

## KCIST ONLINE LECTURE SERIES KI@KIT

31 May 2021, 17:30 – 19:00

KIT Center Information · Systems · Technologies

Intelligence is the  
ability to adapt to  
change

Stephen Hawking



# Living the Change

### Program

**Prof. Dr. Ralf Mikut**

*Deep Learning & Alternatives for Image Analysis in Life Sciences and Industry 4.0*

**Dr. Markus Götz**

*An Introduction to Helmholtz AI &  
BaumBauen - Reconstruction of Particle Decays using Deep Learning*



## PROGRAM



**Prof. Dr. Ralf Mikut**

Institute for Automation and Applied Informatics (IAI)

**Title:** *Deep Learning & Alternatives for Image Analysis in Life Sciences and Industry 4.0*

**Abstract:** The automated analysis of images plays an important role in many real-world life science and engineering applications. Examples in life sciences are 2D(+t) or 3D(+t) cell segmentation and tracking, the online detection of tissue types and the detection of droplets and beads; an example in Industry 4.0 is the design of online monitoring for production systems. Typical challenges are limitations in training datasets (e.g., underrepresented cases, few annotations) and the need for the integration of prior knowledge to increase user acceptance. Deep learning competes with classical algorithms based on handcrafted features and bag-of-visual words. The aim of the talk is to discuss advantages and disadvantages of various strategies and to give insights in real-world use cases in our group.



**Dr. Markus Götz**

Steinbuch Centre for Computing (SCC)

**Title:** *An Introduction to Helmholtz AI & BaumBauen - Reconstruction of Particle Decays using Deep Learning*

**Abstract:** The Helmholtz Artificial Intelligence Cooperation Unit (Helmholtz AI) is one of five platforms initiated by the Helmholtz Information and Data Science Incubator. Its main goal is to become a driver for applied artificial intelligence (AI) through the development and distribution of AI methods across all Helmholtz centres, effectively combining AI-based analytics with Helmholtz' unique research questions and datasets. The talk will highlight collaboration opportunities in line with the voucher system, funding opportunities for innovative AI research projects as well as getting access to the AI compute resources HAICORE.

One of the Helmholtz AI vouchers we are consulting on is concerned with particle decay reconstruction in high energy physics (HEP). The ability to correctly identify decays allows researchers to make precision measurements of the physics governing particle interactions. The current Belle-II generic reconstruction tool used, the Full Event Interpretation (FEI) has several design limitations, namely that it is not end-to-end trainable and that the decay processes it can reconstruct are hand-coded. In line with this we develop a deep learning approach to reconstruct the decays trees. The project is a collaboration between several institutes: the Institut für Experimentelle Teilchenphysik (Karlsruhe Institute of Technology, DE), the High Energy and Detector Physics Group (University of Bonn, DE), and the Institut Pluridisciplinaire Hubert Curien (University of Strasbourg/Centre national de la recherche scientifique, FRA).