| Central European Time (CET) | | August 1 | August 2 | August 3 |
|---|---|---|---|---|
| 9:00 AM | 9:15 AM | | Session 7 | Session 8 | Session 9 (Virtual) | Session 11 | Session 12 (Virtual) | Session 13 (Virtual) |
| 9:15 AM | 9:30 AM | Registration | | | | | | |
| 9:30 AM | 9:45 AM | | | | | | | |
| 9:45 AM | 10:00 AM | Opening (Room 1) | | | | | | |
| 10:00 AM | 10:15 AM | | | | | | | |
| 10:15 AM | 10:30 AM | Keynote 1 (In-Person \| Room 1) | | | | | | |
| 10:30 AM | 10:45 AM | | | | | | | |
| 10:45 AM | 11:00 AM | Coffee Break | Coffee Break | Coffee Break |
| 11:00 AM | 11:15 AM | Session 1 | Session 2 (Virtual) | Session 3 (Virtual) | Panel: Diversity & Inclusion (In-Person) | Tutorial 1 (Virtual) | Session 14 | Session 15 | Session 16 (Virtual) |
| 11:15 AM | 11:30 AM | | | | | | | | |
| 11:30 AM | 11:45 AM | | | | | | | | |
| 11:45 AM | 12:00 PM | | | | | | | | |
| 12:00 PM | 12:15 PM | | | | | | | | |
| 12:15 PM | 12:30 PM | | | | | | | | |
| 12:30 PM | 12:45 PM | | | | | | | | |
| 12:45 PM | 1:00 PM | Break & Lunch | Awards & Closing (Room 1) |
| 1:00 PM | 1:15 PM | | | | | | | | |
| 1:15 PM | 1:30 PM | | | | | | | | |
| 1:30 PM | 1:45 PM | | | | | | | | |
| 1:45 PM | 2:00 PM | | | | | | | | |
| 2:00 PM | 2:15 PM | | | | | | | | |
| 2:15 PM | 2:30 PM | | | | | | | | |
| 2:30 PM | 2:45 PM | Keynote 2 (Virtual \| Room 1) | Keynote 3 & 4 (Virtual \| Room 1-2) | |
| 2:45 PM | 3:00 PM | | | | | | | | |
| 3:00 PM | 3:15 PM | Coffee Break | Coffee Break | |
| 3:15 PM | 3:30 PM | Session 4 | Session 5 (Virtual) | Session 6 (Virtual) | Tutorial 2 | Tutorial 3 (Virtual) | Session 10 (Virtual) | | |
| 3:30 PM | 3:45 PM | | | | | | | | |
| 3:45 PM | 4:00 PM | | | | | | | | |
| 4:00 PM | 4:15 PM | | | | | | | | |
| 4:15 PM | 4:30 PM | | | | | | | | |
| 4:30 PM | 4:45 PM | | | | | | | | |
| 4:45 PM | 5:00 PM | | | | | | | | |
| 5:00 PM | 5:15 PM | | | | | | | | |
| 5:15 PM | 5:30 PM | | | | | | | | |
| 5:30 PM | 5:45 PM | | | | | | | | |
| 5:45 PM | 6:00 PM | | | | | | | | |
| 6:00 PM | 6:15 PM | | | | | | | | |

Room 1
Room 2
Room 3

| Session # | Authors | Title | Type | Style |
|---|---|---|---|---|
| 1 | Fabian Kovac, Oliver Eigner, Alexander Adrowitzer, Hubert Schölnast and Alexander Buchelt | Classification of rain events using directional radio data of commercial microwave links | In-Person | (Long) |
| | Jan Krummenauer, Nesrine Kammoun, Benedikt Stein and Jürgen Götze | Encoding categorical variables in physics-informed graphs for Bayesian Optimization | In-Person | (Long) |
| | Koki Fujita, Shugo Fujimura, Yuwei Sun, Hiroshi Esaki and Hideya Ochiai | Federated Reinforcement Learning for the Building Facilities | In-Person | (Long) |
| | Andres Gomez | The case for a batteryless Internet of Things | In-Person | Mini-Keynote |
| 4 | Monerah Al-Mekhlal, Abdulrahman Alyahya, Abdullah Aldhamin and Azmath Khan | Network Automation Python-based Application: The performance of a Multi-Layer Cloud Based Solution | In-Person | (Long) |
| | Thomas Becnel, Kerry Kelly and Pierre-Emmanuel Gaillardon | Tiny Time-Series Transformers: Realtime Multi-Target Sensor Inference At The Edge | In-Person | (Long) |
| | Davide Martintoni, Valerio Senni, Ernesto Gomez Marin and Antonio Javier Cabrera Gutierrez | Sensitive information protection in blockchain-based supply-chain management for aerospace | In-Person | (Long) |
| 7 | George Routis, Marios Paraskevopoulos, Ioannis Vetsikas, Ioanna Roussaki, Dimitris Stavrakoudis and Dimitrios Katsantonis | Data-Driven and Interoperable Smart Agriculture: An IoT-based Use-Case for Arable Crops | In-Person | (Long) |
| | Szymon Mueller, Marcin Plociennik, Maciej Zacharczuk, Adam Fojud, Michał Błaszczak, Alicja Laskowska, Raul Palma, Magdalena Jakubowska and Andrzej Wojtowicz | Leveraging IoT Solutions as a base for development of the agriculture advisory services | In-Person | (Long) |
| | Stevan Cakic, Tomo Popovic, Srdjan Krco, Daliborka Nedic and Dejan Babic | Developing Object Detection Models for Camera Applications in Smart Poultry Farms | In-Person | (Short) |
| | Sune Chung Jepsen, Torben Worm and Eunsuk Kang | Reconfigurability For Industry 4.0 Middleware Software Architectures | In-Person | (Long) |
| | Markus Sauer, Andreas Dachsberger, Leonard Giglhuber and Łukasz Zalewski | Decentralized Deadlock Prevention for Self-Organizing Industrial Mobile Robot Fleets | In-Person | (Short) |
| 8 | Gokul Chinnappan and Bharadwaj Veeravalli | Time and Energy trade-off analysis for Multi-Installment Scheduling with result retrieval strategy for Large Scale data processing | In-Person | (Long) |
| | Gereziher Adhane, Mohammad Mahdi Dehshibi and David Masip | Incorporating Reinforcement Learning for Quality-aware Sample Selection in Deep Architecture Training | In-Person | (Long) |
| | Khaled Sidahmed Sidahmed Alamin, Yukai Chen, Enrico Macii, Massimo Poncino and Sara Vinco | A Machine Learning-based Digital Twin for Electric Vehicle Battery Modeling | In-Person | (Long) |
| | Jose Maria Moyano Murillo, Jose María Luna Ariza and Sebastian Ventura Soto | Improving the Performance of Multi-Label Classifiers via Label Space Reduction | In-Person | (Long) |
| 11 | Giulia Rafaiani, Paolo Santini, Marco Baldi and Franco Chiaraluce | Implementation of Ethereum Accounts and Transactions on Embedded IoT Devices | In-Person | (Long) |
| | Alpesh Bhudia, Anna Cartwright, Edward Cartwright, Julio Hernandez-Castro and Darren Hurley-Smith | Extortion of a Staking Pool in a Proof-of-Stake Consensus Mechanism | In-Person | (Long) |
| | Asma Channa, Giuseppe Ruggeri, Nadia Mammone, Rares Cristian Ifrim, Antonio Iera and Nirvana Popescu | Parkinson's Disease Severity Estimation using Deep Learning and Cloud Technology | In-Person | (Short) |
| | Shugo Fujimura, Koki Fujita, Yuwei Sun, Hiroshi Esaki and Hideya Ochiai | A Flexible Distributed Building Simulator for Federated Reinforcement Learning | In-Person | (Short) |
| 14 | Flavio Ponzina, Miguel Peón-Quirós, Giovanni Ansaloni and David Atienza | An Accuracy-Driven Compression Methodology to Derive Efficient Codebook-Based CNNs | In-Person | (Long) |
| | Teresa Serrano Gotarredona, Farnaz Faramarzi and Bernabe Linares-Barranco | Electronically Foveated Dynamic Vision Sensor | In-Person | (Short) |
| | Ahmed Alqattaa, Daniel Loebenberger and Lukas Moeges | Analyzing the Latency of QUIC over an IoT Gateway | In-Person | (Short) |
| | Eduardo Pérez and Sebastián Ventura | Multi-view Deep Neural Networks for multiclass skin lesion diagnosis | In-Person | (Long) |
| 15 | Maxime Méré, Frédéric Jouault, Loïc Pallardy and Richard Perdriau | Trustworthy SoC Reconfiguration Aimed at Product-Service Systems: a Literature Review | In-Person | (Long) |
| | Artem Barger, Olga Ilina, Alexander Zemtsov and Ksenia Tagirova | Trustful Charity Foundation platform based on Hyperledger Fabric. | In-Person | (Short) |
| | Rasool Seyghaly, Jordi Garcia, Xavi Masip-Bruin and Mohammad Mahmoodi Varnamkhasti | Interference Recognition for Fog Enabled IoT Architecture using a Novel Tree-based Machine Learning Method | In-Person | (Short) |
| | Shamma Al Blooshi and Kyusuk Han | A Study on Employing UPTANE for Secure Software Update OTA in Drone Environments | In-Person | (Long) |
| | | | | |
| 2 | Kristián Košťál and Richard Marko | Management of Decentralized Autonomous Organizations | Virtual | (Long) |
| | Joan Arnedo-Moreno and Victor Garcia-Font | Research opportunities in the application of blockchain in video games: A scoping review | Virtual | (Short) |
| | Bartosz Kuśmierz and Roman Overko | How centralized is decentralized? Comparison of wealth distribution in coins and tokens | Virtual | (Short) |
| | Malcolm Smith, Alexander Castro, Mohamed Rahouti, Moussa Ayyash and Lesther Santana | ScreenCoin: A Blockchain-Enabled Decentralized Ad Network | Virtual | (Short) |
| | Alia Al Sadawi and Malick Ndiaye | A Comprehensive Blockchain Framework for (COVID-19)Vaccine Program Registration, Supply Chain and Side Effects | Virtual | (Short) |
| 3 | Kengo Watanabe and Fumio Machida | Availability Analysis of a Drone System with Proactive Offloading for Software Life-extension | Virtual | (Long) |
| | Pi-Chung Wang | Packet Classification with Segregated Cross-Producting | Virtual | (Long) |
| | Dominik Weikert, Christoph Steup and Sanaz Mostaghim | Multi-Objective Task Allocation for Dynamic IoT Networks | Virtual | (Long) |
| | Saidur Rahman, Apostolos Kalatzis, Mike Wittie, David Millman and Laura Stanley | Dynamic Checkpoint Initiation in Serverless MEC | Virtual | (Short) |
| | Eunsook Eunah Kim, Maurizio Rossi, Betty Cortiñas Lorenzo, Babis Magoutas, Cédric Crettaz, Andrea Fernández Martínez, Efthimios Bothos and Juan Manuel Fernández Montenegro | Water Economy with Smart Water System in the City of Carouge | Virtual | (Short) |
| | Zouheir Trabelsi, Tariq Qayyum, Kadhim Hayawi and Muhammad Ali | Global Aggregation Node Selection Scheme in Federated Learning for Vehicular Ad Hoc Networks (VANETs) | Virtual | (Long) |
| 5 | Rohit Gangupantulu, Tyler Cody, Paul Park, Abdul Rahman, Logan Eisenbeiser, Dan Radke, Ryan Clark and Christopher Redino | Using Cyber Terrain in Reinforcement Learning for Penetration Testing | Virtual | (Long) |
| | Kumar Saurabh, Ayush Singh, Uphar Singh, O.P. Vyas and Rahamatullah Khondoker | GANIBOT: A Network Flow Based Semi Supervised Generative Adversarial Networks Model for IoT Botnets Detection | Virtual | (Short) |
| | Javier Gálvez-Goicuría, Josué Pagán, Lucía Pérez, Julián Catalina-Gómez, José M. Moya and José L. Ayala | Reproducible and accurate subject-wise sleep posture detection by detecting and removing turns | Virtual | (Short) |
| | Naga Durga Krishna Mohan Eaty and Priyanka Bagade | Electric Vehicle Battery Management using Digital Twin | Virtual | (Short) |
| | Jyothish J. Kumar, Amish Bibhu, Shreya Shivangi, Subhankar Mishra and Sulagna Saha | MIMA - Multifunctional IoT integrated Menstrual Aid | Virtual | (Short) |
| 6 | Georgios Tertytchny and Maria K.Michael | Two-dimensional Dataset Reduction in Data-Driven Fault Detection for IoT-based Cyber Physical Systems | Virtual | (Long) |
| | Tyler Cody, Stephen Adams, Peter Beling and Laura Freeman | On Valuing the Impact of Machine Learning Faults to Cyber-Physical Production Systems | Virtual | (Long) |
| | Tej Kiran Boppana and Priyanka Bagade | Security risks in MQTT-based Industrial IoT Applications | Virtual | (Short) |
| | Purboday Ghosh, Hao Tu, Timothy Krentz, Gabor Karsai and Srdjan Lukic | An Automated Deployment and Testing Framework for Resilient Distributed Smart Grid Applications | Virtual | (Short) |
| | Elisavet Grigoriou, Manolis Fountoulakis, Emmanouil Kafetzakis, Ioannis Giannoulakis, Eleftherios Fountoukidis, Paris Alexandros Karypidis, Dimitrios Margounakis, Cleo Varianou Mikelidou, Iasonas Sennekis and George Boustras | Towards the RESPOND-A initiative: Next-generation equipment tools and mission-critical strategies for First Responders | Virtual | (Short) |

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|---|---|---|---|---|
| 9 | Carmine Stefano Clemente, Daniele Davino, Immacolato Iannone and Vincenzo Paolo Loschiavo | A real-time Arduino based AC-DC Boost converter for Vibration Energy Harvesting devices | Virtual | (Long) |
| | Ludmilla Grzelak, Alexis Lasserre, Olivier Brousse, Jérôme Rossignol, Didier Stuerga and Michel Paindavoine | Towards real-time ammonia concentration measurement using a microwave gas sensor associated with machine learning models | Virtual | (Long) |
| | Daniel Flood, Neethu Robinson and Shanker Shreejith | FPGA-based Deep-Learning Accelerators for Energy Efficient Motor Imagery EEG classification | Virtual | (Long) |
| | Alejandra Sanchez-Flores, Lluc Alvarez and Bartomeu Alorda | A review of CNN accelerators for embedded systems based on RISC-V | Virtual | (Long) |
| 10 | Laurent Yves Emile Ramos Cheret and Thiago Eustaquio Alves de Oliveira | Encoding High-Level Features: An Approach To Robust Transfer Learning | Virtual | (Long) |
| | Dejan Babic, Ivan Jovovic, Tomo Popovic, Stevan Cakic and Luka Filipovic | Detecting Pneumonia With TensorFlow and Convolutional Neural Networks | Virtual | (Long) |
| | Johannes Wirth and René Peinl | Automatic Speech Recognition in German: A Detailed Error Analysis | Virtual | (Long) |
| | Joe Lorentz, Assaad Moawad, Thomas Hartmann and Djamila Aouada | Profiling the real world potential of neural network compression | Virtual | (Long) |
| | Marco Antonio Barron, Jose Maria Luna and Sebastián Ventura | Dynamic Airline Discounts using an Evolutionary Subgroup Discovery Methodology | Virtual | (Long) |
| 12 | Sonia Bilbao-Arechabala and Belen Martinez-Rodriguez | A practical approach to cross-agri-domain interoperability and integration | Virtual | (Long) |
| | Dominik Walczuch, Tim Nitzsche, Tim Seidel and Julius Schöning | Overview of Closed-Loop Control Systems and Artificial Intelligence Utilization in Greenhouse Farming | Virtual | (Short) |
| | Arkadiusz Radziuk, Grzegorz Gryziak, Juliusz Pukacki, Wiesław Podyma, Kazimierz Wilk, Michał Błaszczak and Jerzy H. Czembor | IoT based solution for seed collection management of genebank | Virtual | (Short) |
| | Xuening Dong, Amirali Amirsoleimani, Mostafa Rahimi Azghadi and Roman Genov | In-Memory Memristive Transformation Stage of Gaussian Random Number Generator | In-Person | (Short) |
| | Brian Reily, Caden Coniff, John G. Rogers and Christopher Reardon | Disruption of Connectivity Graphs in Uncertain Multi-Agent Systems | Virtual | (Long) |
| 13 | Laura Hernández-Lorenzo, Iñigo Sanz Ilundain and Jose Luis Ayala Rodrigo | Timeseries biomarkers clustering for Alzheimer's Disease progression | Virtual | (Long) |
| | Hiran Lowe, Minul Lamahewage and Kutila Gunasekera | Towards a Low-cost WiFi based Real-time Human Activity Recognition System | Virtual | (Long) |
| | Petros Vavaroutsos, Ioannis Oroutzoglou, Dimosthenis Masouros and Dimitrios Soudris | Towards making the most of NLP-based device mapping optimization for OpenCL kernels | Virtual | (Long) |
| | Pierrick Pochelu, Serge G. Petiton and Bruno Conche | Distributed Ensembles of Reinforcement Learning Agents for Electricity Control | Virtual | (Long) |
| 16 | Habib Irani, Fatemeh Elahi, Mahmood Fazlali, Mahyar Shahsavari and Bahar Farahani | Auto-tuning HyperParameters of SGD Matrix Factorization-Based Recommender Systems Using Genetic Algorithm | Virtual | (Long) |
| | Partha Mukherjee and Youakim Badr | Detection of Defaulters in P2P Lending Platforms using Unsupervised Learning | Virtual | (Short) |
| | Marcel Koch, Fabian Schlenke, Fabian Kohlmorgen, Markus Kuller, Jörg Bauer and Hendrik Wöhrle | Detection and Classification of Human Activities using Distributed Sensing of Environmental Vibrations | Virtual | (Short) |
| | Leila Ismail and Huned Materwala | From Conception to Deployment: Intelligent Stroke Prediction Framework using Machine Learning | Virtual | (Short) |
| | Yar Muhammad, Mian Ahmad Jan, Spyridon Mastorakis and Bakht Zada | A Deep Learning-Based Smart Assistive Framework for Visually Impaired People | Virtual | (Long) |

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# Keynote: Co-Designing Privacy-Preserving Medical Wearables in the IoT Era


Prof. David Atienza Alonso

Embedded Systems Lab. (ESL), EPFL, Switzerland


August 1, 2022


The Internet of Things (IoT) has been hailed as the next frontier of innovation in which our everyday objects are connected in ways that can improve our daily lives and transform healthcare. However, significant challenges remain in achieving this potential due to the inherent resource-constrained and high-precision nature of medical wearables, coupled with privacy restrictions that prevent broad data gathering for Big Data studies in medical applications. This combination can result in inaccurate medical wearables in the IoT era. In this talk, Prof. Atienza will first discuss the challenges of designing edge Artificial Intelligence (AI) wearables in the IoT era. Then, it will be discussed how to co-design the next generation of medical wearables exploiting heterogeneous edge AI architecture to execute different ML algorithms. Moreover, it will be shown how the inclusion of federated learning can overcome the restrictions of medical data sharing with the Cloud, while enabling wearables personalization.


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# Biography of Prof. David Atienza

David Atienza is a Full Professor of Electrical and Computer Engineering and leads the Embedded Systems Laboratory (ESL) at EPFL, Switzerland. He received his MSc and PhD degrees in Computer Science and Engineering from UCM (Spain) and IMEC (Belgium). His research interests focus on system-level design methodologies for energy-efficient multi-processor system-on-chip architectures (MPSoC) and next-generation smart embedded systems (particularly wearables) for the Internet of Things (IoT) era. In these fields, he is co-author of more than 350 publications, 12 patents, and received several best paper awards in top conferences. He also was the Technical Program Chair of DATE 2015 and General Chair of DATE 2017. Dr. Atienza received the DAC Under-40 Innovators Award in 2018, IEEE TCCPS Mid-Career Award in 2018, an ERC Consolidator Grant in 2016, the IEEE CEDA Early Career Award in 2013, the ACM SIGDA Outstanding New Faculty Award in 2012, and a Faculty Award from Sun Labs at Oracle in 2011. He is an IEEE Fellow and an ACM Distinguished Member, as well as Chair of EDAA for the period 2022-2023.

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# Keynote: IoT for Smart and Connected Health

## Prof. Honggang Wang

Editor-in-Chief of IEEE Internet of Things

Director of Internet of Things and Data Engineering Lab, UMass Dartmouth, USA

August 1, 2022

Dr. Honggang Wang is a professor and the "Scholar of The Year" (2016). Before he joined UMass Dartmouth in 2009, he worked for Bell Labs Lucent Technologies China from 2001 to 2004 as a Member of the Technical Staff and received Lucent Global Switching Software Silver Award, in Naperville IL, USA, 2002. He received his Ph.D. in Computer Engineering at the University of Nebraska-Lincoln in 2009. He was early promoted to a full professor at UMassD in 2020. He is an alumnus of NAE Frontiers of Engineering program. He has graduated 30 MS/Ph.D. students and produced high-quality publications in prestigious journals and conferences in his research areas, wining several prestigious best paper awards. His research interests include Internet of Things and their applications in health and transportation (e.g., autonomous vehicles) domains, Machine Learning and Big Data, Multimedia and Cyber Security, Smart and Connected Health, Wireless Networks and Multimedia Communications. His research is reported by media such as USA ABC 6 TV, Standard Times Newspaper. He is an IEEE distinguished lecturer and an IEEE Fellow with the citation "for contribution to low power wireless for IoT and multimedia applications". He has also been serving as the Editor in Chief (EiC) for IEEE Internet of Things Journal (5 Year Impact Factor: 11.7) since 2020. He was the past Chair (2018-2020) of IEEE Multimedia Communications Technical Committee and is the IEEE eHealth Technical Committee Chair (2020-2021).

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# Keynote: The Next Three Hot Topics in IoT


Prof. Ranga Rao Venkatesha Prasad

Delft University of Technology


August 2, 2022


IoT has touched almost all the fields. There are many simple applications and domains and there are many which are not easy to address with the usual design of IoT as in “Smart-*”. For example, Smart homes and Smart cities. In this talk I provide a general outlook towards the direction in which the IoT is moving through three examples. The topics are very much connected with IoT – sensors and actuators but there would at least one extreme constraint while designing or when operating/using. Specifically, I touch upon using PIR sensors for very low power tracking and localization. Next the sensors and actuators for tactile Internet applications are touched upon. Lastly, I will showcase the issues involved in building a GPS receiver for a satellite. I would also provide a simple demonstration of an IoT switch that won Airbus competition.


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# Biography of Prof. Ranga Rao Venkatesha Prasad

Dr. R Venkatesha Prasad is an associate professor at the Embedded Networked Systems group of Delft University of Technology (TU Delft) since 2013. Between 2005 and 2012, he was a senior researcher and adjunct faculty at TU Delft. At TU Delft, he has supervised 18 PhD students (15 graduated, 4 ongoing) and 50 MSc students. He has (co-)authored more than 200 publications in the peer-reviewed international transactions/journals and conferences in the areas of Tactile Internet, Internet of Things (IoT), Cyber Physical Systems (CPS), Energy-harvesting, 60 GHz mmWave networks, Smart-energy systems, Personal networks, Cognitive Radios and Voice over Internet Protocol (VoIP). He has been successful in acquiring and executing several European and Dutch national projects in the areas of IoT, Future home networks (60 GHz), Smart-energy systems, Personal networks, and Cognitive Radios.

Venkatesha Prasad received his 4TU University Teaching Qualification diploma with excellence in 2015. Recognizing his research contributions to IoT, he has been selected as an IEEE Communication Society (ComSoc) Distinguished Lecturer on Internet of Things for the period 2016-2018. He has been contributing significantly to valorise research to practice by contributing to standards on Cognitive radios and Tactile Internet. He is currently the vice-chair of IEEE Tactile Internet standardization group. He is also leading many IEEE activities through positions in standards boards (secretary in the ComSoc standards board) and technical committees (vice-chair of cognitive networking committee in 2013-16). He is on the editorial board of many international transactions and magazines and is a regular TPC member for many prestigious journals and conferences. He was responsible for the signing of MoU between IISc - TU Delft and he is anchoring Indian Space Research Organization (ISRO) and TU Delft cooperation. He is the Deputy Project Director for Lunar Zebro – a moon rover project. He is a senior member of IEEE and ACM. He is a Fellow of IETE.

He completed his PhD from IISc, Bangalore, India in 2003. During his PhD research, a scalable VoIP conferencing platform was designed. His thesis work led to a start-up venture, Esqube Communication Solutions. While at Esqube, eight patent applications and three PCT applications were filed along with his colleagues. He was instrumental in Esqube's selection as top 100 IT innovators in India in 2006 by NASSCOM and top 100 promising companies in Asia by RedHerring in 2008. Recently, he led a student team to win the worldwide Airbus challenge -- Fly Your Ideas (2019).

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# Keynote: Intellectual Property Protection in Machine Learning: Data, Hyperparameters, and Models

Prof. Neil Zhenqiang Gong

Duke University

August 2, 2022

Machine learning is revolutionizing many aspects of our society. Training a machine learning model often requires a huge amount of data and computation resources. As a result, both training data and models may represent intellectual property of model providers and data owners. In this talk, we will discuss attacks to compromise the intellectual property of machine learning and defenses against them. In Part I, we will show how an attacker can steal a model provider's training data (in particular graph data), hyperparameters used to train the model, and model parameters via simply querying the model. In Part II, we will discuss how a model provider can protect the intellectual property of its model via fingerprinting its classification boundary. In Part III, we will discuss how a data owner can audit whether its data were misused to train a given model without his/her authorization.

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# Biography of Prof. Neil Gong

Neil Gong is an Assistant Professor in the Department of Electrical and Computer Engineering and Department of Computer Science (secondary appointment) at Duke University. He is interested in cybersecurity and data privacy with a recent focus on the intersections between security, privacy, and machine learning. He received an NSF CAREER Award, Army Research Office Young Investigator Program (YIP) Award, Rising Star Award from the Association of Chinese Scholars in Computing, IBM Faculty Award, Facebook Research Award, and multiple best paper or best paper honorable mention awards. He received a B.E. from the University of Science and Technology of China in 2010 (with the highest honor) and a Ph.D. in Computer Science from the University of California, Berkeley in 2015.

# Panel 1: Navigating the Tech. Industry as a Woman: Insights, Experience, and Lessons Learned from Leading Women in Tech.

This panel will provide a platform for our guests in which tech leaders as women or advocates for women in technology will provide insight into their experiences and share their perspectives. The panelists will highlight the stories and experiences about their successes and challenges in the tech industry, providing opportunities for women in tech to relate to one another and creating an open dialogue about the central role of skills (e.g., practical skills, technical skills, and entrepreneurial skills), career, and relationship building. This holistic panel will also address some of the key questions many women have regarding navigating the tech space, career development, and growth in the fields of IoT/AI/Data.

August 2, 2022

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# Panel 2: Designing for Diversity and Inclusion

Although the convergence of IoT, AI, Data, Edge-Fog-Cloud Computing, and Blockchain provides one of the most significant opportunities for humanity, the corresponding products/services/devices are typically not designed with the diversity of their users base in mind. This panel will discuss and establish strategies to foster genuine and holistic inclusion regarding design for these important technologies capturing the world's complex cultural and environmental diversity factors to tackle the risk of abuse and imbalance.

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# Tutorial: Efficient Deep Learning Computing with Sparsity


Prof. Song Han

MIT, USA


Modern deep learning requires a massive amount of computational resources, carbon footprint, and engineering efforts, making on-device machine learning challenging; retraining the model on-device is even more difficult. We make machine learning efficient by utilizing sparsity. We'll first present neural architecture search techniques by sparsely sampling different paths (proxylessNAS), searching sparsely activated subnet works from the once-for-all network (OFA), and MCUNet that brings AI to micro-controllers. Then I'll describe TinyTL and on-device transfer learning with sparse layer, sparse tensor update, fitting 256KB memory. Next I'll talk about improving the efficiency by utilizing the temporal sparsity for videos, spatial sparsity for point cloud, and token level sparsity for NLP. I'll conclude by hardware and system support for sparsity (TorchSparse, SpAtten, SpArch, PointAcc). The presentation will highlight full-stack optimizations, including the neural network topology, inference library, and the hardware architecture, which allows a larger design space to unearth the underlying principles for sparsity.

August 2, 2022

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# Biography of Prof. Song Han

Song Han is an associate professor in MIT EECS. His research focuses on efficient deep learning computing. He has proposed “deep compression” as a way to reduce neural network size by an order of magnitude, and the hardware implementation “efficient inference engine” that first exploited model compression and weight sparsity in deep learning accelerators. He has received best paper awards at ICLR’16 and FPGA’17. He is also a recipient of an NSF Career Award and MIT Tech Review's 35 Innovators Under 35 award. Many of his pruning, compression, and acceleration techniques have been integrated into commercial artificial intelligence chips. He earned a PhD in electrical engineering from Stanford University.

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# Tutorial: How to deploy productively QKeras deeply quantized networks on tiny micro-controllers


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Tiny machine learning is a well-established topic since few years and the associated community is growing at fast pace. Deep learning frameworks like Keras and exporting procedure into TensorFlow Lite format are well known and used by many IoT practitioners who are looking to advancements in term of interoperability, automatization and productivity.

Established recently, Deeply Quantized Neural Networks (DQNNs) offer new opportunities and interesting advantages to save memory footprint and to enable cheap hardwired implementations. However, their efficient software implementation on off the shelf micro controller is still a challenge and an obvious benchmark is the TensorFlow Lite counter implementation of neural networks.

X-CUBE-AI is an STM32CubeMX Expansion Package capable of automatic conversion of pre-trained Neural Network and classical Machine Learning models, and integration of generated optimized Ansi C library into the user's project.

The attendees to this training will learn more about tinyML, QKeras deep learning framework and associated quantization capabilities. Moreover, they will learn how to design exemplary neural topologies to address some case studies encompassing image classification, electric current classification, anomaly detection and classifications. Furthermore, these neural networks will be deployed automatically on STM32 microcontrollers by using latest X-CUBE-AI version.

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# Biography of Danilo Pau

Danilo PAU (h-index 24, i10-index 58) graduated on 1992 from Politecnico di Milano, Italy. One year before, he joined STMicroelectronics, where he worked on HDMAC and then MPEG2 video memory reduction, video coding, embedded graphics, and computer vision. Today, his work focuses on developing solutions for tiny machine learning tools and applications.

Since 2019 Danilo is an IEEE Fellow; he served as Industry Ambassador coordinator for IEEE Region 8 South Europe, was vice-chairman of the “Intelligent Cyber-Physical Systems” Task Force within IEEE CIS, was IEEE R8 AfI member in charge of internship initiative, a Member of the Machine Learning, Deep Learning and AI in the CE (MDA) Technical Stream Committee IEEE Consumer Electronics Society (CESoc) and currently is AE of IEEE TNNLS. He wrote and achieved on behalf of ST, the IEEE Milestone on Multiple Silicon Technologies on a chip, 1985 which was granted in 2021.

With over 81 patents, 132 publications, 113 MPEG authored documents and more than 54 invited talks/seminars at various worldwide Universities and Conferences, Danilo's favorite activity remains mentoring undergraduate students, MSc engineers and PhD students from various universities in Italy, US, France, and India.

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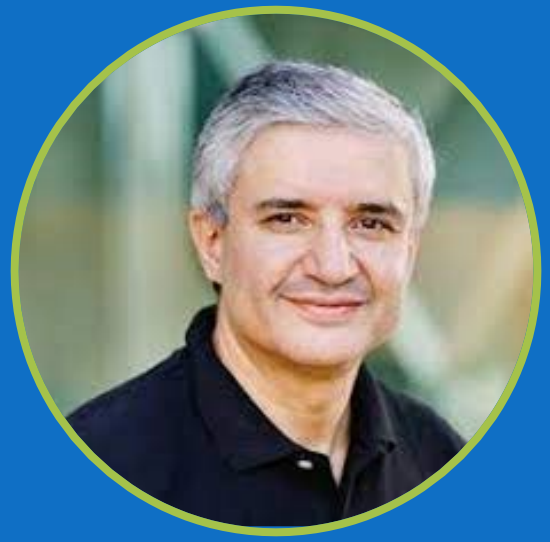


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# Abstract

We are witnessing an unprecedented boost in the space industry. The significant technological advances in the industry of low earth orbit (LEO) satellites have opened the door to a new realm of LEO-based applications. One key application is providing internet broadband services to people everywhere around the globe, which is considered a significant step towards resolving the digital divide problem. The main driver to achieve such satellite-based global connectivity is deploying large numbers of LEO satellites at a set of altitudes, ranging from 300 km to 1500 km, to ensure that every part of the earth will be covered by at least one satellite at all times. Given that we have multiple competing companies launching various constellations with diverse altitudes and numbers of satellites, we can envision a set of spheres concentric with the earth with large numbers of LEO satellites distributed on the surfaces of each of these spheres. Due to the fundamental difference between these novel communication systems, specially the spatial distribution of the communication nodes, and the typical terrestrial communication networks, we need to think of creative techniques to enable mathematically analysing such communication systems. In this tutorial, we discuss a recently proposed mathematical framework that enables tractable analysis of LEO satellite-enabled communication systems while capturing the influence of satellites' numbers and altitudes as well as the spatial distribution of earth stations. Firstly, we describe how this stochastic geometrybased framework is modelled and discuss its accuracy. Next, we provide a detailed example where this framework can be used for coverage analysis. We then introduce and discuss integrated space-aerial-terrestrial networks. Finally, we discuss how this framework can be used to study routing and end-to-end latency analysis in such networks. Realistic values from existing constellations, such as OneWeb and Starlink, are further used as case studies in this tutorial.

# Bio

Mohamed-Slim Alouini [S'94-M'98-SM'03-F'09] was born in Tunis, Tunisia. He received the Ph.D. degree in Electrical Engineering from the California Institute of Technology (Caltech), Pasadena, CA, USA, in 1998. He served as a faculty member in the University of Minnesota, Minneapolis, MN, USA, then in the Texas A&M University at Qatar, Education City, Doha, Qatar before joining KAUST, Thuwal, Makkah Province, Saudi Arabia as a Professor of Electrical Engineering in 2009. His current research interests include the modeling, design, and performance analysis of wireless communication systems.

Mustafa A. Kishk [S'16, M'18] is an Assistant Professor in the Electronic Engineering Department at Maynooth University, Ireland. Before that, he was a postdoctoral research fellow in the communication theory lab at KAUST. He received his B.Sc. and M.Sc. degree from Cairo University in 2013 and 2015, respectively, and his Ph.D. degree from Virginia Tech in 2018. His current research interests include UAV-enabled communication systems and satellite communications.