CANADIAN GERMAN CHAMBER OF INDUSTRY AND COMMERCE INC.
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Conference Report

AI in Healthcare: A German-Canadian Perspective

The Transatlantic Dialogue Initiative – Together into the Future

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As part of the Transatlantic Dialogue Initiative, which is financed through the European Recovery Program of the Federal Ministry for Economic Affairs & Energy of Germany, the Canadian German Chamber of Industry & Commerce Inc. organized the ''AI in Healthcare: A German-Canadian Perspective'' conference on March 28th 2019 at the Canadian Embassy in Berlin. The chamber brought several Canadian experts to Germany in order to discuss relevant topics within the field of Artificial Intelligence and Digital Healthcare. Together with German experts they participated in three rounds of panel discussions. The topics were *''Big Health Data: Building a Health Database for Effective AI Usage''*, *''AI & Pattern Recognition: Prevention to Prediction in Healthcare''* and *''Do-It-Yourself Diagnostics in Healthcare: Perspectives from the 4th Industrial (Tech)-Revolution*".

This report will outline the different conversations, its key discussion points and what further action should be taken on both sides of the Atlantic.

Panel 1 - Big Health Data: Building a Health Database for Effective AI Usage

The first panel discussion focussed on big health data and how to build a database for AI usage. Participants of the panel were Guillaume Paré (Associate Professor at the Dept. of Pathology and Molecular Medicine, McMaster University), Daksh Sikri (Consultant at A.T. Kearney), Yannick Schmid (Business Intelligence Developer at Vivy) and Prof. Dr. Thomas Zahn (Professor for Data Science at bbw University and MD at GeWINO AOK Nordost). The panel was moderated by Michelle Lau (Venture Manager for Health at Creative Destruction Lab).

Building inclusive datasets:

One of the first points brought up during the discussion was the representation of ''healthy populations'' within the global healthcare data sets. The overwhelming majority of collected and documented data is from people who are not healthy. It is important though to also gather health data on healthy populations, as they for example allow the study of chronic diseases, which occur over a longer period of time. A large sample from a healthy population enables researches to gather life-style data and show correlations on how they contribute to conditions such as cancer, diabetes and/or strokes. The government of Ontario already successfully launched such a study (Ontario Health Study) which includes information on healthy populations.[1]

Another discussion point evolved around whether more should be done to include underrepresented groups in healthcare datasets. Most of the global healthcare data is generated from Caucasians and there is for example a lack of accurate data from vulnerable minorities, as they do often not participate in surveys or are left out completely. Guillaume Paré pointed out that inequality in the healthcare data needs to be taken seriously. Majorities are typically the first ones to profit from newly developed technologies, as the algorithms work best in the population, they were developed in. However, we need to ensure participation of the underrepresented minorities and ensure that they are not left behind with each technological advancement. The biases in the data can lead to discriminatory and dangerous decision-making from the AI when

[1] Ontario Health Study. Online available at: < https://www.ontariohealthstudy.ca/ >.

diagnosing and recommending treatment for minorities. Many genetic studies for example suffer from a lack of black patients, leading to incorrect conclusions he added. Another example is that women often experience different symptoms when having a heart attack. The dataset for hearth diseases, however, is typically skewed towards including more men. This can cause inaccurate conclusions on symptoms and lead to delays in treatment. The use of AI in medicine could even worsen health disparities between majorities and minorities, if it is not based on more inclusive data.

Winterlight Labs[2], a Toronto-based start-up was presented as a prime example of what the outcome of a non-representative dataset leads to. Winterlight Labs builds auditory tests for neurological diseases like Alzheimer's disease, Parkinson's, and multiple sclerosis. After publishing their initial research[3] (pdf) in the Journal of Alzheimer's Disease in 2016, the team hit a snag: The technology only worked for English speakers with a particular Canadian dialect. Computer scientists would label this with the following description: Garbage In, Garbage Out.

No trust, no data - No data, no healthcare?

Many companies have growing science teams but without access to data, AI will not come to life. Health record data is seen as something very sensitive and patients need to have a lot of trust in the system in order to feed their personal data into a national health data base. Hence, it is trust that has to be establishes first before the AI can be implemented. As Yannick Schmid stated, a user-centric system is needed. The system needs to allow people to own their encrypted health data and have control over what is accessible by others. Latvia has taken such a step already. Patients can easily access care records using the state's e-services portal. Germany has been trying to introduce such an electronic patient record for a while as well. It will take many years though to build up the required level of trust for it to be used by the mainstream. Younger generations will probably be faster at accepting the new healthcare record system.

Also, people do not understand the technology and capabilities of the AI. The ''Black-box'' scenario, where data is fed into the system from one side and an outcome appears with the help of AI on the other side, makes people reluctant to entrust their data to such a system. Therefor the system needs to be as transparent as possible to gain user's trust. However, then one has to think about doctors being able to explain the technology and why / how it came to its decision. This would require doctors to learn programming and coding on top of their medical studies. Besides, the AI is still in the learning phase and will eventually make mistakes. This will lead to set-backs in the trust users put into the technology.

Panel 2 - AI & Pattern Recognition: Prevention to Prediction in Healthcare

The second panel discussion focussed on AI & Pattern Recognition and how it can be used for prevention or prediction in healthcare. Panelists were Rick Menassa (CEO of Health Espresso Inc. and iCare Home Health), Kiret Dhindsa (Postdoctoral Fellow, Research and High Performance Computing & Department of Surgery at McMaster University), Dr. Dietmar Frey (Project

[2] Winter Labs. Website available at: < https://winterlightlabs.com >.

[3] Kathleen Frasera, Jed Meltzerb and Frank Rudzicz, 2015. Linguistic Features Identify Alzheimer's Disease in Narrative Speech. Online available at: < http://www.cs.toronto.edu/~kfraser/Fraser15-JAD.pdf >.

Leader for PREDICTioN 2020 at Department of Neurosurgery at Charité) and Prof. Dr. Klemens Budde (Senior Physician CCM with focus on Nephrology and Internal Intensive Care Medicine at Charité University Medicine Berlin). The panel was moderated by Amit Maraj (Professor at Durham College School of Business, IT & Management).

Will AI Replace Doctors in Prediction?

Prof. Dr. Clemens Budde pointed out that the current discussion focusses a lot on the so-called ''death algorithm'' [4] or ''dying algorithm''. This algorithm performs surprisingly well at predicting who will die soon and who will continue to live. The false-alarm rate was low: Nine out of ten patients predicted to die within three to 12 months did die within the predicted time frame. 95 % of patients assigned low probabilities to die stayed alive for more than 12 months. The accuracy of the algorithm and the ability to weigh certain factors within the available historical data it performed on surprised experts.

Recently there have been major advancements in the area of prediction in healthcare through AI, mainly due to easy access to large quantities of data and a simultaneous increase in computing power. However, it needs to be remembered that AI is just a fancy way of doing statistics. You still need a doctor for the outlier patient. Besides, the question emerges what to do if there is a case of a 49 % to a 51 % ratio? In this case qualified doctors need to make the "right" decision. AI will remain an assisting system within healthcare.

Currently, we are observing the first steps of implementing automation within certain parts of healthcare. The cooperation between Philips Healthcare and Saratoga Hospital[5] is an example to see how doctors are able to gain efficiency through AI usage. No one is required to manually calculate results by using long complex formulas, as the calculator takes over this task. The downside is, that doctors are not using some of the basics of their profession and over time will forget or won't even learn. Dr. Dietmar Frey commented in this regard that ''we will indeed lose certain knowledge of some areas in our field and we thus need to trust that the technology is certified by experts from an independent institution. Room for error remains. We will lose competence to the new system, but we also acquire new knowledge and capabilities through the technological advancements. We can then shift our focus towards prevention.''

What About Certification?

One of the large issues is the certification of these new AI technologies in healthcare. Who can do this? TÜV Nord in Germany? A newly formed government agency? Besides, how can it be certified if it is a learning system that continually evolves and requires real world application for scaling? And who will be liable in case something goes wrong with such a learning system, which will eventually make mistakes? The agency that certified it, the doctor or the company which programmed the device? The consequences in healthcare can be terrifying if something does go wrong. Medical device regulations have traditionally been applied to physical products (surgical instruments, for example) and software that runs physical clinical machines (the software inside an ECG machine). We now have to look at how the algorithms, on the basis of which the AI operates on, can be certified and whether this is possible on a transnational basis. For

[4] Anand Avati, Kenneth Jung, Stephanie Harman, Lance Downing, Andrew Ng and Nigam H. Shah, 2017. Improving Palliative Care with Deep Learning. Online available at: < https://ai.stanford.edu/~avati/bibm17.pdf >.

[5] Philips. Addressing adverse events at Saratoga Hospital. Online available at: < https://www.philips.ca/healthcare/nobounds/saratoga-reduces-adverse-events >.

example, AI algorithms that support doctors in their decision making are known as ''Clinical Decision Support software'' (CDS) and are regarded as Class II under the current rules of the FDA.[6] A platform for an in-depth discussion to come up with the best possible solutions would be a good first start, Prof. Dr. Clemens Budde pointed out.

Panel 3: Do-It-Yourself Diagnostics in Healthcare: Perspectives from the 4th Industrial (Tech)-Revolution

The last panel discussion focussed on the topic ''Do-It-Yourself Diagnostics in Healthcare: Perspectives from the 4th Industrial (Tech)-Revolution''. Participants of the panel were Dr. Jean-François Houle (Director of Research and Development for the Medical Devices at National Research Council), Heba Ahmad (Product/Project Lead for Digital Health at Lambton College) and Eduardo Peire (CEO of AIScope). The panel was moderated by Julia Pietsch (Senior Manager for Investor Consulting at Germany Trade & Invest).

The Emergence of DIY Diagnostic Tools

The availability and increasing use of mobile health tools, such as health applications, smartphone plug-ins and other gadgets which employ AI are significantly changing the healthcare sector. This trend exemplifies broader trajectories in access to and delivery of healthcare, with greater consumer involvement and decentralisation. The shift can be desrcribed as 'do-it-yourself Healthcare', allowing consumers to individually monitor and manage their health and their healthcare consumption. Technology which enables data collection by patients informs them about vital health metrics giving them access to details and experiences of health or illness. To put it simple: these are tools to help understand specifics about your own health status. However, the tools are not going to enable you to completely self-diagnose at home, Eduardo Peire pointed out during the discussion. They will be used as accompanying tool which can assist the patient. Nonetheless, it will still require a doctor to make the final decision on the diagnosis.

The FAANGs are Entering Healthcare

Tools like the health bracelet or the steps counting apps are already very good at processing data and providing conclusions. Large tech giants such as Apple, Amazon and Google entered the DIY healthcare tools market and are fundamentally transforming this sector. Many of their initiatives are still in the very early stages, but they'll continue to grow. It's a fully comprehensible move: in any country, the healthcare market is one of the biggest industries and the tech giants want their share of it. But these new players will fundamentally shift the power balance between consumers and providers. It is essential to find ways to gain access to the data which DIY healthcare tools generate and not allow the tech giants to have exclusive access. The FDA already made a first move, Jean-Francois Houle stated. It published a white paper[7] with first guidelines on how AI should be regulated in the healthcare sector, including ideas on how data ownership should be organized.

[6] Hugh Harvey, 2017. How to get clinical AI tech approved by regulators. Online available at < https://towardsdatascience.com/how-to-get-clinical-ai-tech-approved-by-regulators-fa16dfa1983b >.

[7] FDA. Proposed Regulatory Framework for Modifications to Artificial Intelligence/Machine Learning (AI/ML)-Based Software as a Medical... Online available at: < https://www.regulations.gov/document?D=FDA-2019-N-1185-0001 >.

Prevention Over Treatment

Most of these tools are using narrow AI, which is only good at handling one (simple) task. So far, there is a lack of tools working with sophisticated general AI, which requires large complex datasets. In order to build such a dataset hospitals and healthcare companies would have to share their accumulated data amongst each other. The status quo is that hospitals in the same city rarely communicate and don't even know what each of them does, Heba Ahmad added during the discussion. This is unfortunate as a large amount of data over a long period of time is required to create solutions to predict or prevent for example chronic diseases with the help of AI. Here DIY diagnostic data would be of great value. Canada already set up a Canadian Task Force on Preventive Health Care[8], an independent panel of health professionals to create guidelines for primary care practitioners along with related tools and resources that will help Canadians stay healthy. Nonetheless, the government can only reach so far and it's still hard to measure the outcome of preventative actions which makes it difficult to gain public support. Germany, on the other hand, set up a small prevention fund. There is definitely an appetite by consumers to use preventative tools. Especially younger generations are more comfortable with using technology in healthcare. The younger generations can be the starting point to build up methods and tools which prevent instead of just treat.

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This conference is part of the Transatlantic Dialogue - Together Into the Future initiative. The Federal Ministry for Economic Affairs & Energy of Germany together with the Canadian German Chamber of Industry & Commerce Inc. have called into life this initiative in order to strengthen the cooperation between Canada and Germany on the field of Big Data, Cybersecurity and AI. The goal of this initiative is to facilitate the exchange of best practices, concepts, new ideas and the creation of a new network between both countries, thereby creating a platform which fosters innovation. Innovation means progress, and only through progress can we create the future.

[8] Canadian Task Force on Preventive Health Care. Online available at: < https://canadiantaskforce.ca/ >.