1st Interdisciplinary „Israel-TUM Summer School in the Alps“

How is Machine Learning changing the Life Sciences?

Facts

- Five-day programme: week to be determined. The following options are shortlisted:
  - September 4 – 8, 2017
  - September 11 – 15, 2017
  - Alternatively: end of October or beginning of November 2017
- Where: Munich's surrounding area, Germany – location to be confirmed
- Who: 20 participants (PhD candidates = 10 from selected Israeli partner institutions; 10 from TUM + lecturers)
- Technical University of Munich funds accommodation, venue, meals and domestic transport for all doctoral candidates and staff for the duration of the course week.
- Participating institutions fund the costs of international travel to Munich for visiting candidates and staff.
- Requirements: PhD candidates with a pronounced interest in obtaining new international experiences and equipped with genuine curiosity for the interdisciplinary interaction of Machine Learning and Life Sciences.

Lectures and Topics

- The 1st Interdisciplinary „Israel-TUM Summer School in the Alps“ is an annual five-day programme comprising about three days of professional skills training in interdisciplinary research and collaboration complemented by two days of themed training as well as activities/field trips together with lectures from academics working in the interdisciplinary area of Machine Learning/Life Sciences.
- Context of the themed training: In the life sciences, researchers are leveraging machine learning in their work to drive groundbreaking discoveries that may help improve the health and wellbeing of people.
- Lectures will stress the importance of interdisciplinary collaboration between life and computer sciences and open discussions provide an international forum for both practitioners seeking new cutting-edge tools for solving their domain problems and theoreticians seeking interesting and real-life applications for their novel algorithms.
- Special interest will be paid to novel machine learning technologies, designed to tackle complex medical, biological, chemical or environmental data that take into consideration the specific background knowledge and interactions between the considered problems.
- Professionals skills training will complement the programme by conveying transferable competences in the areas Personality & Self-Management, Communication & Methodological Competence as well as Leadership & Responsibility.
Format

- Day 1 (Afternoon): Welcome reception with introductory talk and research presentations
- Day 2: Research presentation + lectures
- Day 3 – 4: Professional skills training, possibly combined with an excursion
- Day 5: Lectures + wrap-up session + final discussion

Goals

- Doctoral candidates develop skills and networks that are crucial to becoming a global researcher
- Understand the relation between Machine Learning and Life Sciences
- Realize the connected challenges
- Demonstrate the importance of interdisciplinary approaches
- Scientific exchange and networking
- Start discussions for possible future German-Israeli collaborations

Short CVs of lecturers

- **Prof. Dr. Burkhard Rost – Chair of Bioinformatics**
  Professor Rost conducts research on bioinformatics and computer-aided biology, with a focus on predicting the functions and structures of proteins and genes. He also focuses on enabling earlier diagnosis and more effective treatment of illnesses. The specific niche of his research group links artificial intelligence and machine learning to evolution. After studying physics, history and philosophy at the Universities of Giessen and Heidelberg, Professor Rost received his doctorate at the European Molecular Biology Laboratory (EMBL) in 1994. Following research stays at EMBL and the European Bioinformatics Institute in Cambridge (UK), as well as a brief period in industry at LION Bioscience in Heidelberg, he assumed a professorship at Columbia University (New York) in 1998. In 2009, he accepted an appointment to the Chair of Bioinformatics at TUM. He is a member of the New York Academy of Sciences and has been President of the International Society for Computational Biology since 2007. He has authored 200 scientific publications with a Hirsch index of 50 (2010).

- **Prof. Donna Ankerst, Ph.D. – Biostatistics (tbc)**
  Donna Ankerst (b. 1968) conducts research in the field of applied statistics, in particular on the development of methods for dealing with difficulties encountered in the analysis of observation studies and experiments, including missing data, high-dimensional covariate such as genetic and proteomic risk profiles, as well as the causal inferences of treatment effects. Having completed undergraduate studies in mathematics and receiving her doctorate in statistics at Carnegie Mellon University, Ankerst worked as a postdoctoral researcher at Harvard University, Boston (1997-2000) and at Fred Hutchinson Cancer Research Center, Seattle (2000-2006). In 2006 she took up a position in Munich, initially at LMU Munich. Since 2008 she has headed the associate professorship for mathematical statistics at TUM. Ankerst has also been a research professor at the University of Texas Health Science Center, San Antonio, USA, since 2006.

- **Professor Dr. Daniel Cremers – Chair Computer Vision and Pattern Recognition (tbc)**
  Professor Cremers conducts research on mathematical image processing and pattern recognition. The objective of this research is to improve the ability of machines to analyze and interpret image data. His research focuses on convex optimization methods, partial differential equations, graph theory algorithms and statistical inference. Professor Cremers is a co-editor of the International Journal of Computer Vision, IEEE Transactions on Pattern Recognition and Machine Intelligence and the SIAM Journal of Imaging Sciences. After studying physics and mathematics at Heidelberg University, Indiana State and Stony Brook, Professor Cremers
was awarded a doctorate in computer science in 2002 at the University of Mannheim. Professor Cremers has been full professor of image processing and pattern recognition at TUM since 2009.

- **Prof. Yana Bromberg - Biochemistry and Microbiology – Rutgers University, IAS Fellow (tbc)**
  Dr. Yana Bromberg is an associate professor at the Department of Biochemistry and Microbiology, Rutgers University. She is also a fellow at the Institute of Advanced Studies in the Technical University of Munich. Dr. Bromberg received her Bachelor degrees in Biology and Computer Sciences from the State University of New York at Stony Brook and a Ph.D. in Biomedical Informatics from Columbia University, New York. Currently, research in the Bromberg lab is focused on the molecular functional annotation of microbiomes, aiming to identify emergent functionality specific to individual environmental niches. The lab also analyses human variomes for disease predisposition and the studies evolution of life’s electron transfer reactions. Dr. Bromberg is a member of the Board of Directors of the International Society for Computational Biology and actively participates in organizing the ISMB/ECCB conferences.