

Artificial Intelligence and Health Care

16 - 17 September 2021
9.30 - 12.00 (France, Germany)
16.30 - 19.00 (Japan)
In English

Online

Registration: forms.gle/yWfJLp9vAq95mVQA6

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Abstract

Among all the potentialities of artificial intelligence (AI) but also the related fears and worries (e.g. privacy concerns, data integrity), the application of AI to healthcare is certainly the one that has attracted attention the most and is considered as the most promising in terms of innovation and transformation of our socio-economic systems but also of our intimate life.

To put it simply, artificial intelligence in healthcare is an overarching term used to describe the use of AI to mimic human cognition in the analysis, presentation, and comprehension of complex medical and health care data. Although the concrete applications of AI to healthcare are diverse (e.g. using AI to efficiently diagnose and reduce error; making more accurate and earlier cancer diagnosis with AI; developing new medicines with AI), it is possible to consider that the primary aim of health-related AI applications is to analyze relationships between prevention or treatment techniques and patient outcomes.

At the same time, despite or because of all these promises, AI in healthcare raises several unprecedented ethical concerns related to its practice such as data privacy, automation of jobs, and representation biases. In this context, it is important to mobilize researchers in social sciences in order to discuss, criticize and compare the uses of AI in healthcare, together with stakeholders, patients, doctors, policy makers, and the industry. Moreover, given the differences across countries, it is essential to adopt an international and comparative perspective. From the European viewpoint, it is particularly interesting to look at Japan, where the applications of AI to healthcare are numerous and promising, while the social and ethical debates on this are lively.

These are the major purposes of this event, which is the second symposium of the French-German Dialogue on Japan, a joint initiative by JDZB and FFJ. It will discuss the topic of AI and healthcare, by bringing together trilateral perspectives, research findings, and hands-on experience by panelists from academia and business.

The session 1 will deal with the discussion on the innovative character or expected innovations by AI in healthcare from the perspectives of health professionals, the private sector, and policy makers, while the session 2 will tackle the issues of social and ethical aspects of AI in healthcare.

Program

16 September 2021

9.30-12.00 (France, Germany) | 16.30-19.00 (Japan)

9.30 | Opening Remarks

Yuko Harayama (RIKEN, Executive Director), **Sébastien Lechevalier** (EHESS, President of the Fondation France-Japon de l'EHESS), **Werner Pascha** (JDZB, Vice-President; East Asian Economic Studies, University of Duisburg-Essen)

Chair: Werner Pascha (JDZB, Vice-President; East Asian Economic Studies, University of Duisburg-Essen)

9.45 | Keynote Speech - Extended Intellect in Medicine

Kazuhiro Sakurada (RIKEN, Project Leader for Advanced Data Science Project)

Discussion / Q&A

10.15 | Break

10.20 | Session 1: AI and innovation in health care: Perspectives of health professionals, the private sector, and policy makers

Data save Lives – Deep Learning from omics data in health

Roland Eils (Berlin Institute of Health at Charité, BIH Digital Health Center, Founding Director)

AI boosts opportunities in Healthcare... as some case studies show

Athanasiou Kontopoulos (Air Liquide, Computational & Data Science Global LabDirector)

From the design of drugs and software to the design of AI algorithms for health: a simple teaching to take away? - Uses, appropriation and effectiveness-utility

Thomas Lefèvre (Université Sorbonne Paris Nord, Assistant professor; IRIS, Researcher; Hospital Practitioner)

Computational tender-care science: Computational and cognitive neuroscientific approaches for understanding the tender care

Atsushi Nakazawa (Kyoto University, Associate professor)

AI application for biomarker discovery and rare disease diagnostics

Anne Schwerk (CENTOGENE, IT Project Manager Artificial Intelligence)

Discussant: Romain Huret (EHESS, Professor and head of the EHESS initiative on AI)

Discussion / Q&A

17 September 2021

9.30-12.00 (France, Germany) | 16.30-19.00 (Japan)

Chair: Sébastien Lechevalier (President of the Fondation France-Japon de l'EHESS)

9.30 | Keynote Speech - Philosophical and Ethical Perspectives on AI and Healthcare : insights from the Ethics of Care

Vanessa Nurock (Université Côte d'Azur, Professor; UNESCO, chair on AI)

Discussion / Q&A

10.00 | Break

10.05 | Session 2: Social and ethical aspects of AI in health care

Promissory Practices in Elderly Care Robotics in France

Sébastien Dalgalarondo (CNRS, Researcher) and Boris Hauray (INSERM, Researcher)

Ethical issues of AI, personal data and innovations in healthcare : from theory to practice...

Jean-Louis Davet (Denos Health Management and Medical assistance, President)

The Ethical and Social Implications of AI in Healthcare

Amelia Fiske (Technical University of Munich, Institute for History and Ethics of Medicine, Senior Research Fellow)

Perspectives on AI in primary healthcare

Stefan Höcherl (gematik GmbH, Head of Strategy & European Affairs)

A Japanese Perspective on the Use of Data

Jiro Kokuryo (Keio University, Professor)

Discussant: **Vanessa Nurock** (Université Côte d'Azur, Professor; UNESCO, chair on AI)

Discussion / Q&A

11.45 | Concluding Remarks

Phoebe Stella Holdgrün (JDZB, Head of Project Management), Sébastien Lechevalier (EHESS, President of the Fondation France-Japon de l'EHESS)

Chairs

(alphabetic order)



Yuko Harayama (RIKEN, Executive Director)

Dr. Yuko Harayama is Professor Emeritus at Tohoku University and Executive Director of RIKEN. She is also the former Executive Member of the Council for Science, Technology and Innovation, Cabinet Office of Japan. She is the former Deputy Director of the Directorate for Science, Technology and Innovation, OECD. She is a Legion D'Honneur recipient (Chevalier), and was awarded honorary doctorate from the University of Neuchâtel. Previously, she was Professor in the Department of Management Science and Technology at the Graduate School of Engineering of Tohoku University. She holds a Ph.D. in education sciences and a Ph.D. in economics, both from the University of Geneva.



Phoebe Stella Holdgrün (JDZB, Head of Project Management)

Phoebe Stella Holdgrün is Head of Project Management at the Japanese-German Center Berlin (JDZB). She holds a Ph.D. in Modern Japanese Studies from Heinrich-Heine-University Düsseldorf (2011). From 2012 to 2015 she was Senior Research Fellow, and from 2015 to 2017 Deputy Director of the German Institute for Japanese Studies (DIJ) in Tokyo. Her research focused on policy analysis, gender equality and diversity, multilevel governance and decentralization, and political participation. Before she joined the JDZB in 2019, she also managed a university-wide diversity policy project at Bielefeld University.



Romain Huret (EHESS, Professor and head of the EHESS initiative on AI)

Romain Huret is an historian of the contemporary United States. His work focuses on the State, social and political mobilization, and the links between civil society and national organizations.



Sébastien Lechevalier (EHESS, Professor and President of the Fondation France-Japon de l'EHESS)

Sébastien Lechevalier is an economist and a professor at the School of Advanced Studies in the Social Sciences, Paris (EHESS). He is specialised in Japanese economy and Asian capitalisms. He is also the founder and president of the Fondation France Japon de l'EHESS (FFJ). He has been a visiting professor at various universities in Japan, including Tokyo University, Kyoto University, Hitotsubashi University, Waseda University and Doshisha University.



Werner Pascha (JDZB, Vice-President; East Asian Economic Studies, University of Duisburg-Essen)

Werner Pascha is the Vice-President of the JDZB and Emeritus Professor of East Asian Economic Studies of the Institute of East Asian Studies (IN-EAST) of the University of Duisburg-Essen (UDE) in Germany. In addition, he is the Chairman of the Foundation for Japanese-German Academic and Cultural Relations (JaDe). He was a visiting professor or researcher at several institutions in East Asia, including Kyoto University, the Academy of Korean Studies, Waseda University, Kobe University, the Korea Institute for International Economic Policy (KIEP), Doshisha University and

Busan National University. He has published widely on the political economy of institutional change in Japan and Korea as well as on the international economic relations of the region.

Speakers (alphabetic order)



Sébastien Dalgalarondo (CNRS, Researcher)

Sébastien Dalgalarondo is sociologist at CNRS (French National Centre for Scientific Research), member of the Institute for Interdisciplinary Research on Social Issues (IRIS). His first work focused on the role of patient associations in the pharmaceutical innovation process (see in particular: *Sida: la course aux molécules* (Paris, EHESS, 2004)). He is currently working on the issue of conflict of interest in the health sector. The second part of his research is based on the analysis of professional sports, anti-ageing medicine and "rewilding" practices in order to elaborate a critique of the contemporary ideology of the Optimal Man. He has just published, in collaboration with Tristan Fournier, *L'utopie sauvage* (Paris, Les Arènes, 2020) and has coordinated in 2019 a special issue of *Ethnologie Française* dedicated to the concept of *Self-Optimisation*.

Title: Promissory Practices in Elderly Care Robotics in France

Our presentation will propose an overview of the promissory regime governing the introduction of robots in elderly care in France. To do so, it will first briefly lay out the broader historical context in which current promissory practices take place. Over the past 40 years, three main phases can be identified in the framing of hopes concerning the use of robots in elderly care: 1) the first phase was characterized by an economic framing and highly anticipatory discourses; 2) the second phase focused on first real-life experiences with robots and went in hand with a gamification of their use; 3) the last phase is marked by an inscription of discourse on robots in the larger A.I. announced revolution and the promotion of their use in nursing homes. In a second part, the presentation will analyze the *promissory practices* about robots and elderly care taking place in different social spaces in France: in nursing homes and in the silver economy, in local politics and in academic research. The conclusion will allow us to underline that these promissory practices are connected and shape a political and moral economy in elderly care robotics.



Jean-Louis Davet (Denos Health Management and Medical assistance, President)

Jean-Louis Davet is president of DENOS HM & MA, a healthcare services group which mission is to bring worldwide access to medical excellence and biotechnological innovations leading to personalized medicine. He is an expert in insurance, data and AI for healthcare. He also has 15 years of experience as CEO of health insurance and healthcare groups, and as VP of strategy consultancy firms. He started his career as researcher in mathematics at CNRS (French National Center for Research) and as CEO of a robotics company. He is a board member of several international organizations dedicated to innovation, ethics and new technologies. He is doctor in mathematics (Paris VI University) and graduated from Ecole Centrale de Paris.

Title: Ethical issues of AI, personal data and innovations in healthcare : from theory to practice...

One of the core activities of Denos consists in defining and organizing domestic and international custom-made medical pathways, in order to maximize the opportunity of survival and recovery of the patient by bringing together the benefits of various healthcare systems. Consequently, Denos is focused on three aspects of "personalized" medicine :

- personalization of therapies and patients medical pathways,
- personalization considering the human person in its globality, its complexity, its health determinants and its environment,
- personalization in the modes of day-to-day interaction with the patient, mixing physical accompaniment

and the use of connected devices.

Ethic issues related to AI, personal data and innovation in healthcare are two-fold for Denos. On one hand we have to deal with all the internal challenges related to the gathering and processing of sensitive data necessary to achieve the high level of personalization and medical efficiency we target. On the other hand we need to keep a clear understanding of the benefits and drawbacks of the new solutions, technologies and therapies rising everywhere in the world, in different ethical and regulatory frameworks, in order to give the best possible recommendation to the patient. During this session, we will explore some of these issues and challenges, and the way we tackle them.



Roland Eils (Berlin Institute of Health at Charité, BIH Digital Health Center, Founding Director)

Prof. Dr. Roland Eils is founding director of the Digital Health Center at Berlin Institute of Health (Charité, Berlin) and director of the Health Data Science unit at the Medical Faculty of Heidelberg University. Before, he was founding and managing director of Heidelberg University's Systems Biology center BioQuant and Head of Division "Theoretical Bioinformatics" (B080) at the DKFZ in Heidelberg. His group has delivered significant contributions to the field of cancer genomics and systems biology. Since 2017 Roland Eils is member of the Organizing Committee of the Human Cell Atlas initiative and Coordinator of the HiGH-Med Consortium. He has published over 370 publications cited over 36000 times resulting in an h-index of 87 (source: google scholar, last visited 2020-04-14).



Amelia Fiske (Technical University of Munich, Institute for History and Ethics of Medicine, Senior Research Fellow)

Amelia Fiske is a Senior Research Fellow in the Institute for History and Ethics in Medicine at the Technical University of Munich. Her work is situated at the intersection of cultural anthropology, feminist science and technology studies, and environmental humanities. From 2011 to 2013, she conducted ethnographic research on the production of harm resulting from oil operations in the Ecuadorian Amazon, with a particular focus on matters of toxicity, extractive politics, and environmental justice. She is currently revising a book based on this research, *Encountering Harm* (University of Texas Press) and a graphic novel on the topic of toxicity, *Tóxico* (University of

Toronto Press). She also works on the social, ethical and regulatory aspects of citizen science in health and biomedicine, and how digital and socio-technical changes are opening new possibilities for public participation in medicine and science. She is particularly interested in how digital advances can engender new forms of inequality in health and society. Recent articles have appeared in *Critical Public Health* (2021), *Catalyst: Feminism, Theory, Technoscience* (2020), *American Journal of Bioethics* (2020), *Nature Machine Intelligence* (2020), *the NIB* (2020), *Journal of Medical Ethics* (2019), and *Social Studies of Science* (2018).

Title: The Ethical and Social Implications of AI in Healthcare

AI technology is expected to transform healthcare. With the ability to learn from large sets of clinical data, healthcare AI applications have the potential to support a wide range of activities, including diagnosis, clinical decision making, personalized medicine, clinical research, drug development, and administrative processes. In particular, some healthcare AI applications employ “embodied AI”, in which machine learning and decision-making algorithms are responsive to the patient and their environment through a physically embodied presence, such as artificially intelligent robotic agents or smart prostheses. At the same time, AI raises salient concerns in relation to the principles of medical ethics, which need to be addressed in order for AI applications to fulfil promises of improving the quality and effectiveness of care, controlling expenditure, reaching underserved or vulnerable populations, and relieving overstretched healthcare services.



Boris Hauray (INSERM, Researcher)

Boris Hauray is a sociologist at Inserm (French National Institute for Health and Medical Research), member of the Institute for Interdisciplinary Research on Social Issues (IRIS). His research investigates the social and political dimensions of health innovations. His work has focused on medicines licensing, the regulation of embryo research, anti-aging therapies, conflicts of interests and robots. He has notably published *L'Europe du medicament* (Presses de Sciences Po) and co-edited *Santé Publique. L'état des savoirs* (La Découverte) and *Conflict of Interest and Medicine* (Routledge).

Title: Promissory Practices in Elderly Care Robotics in France

Our presentation will propose an overview of the promissory regime governing the introduction of robots in elderly care in France. To do so, it will first briefly lay out the broader historical context in which current promissory practices take place. Over the past 40 years, three main phases can be identified in the framing of hopes concerning the use of robots in elderly care: 1) the first phase was characterized by an economic framing and highly anticipatory discourses; 2) the second phase focused on first real-life experiences with robots and went in hand with a gamification of their use; 3) the last phase is marked by an inscription of discourse on robots in the larger A.I. announced revolution and the promotion of their use in nursing homes. In a second part, the presentation will analyze the *promissory practices* about robots and elderly care taking place in different social spaces in France: in nursing homes and in the silver economy, in local politics and in academic research. The conclusion will allow us to underline that these promissory practices are connected and shape a political and moral economy in elderly care robotics.



Stefan Höcherl (gematik GmbH, Head of Strategy & European Affairs)

Stefan Höcherl is head of Strategy & European Affairs at gematik since April 2020. As member of the executive management he is responsible for corporate strategy and strategic positioning, interoperability issues and European cooperations at gematik. Stefan Höcherl has over 10 years experience in health care as a strategy consultant as well as in the field of public affairs management.

Title: Perspectives on AI in primary healthcare

The presentation lays down the German state of play on artificial intelligence in primary healthcare and outlines how it relates with ethical and social aspects from the perspective of the national digital health agency gematik. The current state of digital care applications using AI in Germany will be addressed and instruments for the broad establishment of AI supported applications in primary healthcare will be highlighted. Fostering interoperability in healthcare remains to be a key and the contribution of gematik to that will be briefly introduced. In a short forecast, the European Health Data Space will be related to national next steps.



Jiro Kokuryo (Keio University, Professor)

Professor at the Faculty of Policy Management of Keio University, where he served as Dean from 2009 to 2013. He also served as a Vice President from 2013 to 2021 and played a key role in the execution of the digital transformation of the university. Professor Kokuryo's research and teaching interests are focused on developing business and social models that maximize the benefits of information technologies to society. Professor Kokuryo graduated from the University of Tokyo in 1982. While an employee of Nippon Telegraph and Telephone Corporation between 1982 and 1993, he obtained a Master of Business Administration (MBA) in 1988 and Doctor of Business Administration (DBA) in 1992, both from Harvard Business School.

Title: A Japanese Perspective on the Use of Data

Chinese style communalism, founded on the traditional Asian philosophies, may perhaps be more suitable in

making use of data for AI. Individualism, that provided an effective ethos for the industrial economy, is now faced with such economic forces as network externality, low-marginal cost and traceability that seem to favor communalism. New ethos should be developed to protect human dignity while promoting the shared use of data.



Athanasiros Kontopoulos (Air Liquide, Computational & Data Science Global LabDirector)

Athanasiros Kontopoulos currently holds the position of "Computational & Data Science Scientific Director". He is a Chemical Engineer with a PhD in Applied Sciences and Math. He is with Air Liquide since 1995. He found several ways to express his passion for simulation, applied math and data science in both R&D and Operations. In particular, he is a pioneer in the development of predictive control and innovative real-time optimization systems. He presented the first roadmap of big data for Air Liquide and set up the first teams of data scientists within R&D, in 3 continents. He introduced artificial intelligence, through proofs of concept and alliances with innovative companies. He recently launched the "data and decision sciences lab" (d2-lab) initiative in Air Liquide, a network of experts and practitioners, to reach scientific excellence in these areas. Athanasiros Kontopoulos is an Air Liquide International Fellow. He is a great fan of "Augmented Intelligence"

Title: AI boosts opportunities in Healthcare... as some case studies show

This presentation will give a global overview of AL's activities in Healthcare, rapidly focusing on some case studies: How AI can help our Healthcare activities better anticipate during crises? How can it help a better flow organization in hospitals? How can it improve patients and medical personnel efficacy with respect to chronic diseases management, such as sleep apnea?



Thomas Lefèvre (Université Sorbonne Paris Nord, Assistant professor; IRIS, Researcher; Hospital Practitioner)

Thomas Lefèvre conducts research at the intersection of forensic and social medicine, public health, and applied mathematics. He uses classical quantitative methods (epidemiology, statistics), non classical methods (artificial intelligence, big data) and mixed quali/quanti methods, with the help of interdisciplinary collaborations and teams (anthropologist, sociologist, jurist, data scientist, epidemiologists, physicians). Its work is structured around two main areas: the links between violence, health and societies (ViS3), and the uses of digital technology in health, law and public institutions.

Title: From the design of drugs and software to the design of AI algorithms for health: a simple teaching to take away? - Uses, appropriation and effectiveness-utility

The value of a drug, but also its marketing and use authorizations, has long been evaluated in terms of efficacy. That is to say, the evaluation of an effect measured on a main and single quantified outcome, in controlled, experimental settings. It is only recently that, partly motivated by the difficulty of finding and marketing new drugs effective enough to justify their adoption, that attention has been paid to evaluating the efficacy (the effectiveness) of drugs under conditions of "real life": a drug can only be truly effective if it is actually used as it "should". Software design, in all fields, has long been a one-sided design: engineers imagine and design a tool that they believe meets a need shared by a greater or lesser number of people. This estimated need would be also such that it justifies people who must adapt to the tool rather than the other way around. A few companies have seen the value of designing their hardware and software so that the "user experience" is at the center, driving massive adoption of their products. The development of AI in health takes the same path as that of drugs and software: that of a design mainly thought out unilaterally, with the evaluation of efficacy so far very little rigorous. Yet it is said that AI should disrupt even social and professional organizations, at different scales. How then can we not imagine a co-design of these algorithms in an interdisciplinary way, and involving all the actors concerned by these algorithms, in order to promote their adapted and informed adoption?

Atsushi Nakazawa (Kyoto University, Associate professor)



Atsushi Nakazawa is an associate professor in the Department of Infomatics at the Kyoto University. He received his doctorate from the Osaka University in 2001 in Systems Engineering. Afterward, he worked in Institute of Industrial Science, University of Tokyo and then in Cybermedia Center, Osaka University. From 2013, he joined the Kyoto University. During 2007 to 2008, he studied in Georgia Institute of Technology (GaTech), GVU Center, as a visiting researcher, and worked with Professor James M. Rehg and professor Irfan Essa. In 2010, he was awarded the Precursory Research for Embryonic Science and Technology (PRESTO), Japan Science and Technology Agency (JST) and became a researcher of this program. From Oct. 2017, he

becomes a program investigator (PI) of the JST CREST project "Computational and cognitive neuroscientific approaches for understanding the tender care". His research interests are in human behavior/mental analysis using computer vision, eye tracking, eye imaging and motion capture systems. Dr. Nakazawa got the best paper award in International Conf. on Virtual Systems & Multimedia (VSMM2004) and Japan Robotics Society (RSJ). In 2016, his paper is selected as a 'Spotlight on Optics' from Optics Society America (OSA). His recent interest are the corneal reflection and bio-signal analysis for affective computing.

Title: Computational tender-care science: Computational and cognitive neuroscientific approaches for understanding the tender care

This presentation introduce a project that aims to understand the tender care technique known as Humanitude with computational and cognitive neuroscientific approaches. Humanitude is a care style originating in France and has over 35 years of history. According to recent surveys, receiving Humanitude care invigorates care receivers and reduces negative symptoms of dementia, such as behavioral and psychological symptoms of dementia (BPSD), thereby reducing psychotropic drug usage and caregiver burn-out. This project quantize and analyze the Humanitude care skills using computer vision, wearable tactile sensing, and AI technologies. It also investigate how and why humanitude works by observing patients' and caregivers' brain activities. On top of the findings, it develop an Augmented Reality (AR) system that can learn the Humanitude communication skill through interaction with virtual patients. The talk also introduces the future prospects.



Vanessa Nurock (Université Côte d'Azur, Professor; UNESCO, chair on AI)

Vanessa Nurock is Full Professor in Philosophy and Researcher at the Centre pour l'Histoire des Idées (CRHI) of Université de Côte d'Azur (French Riviera University). She is also UNESCO EVA Chair in Ethics of the Living and the Artificial (<https://chaireunesco-eva.univ-paris8.fr/>). Her research is situated at the intersection of ethical, political, and scientific issues, with a particular interest for gender and education. Her current research focuses on the ethical and political problems raised by Artificial Intelligence. She has also worked on topics such as justice and care, animal ethics, nanotechnology, cybergeneitics, and neuroethics. Her published works

include *Sommes nous-naturellement moraux ?* (PUF, 2011), *Rawls, pour une démocratie juste* (Michalon, 2008; Spanish translation Poder Judicial de la Ciudad de Buenos Aires, 2015), and *L'intelligence artificielle: enjeux éthiques et politiques* (Cités 2019/4, PUF). She also published in 2021 with M. Parizeau and R. Chatila What Does "Ethical by Design" Mean?. In: Braunschweig B., Ghallab M. (eds) *Reflections on Artificial Intelligence for Humanity*. Lecture Notes in Computer Science, vol 12600. Springer, Cham.

Title: Philosophical and Ethical Perspectives on AI and Healthcare : insights from the Ethics of Care

Artificial Intelligence (AI) has now become one of the major tools in most areas of healthcare, but it is also a major challenge as new ethical issues arise within this new 'AI Healthcare'. This talk aims at analyzing some of these ethical issues from a philosophical perspective. I will rely on two main working hypothesis. The first one is that, to answer this new challenge not only from a technical or scientifical point of view, but also from an ethical point of view, it is necessary to reframe some of the classical concepts of the philosophy of healthcare (such as health, patient, care-giver etc.). The second one is that the ethics of care may help us to better understand what is at stake in these new concepts and to rethink responsibility in this new 'AI Healthcare'.



Kazuhiro Sakurada (RIKEN, Project Leader for Advanced Data Science Project)

Dr. Kazuhiro Sakurada has been working for RIKEN since April 2016. He served as senior research for Sony Computer Science Laboratories (CSL) from 2008 through 2018 and Distinguished researcher for Sony Corporation from 2011 through 2018. He served as Head of Research Center Japan, Head of Therapeutic Research Group Regenerative Medicine and member of Global Research Management Team for Bayer Schering Pharma (VP class), as well as a member of the Executive Committee of Bayer Yakuhin until December 2007. Prior to the merger of Bayer AG and Schering AG in June 2006, he was a member of the Executive Board of Nihon Schering since joining such company in October 2004, as well as head of research center Japan and a member of Corporate Research Management Team of Schering AG (VP class). Before joining Sony CSL, he served as Chief Scientific Officer of US based start-up company iZumi Bio to transfer human iPS cell technologies developed in Bayer Research Center Japan. From 1988 until September 2004, he was employed by Kyowa Hakko where he held positions of responsibility in Regenerative Medicine and stem cell-based drug discovery. From 2000 through 2004, he was a principal investigator of Kyowa Hakko Tokyo Research Laboratories. He holds a Ph.D. from Osaka University. He will become a Professor of Keio University School of Medicine from October 2021.

Title: Extended Intellect in Medicine

Creating new products lead to the creation of new experiences. SONY's Walkman changed how we listen to music. TV games delivered virtual realities at our home. Conversely a new product or a concept of it can be induced from a desired experience. Applying this to personalized and predictive medicine, we may expect that a new concept can emerge from the question that how a diagnosis and treatment would change patients' experiences. How artificial intelligence (AI) or digital technologies in general can help us in this context? The goal of medicine is to cure patients' disease (or prevent it from becoming harmful) and save their lives. However, medical professionals often face the situation that there is nothing they could do for patients. What they can give to these patients is confidence. Appealing to patient's instinct can significantly enhance self-healing capacity during medical treatments. Medical sciences state that any complicated disease has its own abstract realization patterns. Functional reduction with mechanistic explanation is the standard model in medical sciences. On the other hand, medical treatments have to deal with patients' personal differences as dynamic processes. An organism is an open system that creates order by self-organization. To realize personalized and preventive medicine, specific aspects of the open systems (including emotional factors) have to be incorporated in a reasoning for stratification and prediction. After that, accuracy of the prediction can be improved by combining statistical machine learning, complex systems science, and information science just like the application of advanced deep learning technologies to medical images have achieved much higher accuracy in stratification. Once the treatment has been designed by the intellect of medical professionals, digital transformation (DX) can facilitate the implementation with efficiency. However, AI or DX in general cannot substitute the designing processes. Combination of human intellect and artificial intelligence is the path to the future medicine. Similarly, technologies must be in line with humanity. Future technologies would be less technical and closer to human feeling.



Anne Schwerk (CENTOGENE, IT Project Manager Artificial Intelligence)

Dr. Anne Schwerk obtained her PhD at the Charité, Berlin, conducting neuroscience research for modulating Parkinson's disease by applying stem cell treatments. She works currently as a project and team lead at the intersection of AI and healthcare at CENTOGENE. Her focus is on applying ML for rare disease diagnostics and on using multi-omics data for deriving novel insights, including biomarkers and mechanisms of actions. Before her work at CENTOGENE, she worked at the Intelligent Analytics of Massive Data Group at the German Research Center for Artificial Intelligence, where she led projects, mentored students, and gave seminars for AI application in healthcare fields at the TU, Berlin.

Title: AI application for biomarker discovery and rare disease diagnostics

The talk will focus on how AI can be used to unravel novel disease insights, including the discovery of biomarkers for diagnostic purposes and the integration of different omics data for enabling the derivation of mechanisms of actions. A major aspect will be the usage of metabolomics data and the intrinsic difficulties of these high-

dimensional data for finding reliable signals indicative of disease profiles. In order to allow for standardization and performant analyses, a major overarching theme is automation of processes and pipelines, which requires digital infrastructures and intelligent workflows, such as robotic process automation. To enable valid results, it is of pivotal importance to work with strong quality controls and high-quality data - an aspect that is not intuitive nor easy to implement.