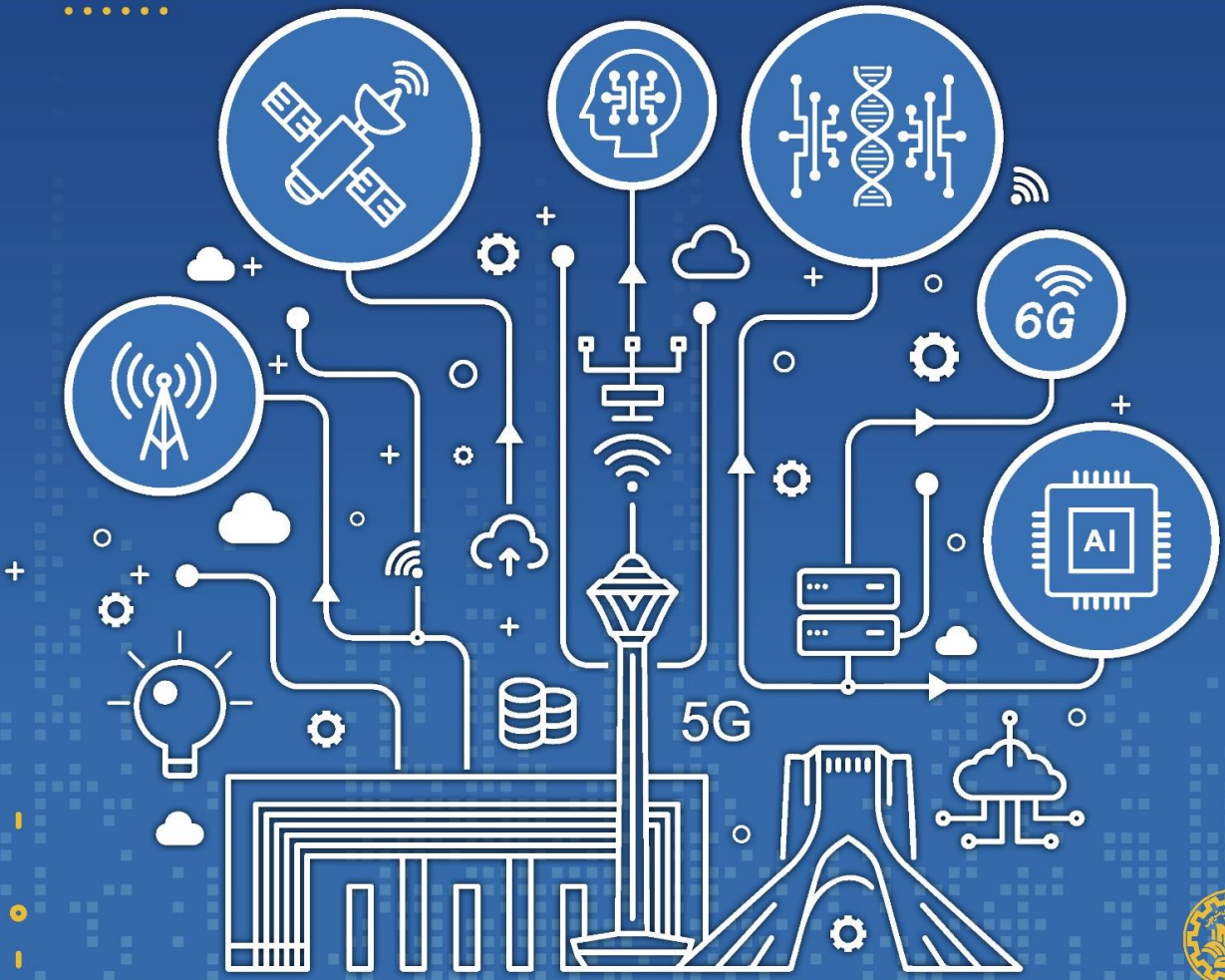


IWCIT 2024



12th Iran Workshop on Communication and Information Theory

May 1st-2nd 2024 | iwcit@sharif.ir | [@iwcit](https://www.instagram.com/iwcit)

Sharif University of Technology, Tehran, Iran

Visit us at

www.iwcit.com



Link to conference website

[in](https://www.linkedin.com/company/iwcit) [@iwcit](https://www.instagram.com/iwcit)

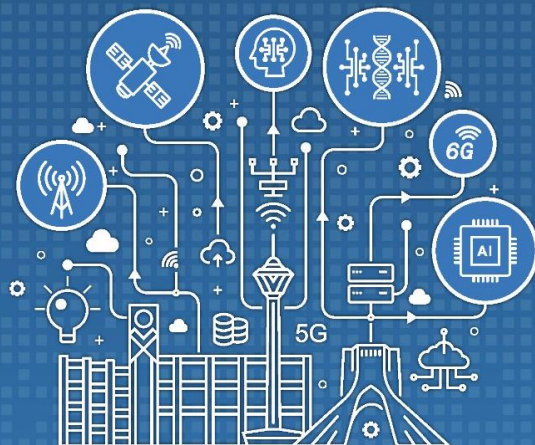
www.iwcit.com



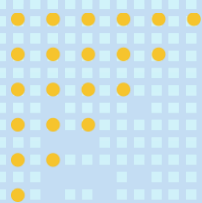
IWCIT 2024

12th Iran Workshop on Communication and Information Theory

Sharif University of Technology, Tehran, Iran



Sponsors



ریاست جمهوری
معاونت علمی، فناوری و اقتصاد دانش بنیان
سازمان توسعه فناوری های اتصال پذیری و ارتباطات



هاده اولک



Link to conference website

Contact Us:

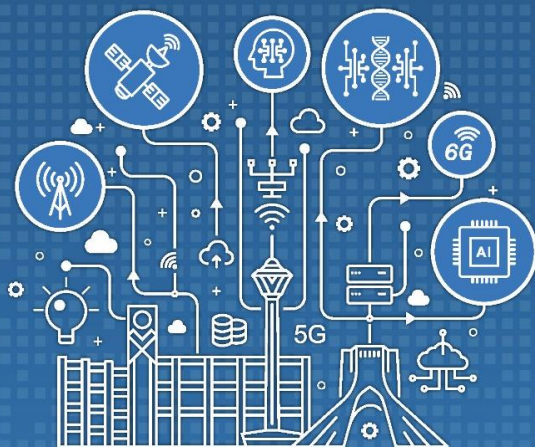
Address: Room 503, Faculty of Electrical Engineering,
Sharif University of Technology, Tehran, Iran
Email: iwcit@sharif.ir Tel: +9821-66164380



IWCIT 2024

12th Iran Workshop on Communication and Information Theory

Sharif University of Technology, Tehran, Iran



Technical Program

May 1st 2024

Wednesday, May 1st 2024

07:30 – 07:45	Babak Khalaj (Opening Talk)	
07:45 – 08:00	Vahid Shahmansoori (Sponsor Talk)	
08:00 – 09:00	Merouane Debbah (Keynote Speech)	Large Language Models: The Falcon Case Study
09:00 – 09:15	Break	
09:15 – 10:45	Paper Presentation (Data Analysis & AI)	
10:45 – 12:15	Salman Beigi (Tutorial, Part 1)	Error Exponents in Quantum Information Theory
12:15 – 13:45	Lunch	
13:45 – 15:15	Salman Beigi (Tutorial, Part 2)	Error Exponents in Quantum Information Theory
15:15 – 15:45	Break & Banquet Registration	
15:45 – 16:30	Shirin Saeedi (Invited Talk)	Learning-Based Data Compression: Fundamental Limits and Algorithms
16:30 – 17:30	Mohammad Hajiaghayi (Keynote Speech)	Massively Parallel Algorithms for Maximal Matching and Edit Distance
19:30 – 21:30	Banquet	

IWCIT 2024

12th Iran Workshop on Communication and Information Theory

Sharif University of Technology, Tehran, Iran



Technical Program

May 2nd 2024

Thursday, May 2nd 2024		
07:45 – 08:00	Arash Amini (Sponsor Talk)	
08:00 – 09:15	Paper Presentation (Applications & Coding)	
09:15 – 10:00	Mohammad Mahmoody (Invited Talk)	Watermarking LLM-generated Texts
10:00 – 10:15	Break	
10:15 – 11:15	Mazyar Mirrahimi (Keynote Speech)	Roadmaps to Fault-tolerant Quantum Computation with Superconducting Circuits
11:15 – 12:00	Giovanni Geraci (Invited Talk)	Model-based and Data-driven Cell Optimization for 3D Coverage and Capacity
12:00 – 13:30	Lunch	
13:30 – 14:30	Sinem Coleri (Keynote Speech)	Explainable AI Based Ultra-Reliable Wireless Networked Control Systems in 6G
14:30 – 16:00	Paper Presentation (Communication)	
16:00 – 16:15	Break	
16:15 – 19:15	Pooya Shariatpanahi Antti Tölli Mohammad Javad Salehi (Tutorial)	Multi-antenna Coded Caching for Enhanced Wireless Content Delivery

IWCIT 2024

12th Iran Workshop on Communication and Information Theory

Sharif University of Technology, Tehran, Iran



Technical Program

May 1st 2024

Wednesday, May 1st 2024

Keynote Speeches



Merouane Debbah

**Large Language Models: The
Falcon Case Study**

08:00 – 09:00



Mohammad Hajiaghayi

**Massively Parallel Algorithms for
Maximal Matching and Edit
Distance**

16:30 – 17:30

Invited Talks



Shirin Saeedi

**Learning-Based Data
Compression: Fundamental
Limits and Algorithms**

15:45 – 16:30

Tutorials



Salman Beigi

**Error Exponents in Quantum
Information Theory**

10:45 – 12:15

13:45 – 15:15



Link to conference website

Contact Us:

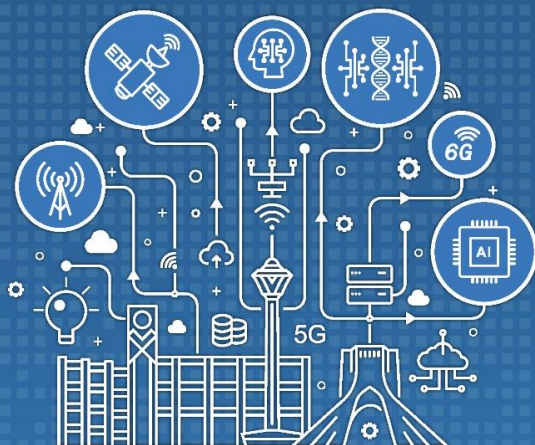
Address: Room 503, Faculty of Electrical Engineering,
Sharif University of Technology, Tehran, Iran
Email: iwcit@sharif.ir Tel: +9821-66164380



IWCIT 2024

12th Iran Workshop on Communication and Information Theory

Sharif University of Technology, Tehran, Iran



Technical Program

May 2nd 2024

Thursday, May 2nd 2024

Keynote Speeches



Mazyar Mirrahimi

**Roadmaps to Fault-tolerant
Quantum Computation with
Superconducting Circuits**
10:15 – 11:15



Sinem Coleri

**Explainable AI Based Ultra-
Reliable Wireless Networked
Control Systems in 6G**
13:30 – 14:30

Invited Talks



Mohammad Mahmoody

**Watermarking LLM-generated
Texts**
09:15 – 10:00



Giovanni Geraci

**Model-based and Data-driven
Cell Optimization for 3D
Coverage and Capacity**
11:15 – 12:00

Tutorials



Pooya Shariatpanahi

Antti Tölli

Mohammad Javad Salehi

**Multi-antenna Coded Caching for Enhanced
Wireless Content Delivery**
16:15 – 19:15



Link to conference website

Contact Us:

Address: Room 503, Faculty of Electrical Engineering,
Sharif University of Technology, Tehran, Iran
Email: iwcit@sharif.ir Tel: +9821-66164380



IWCIT 2024

12th Iran Workshop on Communication and Information Theory

Sharif University of Technology, Tehran, Iran



Paper Presentations (Data Analysis & AI)

Wednesday, May 1st 2024, 09:15 – 10:45

Paper Presentation, Data Analysis & AI Track

09:15 – 09:30

Ali Ghandi, Saeed Bagheri
Shuraki

Deep ExRL: Experience-Driven Deep Reinforcement Learning with Improving Learning in Control Problems

09:30 – 09:45

Arash Jamshidi, Seyed
Mohammad Hoseini,
Seyed Mahdi
Noormousavi,
Mahdi Jafari Siavoshani

Differentially Private Machine Learning-Powered Combinatorial Auction Design

09:45 – 10:00

Fatemeh Kasraei, Arash
Amin

Fast High-Quality Directed Graph Learning

10:00 – 10:15

Erfan Zinvandi, Morteza
Alikhani, Zahra
Pourbahman, Reza
Kazemi, Arash Amini

Persian Text Information Retrieval Corpus

10:15 – 10:30

Javad Ebrahimi,
Alireza Tofighi
Mohammadi

Extending Partial Differential Private Mechanisms via Linear Programming



Link to conference website

Contact Us:

Address: Room 503, Faculty of Electrical Engineering,
Sharif University of Technology, Tehran, Iran
Email: iwcit@sharif.ir Tel: +9821-66164380



IWCIT 2024

12th Iran Workshop on Communication and Information Theory

Sharif University of Technology, Tehran, Iran



Paper Presentations (Applications & Coding)

Thursday, May 2nd 2024, 08:00 – 09:15

Paper Presentation, Applications & Coding Track

08:00 – 08:15	Ghosseh Abed Hodtani, Faramarz Ajami Khales Fadafen	NOMA Security Analysis with STAR-RIS: Investigating Coverage Region and Outage Probability
08:15 – 08:30	Nurassyl Askar, Stefano Rini	Deep CSI Compression in Wireless Networks: Exploiting Data Heterogeneity for User Clustering
08:30 – 08:45	Mohammad Bagher Iraji, Mohammad Eini, Arash Amini, Stefano Rini	Stationary Processes on Directed Graphs
08:45 – 09:00	Mohammad-Reza Sadeghi, Farzane Amirzade, Daniel Panario	Disjoint Difference Sets and QC-LDPC Codes with Girth 10



Link to conference website

Contact Us:

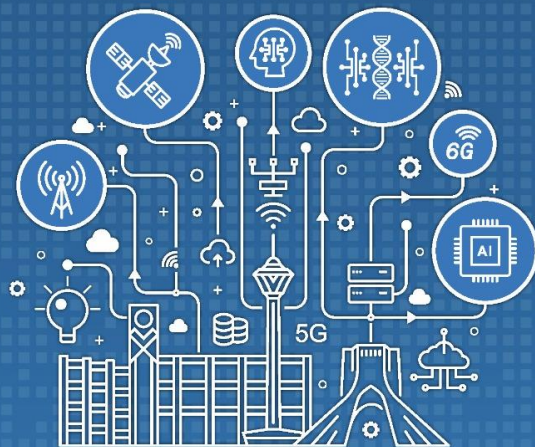
Address: Room 503, Faculty of Electrical Engineering,
Sharif University of Technology, Tehran, Iran
Email: iwcit@sharif.ir Tel: +9821-66164380



IWCIT 2024

12th Iran Workshop on Communication and Information Theory

Sharif University of Technology, Tehran, Iran



Paper Presentations (Communication)

Thursday, May 2nd 2024, 14:30 – 16:00

Paper Presentation, Communication Track

14:30 – 14:45	Mohammad Mehdi Setoode, Mohammad Reza Kavianiinia, Mohammad Javad Emadi	Query Age of Information Analysis in STAR-RIS-Assisted PQ and QAPA Systems
14:45 – 15:00	Mohammad Reza Dibaj, Pouya Mehdizadeh, Hamzeh Beyranvand, et. al	Cost-Optimized Quantum Communication Networks: The Crucial Role of Trusted Node Placement in Multi-Band and Multi-Fiber Realms
15:00 – 15:15	Sepehr Asvadi, Farid Ashtiani	Age of Information in Symmetric Broadcast Networks with Stochastic Packet Arrivals
15:15 – 15:30	Seyed Alireza Javid, Seyed Pooya Shariatpanahi, Mahdi Jafari Siavoshani	Intelligent Reflecting Surface Assisted Over-The-Air Computation with Device-To-Device Communication
15:30 – 15:45	Mehran Rahnamania, Farid Ashtiani	A New Analytical Approach for Delay Analysis in the Presence of Correlated Arrivals



Link to conference website

Contact Us:

Address: Room 503, Faculty of Electrical Engineering,
Sharif University of Technology, Tehran, Iran
Email: iwcit@sharif.ir Tel: +9821-66164380



IWCIT 2024

12th Iran Workshop on Communication and Information Theory

Sharif University of Technology, Tehran, Iran



Keynote Speeches



Merouane Debbah



Mohammad Hajiaghayi



Sinem Coleri



Mazyar Mirrahimi



Invited Talks



Giovanni Geraci



Mohammad Mahmoody



Shirin Saeedi



Link to conference website

Contact Us:

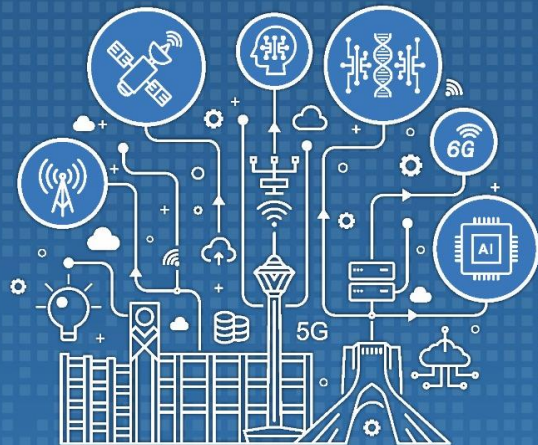
Address: Room 503, Faculty of Electrical Engineering,
Sharif University of Technology, Tehran, Iran

Email: iwcit@sharif.ir Tel: +9821-66164380

IWCIT 2024

12th Iran Workshop on Communication and Information Theory

Sharif University of Technology, Tehran, Iran



Tutorials



Salman Beigi



Pooya Shariatpanahi



Antti Tölli



Mohammad Javad Salehi



Link to conference website

Contact Us:

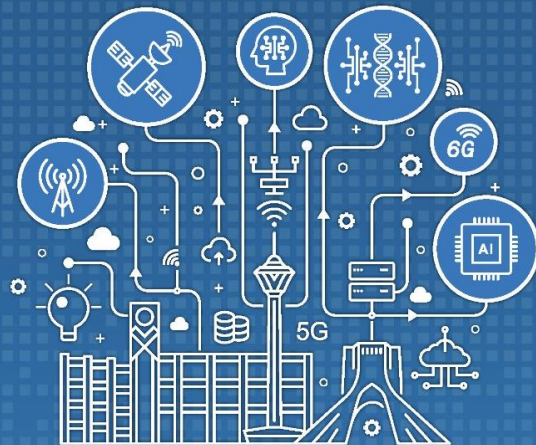
Address: Room 503, Faculty of Electrical Engineering,
Sharif University of Technology, Tehran, Iran
Email: iwcit@sharif.ir Tel: +9821-66164380



IWCIT 2024

12th Iran Workshop on Communication and Information Theory

Sharif University of Technology, Tehran, Iran



Keynote Speech

Wednesday, May 1st 2024, 08:00 – 09:00



Merouane Debbah



Link to conference website



Contact Us:

Address: Room 503, Faculty of Electrical Engineering,
Sharif University of Technology, Tehran, Iran

Email: iwcit@sharif.ir Tel: +9821-66164380

Large Language Models: The Falcon Case Study

Abstract:

In this talk, we will introduce the Falcon series which are causal decoder-only models trained on a diverse high-quality corpora predominantly assembled from web data. The largest model, Falcon-180B, has been trained on over 3.5 trillion tokens of text—the largest openly documented pretraining run. We will discuss in detail on the challenges and opportunities offered by Open Source Large Language Models as well the main applications in the field of Telecommunication.

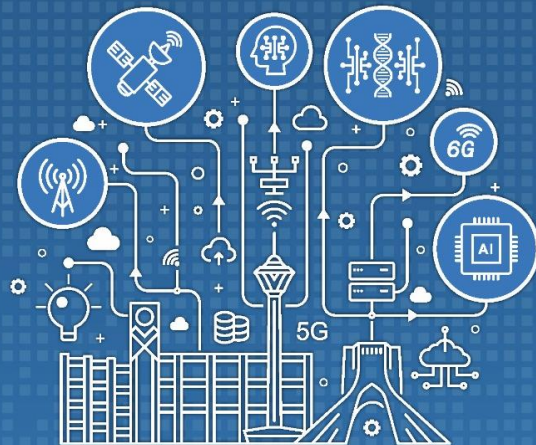
Biography:

Mérouane Debbah is a researcher, educator and technology entrepreneur. Over his career, he has founded several public and industrial research centers, start-ups and is now Professor at Khalifa University of Science and Technology in Abu Dhabi and founding Director of the KU 6G Research Center. He is also the Chief Scientific AI Advisor at the Technology Innovation Institute. He is a frequent keynote speaker at international events in the field of telecommunication and AI. His research has been lying at the interface of fundamental mathematics, algorithms, statistics, information and communication sciences with a special focus on random matrix theory and learning algorithms. In the Communication field, he has been at the heart of the development of small cells (4G), Massive MIMO (5G) and Large Intelligent Surfaces (6G) technologies. In the AI field, he is known for his work on Large Language Models, distributed AI systems for networks and semantic communications. He received multiple prestigious distinctions, prizes and best paper awards (more than 40 IEEE best paper awards) for his contributions to both fields and according to research.com is ranked as the best scientist in France in the field of Electronics and Electrical Engineering. He is an IEEE Fellow, a WWRP Fellow, a Eurasip Fellow, an AAIA Fellow, an Institut Louis Bachelier Fellow and a Membre émérite SEE. His recent work led to the development of NOOR (upon its release, largest language model in Arabic) released in 2022, Falcon LLM (upon its release, top ranked open source large language model) released in 2023 and the Falcon Foundation in 2024. The Falcon Model Series and The Falcon Foundation have positioned the UAE as a global leader in the generative AI field. He is a member of the Marconi Prize Selection Advisory Committee.

IWCIT 2024

12th Iran Workshop on Communication and Information Theory

Sharif University of Technology, Tehran, Iran



Tutorial

Wednesday, May 1st 2024, 10:45 – 12:15, 13:45 – 15:15



Salman Beigi



Error Exponents in Quantum Information Theory

Abstract:

This tutorial is about error exponents in some primitive quantum information theoretic tasks, namely quantum hypothesis testing and classical-quantum channel coding. The goal of the tutorial is to review some known results in this area and discuss some open problems. We start with a review of basic results in classical information theory. Next, after a brief discussion of the formalism of quantum physics, we review the aforementioned results in quantum information theory. We finish with some open problems. Knowledge of information theory is beneficial to follow the talks, yet prior knowledge of quantum information theory or quantum physics is not necessary.

Biography:

Salman Beigi received B.Sc. from the Department of Mathematics at Sharif University of Technology in 2004. He received Ph.D. from the Department of Mathematics of MIT in 2009 under the supervision of Peter Shor. Before joining IPM, he was a postdoc at Institute for Quantum Information at Caltech. He is a member of the editorial advisory board of the Journal of Mathematical Physics.



Link to conference website



Contact Us:

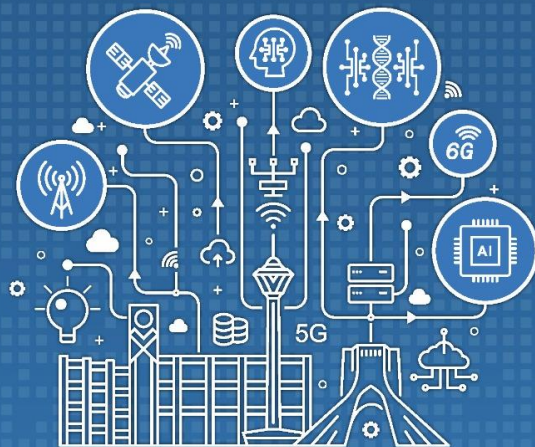
Address: Room 503, Faculty of Electrical Engineering,
Sharif University of Technology, Tehran, Iran

Email: iwcit@sharif.ir Tel: +9821-66164380

IWCIT 2024

12th Iran Workshop on Communication and Information Theory

Sharif University of Technology, Tehran, Iran



Invited Talk

Wednesday, May 1st 2024, 15:45 – 16:30



Shirin Saeedi



Learning-Based Data Compression: Fundamental Limits and Algorithms

Abstract:

Data-driven methods have been the driving force of many scientific disciplines in the past decade, relying on huge amounts of empirical, experimental, and scientific data. Working with big data is impossible without data compression techniques that reduce the dimension and size of the data for storage and communication purposes and effectively denoise for efficient and accurate processing. In the past decade, learning-based compressors such as nonlinear transform coding (NTC) have shown great success in the task of compression by learning to map a high dimensional source onto its representative latent space of lower dimension using neural networks and compressing in that latent space. Despite this success, it is unknown how the rate-distortion performance of such compressors compare with the optimal limits of compression (known as the rate-distortion function) that information theory characterizes and how those limits could be computed for real-world high dimensional datasets. It is also unknown how advances in the field of information theory translate to practice in the paradigm of deep learning. In the first part of the talk, we develop neural estimation methods to compute the rate-distortion function of high dimensional real-world datasets. Using our estimate, and through experiments, we show that the rate-distortion achieved by NTC compressors are within several bits of the rate-distortion function for real-world datasets such as MNIST. We then ask if this gap can be closed using ideas in information theory. In the second part of the talk, we go beyond nonlinear transform coding and discuss generative compression methods based on textual transform coding with a focus on the regime of ultra-low compression rate.

Biography:

Shirin Saeedi Bidokhti is an assistant professor in the Department of Electrical and Systems Engineering at the University of Pennsylvania (UPenn). She received her M.Sc. and Ph.D. degrees in Computer and Communication Sciences from the Swiss Federal Institute of Technology (EPFL). Prior to joining UPenn, she was a postdoctoral scholar at Stanford University and the Technical University of Munich. She has also held short-term visiting positions at ETH Zurich, University of California at Los Angeles, and the Pennsylvania State University. Her research interests broadly include the design and analysis of network strategies that are scalable, practical, and efficient for use in Internet of Things (IoT) applications, information transfer on networks, as well as data compression techniques for big data. She is a recipient of the 2023 Communications Society & Information Theory Society Joint Paper Award, 2022 IT society Goldsmith lecturer award, 2021 NSF-CAREER award, 2019 NSF-CRII Research Initiative award and the prospective researcher and advanced postdoctoral fellowships from the Swiss National Science Foundation.



Link to conference website



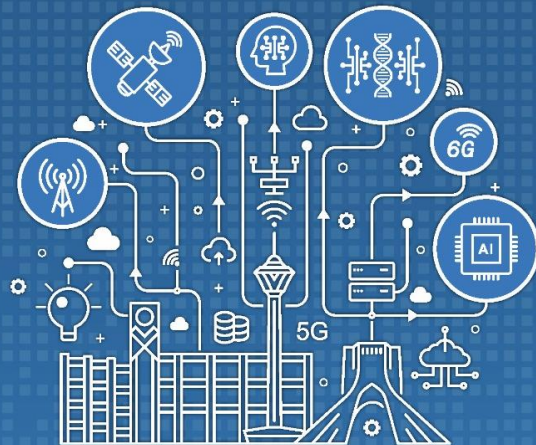
Contact Us:

Address: Room 503, Faculty of Electrical Engineering,
Sharif University of Technology, Tehran, Iran
Email: iwcit@sharif.ir, Tel: +9821-66164380

IWCIT 2024

12th Iran Workshop on Communication and Information Theory

Sharif University of Technology, Tehran, Iran



Keynote Speech

Wednesday, May 1st 2024, 16:30 – 17:30



Mohammad Hajiaghayi



Massively Parallel Algorithms for Maximal Matching and Edit Distance

Abstract:

In this talk we will discuss the recent algorithmic progress made on the Massively Parallel Computations (MPC) model. The MPC model provides a clean theoretical abstraction of modern parallel computation frameworks such as MapReduce, Hadoop, Spark, etc., which have been extremely successful in processing large-scale data-sets. Our main focus in the talk will be on the maximal matching problem. We give an outline of the analysis of an extremely simple algorithm, improving exponentially over previous maximal matching results. The analysis is based on a novel method of proving concentration bounds for algorithms satisfying a certain “locality” property, which we believe may find applications beyond the MPC model. We will also survey some other recent results in the area. Particularly, we will overview an algorithm for edit distance and longest common subsequence with almost tight bounds.

Biography:

Dr. Mohammad T. Hajiaghayi is the Jack and Rita G. Minker Associate Professor of Computer Science at the University of Maryland with a joint appointment in the University's Institute for Advanced Computer Studies (UMIACS). In addition, he holds a Research Affiliate position in MIT Computer Science and Artificial Intelligence Laboratory (CSAIL) and is a Permanent Member of Center for Discrete Mathematics and Theoretical Computer Science (DIMACS) at Rutgers. Before joining the University of Maryland, he was a Senior Researcher in the Algorithms and Theoretical Computer Science group at AT&T Labs-- Research to which he is still a consultant. Before that, he was a one-year Postdoctoral Fellow in the School of Computer Science at Carnegie Mellon University (with ALADDIN project) and a one-year Postdoctoral Associate in MIT Computer Science and Artificial Intelligence Laboratory (CSAIL) from which he also earned his Ph.D in 2005. During his Ph.D. studies, he spent some time at IBM Research centers and Microsoft Research centers. Dr. Hajiaghayi got his M.Sc. in Computer Science from the University of Waterloo in 2001 and his B.Sc. in Computer Engineering from Sharif University of Technology in 2000. Dr. Hajiaghayi's research interests are algorithmic game theory and combinatorial auctions, network design, combinatorial optimizations and approximation algorithms, fixed-parameter algorithms, algorithmic graph theory, distributed and mobile computing, and computational geometry and embeddings. In the course of his professional career in these areas, he has published more than 110 papers in top conferences and journals of computer science, won a few best paper awards, and served in program committees or editorial boards of several well-known international conferences and journals. He has received an NSF CAREER Award in 2010, a Google Faculty Research Award in 2010, an ONR Young Investigator Award in 2011, and the University of Maryland Research and Scholarship Award (RASA) in 2011. He won best paper awards at the ACM Symposium on Parallelism in Algorithms and Architectures (SPAA) 2010, the International Symposium on Algorithms and Computation (ISAAC) 2006, and the Robocup 2001 Conference.



Link to conference website



Contact Us:

Address: Room 503, Faculty of Electrical Engineering,

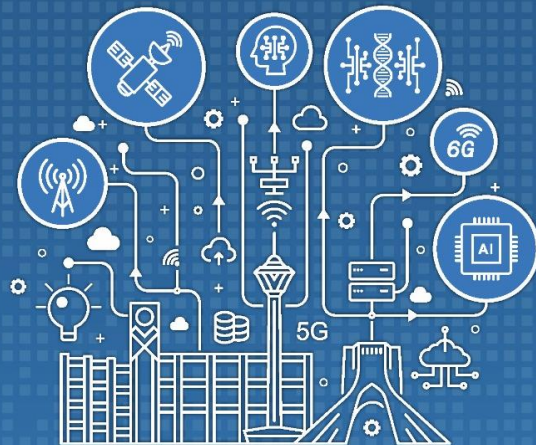
Sharif University of Technology, Tehran, Iran

Email: iwcit@sharif.ir, Tel: +9821-66164380

IWCIT 2024

12th Iran Workshop on Communication and Information Theory

Sharif University of Technology, Tehran, Iran



Invited Talk

Thursday, May 2nd 2024, 09:15 – 10:00



Mohammad Mahmoody



Link to conference website



Contact Us:

Address: Room 503, Faculty of Electrical Engineering,

Sharif University of Technology, Tehran, Iran

Email: iwcit@sharif.ir Tel: +9821-66164380

Watermarking LLM-generated Texts

Abstract:

With the popularity and extensive uses of large language models (LLMs) watermarking the text generated by LLMs has become an important problem. In this talk, I will talk about the theoretical foundations and a formalism of this problem, and then I will discuss information-theoretic, private-key and public-key approaches to this task.

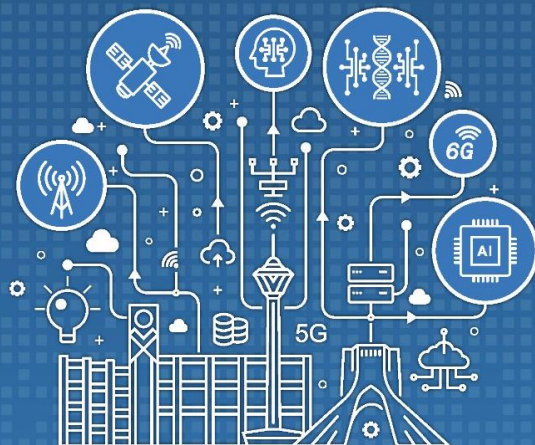
Biography:

Mohammad Mahmoody obtained his undergraduate degree from Sharif's computer engineering department in 2004. He then got his PhD from Princeton's computer science department in 2010. He joined Cornell as a postdoc associate and then University of Virginia as an assistant professor in 2013. His research interests are in foundations of theory of cryptography and trustworthy machine learning.

IWCIT 2024

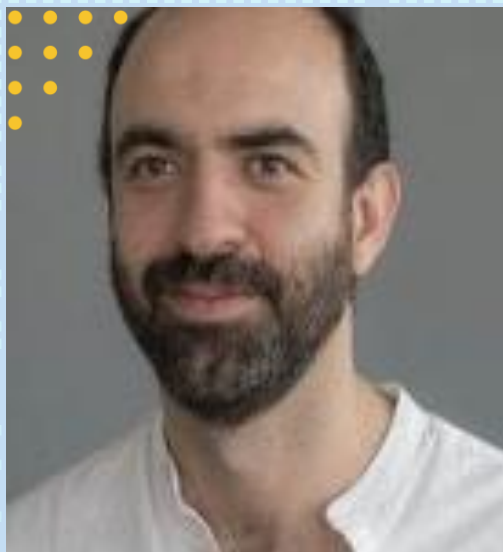
12th Iran Workshop on Communication and Information Theory

Sharif University of Technology, Tehran, Iran



Keynote Speech

Thursday, May 2nd 2024, 10:15 – 11:15



Mazyar Mirrahimi

Inria



Link to conference website



Contact Us:

Address: Room 503, Faculty of Electrical Engineering,

Sharif University of Technology, Tehran, Iran

Email: iwcit@sharif.ir Tel: +9821-66164380

Roadmaps to Fault-tolerant Quantum Computation with Superconducting Circuits

Abstract:

The remarkable recent progress in control and readout of superconducting qubits has led to an accelerated race towards building a useful quantum computer. A portion of the recent developments deal with noisy quantum bits and aim at proving an advantage with respect to classical processors. However, in order to fully exploit the power of quantum physics in computation, developing fault-tolerant processors is unavoidable. In such a processor, quantum bits and logical gates are dynamically and continuously protected against noise by means of quantum error correction. While a theory of quantum error correction has existed and developed since mid 1990s, the first experiments are being currently investigated in the physics labs around the world. I will review the main approach pursued in this direction and state of progress towards error corrected qubits. I will also present various shortcut approaches that are pursued to reduce the significant hardware overhead of error correction. Finally, by focusing on one of these shortcuts (the one pursued in our lab) I will explain how it can lead to drastic simplification of hardware requirements.

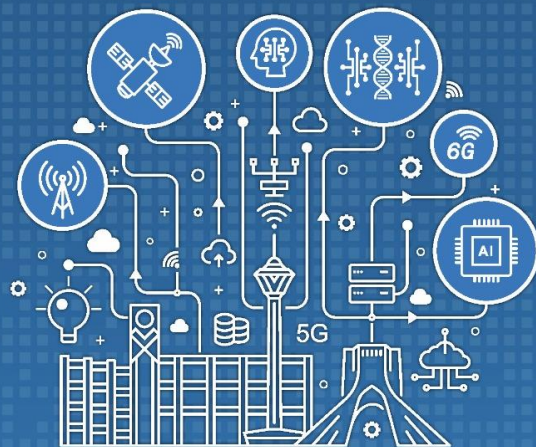
Biography:

Mazyar Mirrahimi graduated from Ecole Polytechnique, France, in 2003, and from Mines Paristech with a PhD on Applied Mathematics and Control Theory in 2005. He is a director of research at Inria Paris and part-time professor at Ecole Polytechnique. He is the leader of Quantic research team (<https://quantic.phys.ens.fr>), a joint team between Inria, Ecole Normale Supérieure, Mines Paristech and CNRS, formed by experimental physicists and applied mathematicians. His current research interests include quantum control, quantum error correction and fault-tolerance, quantum reservoir engineering, superconducting circuits, quantum nonlinear dynamics and quantum algorithms. In the past he has also worked on geometric nonlinear control, dynamical systems, stochastic systems and their stabilization, partial differential equations and their control, inverse problems. From 2011 to 2019, he also held a visiting scientist position at the Applied Physics Department of Yale University, collaborating with the teams of Michel Devoret and Robert Schoelkopf. Through these collaborations, he contributed to the design and analysis of various experiments on quantum error correction, quantum feedback control and quantum reservoir/dissipation engineering with superconducting circuits. He won "Inria-French Academy of Science young researcher award" in 2017.

IWCIT 2024

12th Iran Workshop on Communication and Information Theory

Sharif University of Technology, Tehran, Iran



Invited Talk

Thursday, May 2nd 2024, 11:15 – 12:00



Giovanni Geraci



Model-based and Data-driven Cell Optimization for 3D Coverage and Capacity

Abstract:

Traditional cellular deployments, optimized for 2D ground service, necessitate re-engineering of the existing infrastructure to provide reliable aerial connectivity. Optimizing cellular antenna settings is complex due to the interdependence of these parameters, with ground-aerial coverage and capacity representing conflicting objectives. In this talk, we discuss model-based and data-driven strategies for designing cellular networks that serve both ground users and aerial corridors.

Biography:

Giovanni Geraci is a Principal Research Scientist at Telefonica, an Associate Professor at UPF Barcelona, and serves as an IEEE Distinguished Lecturer. He was previously with Nokia Bell Labs and holds a dozen patents on wireless technologies. He received the IEEE Communications Theory Technical Committee Early Achievement Award (2023), the IEEE ComSoc EMEA Outstanding Young Researcher Award (2018), and Best Paper Awards at IEEE Globecom (2022) and PIMRC (2019)



Link to conference website



Contact Us:

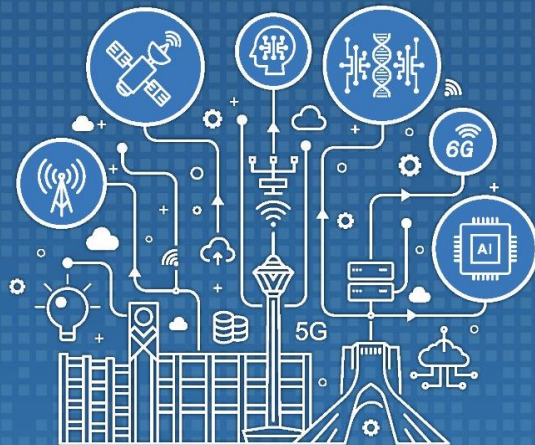
Address: Room 503, Faculty of Electrical Engineering,
Sharif University of Technology, Tehran, Iran

Email: iwcit@sharif.ir Tel: +9821-66164380

IWCIT 2024

12th Iran Workshop on Communication and Information Theory

Sharif University of Technology, Tehran, Iran



Keynote Speech

Thursday, May 2nd 2024, 13:30 – 14:30



Sinem Coleri



Explainable AI Based Ultra-Reliable Wireless Networked Control Systems in 6G

Abstract:

Unlike previous generation networks that were mainly designed to meet the requirements of human-type communications, 5G networks enable the collection of data from the machines with the total number of devices expected to be about 26 billion in 2026 according to Ericsson Mobility Report. The next step in 6G systems is to enable a new spectrum of control applications based on these data, such as extended reality, remote surgery, autonomous vehicle platoons. The design of communication systems for control applications requires meeting the strict delay and reliability requirements of communication systems, addressing the semantics of the control systems and achieving robustness in resource management. In the first part of this talk, ultra-reliable channel modeling and communication techniques are presented for the joint design of control and communication systems based on extreme value theory and artificial intelligence (AI). AI enables predicting the channel parameters with higher accuracy while incorporating various system inputs at high frequency bands, including THz, optical and mmwave communication, while providing adaptivity to time-varying scenarios. In the second part of the talk, the importance and means of achieving explainability and robustness are presented for AI based radio resource management in 6G networks. The usage of explainable and robust AI techniques for feature attribution, model simplification, model compression and sensitivity analysis is provided in radio resource management.

Biography:

Sinem Coleri is a Professor and the Chair of the Department of Electrical and Electronics Engineering at Koc University. She is also the founding director of Wireless Networks Laboratory (WNL) and director of Ford Otosan Automotive Technologies Laboratory. Sinem Coleri received the BS degree in electrical and electronics engineering from Bilkent University in 2000, the M.S. and Ph.D. degrees in electrical engineering and computer sciences from University of California Berkeley in 2002 and 2005. She worked as a research scientist in Wireless Sensor Networks Berkeley Lab under sponsorship of Pirelli and Telecom Italia from 2006 to 2009. Since September 2009, she has been a faculty member in the department of Electrical and Electronics Engineering at Koc University. Her research interests are in 6G wireless communications and networking, machine learning for wireless networks, machine-to-machine communications, wireless networked control systems and vehicular networks. Dr. Coleri has more than 150 publications with citations over 10700 (Google scholar profile). She has received numerous awards and recognitions, including N2Women: Stars in Computer Networking and Communications in 2022; TUBITAK (The Scientific and Technological Research Council of Turkey) Incentive Award and IEEE Vehicular Technology Society Neal Shepherd Memorial Best Propagation Paper Award in 2020. Dr. Coleri currently holds the position of Editor-in-Chief at the IEEE Open Journal of the Communications Society. Dr. Coleri is an IEEE Fellow and IEEE ComSoc Distinguished Lecturer.



Link to conference website



Contact Us:

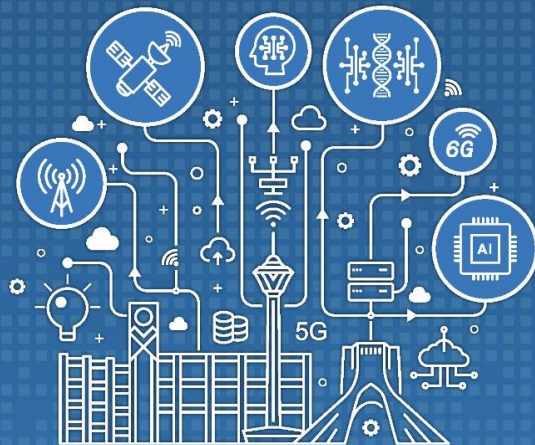
Address: Room 503, Faculty of Electrical Engineering,
Sharif University of Technology, Tehran, Iran

Email: iwcit@sharif.ir Tel: +9821-66164380

IWCIT 2024

12th Iran Workshop on Communication and Information Theory

Sharif University of Technology, Tehran, Iran



Tutorial

Thursday, May 2nd 2024, 16:15 – 19:15



Pooya Shariatpanahi



Link to conference website

Contact Us:

Address: Room 503, Faculty of Electrical Engineering,
Sharif University of Technology, Tehran, Iran

Email: iwcit@sharif.ir, Tel: +9821-66164380



Multi-antenna Coded Caching for Enhanced Wireless Content Delivery

Abstract:

Multi-antenna coded caching combines a global caching gain proportional to the cumulative cache size found across the network. An additional spatial multiplexing gain stems from using multiple transmitting antennas. However, a closer look reveals a few severe bottlenecks that hinder its practical implementation:

- 1) The well-known exponential sub-packetization bottleneck dramatically reduces performance when the communicated file sizes are finite.
- 2) The considerable optimization complexity of beamforming multicast messages when the SNR is finite.
- 3) The near-far issue limits the attainable performance at any multicast group to the achievable rate of the user with the worst channel conditions within the group.

In this tutorial, we investigate these three major impediments and review the related literature. For the sub-packetization bottleneck, we first check solutions based on single antenna transmitters and then provide an overview of recent multi-antenna schemes with novel interference cancellation techniques resulting in much smaller sub-packetization requirements. For the beamformer design, we introduce efficient reduced-complexity schemes where the spatial multiplexing gain and multicast group sizes are adjusted intelligently. Finally, for the near-far issue, we show how location-dependent caching techniques can be used to alleviate the problem by allocating larger cache portions for data likely to be requested in locations with poor wireless connectivity. Specifically, we consider an emerging immersive viewing application and illustrate how such uneven cache placement of location-dependent multimedia content can help achieve a more evenly distributed quality of experience within the application environment.

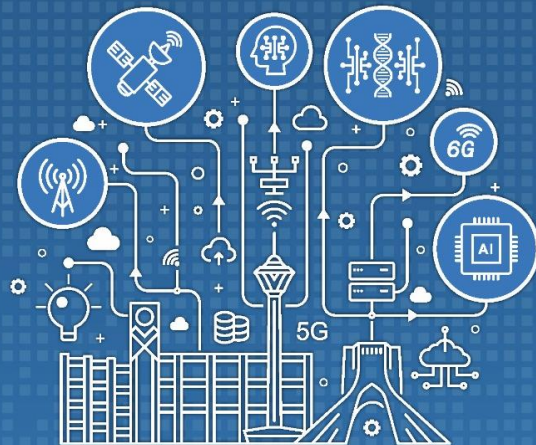
Biography:

Seyed Pooya Shariatpanahi received the B.Sc., M.Sc., and Ph.D. degrees from the Department of Electrical Engineering, Sharif University of Technology, Tehran, Iran, in 2006, 2008, and 2013, respectively. He is currently an Assistant Professor with the School of Electrical and Computer Engineering, University of Tehran. Before joining the University of Tehran, he was a Researcher with the Institute for Research in Fundamental Sciences (IPM), Tehran. His research interests include information theory, network science, wireless communications, and complex systems. He was a recipient of the Gold Medal at the National Physics Olympiad in 2001.

IWCIT 2024

12th Iran Workshop on Communication and Information Theory

Sharif University of Technology, Tehran, Iran



Tutorial

Thursday, May 2nd 2024, 16:15 – 19:15



Antti Tölli



Link to conference website

Contact Us:

Address: Room 503, Faculty of Electrical Engineering,
Sharif University of Technology, Tehran, Iran

Email: iwcit@sharif.ir, Tel: +9821-66164380



Multi-antenna Coded Caching for Enhanced Wireless Content Delivery

Abstract:

Multi-antenna coded caching combines a global caching gain proportional to the cumulative cache size found across the network. An additional spatial multiplexing gain stems from using multiple transmitting antennas. However, a closer look reveals a few severe bottlenecks that hinder its practical implementation:

- 1) The well-known exponential sub-packetization bottleneck dramatically reduces performance when the communicated file sizes are finite.
- 2) The considerable optimization complexity of beamforming multicast messages when the SNR is finite.
- 3) The near-far issue limits the attainable performance at any multicast group to the achievable rate of the user with the worst channel conditions within the group.

In this tutorial, we investigate these three major impediments and review the related literature. For the sub-packetization bottleneck, we first check solutions based on single antenna transmitters and then provide an overview of recent multi-antenna schemes with novel interference cancellation techniques resulting in much smaller sub-packetization requirements. For the beamformer design, we introduce efficient reduced-complexity schemes where the spatial multiplexing gain and multicast group sizes are adjusted intelligently. Finally, for the near-far issue, we show how location-dependent caching techniques can be used to alleviate the problem by allocating larger cache portions for data likely to be requested in locations with poor wireless connectivity. Specifically, we consider an emerging immersive viewing application and illustrate how such uneven cache placement of location-dependent multimedia content can help achieve a more evenly distributed quality of experience within the application environment.

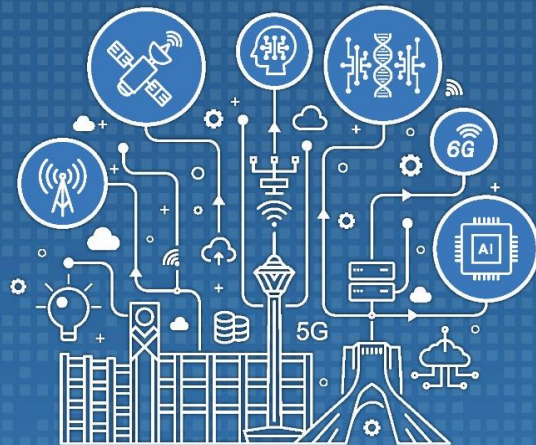
Biography:

Antti Tölli is an Associate Professor with the Centre for Wireless Communications (CWC), University of Oulu. He received the Dr.Sc. (Tech.) degree in electrical engineering from the University of Oulu, Oulu, Finland, in 2008. From 1998 to 2003, he worked at Nokia Networks as a Research Engineer and Project Manager both in Finland and Spain. In May 2014, he was granted a five-year (2014-2019) Academy Research Fellow post by the Academy of Finland. During 2015-2016, he visited EURECOM, Sophia Antipolis, France. From August 2018 till June 2019, he visited the University of California Santa Barbara, USA. He has authored numerous papers in peer-reviewed international journals and conferences and several patents, all in signal processing and wireless communications. His research interests include radio resource management and transceiver design for broadband wireless communications, emphasizing distributed interference management in heterogeneous wireless networks. From 2017 to 2021, he served as an Associate Editor for IEEE Transactions on Signal Processing.

IWCIT 2024

12th Iran Workshop on Communication and Information Theory

Sharif University of Technology, Tehran, Iran



Tutorial

Thursday, May 2nd 2024, 16:15 – 19:15



Mohammad Javad Salehi



Link to conference website

Contact Us:

Address: Room 503, Faculty of Electrical Engineering,
Sharif University of Technology, Tehran, Iran

Email: iwcit@sharif.ir, Tel: +9821-66164380



Multi-antenna Coded Caching for Enhanced Wireless Content Delivery

Abstract:

Multi-antenna coded caching combines a global caching gain proportional to the cumulative cache size found across the network. An additional spatial multiplexing gain stems from using multiple transmitting antennas. However, a closer look reveals a few severe bottlenecks that hinder its practical implementation:

- 1) The well-known exponential sub-packetization bottleneck dramatically reduces performance when the communicated file sizes are finite.
- 2) The considerable optimization complexity of beamforming multicast messages when the SNR is finite.
- 3) The near-far issue limits the attainable performance at any multicast group to the achievable rate of the user with the worst channel conditions within the group.

In this tutorial, we investigate these three major impediments and review the related literature. For the sub-packetization bottleneck, we first check solutions based on single antenna transmitters and then provide an overview of recent multi-antenna schemes with novel interference cancellation techniques resulting in much smaller sub-packetization requirements. For the beamformer design, we introduce efficient reduced-complexity schemes where the spatial multiplexing gain and multicast group sizes are adjusted intelligently. Finally, for the near-far issue, we show how location-dependent caching techniques can be used to alleviate the problem by allocating larger cache portions for data likely to be requested in locations with poor wireless connectivity. Specifically, we consider an emerging immersive viewing application and illustrate how such uneven cache placement of location-dependent multimedia content can help achieve a more evenly distributed quality of experience within the application environment.

Biography:

Mohammad Javad Salehi received the B.Sc., M.Sc., and Ph.D. degrees from the Department of Electrical Engineering, Sharif University of Technology, Tehran, Iran, in 2010, 2012, and 2018. Since 2019, he has been a postdoctoral researcher at the Center for Wireless Communication (CWC) at the University of Oulu, Finland. His main research interests include multi-antenna communications and wireless coded caching.