PROGRAM

ELEVENTH NORDIC WORKSHOP ON SYSTEM AND NETWORK OPTIMIZATION FOR WIRELESS

30th March-2nd April 2020, Åre, Sweden

Tuesday 31/3

08:30-09:30 Keynote by Petar Popovski, "A Prospect in Wireless Research: Embracing Heterogeneous Connectivity"

Abstract:

The wireless landscape evolves towards supporting a large population of connections for humans and machines with very diverse features and requirements. An important step in embracing heterogeneous connectivity has been the definition of the three cornerstone services in 5G: enhanced mobile broadband (eMBB), massive machine-type communications (mMTC), and ultra-reliable low-latency communications (URLLC). However, this classification is rather limited and is currently undergoing a revision within the research community. Service heterogeneity can be accommodated by network slicing, through which each service is allocated resources to provide performance guarantees and isolation from the other services. Nevertheless, slicing gets a completely new dimension in the context of the shared, interfering nature of the wireless medium. For example, what is the tradeoff when two links are sharing the wireless medium, where one link requires low latency and the second link requires a high rate? This talk will address this type of questions and shed light on the research challenges and

opportunities in addressing those questions. Overall, supporting assorted connectivity types in a shared wireless spectrum is an important prospect for connectivity beyond 5G.

Bio:

Petar Popovski is a Professor Aalborg University, where he heads the section on Connectivity. He received his Dipl.-Ing and M. Sc. degrees in communication engineering from the University of Sts. Cyril and Methodius in Skopje and the Ph.D. degree from Aalborg University in 2005. He is a Fellow of the IEEE. He received an ERC Consolidator Grant (2015), the Danish Elite Researcher award (2016), IEEE Fred W. Ellersick prize (2016), IEEE Stephen O. Rice prize (2018) and Technical Achievement Award from the IEEE Technical Committee on Smart Grid Communications (2019). He is currently a Member at Large at the Board of Governors in IEEE Communication Society. Prof. Popovski is a Steering Committee Member of IEEE SmartGridComm and IEEE TRANSACTIONS ON GREEN COMMUNICATIONS AND NETWORKING. He previously served as a Steering Committee Member of the IEEE INTERNET OF THINGS JOURNAL. He is currently an Area Editor of the IEEE TRANSACTIONS ON WIRELESS COMMUNICATIONS. Prof. Popovski was the General Chair for IEEE SmartGridComm 2018 and IEEE Communication Theory Workshop 2019. His research interests are in the area of wireless communication and communication theory. His book "Wireless Connectivity: An Intuitive and Fundamental Guide" will be published by Wiley in April 2020.

09:30-10:00 Coffee break

10:00-12:00 Networking

12:00-14:00 Lunch break

Session (16:00-17:40)

16:00-16:25 R. Vehkalahti, T. Pllaha, and O. Tirkkonen (Aalto University, Finland), Towards Ultra-Reliable Signature Coding With Multiple Antennas

16:25-16:50 Jonas Olsson, Alexey Shapin (ERICSSON Research, Sweden), Ultra-Reliable Low Latency Communication (URLLC) in 5G NR (New Radio): Features, coverage and capacity

16:50-17:15 Jens Abraham, Torbjörn Ekman and Kimmo Kansanen (NTNU), The URLLC Frontier and the Effective Massive MIMO Channel

17:15-17:40 Muhammad Royyan, Mikko Vehkapera, Themistoklis Charalambous, and Risto Wichman (Aalto University), Adaptive Coded Modulation for Stabilization of Wireless Networked Control Systems over Discrete Memoryless Channels

17:40-18:10 Coffee break

18:10-18:35 Afsaneh Mahmoudi, Hossein S. Ghadikolaei, and Carlo Fischione (KTH Royal Institute of Technology), Is Co-design of Distributed Optimization and Communication Protocols Essential for Machine Learning over Networks?

18:35-19:00 Henrik Hellström, Viktoria Fodor, and Carlo Fischione (KTH Royal Institute of Technology), An Introduction to Radio Resource Management for Machine Learning over Networks

19:00-19:25 O. Tirkkonen & T. Pllaha (Aalto University, Finland) and R. Calderbank (Duke University, USA), Binary Subspace Chirps and Their Applications

20:00 Dinner

Wednesday 1/4

08:30-09:30 Keynote by Roy Yates, "The Age of Information: Real-time Status Updates at the Edge"

Abstract:

Ubiquitous network connectivity has led to applications in which sources such as environmental sensors, video cameras, and autonomous vehicles send updates of their status to interested recipients. These applications require timely status updates at the recipients; however, this is typically constrained by limited communication and network resources. We describe Age-of-Information (AoI) timeliness metrics for the evaluation of status update systems and we characterize the AoI requirements of a range of real-time applications. We derive general methods for calculating AoI that we apply to system abstractions of sources, monitors, networks, and edge cloud processors. We identify optimal updating policies based on the bandwidth and energy constraints of the senders and system. We observe that optimal updating policies can be counter-intuitive and differ from the throughput/delay tradeoffs that typically describe low latency networking.

Short Bio:

Roy Yates is a Distinguished Professor with the Wireless Information Networks Laboratory (WINLAB) and the Electrical and Computer Engineering (ECE) department at Rutgers University. He received the B.S.E. degree in 1983 from Princeton University, and the S.M. and Ph.D. degrees in 1986 and 1990 from M.I.T., all in Electrical Engineering. He is an author of three editions of the John Wiley textbook "Probability and Stochastic Processes: A Friendly Introduction for Electrical Engineers." An IEEE Fellow in 2011, Dr. Yates is a past associate editor of the IEEE Journal on Selected Areas of Communication Series in Wireless Communication and also a past Associate Editor for Communication Networks of the IEEE Transactions on Information Theory.

09:30-10:00 Coffee break

10:00-12:00 Networking

12:00-14:00 Lunch break

Session (16:00-17:40)

16:00-16:25 Mohammad Hatami, and Markus Leinonen (University of Oulu), Age-Aware Status Update Control for Energy Harvesting Sensors: A Reinforcement Learning Approach

16:25-16:50 A. Kosta, N. Pappas, A. Ephremides, and V. Angelakis (Linköping University), Non-linear Age of Information in a Discrete Time Queue: Stationary Distribution and Average Performance Analysis,

16:50-17:15 Mohammad Moltafet, Markus Leinonen (University of Oulu), and Marian Codreanu (Linköping University), AoI in a Multi-Source M/M/1 Queueing Model: Prioritized Packet Management with Self Preemption

17:15-17:40 Emmanouil Fountoulakis, Nikolaos Pappas, Marian Codreanu, Anthony Ephremides (Linköping University), Optimal Sampling Cost in Wireless Networks with Age of Information Constraints

17:40-18:10 Coffee break

Session (18:10-19:25)

18:10-18:35 Giuseppe Caire (TU Berlin), Optimal Link Scheduling in mmWave Relay Networks

18:35-19:00 Cristian Tatino, Nikolaos Pappas (Linköping University), Ilaria Malanchini, Lutz Ewe (Nokia Bell Labs, Stuttgart), and Di Yuan (Uppsala University), Learning-Based Link Scheduling in Millimeter-wave Multi-connectivity Scenarios

19:00-19:25 Parham Kazemi, Hanan Al-Tous, Christoph Studery and Olav Tirkkonen, SNR Prediction in Cellular System for Handover based on Channel Charting

20:00 Gala dinner

Thursday 2/4

08:30-09:30 Keynote by Ralf Muller Plenary, "Towards an Information Theory of Computation"

Abstract:

Rate-distortion theory has comprehensively solved the problem of approximating data to any given accuracy. But what about approximating functions? Recent advantages in neural information processing teach us that most functions can be approximated by compositions of scalar nonlinearities and multi-dimensional linear functions. We pose the problem of computing a multi-dimensional linear function to a given accuracy with minimum effort. We show that the effort scales less than quadratically with dimensionality and present an algorithm to capitalize on that. We highlight the relations of computation with minimum effort to rate-distortion theory and sparse recovery.

Bio:

Ralf R. Müller received the Dipl.-Ing. and Dr.-Ing. degree with distinction from Friedrich-Alexander-Universität (FAU) Erlangen-Nürnberg in 1996 and 1999, respectively. From 2000 to 2004, he directed a research group at The Telecommunications Research Center Vienna in Austria and taught as an adjunct professor at TU Wien. In 2005, he was appointed full professor at the Department of Electronics and Telecommunications at the Norwegian University of Science and Technology in Trondheim, Norway. In 2013, he joined the Institute for Digital Communications at FAU Erlangen-Nürnberg in Erlangen, Germany. He held visiting appointments at Princeton University, US, Institute Eurécom, France, University of Melbourne, Australia, University of Oulu, Finland, National University of Singapore, Babes-Bolyai University, Cluj-Napoca, Romania, Kyoto University, Japan, FAU Erlangen-Nürnberg, Germany, and TU München, Germany. Dr. Müller received the Leonard G. Abraham Prize (jointly with Sergio Verdú) for the paper "Design and analysis of low-complexity interference mitigation on vector channels" from the IEEE Communications Society. He was presented awards by the Vodafone Foundation for Mobile Communications and the German Information Technology Society (ITG). Moreover, he received the ITG award for the paper "A random matrix model for communication via antenna arrays" as well as the Philipp-Reis Award (jointly with Robert Fischer). Dr. Müller served as an associate editor for the IEEE Transactions on Information Theory from 2003 to 2006 and on the executive editorial board of the IEEE Transactions on Wireless Communications from 2014 to 2016.

09:30-10:00 Coffee break

Session (10:00 – 11:40)

10:00-10:25 Claes Beckman (KTH Royal Institute of Technology), Alternative Technologies for Providing Voice Services onboard Trains

10:25-10:50 Mohammad Javad Salehi, Antti Tölli, Seyed Pooya Shariatpanahi and Jarkko Kaleva (University of Oulu), Subpacketization-Rate Trade-off in Multi-Antenna Coded Caching

10:50-11:15 Ghafour Ahani and Di Yuan (Uppsala University), Cost-Optimal Caching for D2D Networks with Presence of User Mobility

11:15-11:40 Jaya Prakash Champati, Ramana R. Avula, Tobias J. Oechtering, and James Gross (KTH Royal Institute of Technology), On the Minimum Achievable Age of Information for General Service-Time Distributions

11:40-11:45 Closing remarks

11:45 Lunch