# HORIZONTE "Artificial Intelligence" on Nov. 14, 2017
# with Dr. Hermann Hauser and Mr. Kazunori Sato

**Summary of Keynote and Panel Discussion**

### Keynote by Dr. Hermann Hauser: "Utopia vs. Dystopia – a Comparison between Intelligent Machines of Biological and Artificial Kind"

- Competition between biological and artificial machines - human (based on evolution) and machine (based on design):
- Neurons: Machines often are more sophisticated already, but the brain can retain more information and neurons are winning with the large amount of connections in the brain. Complex story of neurons (a lot of control chemically based to produce signals, complexity allows for arguable intelligence). The concept of transistors is simple (electrons passing): NAND (not/and) gate (universal building block), but you cannot describe well the real world with a binary system of 1's and 0's (using probabilities to describe the world needed).
- In relation to the weight, computer chips have already more capacity than the brain. The brain is still one of the fastest processors with a very low energy consumption. The brain works massively in parallel. New computers try to mimic the brain.
- Machine learning (ML) made it necessary to develop a new type of processor: IPU (Intelligent Processing Unit) from new start-up Graphcore: it mirrors the brain architecture. Moore's Law has come to an end (steady improvement of computers).
- Ear vs. microphone: we lose the battle against the machine. Further development with Alexa, Echo and Google Home: Beam-forming microphones allow a computer to focus like a human in a noisy environment.
- We only have two eyes, but there exist already 100,000's of interconnected webcams (autonomous vehicles). Cameras can see more frequencies.
- In about 5 years, autonomous driving will be widely used [Tesla video]. Arising revolution the car industry will work. There is still the technical question who goes first – culturally dependent. Up to 16 cameras on an autonomous car: this is one of the reasons why these cars will be much safer than those driven by humans are. Startup five.ai developing software for autonomous driving. The computer has to track each of the pedestrians and cars, predicting their behaviour.
- Intelligence means "knowing what to do next": humans have an advantage.
- Humans are not superior to computers in object recognition any more (different layers to define finally the object).
- Move: leg vs. robot [Boston Dynamics video] – the robot on wheels can balance very well already, slide, take steps, jump and carry heavy weight.
- Sir Dr. Hermann Hauser is the only venture capitalist who is also a Fellow of the Royal Society. Committee on Science, Technology and Industry organizes workshops like with Geoffrey Hinton [ML report on the Royal Society website].
- Unsupervised learning is a lot harder for ML than supervised learning. Reinforcement learning is even harder: incentive to learn like in a game. ML in speech and object recognition work very well.
- Dr. Hermann Hauser's most important message of the evening: The right way to describe the world is always in probabilities. Everything is more or less probable. True means very probably, but in fact, nothing is sure. ML: You give up determinism, not statistical any more, but you gain the way to learn, provide the system with training data sets – this needs big data, but also human goals.
- What are the human goals? "Aladdin-Genie problem": humans wish for the wrong thing. Computers are powerful – if you give them wrong goals, they will do the wrong thing.

- Book from Max Tegmark: "Life 3.0 – Being Human in the Age of Artificial Intelligence". HH more worried about that than AI – human hardware and software are designed.
- Go play competition: computer invented a new move, intuitive. Computer won 4 of 5 games against the world best Go player.
- ARM: fight against Intel, finally won by ARM because of different business model: licensees instead of own factories. 20 ARM processors in one phone. 95 % of market share in mobile phone processors, also outselling Intel in profit.
- 6 waves of computing: if somebody dominates one wave, will miss or do not play an important role in the next wave (e.g. IBM, Dec, Sun). New world: no decision involving high amounts of money (Uber instead of buying car). Car producers will be only a component supplier for service providers, for long time no change in business model – a basic power shift. Shift of attitude among young people towards the need of owning a car.
- Similar problem with healthcare with the business model of pharma.
- The story of natural selection is really finished, we now determine the future of ourselves (Aristoteles (logistics – the base formula to introduce probabilistic arguments) – Alan Turing (computability).
- We will have a new partner: by 2050, we will have superintelligence – more intelligent to human kind in every aspect. The key problem for us will be how we coevolve with machines, how we make sure that these new intelligent machines will have human goals and will live happily with us.

**Panel Discussion**

Participants:
o Dr. Hermann Hauser (HH): investor in startups, Chairman of European Innovation Council
o Kazunori Sato (KS): Tech Lead for Data & Analytics, Cloud Platform | Google Japan
o Prof. Dr. Karin Pröll (KP): Progr. Dir. MSc Data Science & Engineering | FH OÖ Hagenberg
o Prof. Dr. Peter Purgathofer (PP): Head of Human Computer Interaction | TU Vienna
o Heinrich Schmid-Schmidsfelden (HSS): Head of Corporate Innovation | Kapsch TrafficCom
o moderator: Clemens Wasner (CW): CEO & Co-Founder | enliteAI

HH to question what is different now to the past that artificial intelligence finds a break-through: Citing Geoffrey Hinton – increasing order of importance to solve today's problems, improvement of algorithms, availability of the right data and infrastructure to deal with big data. We should not be too afraid from this development: in general, new technological introductions produce an improvement for people.

KP: Many Open Source software packages at a low cost are available to develop artificial intelligence (AI) in research and education.

HSS: We can improve our services and products through AI offering higher value added to our customers. We are still waiting for the huge step of AI development; there is much more a hype in AI now.

PP: In certain situations, we will prefer to talk to humans than to machines. Many people do not want to communicate with machines at all. AI works well in nice situations but not in situations that are more critical. The world is not perfect – the cases when technology fails. We know from automation the irony of introducing technology: human lose knowhow to do it on their own as soon as they hand over tasks to devices. The human should not take over the machine in the critical 2% of autonomous driving. The

automation systems must be more oriented towards the needs of human than optimizing efficiency of the systems.

KS about impact on labour market by introducing AI: need of more people who can focus on creativity and productivity.

KP: A small number of people will lose their jobs who cannot develop their knowledge. The new technologies are helpful; people will like to use them. There will be a change of job profiles and an upgrade of responsibilities, less boring tasks.

HH: Critics to studies generalizing the loss of white-collar jobs through automation: failures in the concept of Oxford study, if you analyse the presumptions in more details (Mannheim study): clerks do not deal with filing all day, but are much more involved in interaction with others. Consequently, they would get more time for interaction and lose boring tasks with AI. Introduction of autonomous driving of trucks on motorways in the US will happen within less than 5 years (a driver will bring the truck into the city). Many critics, but the only solution to deal with the lack of truck drivers in the near future. Ethical problem using drones for weapon systems, petition to ban the use of automated weapons based on AI. More and more big IT companies employ sociologists to integrate social aspects in their programmes.

KP: Ethical topics do not find interest among IT students, but after some years employed they realise the importance of this issue. Data scientists are lacking who are able to prepare data correctly.

KZ: Google dealing with ethical questions – serious validation before rolling out software.

Public question about Alexa used by children. PP: Alexa is always nice to you no matter how badly you behave with Alexa. This may have a negative impact on the learning of children how to deal with to other people, especially with women. Many families are not aware of.

ZS: Child in Japan with disabilities to communicate – positive effect of learning through AI.

Public question about disconnecting from databases to HH: you cannot pull the plug, because databases are worldwide connected and stored in many places. He recommends the book "Life 3.0" from Max Tegmark (in which ways life can develop) as well as Nick Bostrom's book on superintelligences.

Public question on autonomous driving making sure that the system runs without failure. PP: companies like Tesla do not disclose their test data to the public. Legislation has to step in to guarantee access to learn out of accidents.

Public statement that personal data does not belong to others. PP: in theory, but not in practice: case of Max Schrems fighting against Facebook not succeeding to get his data.

Public question on voice recognition, Alexa cannot replace humans, not intelligent enough. New technology does not necessarily make people happy, but also many positive cases. How could we invent technologies that really help people, observing ethical standards?

HSS: We are in uncharted territories here, but using AI as a chance, praising change. We can see the future bright and positive.

KZ: cucumber-sorting case in Japan, engineer left his job to develop an AI-based cucumber-sorting machine by using Google TensorFlow. The users have the choice to use AI.

PP: case cobras in India and the British army – do not intervene in a society you do not know perfectly. Better to educate users, the youth to use Internet etc. correctly. We are a learning society.

Public question: how long will it take that AI will understand a joke? PP: we are nearing to the AI bubble burst, creating false expectations. ML is not really learning in a human way, but much more making deductions from large data sets with better algorithms. Not yet clear how does the brain actually work, how emotions arise. It will still take time to AI to laugh at a joke.

KS: use machine learning as an efficient tool and forget the rest about AI.

HH: opposite argument – importance on the influence of neuroscience for AI. Latest programmes display already a lot of imagination. The progress now is very rapid. Encroaching areas in humanity we did not expect.
We are creating virtual simulation environments where AI can train by itself without implementation in real environments. The autonomous driving system will also make mistakes, but fewer mistakes than people will.

HSS: number of driving licenses and car sales go down – autonomous driving will come fast.

KZ presenting TensorFlow (open source software for ML development by Google) business cases: cucumber sorting, AUCNET (upload of photos and recognition of second-hand cars), kewpie (quality check of baby food), movements of fishing trailers, AXA (predicting drivers with probable large-scale accidents with 80% accuracy). Deep learning needs much data – new techniques like transferal learning. ML Engine by Google Cloud.

KP to situation in Austria for AI projects: companies cooperate intensively with universities, because they do not have the necessary scientists to prepare and analyse the data. Additional public funding of projects.

HSS: lack of data scientists for sensitive data, lack of embracing change for large corporates. Cooperation with start-ups in Factory1: get the line organisation to work with external people to solve problems.

CW: admission limitation on the Technical University of Vienna for IT subjects despite the fact that IT engineers are lacking. PP: we cannot handle the amount of students any more.

KP: There is not sufficient interest in studying computer sciences. MINT studies (mathematics, informatics, natural sciences and technology) should be promoted.

PP recommends giving much money into these studies to educate more students broadly.

HH: The Austrian government has to be more serious in spending higher amounts for the tertiary educational system if they really want to establish Austria as innovation leaders.

Public question about AI in medical area, e-learning etc. HH: no fear that AI will cost jobs in medical sector because of better interpretation of tumours, because doctors will have more time to consult patients.

Public question on "machines have to know when they don't know". HH: encouraging results with model building in AI. We are beginning to build models that need less data.

Public question on "how is Google dealing with the loss of power". HH: we should not fear that Google would lose power. KS: installed TensorFlow on Rasberry Pi to record habits.

Public question on self-determination. PP: balancing of power between state and individual. Self-determination is a force that breaks out once too much limited.