1. Hello everyone, my name is Nikhil Raina and this is my Individual Research Presentation. This presentation is on a foresightful paper called The Profiling Potential of Computer Vision and the Challenge of Computation whose author is an alumnus of Cornell University named Jake Goldenfein. On a wholistic level, this paper discusses the ways computer vision and computational empiricism is being used in order to grab, translate and understand the instance of the real world and thus produce an assessment of the world state or the subject at hand. The general read of the paper is straightforward and filled with real world examples to enforce engagement of the reader. It requires a base level of understanding in areas like machine learning, neural networks, and its hidden layers.
2. The paper can broadly be distinguished into 3 categories. Profiling, profiling knowledge claims and effect of law in the computer vision field. The paper introduces the important definitions to familiarize the reader with terminologies that would be used multiple times throughout the paper itself. Out of the definitions, one that is important is the meaning of ‘Profiling’. For this paper, the term has been defined as the automated evaluation of certain traits about a person, simultaneously reminding us of the legal significance of “classification” even without subsequent discrimination. The knowledge claims represent the core of the paper. It talks about ways of gathering information or knowledge from the real world and then understanding it. Here are the areas where the profiling claims get mentioned. Each will be addressed briefly as we progress through the presentation. The final element that Goldenfein mentions in his paper is the law that restricts and allows connection between the real world and the world state at that instance.
3. Now we will be focusing on the core aspect of the paper, that is the profiling knowledge claims, discussing their merits, their progress and impact.
4. Personality analysis has been a sought out adventure by many scientists and engineers since 1990s. Two prominent types of such analysis are the Apparent Personality Analysis and the Apparent Personality Recognition. Personality computation makes use of faces, postures, gestures, emotions, interactions and actions to interpolate personality traits. Some try to achieve this by using static information like how a person looks, while some implement multiple modalities like combining information from visual data and audio data with different configurations.

In order to explain Personality Analysis, an assumption has been made in this paper where there is a stable statistical relationship between a stimuli and social personality, which is for APA or a true personality characteristic, which is specifically for APR.

According to the paper, the goals of both these analysis types explore multiple stimuli, from dynamic facial information, handwriting and even audio, that is speech. This exploration brings to light to a type of study called Computational Physiognomy.

The early representation of this study was using a simple machine learning practice by implementing models using Euclidean distances, thus straight-line measurements. Triangles with varying angles were used to classify facial features. This was made possible due to the division of the face into 32 classes, which was pioneered by Johann Kasper Lavator. This process eventually allowed the introduction of convoluted deep neural networks. This brought about an advancement to the analysis of personality by predicting intelligence and other personality characteristics based on the image.

Here, Goldenfein highlights an example project of Wu and Zhang’s paper, the Automated inference on Criminality Using Face Images. Half of the dataset was filled with images of subjects that were criminally convicted. The results of this project wasn’t able to differentiate the differences between a criminal and a non-criminal. However, the research established an understanding of the requirements and the depth of computation that could be necessary to interpolate such a difference. According to the text, “Only through the higher dimensional computational analysis of numerical quantitative measurements was this statistical separation discernible.”

1. Among all ways to perceive information, for images, photography naturally appears to be at the top. According to the paper, photography was a way to ‘see into the nature’s cabinet’. Goldenfein talks about the different types of instruments that were used in order to photograph an instance of the world. Like using the telescope for celestial objects or using the microscope to identify cellular objects.

The next way to see information about an image is through data. In computer vision, the constant and repeated measurements, encoding and decoding, and knowledge discovery is automated. A heavy weight is usually given to the initial process of clustering where the system is allowed to identify representations of groups of data, calling this process ‘feature creation’.

Computer vision systems measure visual data in order to determine the current or the previous state of the world. This is the mathematical bridge between technology and the physical world. According to the paper, “computer vision profiling is about noticing, measuring and analysing that which was previously not available to human perception and cognition.” For the system to be able to depict the information from the real world, the 3-dimensional data of the real world is reduced to 2-dimensional data set of measurements. Here, Goldenfein cleverly brings out the uncertainty of the reality of a data set being unable to accurately represent the 3-dimensional state. Taking account of the other dimension, which can’t be accurately interpolated, probability is used to define the best possibility of the state of the world at that point. To tackle the challenge of immense data being utilized, computer systems take in symbolic representations, which is essentially clustering of data into groups representing one unit. Representation learning taken places when the process of clustering is allowed on the dataset being read in. Further deep learning practices take place that allow the system to understand and learn automatically thereby discover representations needed for detection or classification.

Next is the computational empiricism as a Dominant Epistemology. This area broadly identifies the forms of computational empiricism applied to understand people as subjects. They are divided into 3 elemental structures:

The first is that the external measurement or observation is more reliable to knowledge or information than the symbolic output from subjects. To illustrate this, the paper takes the example of a stethoscope where the practice of ‘auscultation’ bore fruit. It is the process of listening to the body at a physical distance. According to Goldenfein “stethoscopes have been invoked to demonstrate the movement from theoretical to perceptual ways of knowing the body.”

Next is a type of computational intervention in the relationship between measurement and classification. This brings light to the decisions and choices about what attributes of a measurement in each layer of representation within the neural network. This primarily talks about the system having its own mind to understand the data that has been given to it for processing.

Finally, as mentioned here, is the blind yet knowledgeable belief that there’s more to see than what meets the eye. In other words, the system is exposing the fundamental substructures of reality of that instance of the world state, to which we are entitled to. Goldenfein says that this belief is “a metaphysical commitment to a world of truth”.

1. The final topic that is evidently mentioned in the paper is the law with regards to Computer Vision and its practices.
2. So far, the paper has done a good job in being hopeful and positive about how the real world is being viewed at an instant with the help of computation systems. Given that the current systems act like a “screen”, it not necessarily exposes the underlying truth that we seek instead, it puts forth a filter under which the ‘real’ or ‘genuine’ slowly decays. This is how digital profiling works. According to the paper, this type of profiling is used as “proxies for defining characteristics about us.” Thus, there is a substantial amount of rectification of data of individuals, or subjects, to help maintain the ‘borderlines of meaning’ about themselves. However, this is susceptible to change.

To address the issues occurring with digital profiling, there have been many different legal approaches. One is for the improvement of automated systems, that is reaching close to a ‘fairer’ computation of the real world and the subject. Thus, limiting the bias factor exponentially. However, this brings in the question of ‘ruling and governance’ within a society, where “grievances with society’s institutions can be reframed as questions of algorithmic accountability.”

The next is the legal challenges that are being presented to overachieving data science applications. These usually have a negative or a harmful impact on society. Thus it narrows down to “defending the fundamental dignity and opacity of persons”. With subjects being exposed to digital profiling, there is also an area for consent that allows whether the subject wishes to be part of this. Alongside the thoroughness of the access and rectification rights and the fundamental principles of processing in Article 5, Article 22 allows subjects to be either willing or against the mechanism of profiling. To meet a sweet spot of consent and getting profiled, Hilderbrandt, focuses on “Right to human non-computability built on the philosophical principle of indeterminate identity”. This does not imply diving down to prehistoric times of privacy, but instead allows a to limit certain classes of knowledge claims.

1. All in all, this paper has done a good job showcasing the challenges for image analysis and brought about deterministic structure to identify the uniqueness in algorithmic computation.

Other than this, lawmakers have good work laid out in front of them where the philosophy of measuring everything and drawing knowledge from those measurements is the path to truth. In this paper, we have come to know that critiquing data science, that is the algorithms, and its feedback system means exposing the difference between the real or physical world and the ‘world state’. Thereby challenging the idea of systems accessing the ‘hidden reality’ of the world than producing para-realities.

One improvement that I feel could make this paper better is the inclusion of some visual representations like graphs or some statistics that could illustrate the Core profiling methods and the challenges they are facing. I think it would have been a good idea to illustrate the comparison and the similarities with photographs and statistics in a visual manner to make Goldenfein’s reason that much more evident than just mentioning it in the literature.

1. These are the sources I have used throughout this presentation in order for me to discuss what the paper entails.

Thank you!