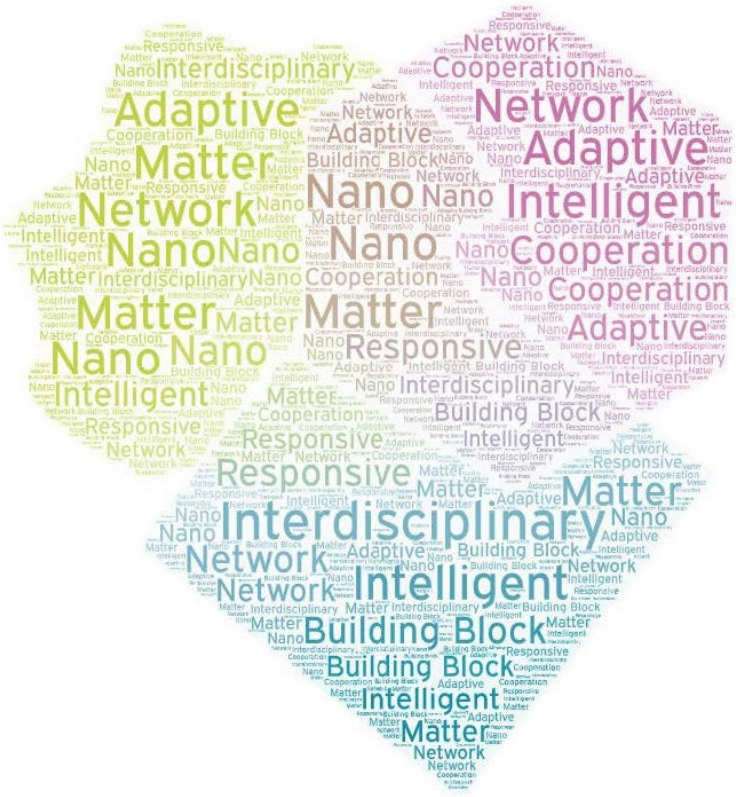
Westfälische Wilhelms-Universität Münster

Center for Soft Nanoscience

CRC 1459 INTELLIGENT MATTER

CRC 1459
Spring Colloquium 2023

April 20th 2023 | 3:00pm (CEST)
Münster, Germany



Booklet of Abstracts

Program

3:00 pm	**Helen Tran** University of Toronto, Canada ***Macromolecular Bioelectronics***	*Malte Schrader*
4:00 pm	**Emre Neftci** Jülich Forschungszentrum, Germany ***Learning with Brain-Inspired Computers***	*Niklas Vollmar*
5:00 pm	**CRC Networking Event**	

Please see our website www.uni-muenster.de/SFB1459/events for updates
or contact crc1459@uni- muenster.de if you have any questions!

Speakers

Prof. Helen Tran

Department of Chemistry
University of Toronto
Toronto, Canada

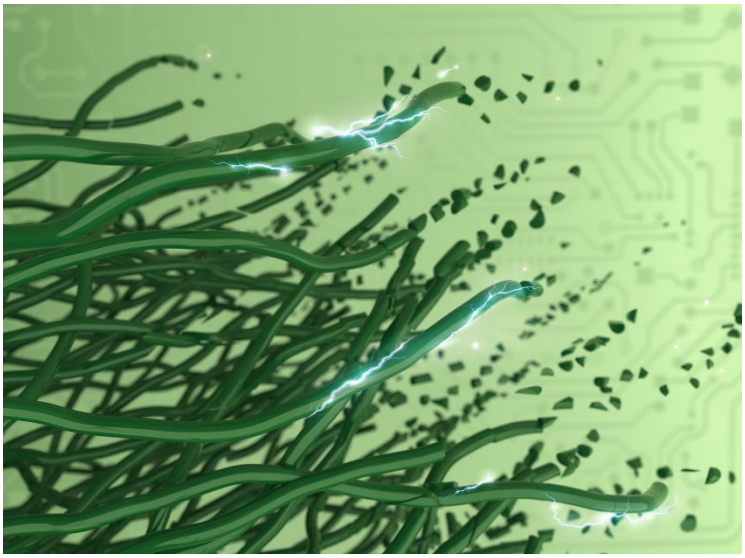
Dr. Tran is an Assistant Professor at the University of Toronto in the Department of Chemistry (cross-appointed in the Department of Chemical Engineering, started 2021). She was an Intelligence Community postdoctoral fellow at Stanford University under the mentorship of Prof. Zhenan Bao in the Chemical Engineering Department, where she worked on stretchable and biodegradable electronics. She received her BS in Chemistry with a minor in Chemical Engineering from the University of California—Berkeley in 2009, conducting undergraduate research with Prof. Tsu-Jae King Liu (Electrical Engineering, Berkeley) and Prof. Christopher Schuh (Material Science, Massachusetts Institute of Technology). In the two subsequent years, Dr. Tran was a post-baccalaureate fellow and Scientific Engineering Assistant in Dr. Ronald Zuckermann's research group at the Molecular Foundry at Berkeley National Labs, exploring the self-assembly of biomimetic polymers into 2D nanosheets. She completed her PhD at Columbia University in 2016 under the supervision of Prof. Luis Campos, broadly investigating hierarchical ordering and periodic patterning in block copolymer systems. Also, she was selected as an AAAS IF/THEN Ambassador for her outreach endeavors, leading to media opportunities such as being featured on the CBS TV show Mission Unstoppable and on the Girl Scouts Cadette Badge Workbook for Exploring STEM Careers. Dr. Tran has been committed to scientific outreach, endorses communication among interdisciplinary disciplines, and continually strives to become a supportive mentor.

Macromolecular Bioelectronics

Helen Tran, University of Toronto, Canada

Next-generation electronics will autonomously respond to local stimuli and be seamlessly integrated with the human body, opening the doors for opportunities in environmental monitoring, advanced consumer products, and health diagnostics for personalized therapy. For example, biodegradable electronics promise to accelerate the integration of electronics with health care by obviating the need for costly device-recovery surgeries that increase

infection risk. Moreover, the environmentally critical problem of discarded electronic waste would be relieved. The underpinning of such next-generation electronics is the development of new materials with a wide suite of functional properties beyond our current toolkit. Organic polymers are a natural bridge between electronics and soft matter, where the vast chemical design space allows tunability of electronic, mechanical, and transient properties. Our research group leverages the rich palette of polymer chemistry to design new materials encoded with information for self-assembly, degradability, and electronic transport. In this talk, I will share an overview or projects underway in our group.



Prof. Dr. Emre Neftci

Peter Grünberg Institut
Forschungszentrum Jülich
Jülich, Germany

Dr. Neftci received his MSc degree in physics from EPFL in Switzerland, and his Ph.D. in 2010 at the Institute of Neuroinformatics at the University of Zurich and ETH Zurich. He is an associate professor in the Department of Cognitive Sciences and Computer Science at the University of California, Irvine and since July 2021, an institute director at the Jülich Research Centre. His current research explores the bridges between neuroscience and machine learning, with a focus on the theoretical and computational modeling of learning algorithms that are best suited to neuromorphic hardware and non-von Neumann computing architectures.

Learning with Brain-Inspired Computers

Emre Neftci, Forschungszentrum Jülich, Germany

Continual learning at the edge is an aspirational goal of AI technologies. Neuromorphic hardware that implements large Spiking Neural Networks (SNN) is particularly attractive in this regard, thanks to its inherently local computational paradigm and its potential compatibility with future and emerging computing devices.
This talk will first overview of current methods for learning in SNNs using gradient-based methods, which can achieve competitive accuracy and performance compared to Deep Neural Networks (DNNs). The resulting learning algorithms can be implemented as local synaptic plasticity rules. However, similar to DNNs, these are based on data-intensive and iterative training processes that are incompatible with the realities of neuromorphic hardware. I will argue that gradient-based meta-learning (learning-to-learn) can play a key role in closing this gap by enabling accurate and fast learning that is robust to hardware non-idealities. These results bring neuromorphic engineering several steps closer to building intelligent agents that can continuously adapt to their environment in real time.