

IWCIT 2022



دانشگاه یزد

10th Iran Workshop on Communication and Information Theory

May 11-12th 2022 | iwcit@sharif.ir | [@iwcit](https://twitter.com/iwcit)

Yazd University, Yazd, Iran | Sharif University of Technology, Tehran, Iran

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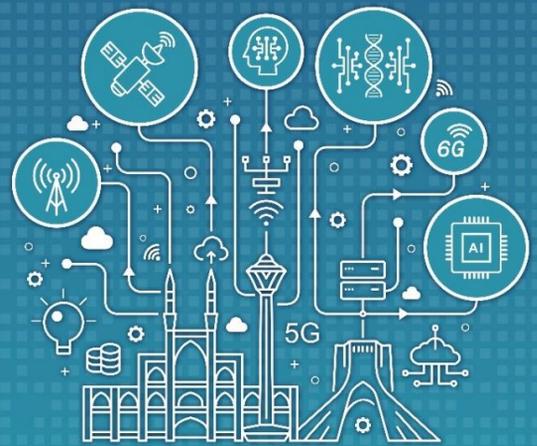
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دانشگاه یزد





مهره اول

www.mci.ir

همراه اول دیجیتال همراه لحظه‌های



دارای مجوز از سازمان تنظیم مقررات و ارتباطات رادیویی
سازمان پژوهش و فناوری ۱۳۹۰-۱۳۹۱

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Sharif University of Technology, Tehran, Iran



Technical Program

Wednesday, 11 May 2022

9:30 – 10:00	Opening Ceremony	
10:00 – 11:00	Michael C. Gastpar (Keynote Speaker)	Information Measures and Learning
11:30 – 12:30	Erdal Arıkan (Keynote Speaker)	Polar coding for Tb/s applications
13:30 – 14:10	Ertugrul Basar (Invited Talk)	Reconfigurable Intelligent Surface-Empowered Communications for 6G Wireless Networks
14:30 – 15:10	Ashwin Nayak (Invited Talk)	Applications of the Information-Theoretic Method in Quantum Computation
15:30 – 16:10	Paper Presentation #1	Shannon Theory Track
17:00 – 20:00	Gautam Kamath (Tutorial)	An Introduction to Differential Privacy

Thursday, 12 May 2022

8:30 – 9:30	Salman Avestimehr (Keynote Speaker)	FedML: A Secure, Scalable, and Efficient Edge-Cloud Platform for Federated Learning
10:00 – 11:00	Mohammad Ali Maddah-Ali (Keynote Speaker)	Security and Reliability in Distributed Systems: A Coding Theoretic Perspective
14:00 – 14:40	Mahtab Mirmohseni (Invited Talk)	Identity and Access Management without Breaching the Privacy in Distributed Systems
15:00 – 15:40	Paper Presentation #2	Communication Theory Track



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Paper Presentations

Wednesday, 11 May 2022, 15:30 – 16:10

Shannon Theory Track

15:30 – 15:50

Farshad Rostami, Ghadi
Francisco Javier Lopez-
Martinez
Ghosheh Abed Hodtani

**Copula-Based Analysis of
Interference Channels: Outage
Probability**

15:50 – 16:10

Javad B. Ebrahimi
Elahe Ghasemi
Mohammad Rashid

**Entropic Weighted Rank
Function**

Thursday, 12 May 2022, 15:00 – 15:40

Communication Theory Track

15:00 – 15:20

Saleheh Poursheikhali
Fatemeh Ghanami

**Smart NOMA-HARQ for Short
Packet Communications**

15:20 – 15:40

Sahar Shahbaz
Mahtab Mirmohseni
Masoumeh Nasiri-Kenari

**A Jamming Resistant Molecular
Communication Scheme**



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Keynote Speaker

May 11-12th 2022



Erdal Arıkan



Salman Avestimehr



Michael C. Gastpar



**Mohammad Ali
Maddah-Ali**



Invited Talk

Tutorial



Ashwin Nayak



Ertugrul Basar



Mahtab Mirmohseni



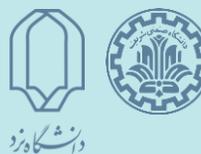
Gautam Kamath



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Yazd University, Yazd, Iran

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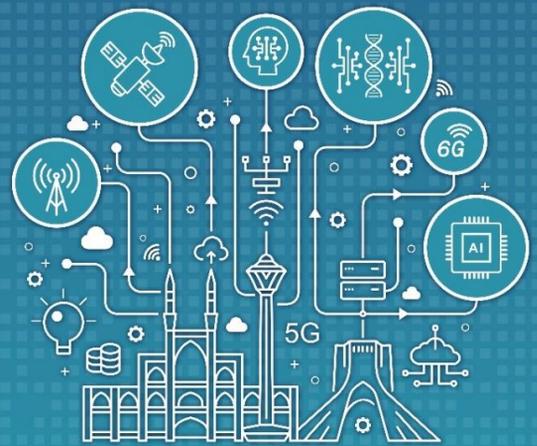


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Sharif University of Technology, Tehran, Iran



Keynote Speaker

Wednesday, May 11th 2022, 10:00 – 11:00



Michael C. Gastpar



ÉCOLE POLYTECHNIQUE
FÉDÉRALE DE LAUSANNE



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Information Measures and Learning

Abstract:

Recent progress has shed new light on the role played by information measures as a powerful language to understand problems of statistical learning. In this talk, we discuss three vignettes. First, we consider universal prediction and show how information measures lead to a natural generalization of the celebrated Krichevsky-Trofimov predictor as well as the normalized maximum likelihood predictor. In the second vignette, we turn to the problem of bounding the generalization error of general learning procedures. Strengthened bounds are expressed in terms of a variety of information measures, including Renyi and f-divergences. In the third vignette, we study the problem of bounding the risk in parameter estimation procedures. Joint work with Marco Bondaschi, Amedeo Roberto Esposito, Ibrahim Issa, and Adrien Vandenbroucque.

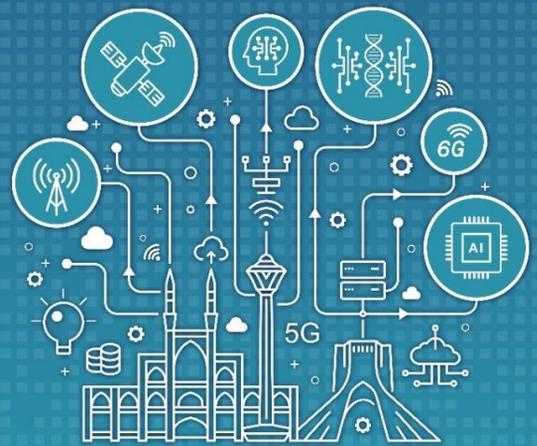
Biography:

Michael Gastpar is a Professor at Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland. From 2003 to 2011, he was a professor at the University of California at Berkeley, earning his tenure in 2008. He received his Dipl. El.-Ing. degree from ETH Zürich, Switzerland, in 1997 and his MS degree from the University of Illinois at Urbana-Champaign, IL, USA, in 1999. He defended his doctoral thesis at EPFL on Santa Claus day, 2002. His research interests are in network information theory and related coding and signal processing techniques, with applications to sensor networks and neuroscience. He is a Fellow of the IEEE. He is the co-recipient of the 2013 Communications Society & Information Theory Society Joint Paper Award. He was an Information Theory Society Distinguished Lecturer (2009-2011). He won an ERC Starting Grant in 2010, an Okawa Foundation Research Grant in 2008, an NSF CAREER award in 2004, and the 2002 EPFL Best Thesis Award. He has served as an Associate Editor for Shannon Theory for the IEEE Transactions on Information Theory (2008-11), and as Technical Program Committee Co-Chair for the 2010 and 2021 IEEE International Symposia on Information Theory.

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Keynote Speaker

Wednesday, May 11th 2022, 11:30 – 12:30



Polar Coding for Tb/s Applications

Abstract:

Several use-cases are emerging that require data communications at rates approaching Tb/s. This talk will discuss implementation challenges and potential solutions from a polar coding viewpoint.

Biography:

Erdal Arıkan has been a member of the faculty at the Electrical-Electronics Engineering Department, Bilkent University, Ankara, Turkey since 1987. He received his Ph.D. degree from the Massachusetts Institute of Technology, Cambridge, MA, in 1985. His main research interests are in error correction coding. For his work on polar coding, he was awarded the 2010 IEEE Information Theory Society Best Paper Award, the 2013 IEEE W. R. G. Baker Award, the 2018 IEEE Hamming Medal, and the 2019 Shannon Speaker award. He is an IEEE Fellow and a member of the Turkish Academy of Sciences.

Erdal Arıkan



Bilkent University



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Invited Talk

Wednesday, May 11th 2022, 13:30 – 14:10



Ertugrul Basar



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Reconfigurable Intelligent Surface- Empowered Communications for 6G Wireless Networks

Abstract:

Signal processing and communication communities have witnessed the rise of many exciting communication technologies in recent years. Notable examples include alternative waveforms, massive multiple-input multiple-output (MIMO) signaling, non-orthogonal multiple access (NOMA), joint communications and sensing, sparse vector coding, index modulation, and so on. It is inevitable that 6G wireless networks will require a rethinking of wireless communication systems and technologies, particularly at the physical layer (PHY) since the cellular industry reached another important milestone with the development of 5G wireless networks with diverse applications. Within this perspective, this talk aims to shed light on the rising concept of reconfigurable intelligent surface (RIS)-empowered communications towards 6G wireless networks. We discuss the recent development in the field and put forward promising candidates for future research and development. Finally, we also envision an ultimate RIS architecture, which can adjust its operation modes dynamically, and introduce the new concept of PHY slicing over RISs towards 6G wireless networks.

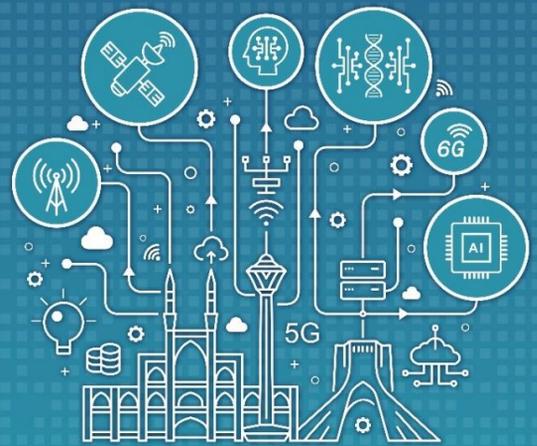
Biography:

Ertugrul Basar received his Ph.D. degree from Istanbul Technical University in 2013. He is currently an Associate Professor with the Department of Electrical and Electronics Engineering, Koç University, Istanbul, Turkey and the director of Communications Research and Innovation Laboratory (CoreLab). His primary research interests include beyond 5G systems, index modulation, intelligent surfaces, waveform design, and signal processing for communications. Dr. Basar currently serves as a Senior Editor of IEEE Communications Letters and an Editor of IEEE Transactions on Communications and Frontiers in Communications and Networks. He is a Young Member of Turkish Academy of Sciences and a Senior Member of IEEE. He is also the founding Academic Chair of the newly established IEEE ComSoc Emerging Technologies Initiative on Reconfigurable Intelligent Surfaces.

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Invited Talk

Wednesday, May 11th 2022, 14:30 – 15:10



Ashwin Nayak



Applications of the Information-Theoretic Method in Quantum Computation

Abstract:

Quantum phenomena offer the possibility of more efficient computation in a host of information processing scenarios. At the same time, their unusual properties also make it challenging for us to characterize potential gains in efficiency. In this talk, we will review recent results in different settings such as distributed computation and learning theory. All of these results are based on the information-theoretic method, which provides an intuitive approach for understanding highly counter-intuitive behaviour.

Biography:

Ashwin Nayak is a Professor in the Department of Combinatorics and Optimization, and Institute for Quantum Computing at University of Waterloo, Canada. Ashwin received his B.Tech. at Indian Institute of Technology, Kanpur (1995) and his Ph.D. at University of California, Berkeley (1999), both in Computer Science. After holding post-doctoral positions jointly at DIMACS Center and AT&T Labs–Research, then at California Institute of Technology, he joined University of Waterloo in 2002. His research primarily revolves around quantum information and computation, with an emphasis on algorithms, complexity, and communication. He continues to work more broadly on theoretical computer science.



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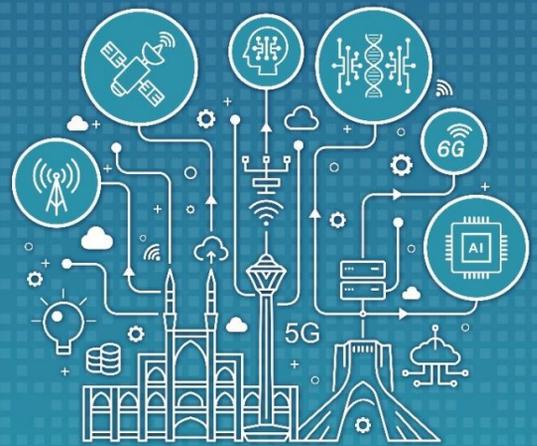
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Tutorial

Wednesday, May 11th 2022, 17:00 – 20:00



An Introduction to Differential Privacy

Abstract:

Differential privacy is a promising approach to privacy-preserving data analysis. Differential privacy provides strong worst-case guarantees about the harm that a user could suffer from participating in a differentially private data analysis, but is also flexible enough to allow for a wide variety of data analyses to be performed with a high degree of utility. Having already been the subject of a decade of intense scientific study, it has also now been deployed at government agencies such as the U.S. Census Bureau and companies including Apple, Google, Facebook, and Microsoft. In this tutorial, I will present the basic conceptual and mathematical principles of differential privacy, as well as applications to private machine learning. No prior background in differential privacy will be assumed.

Biography:

Gautam Kamath is an Assistant Professor at the David R. Cheriton School of Computer Science at the University of Waterloo, and a faculty affiliate at the Vector Institute. He has a B.S. in Computer Science and Electrical and Computer Engineering from Cornell University, and an M.S. and Ph.D. in Computer Science from the Massachusetts Institute of Technology. His research interests lie in methods for statistics and machine learning, with a focus on challenges related to trustworthy machine learning, including data privacy and robustness. He was a Microsoft Research Fellow, as a part of the Simons-Berkeley Research Fellowship Program at the Simons Institute for the Theory of Computing. He is recipient of an NSERC Discovery Accelerator Supplement, and was awarded the Best Student Presentation Award at the ACM Symposium on Theory of Computing in 2012.

Gautam Kamath



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Keynote Speaker

Thursday, May 12th 2022, 8:30 – 9:30



Salman Avestimehr



FedML: A Secure, Scalable, and Efficient Edge-Cloud Platform for Federated Learning

Abstract:

Federated learning has emerged as a promising approach to enable decentralized machine learning directly at the edge, in order to enhance users' privacy, comply with regulations, and reduce development costs. We have developed FedML (<https://fedml.ai>) as a machine learning platform that enables zero-code, lightweight, cross-platform, and provably secure federated learning and analytics. In this talk, I will provide an overview of the FedML platform, which consists of (1) cutting-edge federated learning algorithms; (2) a lightweight and cross-platform Edge AI SDK for deployment over GPUs, smartphones, and IoTs; (3) a user-friendly MLOps platform to simplify collaboration and real-world deployment; and (4) platform-supported vertical Solutions across a broad range of industries (healthcare, finance, insurance, smart cities, IoT, etc.) and applications (computer vision, natural language processing, data mining, and time-series forecasting). I will highlight several key design features and their algorithmic innovations. I will also present a tutorial on using FedML.

Biography:

Salman Avestimehr (<https://www.avestimehr.com>) is the CEO and co-founder of FedML. He is also a Dean's Professor and the inaugural director of the USC-Amazon Center on Trustworthy AI at the ECE and CS Department of University of Southern California. His research interests include decentralized and federated machine learning, information theory, security, and privacy. Dr. Avestimehr has received many awards for his research, including the Presidential PECASE award from the White House (President Obama), the James L. Massey Research & Teaching Award from IEEE Information Theory Society, an Information Theory Society and Communication Society Joint Paper Award, and several Best Paper Awards at Conferences. He has been an Amazon Scholar in Alexa-AI, and is a fellow of the IEEE.



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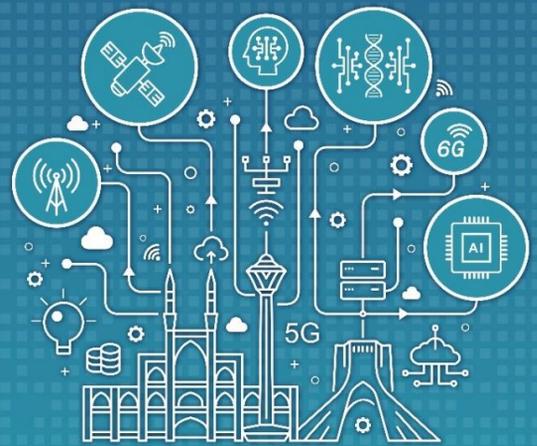
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Yazd University, Yazd, Iran
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Keynote Speaker

Thursday, May 12th 2022, 10:00 – 11:00



Mohammad Ali Maddah-Ali



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Security and Reliability in Distributed Systems: A Coding Theoretic Perspective

Abstract:

Coding is known as an effective approach to deal with some of the major challenges in distributed systems in terms of security of the network, privacy of the data and efficiency of the resource management. In this talk, we argue that there are some major scenarios and threat models that do not conform to the traditional rules. For example (1) Coding techniques are often designed for "exact error-free decoding". However, in some scenarios, e.g. straggler-resistance computing for machine learning, only an "approximate decoding" is enough, (2) In conventional coding techniques, "input sources" are supposed to be conveyed and decoded correctly. However, in some scenarios (e.g. sharded blockchains), some parts of "input symbols" are chosen and distributed adversarially to prevent "other input symbols" from being recovered correctly. In this talk, we will review some solutions and bounds for those scenarios and discuss some open problems.

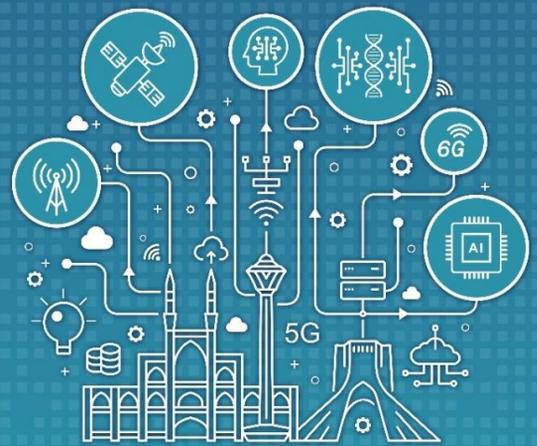
Biography:

Mohammad Ali Maddah-Ali received the B.Sc. degree from Isfahan University of Technology, the M.Sc. degree from the University of Tehran, and the Ph.D. degree from the Department of Electrical and Computer Engineering, University of Waterloo, Canada in 2007. From 2007 to 2008, he was with the Wireless Technology Laboratories, Nortel Networks, Ottawa, ON, Canada. From 2008 to 2010, he was a Postdoctoral Fellow in the Department of Electrical Engineering and Computer Sciences, University of California at Berkeley. From 2010 to 2020, he was working at Bell Labs, Holmdel, NJ, as a Communication Network Research Scientist. He is a faculty member at the Department of Electrical Engineering, Sharif University of Technology. Dr. Maddah-Ali is a recipient of the IEEE International Conference on Communications (ICC) Best Paper Award in 2014, the IEEE Communications Society and IEEE Information Theory Society Joint Paper Award in 2015, and the IEEE Information Theory Society Paper Award in 2016. He is currently serving as an associate editor for the IEEE Transactions on Information Theory.

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Invited Talk

Thursday, May 12th 2022, 14:00 – 14:40



Identity and Access Management without Breaching the Privacy in Distributed Systems

Abstract:

With the growth of cyber-physical systems, identity and access management is an essential, first line, security feature in communication systems. Acquiring user information to provide this feature might severely breach the user-privacy. In this talk, we discuss privacy-aware information-theoretic protocols for the main blocks of an identity and access management system; i.e., private user authentication, private access control, and private hypothesis testing.

Biography:

Mahtab Mirmohseni is an associate professor at Electrical Engineering Department, Sharif university of Technology. She joined Sharif in Spring 2014 as an assistant professor. Prior to that, she was a postdoctoral researcher at Royal Institute of Technology (KTH), Stockholm. Mahtab received the B.Sc., M.Sc. and Ph.D. degrees from Electrical Engineering Department, Sharif University of Technology, IRAN in the field of Communication Systems in 2005, 2007 and 2012, respectively. She was the recipient of the Award of the national festival of the Women and Science (Maryam Mirzakhani Award), 2019. Her current research interests include different aspects of information theory, mostly focusing on secure and private communication and molecular communication.

Mahtab Mirmohseni



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Yazd University, Yazd, Iran
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معرفی شرکت

شرکت پیش تازان صنعت فراز ارتباط با مجموعه‌ای بیش از ۴۰۰ نیروی مجرب فارغ‌التحصیل از معتبرترین دانشگاه‌های کشور، از نظر ساختار سازمانی در قالب بخش‌های خدمات مشتریان، اندازه‌گیری رادیویی، شناسایی رادیویی، منابع سازمانی و مرکز تحقیقات بین دانشگاهی، یکی از قوی‌ترین شرکت‌های تحقیق و توسعه‌ی دانش‌بنیان حوزه‌ی الکترونیک و مخابرات کشور است. این شرکت با برخورداری از آزمایشگاه‌های مجهز و پیشرفته، سایت‌های تست و کالیبراسیون بی‌نظیر در کشور، توانایی تست، ارزیابی و اخذ استانداردهای لازم را برای کلیه‌ی محصولات تولیدی داراست.

زمینه‌های فعالیت بخش‌های شرکت فراز ارتباط

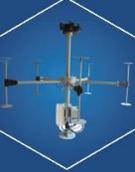
قابل حمل



خودرویی



استقراری



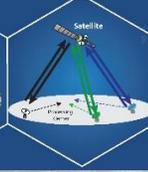
پایش طیف



سامانه‌های پایش طیف، تحلیلگرهای شبکه موبایل و جهت‌یاب‌های رادیویی برای سازمان‌های رگولاتوری و اپراتورهای تلفن همراه.

پایش سیگنال‌های
ویدیوی مکانی ماهواره‌ای

کالیبراتور رادیویی ماهواره‌ای

موقعیت یاب
فرستنده ماهواره‌ای

ارتباطات ماهواره‌ای



سامانه ارتباط امن ماهواره‌ای همراه با سامانه پیشرفته شناسایی تداخل سیگنال‌های ماهواره‌ای برای ایجاد بهترین کیفیت در ارتباطات

رادار حفاظت پیرامونی



رادار شناسایی عامل اختاری



سامانه مقابله با ریزپرنده



حفاظت پیرامونی



سامانه‌های راداری پیشرفته شهری شامل، حفاظت پیرامونی، شناسایی عامل اختاری و مقابله با ریزپرنده

آنتن‌های سلولر



تحلیلگر شبکه‌های سلولر



تکرار کننده چندبند



ارتباطات سلولی



آنتن‌ها و تجهیزات بهینه‌ی شبکه موبایل، مجهز به بروزترین فناوری‌های شبکه سلولی برای اپراتورهای شبکه موبایل

ماژول NB-IOT



موتور جستجوگر امن



سامانه شبکه خصوصی



ارتباطات امن



راهکارهای ارتباطی امن جهت حفاظت از ارتباطات سازمانی راه دور

آنتن آکتیو



آنتن بال کوسه ای



ماژول کنترل بدنه



محصولات خودرویی



راهکارهای موتور در طراحی و تولید محصولات فناوریانه صنعت خودرو با استفاده از دانش و ظرفیت‌های بومی





۱۳۹۷

• ورود به حوزه پایش سلامت
• معرفی برند wizer

۱۳۹۵

• ورود به حوزه پایش شبکه موبایل
• بروزرسانی گواهینامه ISO ۹۰۰۱:۲۰۱۵

۱۳۹۰

• توسعه سامانه نرم افزاری بومی کاوشکام در مدیریت ناوگان حمل و نقل
• ورود به حوزه طراحی و ساخت لینک های رادیویی
• اخذ جایزه علمی خوارزمی

۱۳۸۵

• طراحی مدار مجتمع RFID و قرائتگر آن و نرم افزارهای مربوطه
• ورود به حوزه بهینه سازی پوشش شبکه موبایل (IBS)

۱۳۸۰

• ورود به حوزه سیستم های مدیریت ناوگان حمل و نقل
• طراحی و ساخت تقویت کننده و مسدود کننده موبایل

۱۳۷۷

• ورود به صنعت روشنایی با تاسیس شرکت صنایع الکترونیک افراتاب
• اخذ جایزه علمی خوارزمی

۱۳۷۵

• طراحی و ساخت سیستم گیرنده ETACS، تلفن بی سیم و طراحی موبایل در تکنولوژی GSM

۱۳۷۰

• تاسیس شرکت کاوشکام آسیا
• صادرات خدمات مهندسی در زمینه طراحی مدار مجتمع