Artificial Intelligence

«Unmet Clinical Needs Drive our Research»

Digital technology is becoming increasingly important in all aspects of our daily lives, including medicine.[1,2] Artificial intelligence (AI) technology can help physicians with diagnostic procedures (e.g., by computer-based image analysis) and passive data collection, while supporting patients in form of mobile applications.[3-5] In March 2021, the first Center for Artificial Intelligence in medicine (CAIM) in Switzerland opened in Bern. We talked with the center's director, Prof. Dr Raphael Sznitman, about the advantages such a center presents for healthcare professionals and Switzerland as a leading country in medical research.

Prof. Dr Raphael Sznitman
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What fascinates you about AI, especially AI in medicine?
What attracted me to AI was how technology mimics human-like attributes, thus seeming intelligent, although AI is not intelligent in human ways. It is only acting in a way that looks human, but only for very specific things. I began studying cognitive science to understand learning processes and later, I transitioned into a more technical area, wanting to know how machines learn and process new information. Ultimately, I was strongly interested in bringing technology to the patient or the physician. I had very good mentors who had a great influence on me and my career.

How did the idea of founding an AI center come about? And why in Bern?
The story is old and new at the same time. Bern has a long tradition of developing new technology for medicine. For example, Hans Goldmann (1899–1991), an Austrian-Swiss ophthalmologist, and Maurice E. Müller (1918–2009), a Swiss orthopedic surgeon, were game-changers at an international level in their respective domains, to name but a few. This predates me by far, but this tradition has been carried on by a continuum of researchers and clinicians being interested in the synergy of technology and medicine. Around 10 to 15 years ago, the first full professorships in engineering were assigned at the medical faculty of the University of Bern. The ARTORG Center for Biomedical Engineering Research was founded in 2008 and CAIM is a natural continuation of the philosophy of bringing engineering, technology and medicine together.

About 3 years ago, the need for introducing digital technologies into the clinical environment considerably increased in different clinical departments at the university. This bottom-up phenomenon led the faculty to establish CAIM. As AI has been on the rise all around the world, it was strategically important to progress to this next step. We did not have to create the center out of thin air, we could build on the resources and the experience that have been established in Bern over decades.

What is it special about your approach?
Our focus lies with a patient- or clinician-oriented technology development. Basic science is less at the forefront, it is more about how we can bring AI technology to the patient, the clinic and the healthcare community. Our process often starts with an unmet clinical need. This distinguishes us from a more traditional-oriented engineering school, where one builds the hammer first and then finds the nails, so to speak. Unmet clinical needs drive our research. This has been a focus of ARTORG from the very beginning and now of CAIM as well.

CAIM is built upon 4 pillars. Can you please explain what they mean to the center and its research?
The first pillar is education. As a higher education institution, it is our duty to train the next generation of various professions our society needs. Currently, there is a great need for engineers with more medicine-oriented knowledge, all in the context of AI. As a result, we created a new master's program, AI in medicine, which starts in September this year. At the same time, we train physicians and other health care professionals (HCPs), the new generation of doctors and health care practitioners in AI and digitalization in general. This starts at a bachelor's level through to master's, PhD and continuing education.

The second pillar is focused on infrastructure, meaning the provision and development of better hardware and software tools for our research community to advance projects effectively. The third pillar is concerned with internal and external dissemination to our local research community and the public. We have a mission to reach out to high schools and the public, to discuss topics that relate to our society, e.g., privacy, security or fear of AI, policies and ethical questions.

Our last pillar is a research fund, which is meant to dig out all the unmet clinical needs where AI could potentially be of interest and try to foster those projects to advance. We support the more

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Artificial intelligence is of growing importance for tailor-made patient care with better intervention planning and medical training. This interdisciplinary research team develops a tool that can be combined with intra-operative navigation to help make complex interventions safer. (Photo: University of Bern)

common AI areas like radiology, but we also try to expand to disciplines where AI has not yet been established. For example, we ask ourselves: Where can AI help department X or clinical problem Y?

Finally, all of this is surrounded and connected by our newly initiated embedded ethics lab. This group, which consists of experts in ethics, law, politics and philosophy, tries to guide, provide resources and answer questions to connect to higher-level societal issues like data safety and privacy. It is important for us to be an accessible and realistic resource for the general population. We have to clearly state the limitations, risks and benefits of these different technologies, to show where we are today and discuss where we want to go.

How is the interdisciplinary collaboration managed between your 6 project categories?
This is the reason why we established CAIM in Bern. There is already a community of more than 100 researchers from different departments working in this area. We have a large community of people working in AI and health, as well as the largest medical faculty in Switzerland, and CAIM was a way of bringing all this together to make it visible and provide synergies between projects and know-hows. The 6 project areas, bio signaling, medical imaging, clinical data, robotics, precision medicine and the internet of things, reflect the ongoing research and interests of the medical faculty at large in Bern. Teams of very competent people are developing new ideas and driving innovation.

Do you plan to collaborate with other institutes around the world?
Many people working here already have their network of collaborations. CAIM will do its best to support the existing networks and build new ones with local and international partners. AI centers such as ours reach out to one another around the world, thus breaking international boundaries and creating new opportunities and projects for researchers, physicians and patients alike.

What are your visions for CAIM?
In the first phase, we want to identify the fields most interesting for AI technology, beyond the usual suspects. In a second phase, we want to provide a launching point for flagship initiatives and help translate AI technology to the patients. I hope that within a few years, a portfolio of success stories can be presented where AI is not only commercialized but is impacting patient's lives for the better. The Swiss industry needs people with expertise in AI or AI in medicine. Our vision is that Bern becomes a recognized place for people with this know-how, as it already is for biomedical engineering.

How can HCPs or patients help your researchers?
With the technology that we already have today, from specific applications on mobile phones helping a patient to remember taking pills to more complicated matters, the whole medical community – physicians in hospitals, in practices and other HCPs – should be aware of what is happening in the digital world. It is important that they voice their thoughts and wishes, as this makes it easier for researchers to identify potential problems and to help solve them. We appreciate when HCPs reach out to us and suggest a new project, which can bring everyone a step forward. If all stakeholders in the medical community take part, our vision becomes reality and the maximum benefit for the patient and his or her physician is warranted.

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