Smile to Vote: Towards Political Physiognomy Analytics - Predicting Electoral Behavior from Live Video

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Abstract

This Paper proposes a novel application of psychometric computer vision analysis. It describes the experimental use case of an interactive voting booth, which is able to retrieve, in real-time, the political conviction of any given person from their facial physiognomy by means of computer vision. After an overview of relevant developments in the fields of psychometrics, computer vision as well as AI-driven political data science, the article describes the design and the operating principle of the interactive voting booth.

1. Introduction

Against the backdrop of currently trending AI-driven political campaigns and the related 2018 Cambridge Analytica data scandal, *Smile to Vote* escalates the latest research findings in the field of psychometrics and merges them with the worry-free big scale implementation of facial recognition systems in life style products and daily business processes. The conceptual media art piece portrays the fictitious Govtech startup *Smile to Vote* and its cutting edge product with the same name: an ultra efficient e-voting booth.

By means of AI-based facial scanning, the e-voting booth gages the political conviction of any given person and emulates the process of digitally casting a vote at a federal election by simply looking into a camera.

The work addresses the religiously recited aspirations of global IT companies of turning the world into a better place by way of their products, as well as their apparent believe in a superhuman objectivity of algorithmical decision making. Also, it aims at highlighting an apparent discrepancy between these aforementioned aspirations and a surprising lack of respect for personal data and privacy.

Furthermore, the work addresses the question of how the large-scale deployment of AI algorithms and facial recognition applications will affect democratic decision-making processes as well as our individual understanding of privacy, freedom and self-determination.

2. Background

Starting point for the reflections was, on one hand, the perceivable effect of AI-based data analytics on the research fields of psychometrics and computer vision within the last 2 years, and the effect the both research fields are having on one another. The incorporation of deep learning (deep neural networks) into the practice of psychometrics seems to have the most profound potential as an instrument for near-complete surveillance, political manipulation and for predicting human behavior.

Taking into account the outright deceitful behavior of global IT-companies towards their users, which become somewhat apparent in Facebook's 2018 Cambridge Analytica data-scandal, this work is, on the other hand, inspired by the general public's surprising unimpressedness regarding large scale deployments of facial recognition systems.

I am going to give a quick overview over recent developments in digital psychometrics (2.1), political data analytics (2.2), the market acceptance of large-scale facial recognition implementation (2.3), and the clad und unresolved privacy fraud currently being orchestrated by global IT-companies (2.4).

2.1 Digital Psychometrics

Deep neural networks are capable of detecting minute statistical anomalies in data sets, below the threshold of human perception. Therefore machine-learning algorithms are able to interpret information in ways we as humans can't retrace.

Kosinski et al described already in 2013 the minute identification of political convictions by psychometrically analyzing social media data-footprints. They showed to be able to determine personality traits by analyzing not more than Facebook "Likes". Political conviction could be correctly determined with 85% accuracy. [Kosinski et al, 2013]

In 2017 several papers described methods to determine personality traits by means of automated psychometric computer vision analysis of social media profile photos:

Cristina Segalin et al concentrated on the automated evaluation of photos with regard to the personal traits Extraversion and Neuroticism. They also compared the accuracy of the machine's assessments with those of humans. They summarized: "The results show that computer-based classifications are significantly more accurate than averaged human-based classications for these two traits." [Segalin et al, 2017]

Yilun Wang and Michal Kosinski not only showed that "faces contain much more information about sexual orientation than can be perceived and interpreted by the human brain", but also, that computer vision systems based on deep neural networks are capable of predicting the sexual orientation of a person with higher accuracy than humans. [Wang, Kosinski, 2017]

2.2 Political Data Analytics & Micro Targeting

Personal profiles extracted from social-media footprints are used by political parties and other interest groups to optimize their odds at winning elections. Even in modern democracies, in which the protection of the citizens' freedom and privacy supposedly are reason of state, the use of micro targeting by political parties can be observed. In psychographic-based micro targeting, different data sets are combined to derive high resolution profiles of political conviction. Depending on legal situation and quality of the used data sets, the resulting profiling can be accurate down to the individual voter. The two most prevalent use cases of micro targeting in political campaigns are:

A) Personalized digital campaign advertisement
Matching their calculated personal profiles, individual users can be targeted with personalized campaign advertisements on the internet. Brian Swhichkow has shown that the needed tools for individually targeting internet users is readily available for everybody at very low cost and convenient ease of use. [Swhichkow, 2014]

The potency and granularity of such tools can, for example, be gaged by the targeting options listed on the Facebook Advertiser Help Center. (see Table 1)

- What people share on their timelines
- Apps they use
- Ads they click
- Pages they engage with
- Activities people engage in on and off Facebook related to things like their device usage, purchase behaviors or intents and travel preferences
- Demographics like age, gender and location
- The mobile device they use and the speed of their network connection

Table 1: Detailed targeting options in the Facebook Advertiser Help Center [1]

In the wake of Facebook's 2018 Cambridge Analytica data scandal, an Email from May 2014 surfaced, sent by Dr Aleksandr Kogan [2] to Christopher Wylie [3]. In it Dr. Kogan described an ever more granular "shopping list" of predictable personality traits available for targeting. (see Table 2)

- openness
- consciousness
- extraversion
- agreeableness
- neuroticism
- life satisfaction
- iq
- political views = conservative?
- political views = liberal?
- political views = uninvolved?
- political views = libertarian?
- religion (categorical)

Table 2: Selection of more granular targeting options, offered to Cambridge Analytica by Dr. Aleksandr Kogan in May 2014 [4]

It is interesting to note, that none of the six major political parties currently elected in the German German federal parliament (Bundestag) have publicly declared to waive the use of digital campaign advertisements based on micro targeting. [Linder, 2017]

B) Optimization of door to door campaigning
Electorate profile data can be projected onto maps to optimize door to door campaigning. Route optimization can be based on profitability calculation, predicting expectable conversion rates of undecided voters in a specific area.

As an example the company Cambridge Analytica "from July 2016 on […] provided election workers of the Trump campaign with an App, with which they could identify the political conviction as well as the personality type of residents of a specific house." "The election workers also had conversation guidelines matching the personality type of the resident." (Author translation) [Grassegger, Krogerus, 2016]

During the federal election campaign 2017 in Germany, the Christian Democratic Union of Germany (CDU) deployed an app called "Connect17". The CDU party head quarters went on record with the statement: "Via the Deutsche Post Direkt GmbH we have bought a potential analysis [data set] on the level of street accuracy. That means, that the statistical probability, with which the CDU will be voted for, has been calculated for a residential block." (Author translation) [Keller, 2017]

Because of a data breach on the Website of the Free Democratic Party (FDP), the precision of the party's micro targeted campaigning during the German federal election campaign 2017 was revealed. Simon Hegelich, of the Technical University Munich, analyzed the erroneously exposed electioneering tool and noted: "On a map one can zoom in so far (in the big cities), that one gets displayed the likelihood of 60% or 80% whether the inhabitants of individual houses are FDP-voters." (Author translation) [Hegelich, 2017]

2.3 Market Acceptance of Facial Recognition

Facial recognition technology is currently being deployed extensively for the mass market. The potent feature is conveniently implemented in practical use cases, which facilitate mundane daily tasks.

Fig 1. Video still from Apple's iPhone X Commercial, visualizing functionality of Face ID, September 2017 [5]

In September 2017, the IT company Apple implemented a technology, called Face ID, in their latest smartphone iPhone X. Face ID creates high resolution physiognomical data sets of their users' faces by means of a camera and depth sensors. Physiognomical analysis hereby becomes a hip lifestyle product. [6]

Similar to one of Apple's proposed use cases, in which users can identify themselves for business transactions using Face ID on their iPhone X, it is now possible in China to pay in fast food restaurants with just a gaze into a camera. Also in September 2017, Alibaba's facial recognition system "Smile to Pay" saw a large-scale roll out as an identification method for payment processes. [7]

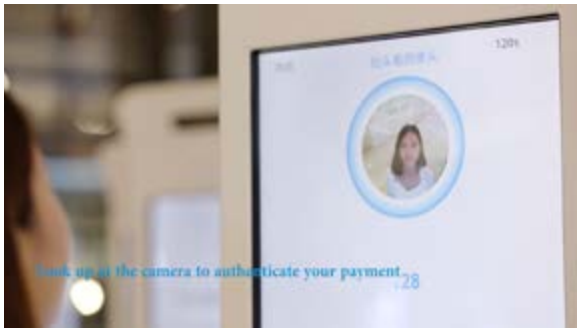

Fig 2. Video still from Alibaba's Smile to Pay Commercial, "Look up at the camera to authenticate your payment", September 2017 [8]

Surprisingly, there is currently no indication of client refusal to use these products and services due to privacy concerns.

2.4 Large-Scale Privacy Fraud and Unprosecuted Mass Surveillance

Despite claiming the opposite, the surveillance and data-collection practices of IT-companies, whose business models are based on micro-targeted advertisement, present an enormous breach of privacy laws in both Germany and Europe. This becomes evident in the light of recent revelations during Facebook's 2018 Cambridge Analytica data scandal. Neither are users asked for their consent to be surveilled, spied upon and psychometrically analyzed, nor are the users given the possibility to gain a comprehensive overview of all the data that have been associated with them.

In his testimony before the U.S. Congress, Mark Zuckerberg claimed, that "The information that we collect, you can choose to have us not collect. You can delete any of it" [9].

In contrast to this statement stands Facebook's proven practice to collect as much data as possible on any internet user - no matter if he or she has a Facebook account - and aggregate these data in so called "shadow profiles". Facebook's Methods to harvest these shadow data include, amongst others:

A) Third-party tracking by means of “Like”-buttons and other browser fingerprinting techniques [Englehardt, Narayanan, 2016].

B) Cross-referencing electronic address books of anybody who uploads her/ his address book to any of face book’s services (see the 6 million user data breach in 2013 [10]).

C) Scraping meta data from users’ activity unassociated with Facebook services, like calling and texting on android phones [Gallagher, 2018].

A complete summary of all data that Facebook has associated with a user - including aggregated and derived meta data - is not offered by the company. This leaves no way to monitor a termination of data collection or the deletion of user-associated data, contrary to what Mr. Zuckerberg has suggested. The fact that it is not possible to access one’s so called “shadow profile”, poses a massive constraint of basic civil rights. Title 2, article 8 of the Charter of Fundamental Rights of the European Union, entitled “Protection of personal data“, states: *“(1) Everyone has the right to the protection of personal data concerning him or her. (2) Such data must be processed fairly for specified purposes and on the basis of the consent of the person concerned or some other legitimate basis laid down by law.* ***Everyone has the the right of access to data which has been collected concerning him or her, and the right to have it rectified.”***[11]

It remains yet to be seen as to when and how Europe’s executive and judicial powers will respond to this continually abolishing of privacy.

3. Smile to Vote

Under the impression of above mentioned observations, the installation *Smile to Vote* pursues two thematic leitmotivs, which solidify in an interactive experience.

Firstly, the consequent application of computer-vision analysis on political conviction.

Secondly, the application of the “Smile to pay” - principle on the process of casting a vote at an election.

3.1 Installation Setup

The installation is comprised of a voting booth equipped with camera, screen, computer and printer (see Fig 3). The computer is running the *Smile to Vote* - software.

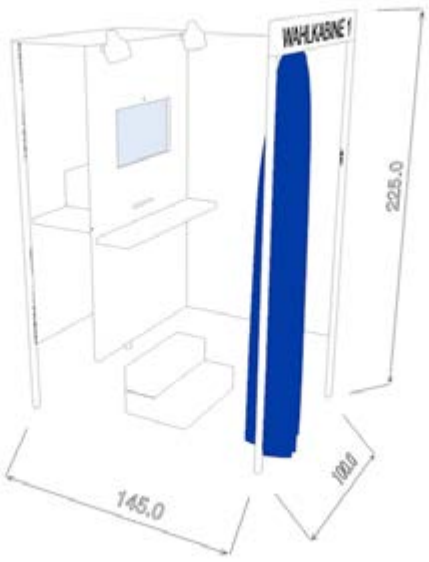

Fig 3. CG-visualization of the *Smile to Vote* voting booth, 2017, ©Alexander Peterhaensel

3.2 The Smile to Vote - Software

Building on the basis of Wang and Kosinski [Wang, Kosinski, 2017], the *Smile to Vote* - software employs AI-based computer vision analysis to gage the facial characteristics of a person and compare them to photo datasets, which have been classified by political conviction. By using a deep neural network, that has been trained on photos of people who's party membership and political affiliation are unequivocal, it becomes possible to deduce, in real time, the political conviction from the face of any given person, that is captured by the camera. (see Fig 4)

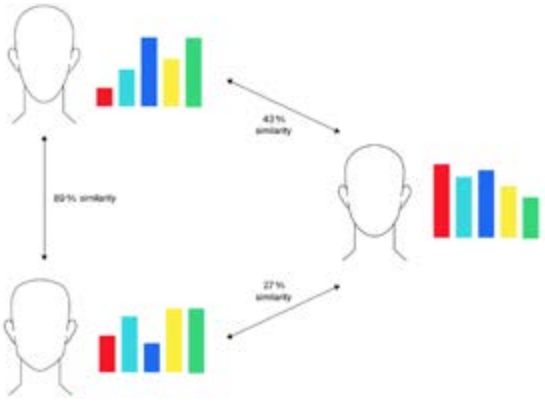

Fig 4. Similarity comparison of facial physiognomy profiles in the *Smile to Vote* - software, 2017, ©Alexander Peterhaensel

The software is programmed in Unity and uses functionalities of OpenCV [12] for face detection and face recognition.

First, the pre-trained OpenCV algorithm searches for faces in the live video feed. A soon as a face is detected, the cropped area of the video image gets compared with the trained data set of party members and election candidates. The physiognomical congruency between the voter and eligible parties is derived in percent and displayed as a bar chart on the screen.

The software is built on an open and flexible architecture in order to permit for the representation of all kinds of different electoral processes. This paper describes the localized use case for the german electoral system, which features two votes per voter [13].

For possible upcoming German federal elections, the neural network for physiognomical recognition is currently trained with two data sets:

Data set A contains all top candidates of all parties and is relevant for the calculation of the primary vote.

Data set B contains all candidates of all parliamentarians currently elected in the German Bundestag. This data set is relevant for the calculation of the secondary vote. All photos of the members of the German Bundestag are retrievable from the Bundestag website. [14]

The used approach is still experimental to that end that, due to data protection and privacy regulations, the used deep neural networks can currently only be trained with a relatively small data set. A large scale photo database with meta data of political conviction does not exist in Europe (so far). The herein proposed method could potentially be used for creating such a database. Expectable future advancements in the efficiency of deep neural networks and an enhancement regarding the possible use of small data sets, would foster the presented use case and would allow for an even more robust performance.

3.3 Process of Vote-Casting

Step 1: Triangulation. As soon as a person steps in front of the screen, the system awakens. The person's face is tracked by *Smile to Vote*'s computer vision and triangulated. The person is asked to look into the camera to cast her or his vote.

Step 2: Physiognomy scanning. The person's face is scanned and physiognomically measured. (see Fig 5)

Step 3: Psychometric analysis. The system then analyses the characteristic facial feature data set and calculates the person's political conviction. In order to achieve this, a deep-learning algorithm compares the person's facial physiognomy with characteristic

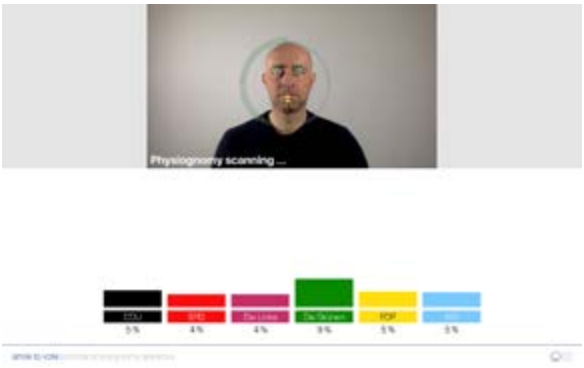

Fig 5. Screen shot of the *Smile to Vote* - software, Physiognomy scanning, 2017, ©Alexander Peterhaensel

physiognomy traits of all political parties eligible for election. The system, thus, is capable to derive the person's concordance with political parties in percent. To facilitate the German electoral process, the primary and secondary vote are derived form the voter's face in a two pass analysis; using data set A for the first pass and and data set B for the second pass.

Step 4: Vote registration. The installation emulates the immediate registrations of the person's vote in the central registry of an electoral commission. The voter is informed on the screen about the successful cast of her/his vote and receives a printed receipt. (see Fig 6)

The whole process takes about one minute.

Fig 6. Screen shot of the *Smile to Vote* - software, Registration of vote, 2017, ©Alexander Peterhaensel

3.4 Localized Versions of the Software

The software can be localized for different countries and electoral systems. All that is needed, are the photos of the electoral candidates.

Currently the *Smile to Vote* - software exists in 3 versions:

- 2019 European Parliament Elections
- 2018 German Federal Elections
- 2018 German Bavarian State Elections

Conclusion

This paper proposed a novel use case of psychometric computer-vision analysis on the basis of deep neural networks for the automated real-time retrieval of political convictions from facial physiognomy. It gave a brief overview over relevant developments in the fields of psychometrics, computer vision as well as AI-driven political data science. Furthermore, the article described the setup as well as the functionality of an experimental prototype, which deploys the proposed methodology as an interactive e-voting booth. The essential novelty of the described installation is the real-time realization of psychometric analysis of a live-video feed.

Especially the real-time capability of the herein proposed method contains enormous hazard potential for privacy, since it could be easily and seamlessly implemented in already existing surveillance infrastructures. Conceivable is a dystopian use case of permanent real-time gaging of political convictions of huge masses of people - if not entire populations.

Interaction with the *Smile to Vote* - voting booth translates the complex ramifications of delegating decision making to IT systems into an aesthetic experience and therefore makes these ramifications immediately tangible and intuitively comprehensible for the recipient. The work confronts us with the implications for political processes as well as for our understanding of self-determination and freedom of will, once predictability of our very behavior through IT systems becomes ubiquitous.

The presented use case is merely a first step in a novel field of research. Many new research questions have already arisen. Next steps of my work will deal with the optimization of data models for the machine learning modules as well as an improvement of the computer vision's accuracy. Apart from producing more localizations of the installation, also the evaluation of user feedback from different cultural backgrounds appears to be of high interest.

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