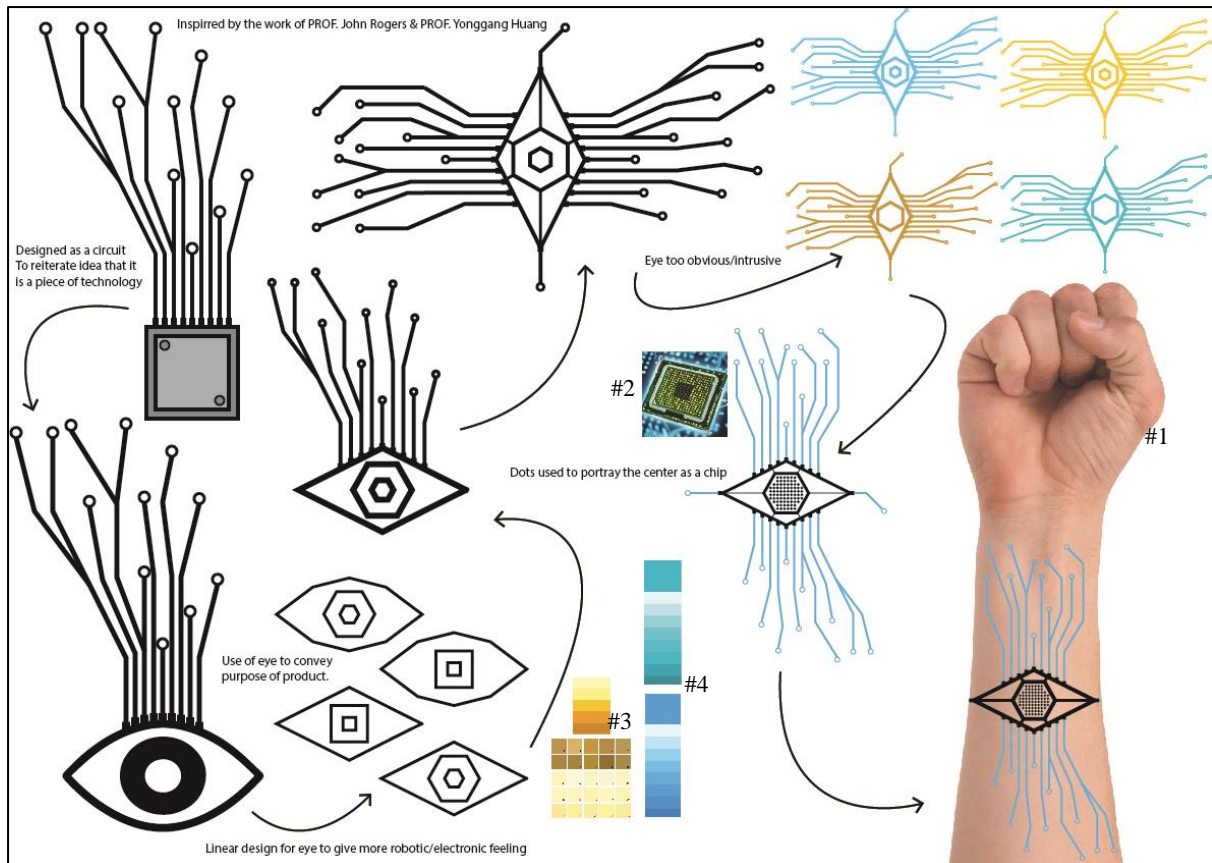
Figure 5 - PurePNG (2018) #1, alphr (2018) #2, House Paint Colors (2018) #3, SparkFlow (2018) #4

Using the inspiration from Figure 3&4 the design page in Figure 5 was created.

3.2.1.3 Audio:

The following (figure 6 & 7) are the ideation pages used to discern how the audio project should be portrayed. Each idea was discussed and explored along with Angelika M., with the idea of using only audio being chosen. Due to time constraints the other projects may not be realizable and additionally, they would add an extra visual element bringing the total to 4, but as stated previously this should be either 3 or 5.

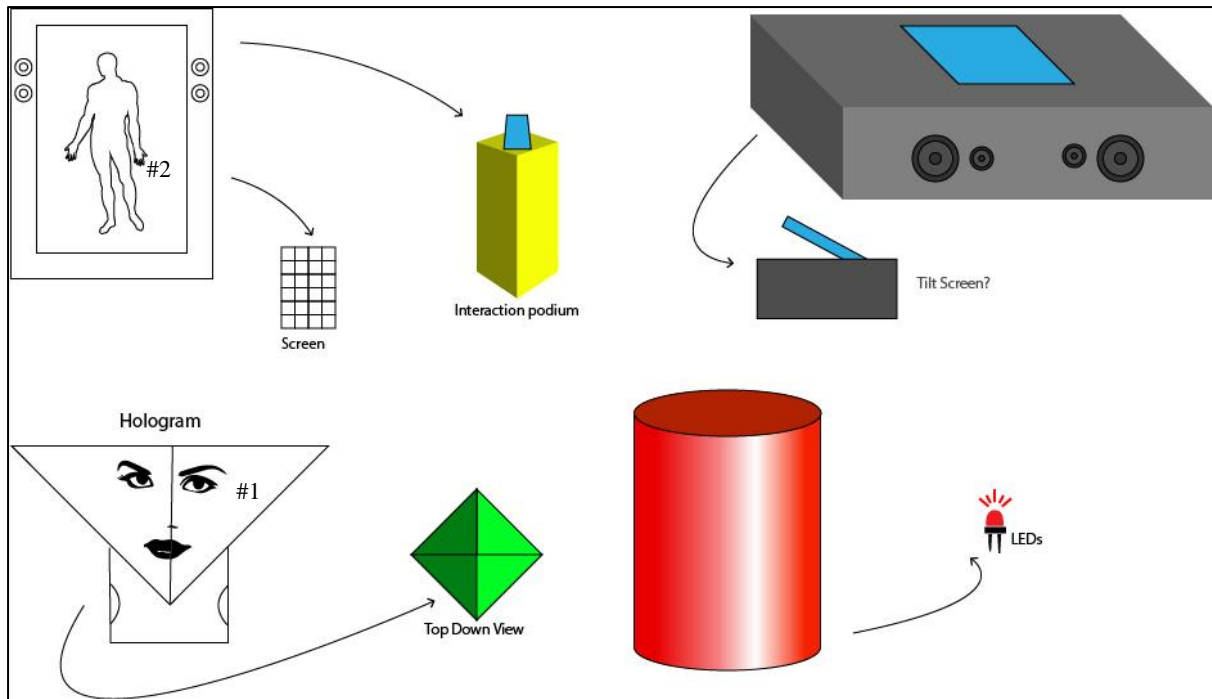*Figure 6 (https://all-free-download.com/) #1, (https://www.flaticon.com/) #2*
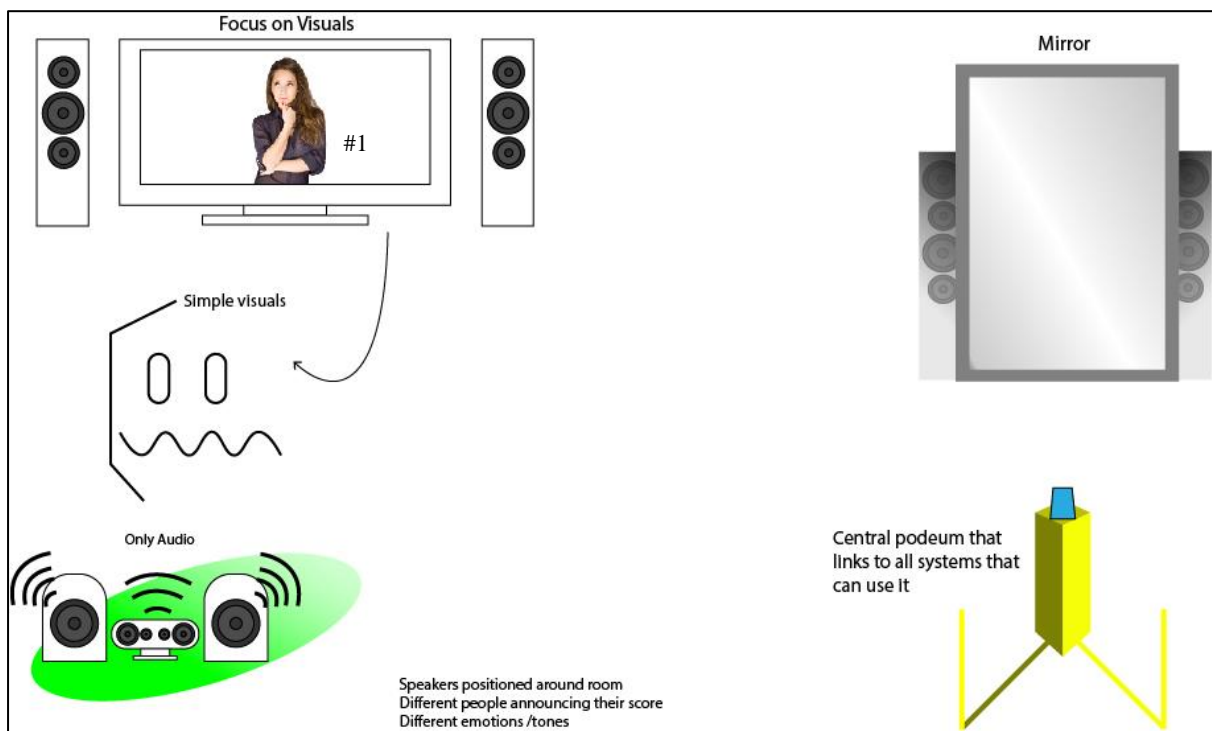

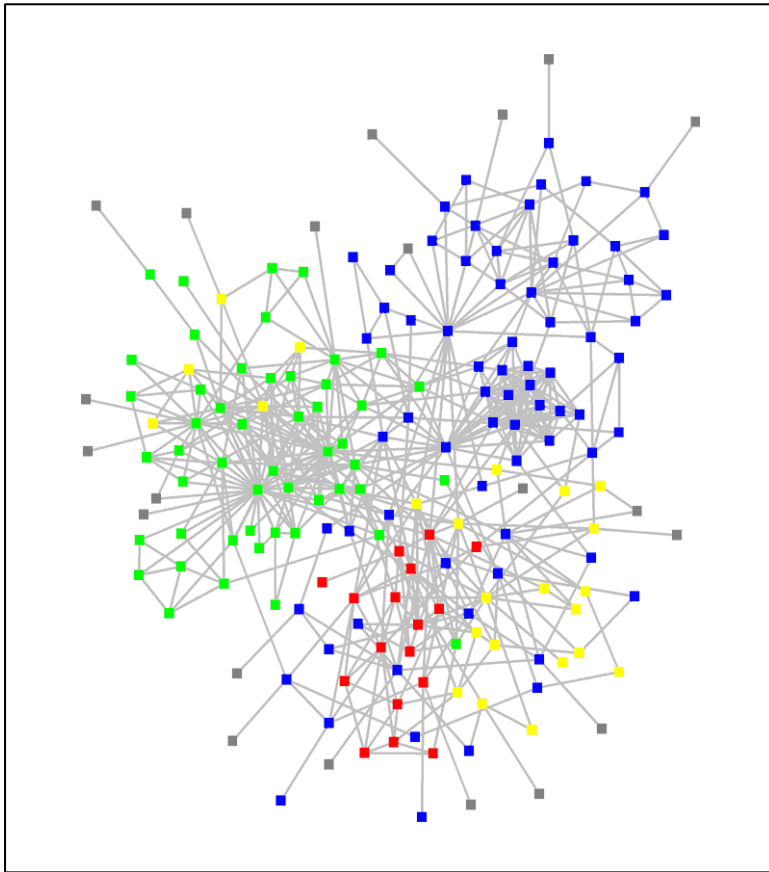*Figure 7 (http://pngimg.com) #1*

3.2.1.4 Flocking Algorithm:

Figure 8 - (Gamasutra, 2018)

Figure 8 - The connection between these nodes is clear through the lines drawn, however, lines should only be present between nodes with similar scores or those with a very strong connection.

Figure 9 - (Ramon, 2018)

Figure 9 - Depicting a flock of birds, this is a real example that the flocking algorithm seeks to emulate. Care should be taken to not imitate the structure depicted above too closely as the goal is to represent the relationships between people, not birds.

Using these inspirations and explorations the previous list of ideas was defined concisely, the results of which are as follows:

- Object Recognition: Perform object recognition on the crowd within the exhibition in real time.
- Smart Tattoo: Design a theoretical product that exemplifies the potential benefits technological developments could hold. The product should be integrated into a persons physiology such as with electronic tattoos.
- Listening to the thoughts of those within the social credit system: Create three personas living within a realized social credit system and convey their thoughts and feelings regarding it through audio
- Flocking Algorithm: Create two flocking algorithms that display the impact of a SCS on relationships between people.

3.3 Generating Interest in the events

To ensure people within The Netherlands visit the exhibition and participate in the discussion, the event needed to be marketed. To do so inspiration was taken from techniques used by companies and other exhibitions to market their own events. This will be derived from previous work experience in the field of marketing, and through the advice of the marketing communications officer for the University of Twente's DesignLab. From this information, it was clear that the issue should be approached through many different mediums in order to maximize the potential reach to the public. This will include a poster, website, Facebook page and personal messages to specific organizations and individuals. Of course, the intended effect is generating awareness, but in addition to this the mediums used need to be encompassed under the theme of the research question and as such need to be linked to the CSCS and UM. The first hurdle to tackle was the creation of a theme which could link all the advertisements together. This meant picking a color scheme, font and design elements such as illustrations that would be kept constant across all mediums.

3.4 Designing an Exhibition

To create a successful exhibition an understanding of how exhibitions are structured was needed. To achieve this, memories from visiting past exhibition will be used as well as refreshing these thoughts by visiting local exhibitions and museums. This will serve as inspiration, facilitating an understanding of the structure, atmosphere, and methods of portrayal used by professional exhibitions and thus allow an extrapolation of these factors to further enhance the exhibition on UM.

The following is an incomplete list of art exhibitions/museums that I have visited in the past. They will serve as inspiration through recollection.

- The Louvre – Paris
- National History Museum – London
- Science Museum – London

Each of these had a notable impact on my perception, expanding my understanding of expression and how experiences shape and influence awareness.

The following are local museums that were visited to refresh understanding and serving as a catalyst to recollect experiences in past museums.

- Museum Twentsewelle – Enschede
- Rijksmuseum Twente - Enschede
- Stedelijk Museum – Amsterdam

Visiting these exhibitions and reminiscing over past visits brought a renewed understanding of art and the importance of exhibitions. It spurred a realization of the parallels between the previously discussed Critical Design and Art. My own understanding of art is that it is a creative work, a form of expression, the manifestation of one's views, hopes and fears. Throughout history art has been a relevant means of declaration and articulation, seeking to alter perceptions by conveying particular ideas. This is not far from the goals of Critical Design which seeks to utilize design to challenge society to evaluate the things they take for granted, imploring them to look for the faults in their current system rather than turning a blind eye. It is clear that these ideals should be retained and expressed within the exhibition. This will be achieved by ensuring the exhibition embodies the same concepts present in the museums previously visited and ensuring that each project designed follows the approach of Critical Design.

3.5 Generating Discussion

The discussion was a goal requested by the client Frank K. and was agreed upon due to it presenting a unique opportunity to test individuals in The Netherlands on their knowledge of the Chinese Credit Score. Additionally, it allowed concepts and thoughts to be explored and through the investigation into these ideas awareness is expanded. Furthermore, by being prompted by other's thoughts users can gain an understanding of new concepts and be prompted into developing their own thoughts further. It was decided in the previously mentioned brainstorm session that the debate will have a loose structure to facilitate the expansion of current understanding and to allow for new proposals to be contemplated and considered by all. That being said, direction was still needed to stimulate discussion and to confine it within the scope of the research question. To provide this, a few topics were devised which would complement the overall theme and be used to steer the discussion where necessary.

Chapter 4: Specification & Realization

In this chapter the requirements that need to be met for the discussion, exhibition and promotion will be conveyed. Additionally, the realized implementation of the each of these aspects is displayed. Each realization is based on the relevant specifications and will be presented in chronological order. Firstly, the Promotional content will be displayed and elaborated upon. Secondly, each project will be conveyed and then thirdly, shown at the exhibition. Finally, notes and ideas from the discussion will be expressed.

4.1 Promotional Content

All promotional content was vindicated through the marketing communications officer for the University of Twente's DesignLab, as well as with an industrial design student, Karim El Ouahabi.

The color scheme was chosen to be shades of red and white as evident in the poster design in APPENDIX A-1. Through the use of color, the audience's attention can be captured. The red was used as it is indicative of China, relating to the main color on their flag and thus would allow the user to easily relate the content to China. Furthermore, red is a dominant color that is naturally eye-catching and as such could aid in the attraction of people's attention. The white is used as it complements the red background with a high contrast, thus giving the onlooker a break from the large amount of red present and steering their attention towards these brighter areas.

The font needed to reflect the content that would be displayed using it. After many considerations, Futura was chosen. The design of the aptly named Futura reflects modernism through its use of geometric proportions and abstinence from serifs or frills. Despite its age, Futura still upholds the appearance of forwardness to this day embodying the ideas of the exhibition and discussion through stressing the importance of looking towards the future. It is for these reasons that it was used as the typeface across the promotional content.

Illustrations are an important factor when attempting to grab the attention of the public. It requires less effort to recognize a well-placed illustration than comprehending text. As such, these elements should be chosen carefully in order to reflect the theme of the exhibition and discussion accurately. Furthermore, through the use of illustrations text can be fortified or even made redundant. Thus, the appropriate use of design can simplify the promotional content and ultimately improve the impact of the advertisements as they will be absorbed quicker and more easily by the onlooker. Three main illustrations were chosen to be representative of the overall theme. The first is the outline of China used as a more obvious link between the events and the country. Notice the yellow stars, these are representative of the flag of China, creating a melding between the flag and the country and as such further emphasizes the link between the content and China. The second is the CCTV camera which

has the obvious link to the subject of surveillance present within UM. Acting as a bridge between the marketing and the exhibition, it is a foreshadowing addition to the overall design. In addition, it allows the user to relate the SCS to an object they know and understand, further cementing it in their minds. The third and final illustration chosen takes the form of the set of icons representative of people and their credit scores. Creating an explicit link to the SCS, the icons portray individuals conducting a range of activities with the hope that at least one of these situations resonates with the onlooker. By attaching a score above all the icons it conveys the purpose of a SCS. Furthermore, if the activities done by these icons echoed activities done by the onlooker they may, in turn, feel the judgment passed on to themselves. This would serve to entice those individuals to explore the SCS more, either seeking to prove the judgment wrong or to understand why they would be judged in such a way.

With the completion of the design theme and poster, the marketing process could commence. The first step to be taken was the creation of the event which was done through Facebook and an event published on the University of Twente's website. These two facets were chosen for two distinct reasons. The use of social media allows the event to be seen by a large number of people and in addition, is easily shared amongst people. It is easily accessible and can leverage social circles to further increase the number of people who are informed about the event. By creating an official event on the Universities website, it is endued with the status and legitimacy of the University. This serves to add professionality to the event and expands its reach to anyone affiliated with the University. Additionally, these two events referenced each other in order to maximize and combine their benefits. Screenshots of the events can be found in APPENDIX A-3 & A-4.

Finally, specific individuals and organizations were contacted and informed about both events, personally. Appealing to people on a direct level resulted in an almost perfect response rate. All who were contacted, bar one, attended either the exhibition, the discussion or both. This is likely due to a combination between the confrontational aspect of such a message and its intimate exclusivity. This letter is displayed in APPENDIX B.
A noteworthy result from this method of contact was the recruitment of Utoday, an independent journalistic medium at the University of Twente. They showed a very high level of interest, opting to cover both events. This would be done in two articles, one prior to the events focusing on an interview, and one after the events which would focus on the realization and interesting aspects experienced by the reporter.

4.2 Individual Projects

4.2.1 Object Recognition

4.2.1.1 Object Recognition Requirements

- Detect people.

  The basic functionality of the project should allow it to detect and locate people when they enter its observable location. The detection of people will have the largest impact on those present in the exhibition and whilst other objects should be detectable, without recognizing people the significance of the project will be lost.

- Convey detection to the user explicitly (such as through a label).

  Those present in the exhibition must be made aware of the detection by the program. This should be immediately evident to the onlooker to generate the best results.

- Run in real time

- Have high enough frames per second that it looks like a video rather than a collection of images

- Displayed on a large screen so it is immediately evident.

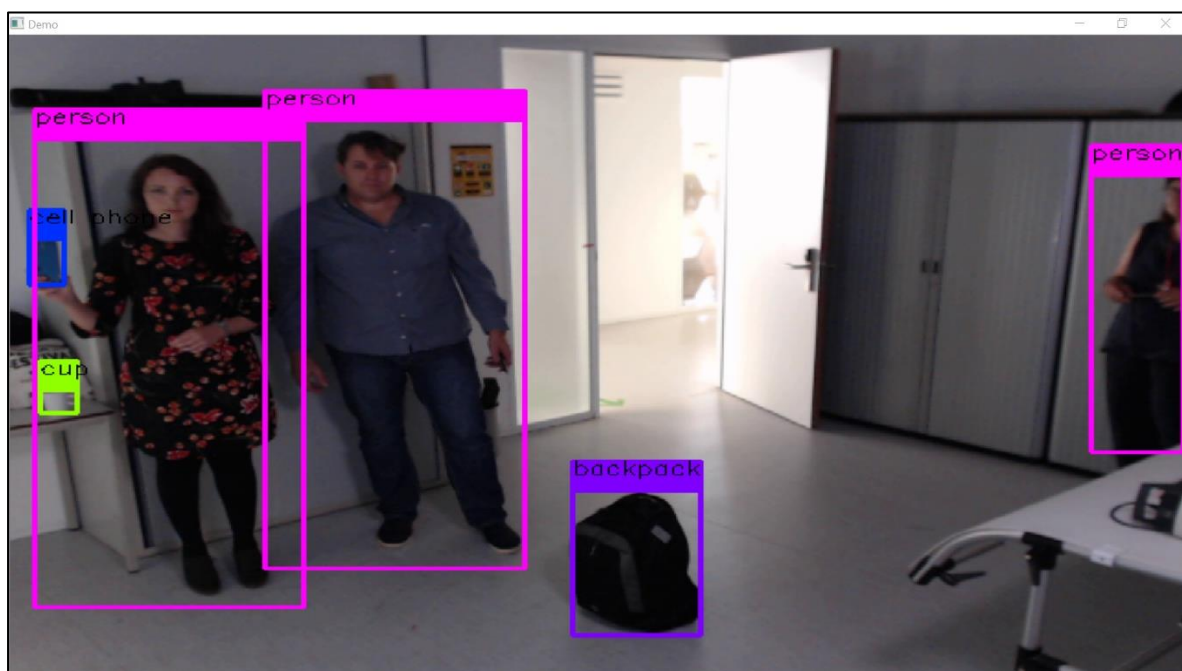#### 4.2.1.2 Object Recognition Realization

Figure 10

As seen in Figure 10 there is a large monitor displaying live video from the exhibition with a machine learning algorithm (a Neural Network) analyzing said video. The algorithm creates labeled bounding boxes around any objects it has recognized. This meant people within the exhibition would see

themselves displayed on the monitor with a box drawn around them labeled as "Person". Furthermore, the algorithm also recognized cell phones, backpacks, and watches to name a few. To accomplish this, the YOLOv3 model was chosen due to its speed and accuracy evident from the graph and table in APPENDIX C-1 & C-2. YOLOv3 works by applying a single neural network to the full image as opposed to other detection systems which apply their model to an image at multiple locations and scales, with high scoring areas becoming detections. The YOLO neural network segments the input into regions, calculating probabilities for each region and attaching a bounding box in the case that this is a significant probability (Redmon, 2018). The coco dataset was used, due to its large size and its accuracy. The GitHub repository containing all the works used for this implementation is referenced in APPENDIX C-3.

Implementation:

To implement YOLOv3 so that it takes the input from the webcam and classifies it in real time the following steps needed to be completed:

- Clone Darknet.

  Darknet is an open source neural network framework written in C and CUDA. YOLOv3 uses Darknet for either central processing unit (CPU) or graphics processor unit (GPU) computation. To install it the git repository was cloned but before it could be compiled its dependencies needed to be installed. This includes Microsoft Visual Studio 2015(MSVS 2015), CUDA 9.1[3], cuDNN 7.0[4] and OpenCV 3.0[5].

- Install a clean version of MSVS 2015

  All other versions of MSVS needed to be removed as multiple versions create an issue when attempting to install CUDA 9.1.

- Install CUDA 9.1.

  This will allow darknet to run using the GPU.

- Install cuDNN 7.0.

  Add windows system variable 'cdnn' with path to cuDNN.

- Build darknet with MSVS 2015.

- Once built, the detector can be run using the command line.

  It is run by accessing the compiled program (darknet.exe) and providing it the necessary parameters such as instructing it to use the coco dataset and YOLOv3 weights.

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[3] A parallel computing platform and programming model that makes using a GPU for general purpose computing possible. (Ebersole, 2018)
[4] A GPU-accelerated deep neural network library.
[5] Built to accelerate the use of machine perception, OpenCV is an open source computer vision and machine learning library. (OpenCV, 2018)

4.2.2 Smart Tattoo (The HUB)

4.2.2.1 Smart Tattoo Requirements

- Exemplify perfect technological development.
- Be without flaws.
- Use conceivable technologies rooted in current developments.

  This will make the product more realistic and as such make it more relatable to the onlookers.

- Be presented in an enticing way.
- Be displayed in a tangible form.

  Creating a tangible portrayal of the product will aid in onlooker's visualization and conceptualization of the product.
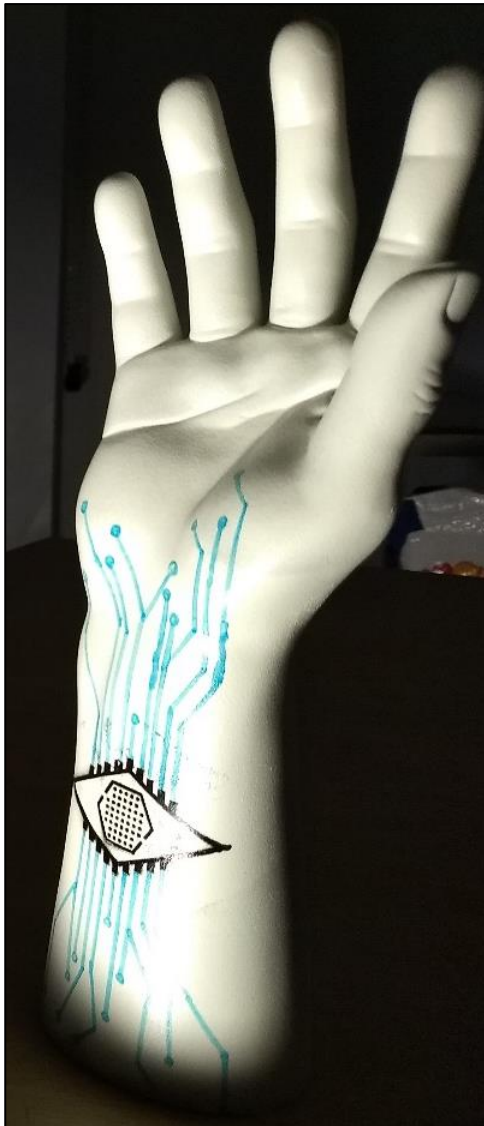
4.2.2.2 Smart Tattoo Realization

Figure 11

THE HUB

By A.I. Incorporated

EVOLUTION THROUGH TECHNOLOGY

#1

What is THE HUB?

The HUB has been designed by our team of experts to be the most convinient product on the market. It functions as your legal identification, your bank card and can interface with thousands of applications.

With our patented SMART TATTOO technology THE HUB is etteched directly onto the user's skin. Don't worry though, the process is painless and takes 2 minutes.

The HUB comes standard with: GPS, NFC, 1 Terabyte of upgradable storage, WIFI, Bluetooth and is powered completely by body heat.

Why THE HUB?

With the most advanced security in the world your data has never been safer.

THE HUB is the new standard. We predict that it will completely eclipse all other payment/identification methods by 2023.

Cross platform integration. Connecting THE HUB to your applications grants you unique benefits such as rentals without deposits, reduced interest rates on loans, special offers/discounts and much much more.

All HUB users are fast tracked and skip all border control in over 72 countries!

THE FUTURE IS NOW

#2

Figure 12 - (Externalizate, 2018) #1, (Ubex AI, 2018) # 2

As seen in figure 11 and 12, the product named the HUB is displayed using a painted model hand and poster designed to be similar to an advertisement. The product took the form of a smart tattoo (circuits printed on to the skin) which function as an all in one product, including aspects such as expandable internal storage, legal identification (replacing passports), access to bank accounts (replacing credit cards and bank cards) and integration with third-party software to allow for further development and integration within society. All this coming together with perfect, impenetrable security, serving to highlight the potential benefits a system such as this has. To conceptualize this, imagine a circuit tattooed on your wrist which when scanned can be used to prove your identity, or used to pay.

Implementation:

The Poster was created using a combination of Adobe's creative suite namely, Illustrator, Photoshop, and InDesign.

The model hand was bought, and the design created using a combination of spray paint and hand painting. The initial idea was to create the 'smart tattoo' using only spray paint, however, due to the delicate nature of the design this was not realizable. The stencil for the design was created using Adobe Illustrator and was then laser cut out of glossy paper which would then be placed around the model hand. This would ensure the realization reflects the design perfectly, with the glossy paper being used as it would not bleed when sprayed. Ultimately, the organic shape of the model hand complicated the procedure and after a few unsuccessful trials, it was decided to do it by hand instead. Of course, this would result in a less accurate representation of the design but would produce a result that would be better than that using only spray paint. The model used to laser cut can be found in APPENDIX D.

4.2.3 Personas

4.2.3.1 Personas Requirements

- Convey three distinct personas.

  Similar to the decision to have three visually presented projects in the exhibition, this was chosen as it creates enough diversity with regards to the opinions conveyed but also will not overwhelm those at the exhibition, allowing them to follow the thoughts of the personas.

- Convey personas within a credit system.

- Be clear and concise audio.

- Use different nationalities for the personas.

  To convey a sense that the score can be implemented anywhere, different accents should be used.

- Not exceed 10 minutes.

  This will ensure that those present in the exhibition hear all the audio.

- Contain 10 lines per persona.

  This will give enough room for the persona to portray their opinions on the SCS and ensure that the lines spoken are explicitly relevant.

- Use three speakers

  One for each persona placed around the exhibition to achieve a 'surround sound' effect.

4.2.3.2 Personas Realization

Dad giving advice to child:

1. I have a score of 770.
2. Everyone in our family has a score above 700, you must work hard to achieve the same.
3. Everything you do is recorded, you must make sure you make the right choices now, so your future is secure.
4. Nobody will take you seriously if you have a low score
5. Stay away from those kids, none of them are over 600, I put you in a private school, so you would make high scoring friends.
6. I have some business partners with influence, I will get you a boost in your score, so you can get an internship this summer.
7. Don't smoke or drink, it will lower your score.
8. You should be thankful, you can choose any career and still have a high score.
9. Only trust people with a high score.
10. If you have a high score you'll have a happy life.

Lady who hates the Chinese Credit Score and blames it for her misfortune:

1. I have a score of 410.
2. I have worked hard my whole life but apparently that doesn't matter.
3. I used to have a better life before the S.C.S..
4. Many of my friends stopped talking to me because of my low score.
5. If I can meet some high-ranking people maybe I can improve my score.
6. It's probably too late for me now, I've already been branded a failure.
7. If I don't do what the government wants, then my score will just get worse.
8. I feel like I'm being watched constantly.
9. I want to leave this all behind and start anew.
10. I want to get out of the system!

Government Official/Score Engineer (advocate of the score system):

1. I have a score of 900.
2. I have a high score because I worked on the implementation and maintenance of the algorithms used in the social credit system.
3. The system uses information the government already had, just in a new, coercive way.
4. Before the score was implemented my family had no way to get loans.
5. My brother was able to start a new company with a loan he got thanks to the Social Credit. Score.
6. The Credit Score gives everyone direction, if they want to improve themselves they know exactly how to.
7. Without the Credit Score, more than half the population would be left with no way to prove their financial worth.
8. It benefits the rich and the poor.
9. Thanks to the S.C.S. we know exactly who to trust.
10. The country is safer and more united than ever.

Figure 13

Three personas were created, each living within an imagined reality of a SCS and conveying their point of view through a pre-recorded monolog that is played on repeat in the exhibition. In order to create a realistic portrayal of the possible thoughts and ideals present within each persona, a day in their life was imagined, conceptually living a day in their lives allowed the formation of the script present in figure 13.

The first was a father instructing his child on how to lead their lives. The motivation behind this is that once a SCS has taken full effect and been accepted by society teachings and upbringing would need to be altered to suit this. Much in the same way that with the introduction of the internet a new form of privacy and protection had to be taught to the generation growing up with it.

The second was a woman who prior to the implementation of the SCS had a satisfactory life but through unfortunate circumstances has fallen into the lower brackets of society. She blames the introduction of the score for her misgivings regardless of their true source. There is likely to be backlash with the implementation of such a system and many people look for something or someone else to blame for their own shortcomings and failures. The SCS would inevitably be targeted by such people and those whose lives have genuinely been negatively impacted by its implementation.

The third and final persona conveys the thoughts of an engineer who worked on the creation of the SCS and currently maintains it. From his insights, he has gained an edge over the rest of society when it comes to ensuring he has a high score. He praises the score, highlighting the positive impacts it has but also nudges at the potential for corruption present.

Implementation:

Three speakers of different nationalities were recruited and consisted of two males and three friends. They were selected carefully, judging them based on how well they reflected the characters they would portray and once selected were informed about the details of the project and that their voice would be broadcasted during the exhibition. The recording was done separately but in the same room using the same equipment in order to assure a consistent volume and tone of voice. Each person was asked to read the script and then given extra details about the current state of the world they should imagine themselves in, to aid in developing a realistic portrayal of their character. It is usual practice to devise a complete persona highlighting fine details and nuances about the individual in order to better portray their ideals and character. However, the individuals chosen were not voice actors and as such, it was decided to allow them to shape the character they are portraying. This would ensure a more natural and motivated performance would be exhibited and was aided by the typecasting.

These recordings were edited using Reaper. Firstly, the background noise was removed by creating a noise profile and then this was subtracted from the tracks leaving only the voice behind. Following this, the recordings were arranged so that they would play with increasing frequency to accommodate for initial explanations/discussions and to create an increasing sense of urgency or disruption. This was done to ensure the audience pays attention to the voices.

4.2.4 Flocking Algorithm

4.2.4.1 Flocking Algorithm Requirements

- Use a flocking algorithm.
- Contain two versions, a regular version, and a score based one.
- Be interactable.
- Allow the user to switch between the two versions easily.
  Switching between the two states should be clearly evident to the user.
- Visually convey the different scores of each 'person'.
  The exact score each person has is less important than the user understanding the difference between two people scores and understanding how this affects their relationship.
- Be displayed on a large screen
  This will ensure it is visually impactful.

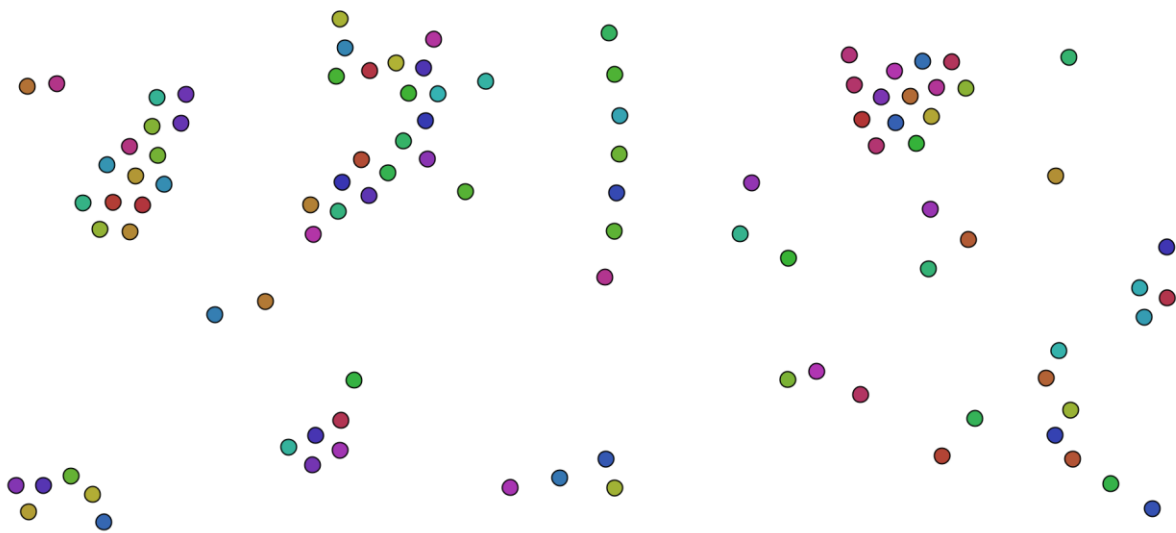### 4.2.4.2 Flocking Algorithm Realization

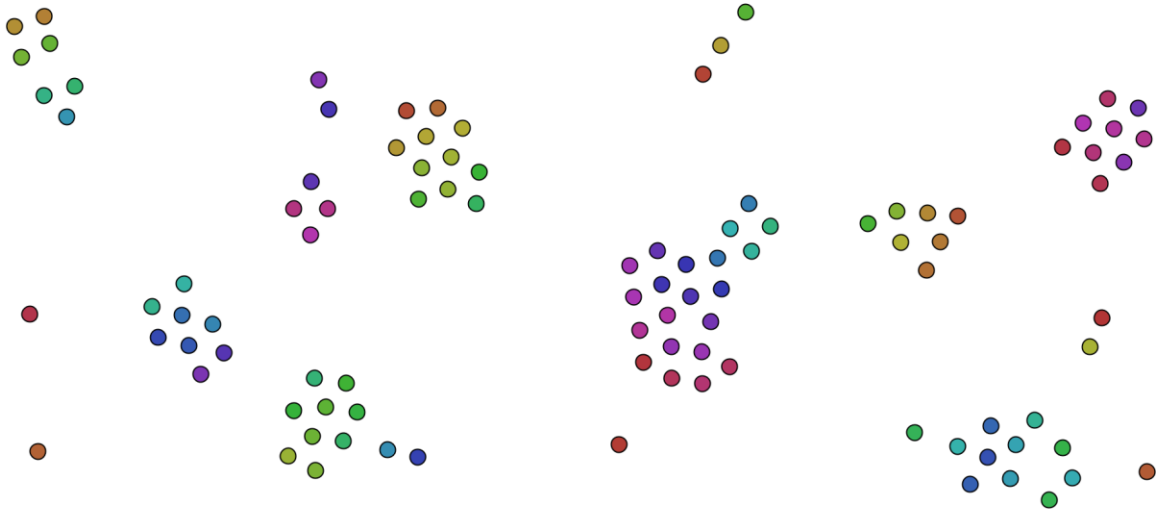*Figure 14*

With Social Credit Score

Figure 15

As seen in figure 14 and 15 the flocking algorithm is a visual program that consists of circular objects (representing people) acting and reacting to one another through the application of forces. The flocking algorithm was altered to accommodate a SCS which is conveyed through their varying color and follows the HSB[6] color model. This program was displayed on a wall by a projector and allowed the user to alternate between an implementation without the credit score (figure 14) and one with a credit score enabled (figure 15). When regular flocking was enabled the user would see the circles interact with each other and flock together regardless of their color, however, when the credit score was activated they would rearrange themselves into interacting with scores similar to their own. Higher scored circles would reject lower scored circles from getting too close and thus form smaller clusters until they eventually found a stable pairing reminiscent of a sorting algorithm, forming a spectrum of scores (or colors).

Implementation:

The program was created using processing 3.3.7, the code for which can be found in APPENDIX E. It features functions which generate forces once specific conditions are met, which in turn make up the movement and interaction between the circles.

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[6] This stands for Hue, Saturation and Brightness, with the Hue effecting the colour.

4.3 The Overall Exhibition

4.3.1 Exhibition Requirements

- Contain 3 or 5 visual projects.

  The client decided this and was based on the principle of odd numbers, adding visual appeal, and capturing the onlooker's gaze.

- Exhibit the theme of Critical Design.

- Bring awareness to UM.

- Be rooted in the CSCS.

- Be accessible to anyone within The Netherlands.

- Be grounded within the methodology developed in section 2.4, i.e. Critical Design

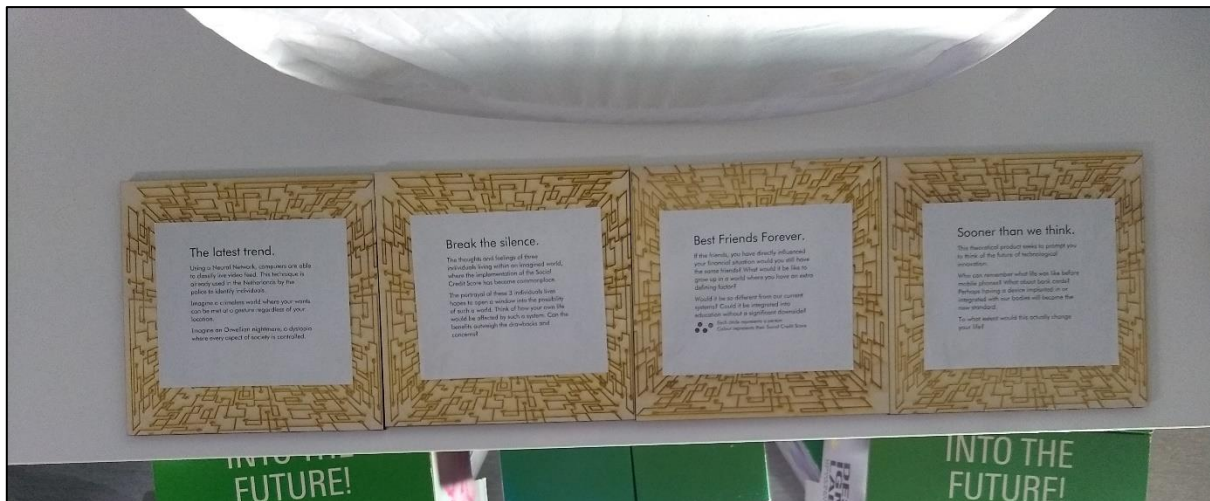## 4.3.2 Exhibition Realization

Figure 16

Figure 17

Figure 18

This was a public exhibition situated on the campus of The University of Twente, within the DesignLab. All the previously mentioned projects were displayed, as well as the audio being played on a loop. Furthermore, I was constantly present at the exhibition to answer questions and discuss any relevant topics with the participants. I also gave explanations to those who wanted extra information about the process and thoughts behind the projects. Participants were asked to complete a questionnaire upon completion of their visit which can be found in APPENDIX F-1.

As evident in figure 17, plaques were created to accompany the projects. This was done to prompt users, suggesting concepts to consider as well as acting as an explanation to some of the projects. The plaques were made using a laser cutter, the design for which and content exhibited is shown in APPENDIX G.

4.3 Discussion

4.3.1 Discussion Requirements

- Facilitate the discussion between all present.
- Expand the views of individuals present.
- Cover the CSCS.
- Cover a theoretical implementation within The Netherlands.
- Cover the difference between our current state and our future state.
- Allow the formation of the new discussion points by those present.
  Although the discussion will be steered to stay within the lines of the research question, the exploration of ideas should be encouraged, and the discussion allowed to evolve to accommodate these new ideas.
- Promote the opportunity to voice individuals concerns and ideas.
  Some people may dominate the conversation, overpowering less overt individual's opinions and thoughts. This should be regulated to ensure everyone has the room to voice their thoughts.
- Give individuals a safe place to voice their opinions.
  This means no recordings will be made despite the benefits they would hold.

5.3.2 Discussion Realization

Following the exhibition, an open debate/discussion was hosted with a total of 12 participants. Interested individuals were invited to converse about the topic of UM in a loosely structured format. The discussion began with an opening by Frank K. which can be found in APPENDIX H and had the effect of creating the appropriate atmosphere to facilitate relevant discussion. Following this, a presentation was given on the exhibition outlining the projects and themes present. This was done to prompt the group and give them a baseline on which to base their thoughts on the discussion. The exchange that followed focused on the current Chinese Credit Score and then evolved into a deliberation of how such a score would be implemented within The Netherlands and which inherent issues we should be wary of. The following is an expansion on a few points that were discussed.

The issue of unequal distribution of technology and power which leads to abuse and corruption: Historically, corruption has been a constant factor in societies, with many people being lead through temptation into breaking rules and abusing their power. Current society is no different and one would

be hard-pressed to find a country where there is no corruption present. By creating new systems without addressing current corruption we are essentially building upon weak foundations. Unless the system explicitly targets the eradication of corruption it seems inevitable that it will fall into the same patterns. Current corruption can be attributed in part to a lack of equality, as this gives individuals with more power the opportunity to exploit those in weaker positions. These ideas raise questions such as: Should development be put on hold until current issues are resolved?

The possibility that all the information required for a SCS in the west is already known it just isn't held by a central body: Considering the power of Governments, large businesses such as Google, and considering current technological progress, it seems nigh impossible to dismiss the possibility that all our sensitive information has already been curated. In this digital age, people produce far more data about themselves than ever before and many are ignorant of how easily this information can be collected and correlated. Think of the internet, used daily by billions, what if your government has required all internet providers to constantly monitor all activity. You might assume that somebody would have spoken up about such an issue but when you consider cases like that of Edward Snowden, one can see that the repercussions for going against a government's wishes can be severe. Furthermore, technologies exist to control the internet, an example of which is in China where online content is filtered to cut off exposure to certain topics and limit any threats to the regime.

A SCS could result in people working for the commonality of society and would be rewarded based on their contributions to the collective rather than their individual progress: A social credit system implemented by a Government would create an archetype for the perfect citizen and urge individuals to become as close to this as possible through incentives. It can be argued that a government would have an ethical motivation to meet the needs and address the concerns of its citizens. However, using the history of civilizations as an example it becomes evident that development is also an important goal of Governments. As such it can be argued that if an archetype for a perfect citizen were to be created by a government it is likely that it would be an individual that works towards the betterment of the entire country over the betterment of their own situation. This could be seen as a positive goal for citizens to work towards but begins to follow the lines of authoritarianism and could easily see individuals lose their freedom of choice.

The discussion of these subjects and more created a realization of the scope of such an issue and just how many ethical ramifications it comes with. Unfortunately, it is not feasible to explore all of these topics. One important takeaway from this discussion worth mentioning was that the world is changing whether people like it or not and technology has become a part of this development, shaping humans as humans shape it. Due to this, it is important that the Western world thoroughly investigates the effects of these developments prior to their implementation in order to minimize the potential for

catastrophe and allow us to shape the world of tomorrow rather than have it shaped for us. Finally, creating awareness of the Chinese system has the potential to polarize citizens of The Netherlands and if enough people support either side of these ideals, it could result in the restructure societal norms. Thus, it becomes more important to allow citizens to frame the situation autonomously without corralling them into a certain standpoint. In this respect Critical Design becomes increasingly important, steering society away from the current spoon-fed methodologies and opening new realms that encourage the populous to challenge taught truths instead of blindly accepting them.

Chapter 5: Evaluation

The following chapter will evaluate the previous chapter, providing an insight into their effectiveness, how well they met the requirements present in chapter 4 and whether they answered the research question.

5.1 Promotion

No concrete tally was taken to measure the number of people who visited the exhibition, as there were moments when large groups arrived and times when a discussion consumed my attention and as such no definitive number of participants can be conveyed. However, from the Facebook event, evident in APPENDIX A-3, it is clear that 146 people were interested in the event and by an incomplete tally the number of people present was over 50 but is estimated to be under 70. This was over the course of one day from 12:45 PM – 19:00 PM and can be considered a success when the scale of the project is taken into account. Whilst 146 people were definitely reached, there may have been more people reached who simply did not indicate this on Facebook which is supported by the questionnaire conducted as seen in APPENDIX F-1. The results show that out of the 20 participants who were given the questionnaire 9 were informed via Facebook, 4 via an invitational letter, 3 via word of mouth, 3 via Utoday, 1 via the poster and 0 via the University's website. It is clear from this that social media had the biggest impact on generating interest in the event. In an attempt to ensure the validity of the results gathered every second person was asked to fill out the questionnaire but as mentioned previously, there were times when this was not possible due to circumstances that arose. Furthermore, it should be mentioned that the University website was uploaded later than intended due to organizational faults within the team in charge of accepting and uploading online pages for the University of Twente. This may have skewed the results presented, and whilst many may have seen the page it is likely the case that they were already informed of the events details.

To improve results the promotional content could be tested with a focus group before being released. This would ensure the correct effect is presented and could further increase the effectiveness of the marketing material. In addition, the website was only uploaded 4 days prior to the event and as such did not have sufficient time to affect its target audience. To remedy this, organizational failures should be taken into account, giving at least a 1-week buffer in order for them to complete the task necessary. Finally, it is worth mentioning that the space used was not easy to locate. Whilst the DesignLab is well known and easily found, once present within the building it was not clearly indicated where the location of the exhibition was. This is in part a failure on behalf of the team in charge of uploading digital images to the televisions displayed in the main lobby of the DesignLab. However, with further forethought, this could have been accounted for and physical signs created and placed to direct the audience. Simple paper printouts were created and placed in relevant places but only halfway through

the event. This could have resulted in people being unable to find the exhibition and inevitably leaving without experiencing it. Finally, if a more public area was chosen to host the exhibition such as within the city center, this would have increased the number of attendees beyond those reached by the promotional material. Interested onlookers and individuals passing by could be attracted to the exhibition regardless of their knowledge of the event. To accommodate these potential participants the event would need to incorporate the Dutch language into the installations or at the very least Dutch explanations for the English content. Whilst many individuals within The Netherlands are fluent or confident in the English language, this is not true for the entire population and as such those individuals would need to be catered to.

5.2 Exhibition

To measure the extent to which individuals awareness was increased a questionnaire was given to 20 participants. This format was chosen due to the concept of awareness being qualitative rather than quantitative. To formulate a definitive result from these questionnaires a 5-point scale was used for two questions as evident in APPENDIX F-1. The participants were asked to specify their level of awareness on UM before and after the exhibition, a technique that was inspired by a Likert Scale but differs from it as it does not present the participant with a statement, rather asks them a question. This was done in an attempt to remove bias results from loaded questions that could arise from the use of a Likert Scale, such as 'To what extent do you agree with this statement: The exhibition raised your awareness on UM'. This would be presented with a scale between strong disagreement and strong agreement, as such giving the participant the perception of a fair choice. However, this question contains an assumption that the exhibition raised the participant's awareness, thus creating a predisposition to agree with the statement regardless of the option to disagree being present. This could have been countered by creating three questionnaires one suggesting a raised awareness, another suggesting no effect on awareness and the final questionnaire suggesting a lowered awareness. However, it is far easier to collect results using the method seen in APPENDIX F-1 and as there was no guaranteed number of participants the method used would be more likely to collect a statistically relevant number of results. Using the results in APPENDIX F-2, a confidence interval was calculated at a 90% confidence level, the following information is relevant for this calculation (note that the table labelled 'before' is the results to the first question, inquiring about the user's awareness before the exhibition, and the table labelled 'after' is the second question, inquiring about the user's awareness after the exhibition):

Degrees of freedom	= 19
Confidence level	= 90%
alpha = (1-0.9)/2	= 0.05
t table value	= 1.729
Standard Error Before	= 0.254
Standard Error After	= 0.170

$1.729 * 0.254 = \pm 0.439$ (confidence interval for before.)

$1.729 * 0.170 = \pm 0.294$ (confidence interval for after.)

Highest awareness for before = 2.850+0.439 = 3.289
Lowest awareness for after = 4.050-0.294 = 3.756

Using this information, it can be said with a confidence level of 90% that the average attendee of the exhibition will always have a greater level of awareness on UM after their attendance. This is because it can be said that 90% of the time the sample mean for the participant's awareness before attending the exhibition is be 2.85 ± 0.439 (57% $\pm$ 8.79%), and the sample mean after will be 4.050 ± 0.294 (81% $\pm$ 5.88%). Thus, the mean awareness after the exhibition should be higher than the mean awareness before the exhibition at least 90% of the time. Furthermore, 14 out of 20 participants saw an increase in their awareness, with the awareness of the other 6 remaining the same. This means 70% of the tested individuals had an increase in their awareness of UM with the average increase of 1.2 or 24%. This result was aided by embodying the philosophy of Critical Design, using the devised methodology to ensure the exhibition as a whole and each individual product generated awareness. Furthermore, the understanding gained from the rest of the State of the Art Research ensured that the created works were grounded in factual evidence. Finally, the use of an exhibition facilitated the generation of awareness by removing any potential inhibiting factors and allowing a freedom to explore and design projects regardless of the projects defining attributes.

Whilst it can be definitively said that the exhibition raised the awareness of the attendees, extrapolating this to the whole of The Netherlands poses an issue. The vast majority of individuals present were affiliated with the University in some way, an expected result when the means of promotion are considered. The University of Twente is not representative of the entire country and as such, it becomes problematic to extend the previous results to the entire country. Furthermore, due to the location of the exhibition, it is likely that those who attended were motivated to do so either by an interest in the subject or otherwise. This is evident from the results gathered, with only 10% of participants having no awareness with regards to UM prior to the exhibition. This could result in the attendees being predisposed to accept the new information and it is conceivable that if they had not seen the promotional content the results of the questionnaire could differ. Additionally, increasing the sample size would generate results further representative of the demographic and the relevant questions could be asked before and after visiting the exhibition respectively to further increase the validity of results. Finally, the method by which they are tested could be improved by making the questionnaire more elaborate. For example, a multiple-choice examination could be devised to test an individual's awareness on UM, asking relevant questions to the topic both before and after the installation has been visited to ascertain the exact level of awareness they have.

5.2.1 Object Recognition

The effect on the participants was clear, allowing attendees to understand the current capabilities of computers and imploring them to think of what could be realizable both currently and in the future. The requirements set in the Specification chapter were definitely met, but without the accompanying plaque, users may fail to see the benefits such a system could have. This project spurred discussion in everyone that saw it, with initial reactions usually showing surprise or fear but later turning into intrigue, with attendees pulling out different objects to see what it can recognize and moving erratically in order to test its tracking and frame rate. The only downside of this project was that it was easily framed as negative, with users fearing being watched, and only until the accompanying plaque was read did they fully understand the potential benefits.

5.2.2 Smart Tattoo

The positivity evident in this implementation was described by a few participants as "eye-opening", and it seemed that it was a tipping point in creating an objective balance. It was noticed that attendees often immediately understood the drawbacks in a SCS but required further help to see the benefits such a system could exhibit. These benefits were clearly evident in this project, serving to give balance to any overtly negative opinions and as a result of this and the project meeting its requirements, it can be thought of as a success. Furthermore, the product being designed as a tattoo aided in making it intrusive, as it would be a permanent addition to the host's body and be with them at every moment for the rest of their lives. By allowing attendees to see the benefit in a product that is arguably more intrusive than any product developed thus far, they are more likely to be able to see the benefits in other intrusive products they might have otherwise dismissed as being completely negative.

5.2.3 Personas

Whilst everything ran smoothly with the development of the audio tracks, issues with the hardware used inhibited this project from meeting the requirements set. The first issue that occurred was one of the three speakers not working correctly on the day of the exhibition, it was tested the day prior to the exhibition but unfortunately was not working when it was required. This meant the backup audio track, with all three audio files combined into one, needed to be used. This removed the intended effect of surround sound and as such failed to meet this requirement. Additionally, the media player used would not play this culminated track correctly, occasionally skipping parts of the track for some or other reason. An attempt was made to correct this but due to the issue only appearing on the day the root cause could not be discovered. For the most part, the track played correctly, and it was not actively noticed by those present in the exhibition due to their unfamiliarity with the audio. All other requirements were met but due to these two issues it cannot be called a success, rather it was passable. Further, the intended effect this project was conveyed to the audience and successfully aided in

creating an atmosphere reminiscent of a world where a SCS is commonplace. This was achieved through the understanding gained from hearing distinct opinions about a SCS's implementation.

5.2.4 Flocking

All requirements were met, and the program ran perfectly as intended. The only issue that occurred on the day was that the VGA to HDMI converter would not work and only displayed a blue screen, however, this was planned for and another laptop that had a VGA port was brought as back up. No case was made to house the mouse and as such, the design could be viewed as less appealing or not conforming to the theme of the exhibition. Users understood the effect of the application and were able to intuitively interact with the application. A sticker was attached to the mouse instructing users to interact with it by clicking, however, at some point, this sticker was either removed or fell off. As such the participants were observed and guided if needed, but for the most part participants naturally figured out the interaction independently. The intended effect of the project was reached, allowing onlookers to understand the potential influence a SCS could have on their relationships. This, in turn, resulted in them scrutinizing their current systems effect on relationships, creating an awareness of separation caused by current class structures.

5.3 Discussion

No metric of measurement was used to assess the effectiveness of the discussion, however, from the content discussed it is clear that most involved had a high level of understanding with regards to UM. Even those unsure about the subject, in the beginning, progressed greatly, raising interesting concerns and benefits, and prompting the exploration of new sub-topics within UM. The scale of the discussion was small, with only 12 participants, however, this did not subtract from the content discussed. Quite the opposite, if a larger group were present it would become difficult to allow each individual the required time to voice their thoughts and for others to rebuttal them effectively. This back and forth between participants allowed them to build on each other's knowledge, effectively endowing each participant with a mean knowledge. This suggests that smaller groups should be kept, and in the case of scaling the project up, multiple groups should be used rather than one large group. Additionally, the use of the exhibition as a prompt served to focus the conversation and provide a clear base with which to build a discussion on and further served to allow for reference material when making a point. A clear drawback of the discussion is that it was not recorded. The motivation behind this is concise, however, there are other ways to ensure the anonymity of those involved, such as using a scribe to take down the entire conversation without any mention of identity. Finally, a similar metric as that discussed in the previous section could be used in order to evaluate the benefits a discussion has on raising awareness effectively and concretely.

Chapter 6: Ethical Ramifications and Motivation

This chapter will focus on the ethical factors present in the previously outlined work. Seeking to evaluate whether this project is ethically justified.

6.1 Privacy and Surveillance

An ethical issue with an intrusive system such as a SCS is rooted within the topics of privacy and surveillance. UM relies on the culmination of data from its client base, and due to its input being the user's sensitive information, the ethics of privacy and surveillance should be explored. The following section will seek to further motivate the importance of raising awareness of UM. Beginning with the defining factors of these topics, David Lyon's definition of surveillance is "any collection and processing of personal data, whether identifiable or not, for the purposes of influencing or managing those whose data have been garnered." and is clear that this is a theme within UM. The surveillance of the public has many ethical implications, one of which is the public's privacy, but the definition of privacy is a debated topic and "it is likely the case that any definition of a right to privacy will not satisfy everyone" (Moore, 2008). However, through the works of K. Macnish (2001) an understanding of the scope of privacy can be obtained. He depicts privacy as a moral right but not an absolute right, the distinction being that the latter "holds in all times and in all places" and the former "can be outweighed by competing considerations". It might be relevant to look at both countries views on privacy and is likely that a dichotomy will form based on each societies cultures and beliefs (Doyle, 2009), but due to the focus of research being within The Netherlands, an emphasis will be placed on western concepts and understandings.

Collecting data on the public is already commonplace in the Western world with organizations such as Google and Facebook containing a large amount of user data. This is accepted as it is sanctioned by the user, but an ethical concern is raised when one considers that people may not understand the repercussions of giving these organizations full control over their data. Is it ethically sound to make use of a person's data in a way that they were/are ignorant of? Consider the terms and conditions that are largely commonplace in today's applications, where legal jargon combined with extensive bodies of text and an easily selected 'I agree' checkbox, coerce users into blindly accepting an extensive document without any concrete idea of what they have agreed to. This is just one example that illustrates how consumers are manipulated into relinquishing their data. A new legislation from the European Union (EU) has attempted to regulate this collection and processing of data, returning the power to the public within the EU (European Commission, 2018). This highlights the importance of

the Western world places on privacy and essentially returns the power of regulating personal data back into the consumer's hands. However, it has not altered the way in which companies retrieve data, merely allowing users more control over the data that they have already given out and will give out in the future. Therefore, there is still the question: Is it the company's responsibility to ensure transparency with regards to what data they collect and how it will be used or is the user's privacy their own responsibility? Either way, it seems the public must be made aware of UM before it is too late. If the EU was more proactive, meeting technologies development at the same pace, the damages that caused them to create the new legislation would have been avoided.

K. Macnish explores a similar line of questioning where he investigates the ethics of surveillance, entertaining the idea of 'sousveillance' which in this case would be the users monitoring the companies. He highlights potential issues it can have and concludes that the unempowered monitoring the empowered is not always justified (Macnish, 2017). This could suggest that whether it is the business or the consumer, granting them the unfiltered access to sensitive information is morally ambiguous, likely due to it granting the surveyor power of the individual surveyed. Knowledge is often related to power, and it can be said that gaining knowledge on an individual's private activities would provide you a certain amount of power over them, the more sensitive or private the activities the larger the power gained. If the link between power and knowledge is assumed to be true then it can be extrapolated that those who are given access to this knowledge must be carefully chosen as "power tends to corrupt, and absolute power corrupts absolutely." (John Emerich Edward Dalberg, 2018). This falls in line with a point formed in the previously mentioned discussion: a user will give access to their data to a central body only if they trust said body. For example, the government of The Netherlands requires individuals to provide sensitive information in order to validate a DigID but I myself did not think twice about how safe my data would be, I assumed that the government of The Netherlands would not abuse the information I had provided them with and as a result of giving them my information I gained access to a tool which added convenience to my life.

Through Doyle's Privacy and Perfect Voyeurism (2009), further emphasis is placed on the importance of proactive thinking with regards to these new potential developments. He argues that perfect voyeurism does not harm and as such cannot be wrong. In addition, "the perfect voyeur has no obligation to forbear from peeping, and his victim has no right to be free of the breach, has no right to privacy in this context." as such if the Western world were to learn from China's implementation of a SCS, altering it to ensure that it did no wrong then, by Doyle's definition, it would be perfect voyeurism and thus would remove all privacy concerns with the system. This is, of course, easier said than done but can be used as motivation in order to create the best possible system for the public. By learning from China as an example and conceptualizing an implementation that fits within the confines of the Western world's definition of morality it would become possible to develop the perfect social credit system. Admittedly, a perfect implementation is unlikely, even if other examples

of the system were studied prior to its development, but it would result in a SCS that is far closer to a perfect system than an implemented score that is derived completely anew.

Regardless of prior study, a system can still be more beneficial than harmful and in such a case it is likely that it would be accepted by most. Doyle (2009) considers surgery, a procedure that initially causes harm to the recipient, but is accepted by the majority of the public due to the benefits it poses in the future. However, he goes on to say, "voyeurism benefits seldom outweigh its costs" and up until the present that has been mostly true due to the limitations of technology. As a result of the latest technological developments data has become a sought-after commodity. Businesses, organizations, and governments are willing to pay large amounts for user data. This is translated into sizable benefits for users and as such it is more likely than ever that voyeurism's benefits will outweigh its drawbacks. This suggests that it is not necessary to create a perfect score to have it be accepted. Rather, it would mean that to create a SCS that is successful in its implementation all that would be required is that the benefits outweigh the drawbacks for each citizen.

6.2 Ranking an Individual

It can be argued that humans have been ranking each other since the conception of our species, where the most dominant, and likely the most physically powerful primitive human would lead the others from a pack-like hierarchy. Through the centuries of human existence, the way in which people are ranked as altered but for the most part has still been evident. This can be seen in our choice to have a single or group of leaders, university degrees and even money to name a few. If this is the case, then a SCS would simply be an additional way to rank ourselves and as such seems less outrageous. However, it is far more explicit as it assigns a concrete value to everyone in society. The explicit nature of being assigned a score may result in more sensitive reactions to such a system than that of current forms of ranking, as it leaves no room for ignorance. A SCS could have drastic effects on people's mentality and even alter the way in which people interact with each other. By creating a ranking system, the population could be segmented into groups corresponding to their score, effectively giving them a clear, defined, rank in society. Would such a system be ethically sound? The saying 'Ignorance is bliss' seems appropriate here, and inspires the question of whether making people aware, essentially shattering that bliss, is ethical? If people believe we are not ranked in society currently and are happy, should that happiness be disrupted? Once a person is made aware of a subject they cannot be made unaware again, but one cannot judge how such an awareness will affect everyone generally. As such it should be left to the individual, the option to keep their ignorance being left intact, whilst providing them with the opportunity to expand their thinking.

This concept of ranking is illustrated by the Black Mirror episode titled "Nosedive" from season 3 (episode 1), set in a world governed by social media where one can rate anyone from 1.0 to 5.0 based on everything from a simple encounter to social media post they upload. This is a cautionary,

foreboding tale, that portrays the issues with such a system indirectly at first but become increasingly blatant. It begins by following an insecure office worker attempting to boost her score, she is full of hope and initially, the ranking system seems quite beneficial. A user can gain discounts and benefits related to their rank and people almost too friendly. However, we soon see the issues unfold as the main character is bombarded with calamity after calamity, clearly conveying the drawbacks of an all-encompassing system. This episode acts as a warning, imploring the watcher to consider life governed by a system with absolute precedence. It can be paralleled with the realistic implementation of the Zhima Credit Score and the future Chinese Credit System, serving to highlight the potential pitfalls. Thus, it could suggest that leaving the populous ignorant might make happier at first, it could have drastic consequences down the line. However, using an 'ends justify the means' methodology it can be argued that it is inconsequential as long as the results are beneficial to all of society. Imagine an implementation where every user benefit even if they have the lowest score possible, is this then justified? Can we condone segregation of a community if everyone is better off? What if it benefits 99% of the community, do we disparage the 1%? This takes the form of the publicly known trolley dilemma, which examines whether moral decisions are simply regarding results or the manner in which you achieve them. There is no 'correct' answer here, a Utilitarian would argue that the most ethical course of actions is one which offers the greatest for the greatest number of people and in contrast a Deontologist would focus on the right and wrong of the actions themselves. Both viewpoints are valid and carry their own benefits and drawbacks. Through this example, it is clear that using different ethical standpoints would result in different decisions with regards to how a SCS should be implemented. As such it would be most beneficial to employ a variety of ethical views in order to minimize potential drawbacks.

Chapter 7: Conclusion

This section will contain the answer and evaluation of the main research question. Furthermore, it will elaborate on the sub-research questions and the State of the Art Review but as this has been concluded in section 2.5 it will be kept brief.

7.1 Conclusion

The goal of this work was to design an installation that generates awareness of Ubiquitous Monitoring within The Netherlands. Through the questionnaire and observation conducted during the exhibition and discussion, it is clear that this objective was met. This was aided by achieving the sub goals through research:

- *How is awareness generated?*
  Through the use of the devised methodology of Critical Design, each project created, and the exhibition as a whole can be designed to create awareness by prompting individuals to reject ignorance. Thus, promoting active thought with regards to UM.
- *What are the current and planned developments in China with regards to Ubiquitous Monitoring?*
  By 2020 China will implement a mandatory Social Credit Score addressing its populous' need for a means to identify their financial standing. Furthermore, the Zhima Credit Score can be seen as a precursor to China's system, with the extrapolation of its benefits and drawbacks serving as an indication for the Chinese Credit Score.
- *What is Ubiquitous Monitoring and how is it perceived?*
  UM is having the ability to survey something at any moment and is usually met with disdain by those being surveyed. However, many external factors can play a role in how UM is perceived which could alter user's thoughts and feelings towards applications that employ it.

Due to the nature of the methods chosen to increase awareness within The Netherlands, the promotion was needed to alert the public of the events and it was found that the most effective method used was through social media. Yet, other forms of promotion should still be employed alongside social media as they will not only increase the number of people reached but also inform individuals who do not use social media or are not within the same social circles as those reached.

Using an exhibition removed any possible limiting factors that could be imposed, facilitating the freedom to explore ideas and this was ultimately reflected in the projects created. Each project embodied a different aspect of UM, prompting the user to analyze their possible future and how different this is from their current situation.

The object recognition gave insight into the current developments in computer's ability to

comprehend and classify the material world, prompting onlookers to contemplate the possibilities for use currently and how this could be developed in the future.

The Smart Tattoo allowed attendees to conceptualize the beneficial possibilities of UM, thus balancing overtly negative opinions and giving rise to a more objective standpoint. Furthermore, the product was created to be as intrusive as possible, serving to highlight the advantageous aspects present within such systems.

The personas gave an insight into the lives and opinions of people in a potential implementation of a SCS. Successfully creating an atmosphere through the evocative comments made by each persona.

The flocking algorithm successfully broadened onlooker's understanding of the effects a SCS could have on the relationships of people but also urged them to compare this to the current system. Allowing them to dissect the class structures they may have taken for granted.

The discussion allowed participants to benefit from each other's perspectives and through their dialog, an understanding of a different mindset was achieved. This effectively raised the awareness of each participant involved.

Whilst it can be said that those who participated in at least one of the events had an increase in their awareness with regards to UM, the demographic that this was tested on does not represent the entire Netherlands. Thus, awareness on UM, using the CSCS as an example, was raised in The Netherlands, but further research is required to extrapolate these results to The Netherlands as a whole.

Finally, the creation of awareness among the public of UM is ethically justified and it is argued that it is would be beneficial to the public, reducing the potentially dangerous consequences caused by unchecked UM. Furthermore, by scrutinizing UM and learning from implementations such as the Chinese Credit Score, steps can be taken to improve future implementations within Western society. This would reduce the drawbacks of the system and thus edge closer to perfect voyeurism which has no liabilities. It is clear that UM should be studied further and by using different standpoints a more complete and comprehensive understanding of it can be formed. However, awareness is not something that can be undone, therefore, it should be left to the individual whether they would like to be made aware of UM as opposed to forcibly making them aware.

Chapter 8: Future Work

This chapter will provide recommended developments on the previous work.

8.1 Promotion

In order to reach a demographic more representative of The Netherlands, other channels of promotions should be explored. This could include newspaper advertisements or posters in cafes around the city.

8.2 Exhibition

As mentioned previously in the evaluation, hosting the exhibition in a public space would vastly increase the number of recipients. Furthermore, it would be a better representative of the country as a whole if data or feedback was gathered.

8.2.1 Object detection

The program could be trained further to make it capable of facial recognition and tracking those it identifies by zooming in on them. This could be complemented by an augmented reality application creating an overlay that displays the scores of people it recognizes.

8.2.2 Smart Tattoo

A working prototype of a realizable implementation such as through an injectable NFC chip could be created with basic functionality to highlight the possibilities realizable today. This could be displayed alongside the current work to further emphasize how realistic such a product is.

8.2.3 Personas

More speakers could be used to create a further immersive experience and could be complemented by technology such as motion detectors. This would allow further varying tones and volumes of the voices, as well as, making it possible to target individuals based on their current location. Additionally, Posters could be made for each persona to make the onlooker/listener further aware of their character.

8.2.4 Flocking

The program could be expanded in order to create an entire visualized ecosystem, allowing the user to follow a detailed representation of a SCS's implementation.

8.3 Discussion

This could be hosted on a larger scale, allowing more people to benefit from it. Furthermore, recording it would not only benefit its evaluation, it would also allow others to view or listen to the discussion and reap similar benefits to those present during the discussion.

8.4 Research

Further investigations into current UM systems could be conducted and analyzed to allow an easier comparison for citizens of The Netherlands. This could include the information The Government, Banks and Insurance companies hold.

8.5 Testing

As already mentioned, a more intricate form of testing could be used such as a multiple-choice examination and splitting the testing into before and after the exhibition. Additionally, the previously introduced PSA-BI model could be used allowing a prediction of the user's behavior in ubiquitously monitored environments to be formed, which can then be tested.

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APPENDICES

APPENDIX A

A-1

(https://www.flaticon.com/) (https://freevectormaps.com)

A-2

A-3

A-4

APPENDIX B

Dear _____,

On the 20th of June Quinton Denman, Frank Kresin and Angelika Mader will host an open debate surrounding the CSCS[1] in DesignLab. The discussion will follow from an interactive exhibition created by Quinton Denman to compliment his thesis topic: How to design an

installation that generates awareness of Ubiquitous Monitoring in The Netherlands, referencing the Chinese Social Credit Score?

We will discuss the benefits and drawbacks of such a system, as well as explore the impact of an eventual implementation within The Netherlands. We believe that your contribution to this debate will be invaluable and as such we would like to cordially invite you to participate and enjoy in the discussion.

Location & Time:
Exhibition: DesignLab, Capture, 12:45-19:00
Debate: DesignLab, Connect, 19:00-20:00

We hope to see you there. Please register before by sending an email to
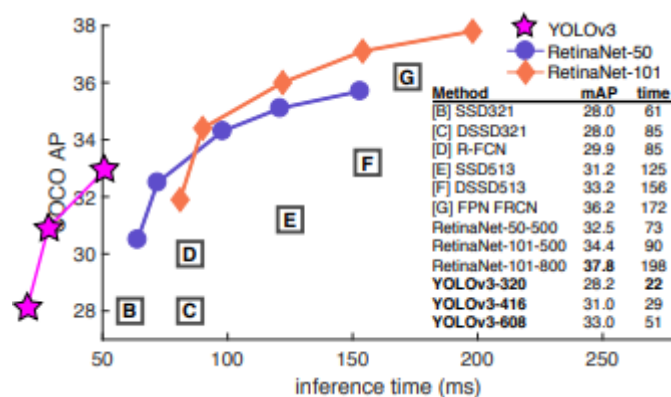q.denman@student.utwente.nl

Kind Regards,

Quinton Denman, Frank Kresin & Angelika Mader

[1] https://en.wikipedia.org/wiki/Social_Credit_System

APPENDIX C

C.1

(Joseph Redmon, 2018)

C.2
Performance on COCO dataset

Model	Train	Test	mAP	FLOPS	FPS	Cfg	Weights
SSD300	COCO trainval	test-dev	41.2	-	46		link
SSD500	COCO trainval	test-dev	46.5	-	19		link
YOLOv2 608x608	COCO trainval	test-dev	48.1	62.94 Bn	40	cfg	weights
Tiny YOLO	COCO trainval	test-dev	23.7	5.41 Bn	244	cfg	weights
SSD321	COCO trainval	test-dev	45.4	-	16		link
DSSD321	COCO trainval	test-dev	46.1	-	12		link
R-FCN	COCO trainval	test-dev	51.9	-	12		link
SSD513	COCO trainval	test-dev	50.4	-	8		link
DSSD513	COCO trainval	test-dev	53.3	-	6		link
FPN FRCN	COCO trainval	test-dev	59.1	-	6		link

|							
Retinanet-50-500	COCO trainval	test-dev	50.9	-	14		link
Retinanet-101-500	COCO trainval	test-dev	53.1	-	11		link
Retinanet-101-800	COCO trainval	test-dev	57.5	-	5		link
YOLOv3-320	COCO trainval	test-dev	51.5	38.97 Bn	45	cfg	weights
YOLOv3-416	COCO trainval	test-dev	55.3	65.86 Bn	35	cfg	weights
YOLOv3-608	COCO trainval	test-dev	57.9	140.69 Bn	20	cfg	weights
YOLOv3-tiny	COCO trainval	test-dev	33.1	5.56 Bn	220	cfg	weights

(Redmon, 2018)

C.3

Github Repository:

https://github.com/pjreddie/darknet
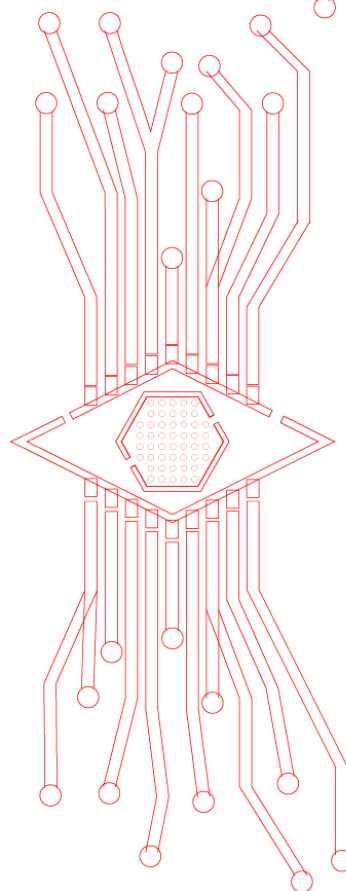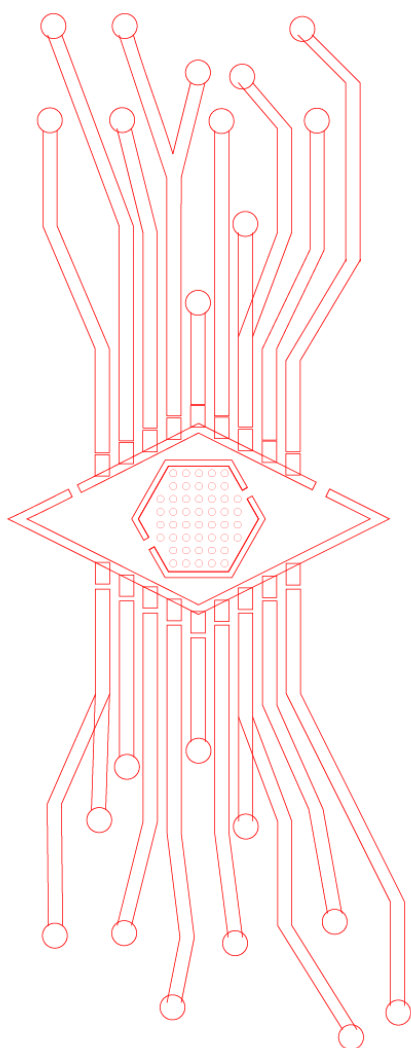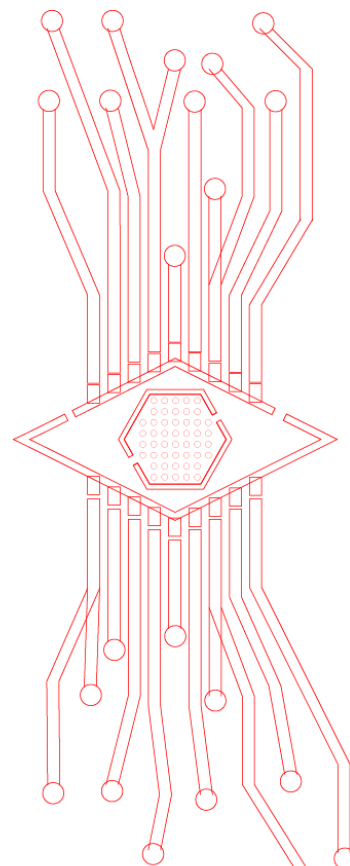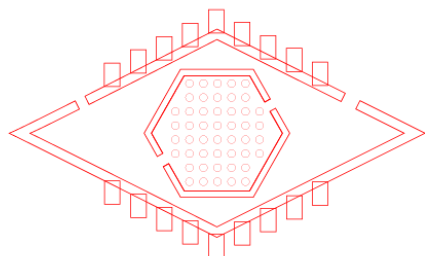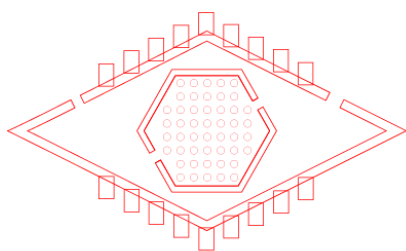
APPENDIX D

APPENDIX E

Flockingtake2

```
/*
Social Credit Score Flocking
Made by Quinton Denman
Code has been taken from Daniel Shiffman's "The Nature of Code"
Processing version 3.3.7
*/
Person[] people = new Person[100];
boolean stop = false;
boolean rightB = false;
String s = "Without Social Credit Score";
String s2 = "With Social Credit Score";
void setup(){
fullScreen();
for (int i = 0; i < people.length; i++) {
people[i] = new Person((i),random(0, 1920),random(0, 1080), random(-1,1),
random(-1,1));
}
}
void draw(){
colorMode(HSB,100);
background(0,0,100);
for (int i=0; i < people.length; i++){
people[i].create();
fill(0);
textSize(80);
if (stop){
text(s2,(500),80);
```

```
people[i].attractSimilar();
people[i].repelLow();
people[i].allignSim();
people[i].noColl();
} else {
text(s,440,80);
people[i].seperate();
people[i].group();
people[i].coh();
}
people[i].update();
people[i].contain();
people[i].repulse2();
//people[i].noEdge();
}
}
void mousePressed(){
if (mouseButton == LEFT){
stop = !stop;
} else {
rightB = !rightB;
}
}
void keyPressed(){
setup();
delay(25);
}
Person
class Person{
```

```
PVector vel;

PVector pos;

PVector acc;

float score;

float rad;

float limit;

float multiplier;

float neighborhood;

float speedL;

float border;

boolean edge;

Person(float s, float x, float y, float a, float b){

score = s;

rad = 25;

pos = new PVector(x,y);

vel = new PVector(a,b);

acc = new PVector(0,0);

limit = 0.8;

neighborhood = 80;

speedL = 3;

border = 50;

}

void applyF(PVector f) {

acc.add(f);

}

void update(){

vel.add(acc);

vel.limit(limit*1.5);

pos.add(vel);
```

```
acc.mult(0);

}

void create(){

//colorMode(HSB,100);

strokeWeight(2);

fill(color(score, 70,70));

ellipse(pos.x,pos.y,rad,rad);

}

void similar(){

for (int i=0; i < people.length; i++){

if(((people[i].score - this.score) <= 20) || ((this.score- people[i].score) <=15)){

multiplier = 0.2;

} else {

multiplier = 0;

}

}

}

void noColl(){ //stop nodes from overlapping

int count = 0;

PVector collision = new PVector();

for (int i = 0; i < people.length; i++){

float dir = this.pos.dist(people[i].pos);

if ((dir > 0) && (dir < (rad*2))){

PVector dif = new PVector();

dif = people[i].pos.copy();

dif.sub(this.pos);

dif.normalize();

dif.div(dir); //dividing by distance

collision.add(dif);
```

```
count++;

}

}

if (count > 0) {

collision.div((count));

} if (collision.mag() > 0) {

collision.normalize();

collision.mult(2*(-limit));

//collision.sub(vel);

//collision.limit(limit);

applyF(collision);

}

}

void allignSim(){ //allign similar scores so the move in the same direction

float scoreDiff = 0;

PVector sum = new PVector();

PVector minus = new PVector();

int count = 0;

for (int i=0; i < people.length; i++){

float d = this.pos.dist(people[i].pos);

scoreDiff = abs(this.score-people[i].score);

if ((d> 0) && (d < (neighborhood/2)) && (scoreDiff <= 20)){

count++;

sum.add(people[i].vel);

}

}

if (count > 0) {

sum.div(count);

sum.normalize();
```

```
sum.mult(4);

minus = PVector.sub(sum,vel);

minus.limit(limit);

applyF(minus);

}

}

void attractSimilar(){ //attract similar scores to each other

int count = 0;

float scoreDiff;

PVector force = new PVector(0,0);

for (int i=0; i < people.length; i++){

float d = this.pos.dist(people[i].pos);

scoreDiff = abs(this.score-people[i].score);

if((d > 0) && (d < (1.5*neighborhood)) && (scoreDiff <= 20)){

count++;

PVector pforce = new PVector();

pforce = people[i].pos.copy();

pforce.sub(this.pos);

//drawV(pforce, people[i].pos);

//float away = pforce.mag();

pforce.normalize();

//force.mult(2);

//pforce.div(away);

force.add(pforce);

//force.add(people[i].pos);

}

}

if (count > 0){

force.div((count));
```

```
force.limit(limit);

applyF(force);

}

}

void repelLow(){ //repel low scores from high scores

int count = 0;

float scoreDiff;

PVector force = new PVector(0,0);

for (int i=0; i < people.length; i++){

float d = this.pos.dist(people[i].pos);

scoreDiff = abs(people[i].score-this.score);

if((d > 0) && (d < (neighborhood*1.5)) && (scoreDiff > 20)){

count++;

PVector pforce = new PVector();

pforce = people[i].pos.copy();

pforce.sub(this.pos);

pforce.normalize();

pforce.mult(-4);

force.add(pforce);

}

}

if (count > 1){

force.div((count));

}

force.limit(speedL);

applyF(force);

}

void noEdge() { //remove edges and allow nodes to move across screen

if (pos.x > width+rad) pos.x = -rad;
```

```
if (pos.y > height+rad) pos.y = -rad;

if (pos.x < -rad) pos.x = width+rad;

if (pos.y < -rad) pos.y = height+rad;

}

void coh(){ //regular flocking cohesion force

int c = 0;

PVector sum = new PVector();

for( int i = 0; i < people.length; i++){

float d = this.pos.dist(people[i].pos);

if ((this != people[i])&&(d<neighborhood)){

sum.add(people[i].pos);

c++;

}

}

if (c > 1){

sum.div((c));

PVector target = PVector.sub(sum, this.pos); //vector pointing to pos of target

target.normalize();

target.mult(speedL); //scale to speed limit

PVector steering = PVector.sub(target,vel); // Steering force = Target - Vel

steering.limit(limit);

applyF(steering);

}

}

void group(){ //regular flocking allignment force

int c = 0;

PVector sum = new PVector();

for( int i = 0; i < people.length; i++){

float d = this.pos.dist(people[i].pos);
```

```
if((this != people[i])&&(d<neighborhood)){
//PVector gForce = new PVector();
sum.add(people[i].vel);
c++;
}
} if(c > 0){
sum.div(c);
sum.normalize();
sum.mult(speedL);
sum.sub(this.vel);
sum.limit(limit);
applyF(sum);
}
}
void seperate(){ //regular flocking seperation force
PVector sum = new PVector(0,0);
float c = 0;
for (int i = 0; i < people.length; i++){
float d = this.pos.dist(people[i].pos);
if ((this != people[i]) && (d<(neighborhood/1.7))){
PVector temp = new PVector(0,0);
temp = this.pos.copy();
temp.sub(people[i].pos);
temp.normalize();
temp.div(d);
sum.add(temp);
c++;
}
} if (c > 0){
```

```
        sum.div(c);

    } if(sum.mag() > 0) {

    sum.normalize();

    sum.mult(speedL);

    sum.sub(vel);

    sum.limit(1.5*(limit));

    applyF(sum);

    }

    }

    //void repulse(){ //have nodes move away from mouse

    // PVector mouse = new PVector(mouseX, mouseY);

    // float d = mouse.dist(this.pos);

    // if (mousePressed && mouseButton == RIGHT && (d < (neighborhood*4))){

    // PVector target = PVector.sub(mouse, this.pos); //vector pointing to pos of
    target

    // target.normalize();

    // target.mult(speedL); //scale to speed limit

    // PVector repulse = PVector.sub(target, vel); // Steering force = Target - Vel

    // repulse.mult(speedL);

    // repulse.mult(-1);

    // applyF(repulse);

    // }

    }

    void repulse2(){ //seperate all nodes from each other

    if (mousePressed && mouseButton == RIGHT){

    PVector sum = new PVector(0,0);

    float c = 0;

    for (int i = 0; i < people.length; i++){

    float d = this.pos.dist(people[i].pos);
```

```
if ((this != people[i]) && (d<(neighborhood*8))){

PVector temp = new PVector(0,0);

temp = this.pos.copy();

temp.sub(people[i].pos);

temp.normalize();

temp.div(d);

sum.add(temp);

c++;

}

} if (c > 0){

sum.div(c);

} if(sum.mag() > 0) {

sum.normalize();

sum.mult(speedL);

sum.sub(vel);

sum.limit(1.5*(limit));

applyF(sum);

}

}

}

void contain() { //Keep nodes in the screen

PVector steer = new PVector(0, 0);

edge = false;

if (pos.x >= width-border) {

steer.x =- speedL;

steer.y =+ vel.y;

edge = true;

}

if (pos.x <= border) {
```

```
steer.x =+ speedL;

steer.y =+ vel.y;

edge = true;

}

if (pos.y >= height-border) {

steer.y =- speedL;

steer.x =+ vel.x;

edge = true;

}

if (pos.y <= ((height*0.2)+border)) {

steer.y =+ speedL;

steer.x =+ vel.x;

edge = true;

}

if (edge) {

steer.normalize();

steer.mult(speedL);

steer.sub(vel);

steer.limit(limit);

applyF(steer);

}

}

}
```

F-1

A Questionnaire to accompany the Exhibition on raising awareness on UM using the example of: The CSCS

To what extent were you aware of UM before being informed about this event? (1=not at all, 5 = completely aware)

1	2	3	4	5

To what extent were you aware of UM after being coming to this event? (1=not at all, 5 = completely aware)

1	2	3	4	5

How did you find out about this event?

University Website	Poster	Facebook Event	Utoday Article	Word of Mouth	Invitational Letter

F-2

Results:

Before	After
1	5
2	4
4	4
4	5
3	5
1	3
1	4

	2	3
	4	4
	3	4
	3	4
	3	5
	3	4
	4	5
	4	4
	5	5
	3	3
	3	3
	2	3
	2	4
Average	2.850	4.050

Lower After	0
Higher After	14
Same After	6

APPENDIX G
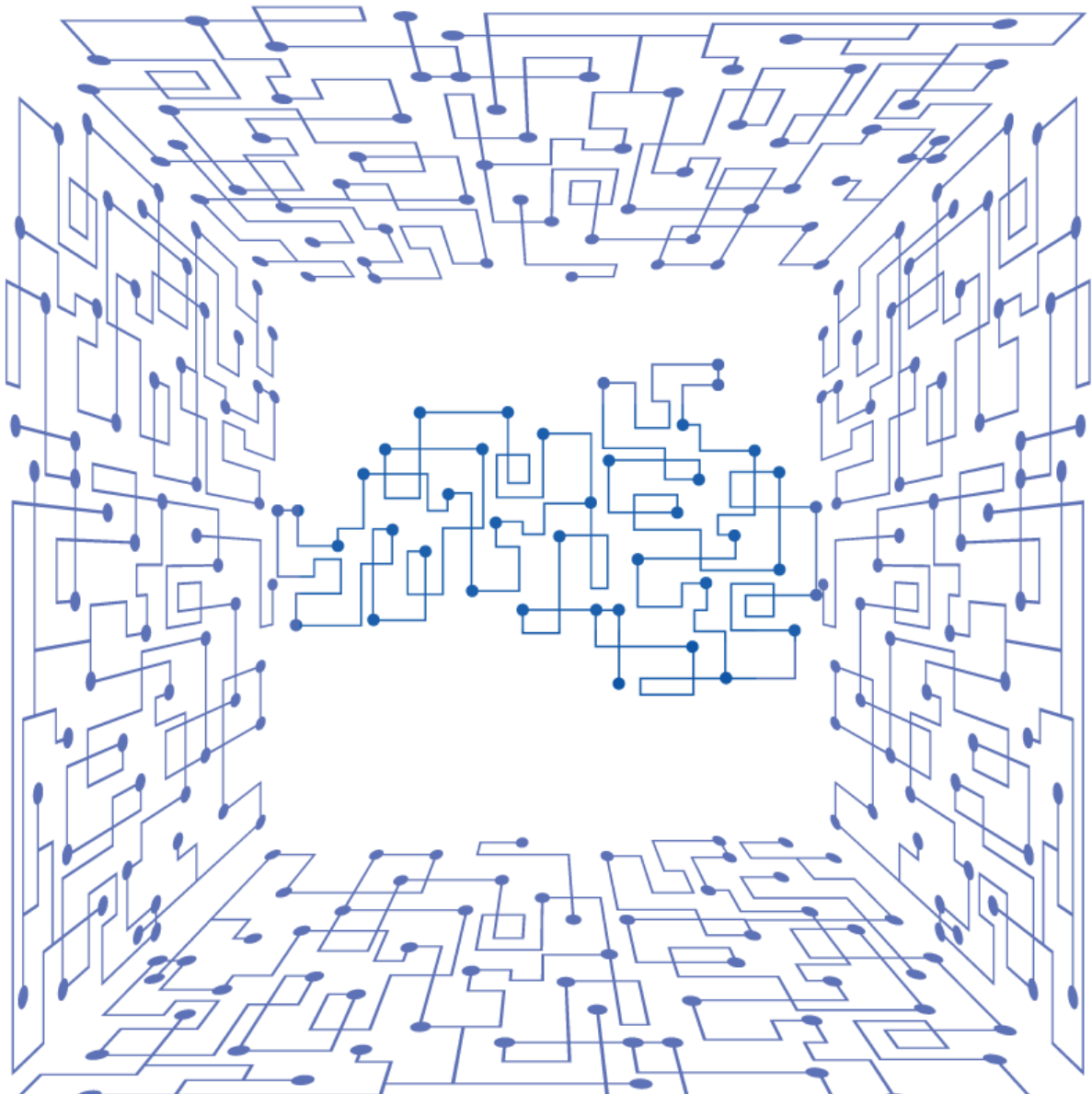
(kisspng, 2018)

APPENDIX H

Dear all,

A wish you a particularly WARM welcome at this presentation & discussion of a possible future – especially to Quinton, that has made this wonderful presentation about an imaginary European implementation of the Social Credit Score that is pioneered in China, but might well make it here, too.

To me, it's an important topic, because it poses all kind of questions:

- Privacy versus transparency

- Individuality versus the collective
- Our possible future versus our not so distance past
- The way technology changes our potential to act and even to think

While a European implementation today seems far-fetched or even out-of-the question, history has learned us that things can change very very quickly – for better or for worse. For interesting quotes we can turn to science fiction writers.

William Gibson, author of Neuromancer, said that **the future is already here – it is just unevenly distributed**. Also, writer Bruce Sterling told us that **it is actually very easy to predict the future – you only extrapolate what you fear the most**.

In both of these senses, the Chinese Social Credit System is a wonderful example. By using data about your on- and off-line behavior, it is possible – actually, it's quite easy – to come up with a score representing our personal social credit – and once available, it is easy to expose it, to the government or to all. Considering the success of the Chinese government has in concerting collective action – and suppressing dissident voices – it is in the perfect position to develop and implement this system – with virtually no opposition. From there, who knows what will happen.

And precisely here – because we don't know - we need the imagination of designers and artists. They can help us to make possible futures tangible, by extrapolating, exaggerating, visualizing, programming, whatever we need to **experience the future as if it exists**. Thereby, they help us to start a discussion that we would normally not have, or not yet, or not in this specific way. They can nurture or focus our attention, stimulate debate, and then step back and see what is happening. We can call this **Speculative Design**.

I'm Frank Kresin, the managing director of the design lab, and I would encourage designers, artists and engineers to use their imagination to perform Speculative Design, to influence reality and discourse not just by making functional products, interactions, and services, but go way beyond and help us to foster meaningful conversations. Artists, designers, step up, show us what you can do, tune into to the future as it unfolds!

I believe that Quinton, as a newly bred speculative designer, has done a perfect job in that. Coming from a – I have to say – quite vague assignment he took from me for his bachelors thesis. Over the months, he has made it into his own and he has come up with four different perspectives on the Chinese Social Credit Score to stimulate our discussion. Actually, while the four prototypes that he

made are important contributions in themselves, part of his success is the discussion that we will have, amongst ourselves, now.

That is where you, and we come in. Proof of the pudding, for Quinton, for us, is the hopefully lively debate that will ensue from his world. In that sense, you / we are all part of this graduation, being an essential part of its development, from now into the near future. Whatever will happen, we have been part of it, and not kept silent. I hope this will follow through into the rest of your lives and make it possible to change, or even stop, developments when the future is taking a questionable turn.

Thank you for coming, and I wish us all a very interesting evening.

Now: Quinton, Angelika, all.

But: this is your evening, so turn it in ways that fit you.