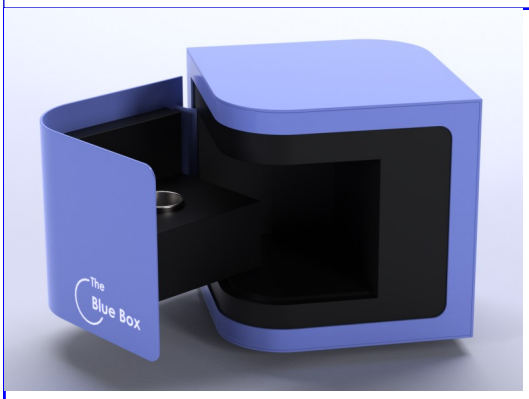
Volume 24, Issue 3
Spring '24

CECS eNEWS

Center for Embedded and Cyber-physical Systems, University of California, Irvine

Inside this Issue:

Promise of The Blue Box



Judit Giró Benet, alumni of the MECPS program, is the cofounder of The Blue Box Biomedical Solutions Inc. since 2020. Benet's breakthrough with biomedical device The Blue Box promises women ages 20-49 a pain-free, radiation-free, and accessible breast caner test.

Winner of the 2020 Global James Dyson Award, Benet's The Blue Box consists of a urine reader based on a proprietary eNose and an AI algorithm that takes treated sample to make assessments.

As of current, Benet and team have validated The Blue Box in 7 hospitals with over 450 patients. Armed with $1.7 million in a combination of equity and grant funding, Benet and team hope to begin clinical trials and launch The Blue Box to the EU market early 2025.

Khargonekar Inducted into UF Hall of Fame

University of Florida's (UF) Department of Electrical and Computer Engineering has inducted CECS affiliated Professor and Vice Chancellor for Research Pramod Khargonekar into their Hall of Fame. As an alumni of UF, Prof. Khargonekar demonstrated institutional leadership, a long-term commitment to UF's engineering program, and impactful research and inventions in the field of electrical or computer engineering. His theories and research are recognized to be one of the greatest theoretical achievements in the control systems field.

Levorato Wins Emerging Innovator of Year Award

CECS affiliated Assistant Professor of Information and Computer Science Marco Levorato won Beall Applied Innovation Center's 2023 UCI Early Career/Emerging Innovator of Year Award. The award recognizes Prof. Levorato's efforts to "drive innovative research into socially and commercially important applications." Prof. Levorato's research focuses on balancing data transfer security and cost for mobile AI applications. Along with the Beall Applied Innovation Center, Prof. Levorato is working on distributing his findings for real world applications.

SmartComp 2024 Accepted Paper

CECS's first collaboration with the Department of Computers and Informatics, Technical University of Kosˇice, Slovakia has been accepted to SmartComp 2024. Paper "Distributed Radiance Fields for Edge Video Compression and Metaverse Integration in Autonomous Driving" was authored by Technical University of Kosˇice students Eugen Šlapak, Matúš Dopiriak, Prof. Juraj Gazda, and CECS affiliated Professors Mohammad Abdullah Al Faruque and Marco Levorato.

IEEE TII 2024 Accepted Paper

Our paper "Adaptive Data Fusion for State Estimation and Control of Power Grids Under Attack" by student Trier Mortlock and Prof. Mohammad Al Faruque has been accepted and published in the IEEE Transactions on Industrial Informatics (IEEE TII'24), 2024. Congratulations, Trier!

Aman Arora - "Hardware for ML and ML for Hardware"

Title: Hardware for ML and ML for Hardware

Speaker: Prof. Aman Arora

Date and Time: Monday, April 1, 11:a.m.

Location: EH 2430

Hosted By: Prof. Sitao Huang

Ganapati Bhat - "Towards Self-Sustainable Wearable IoT Devices for Reliable Mobile Health Applications"

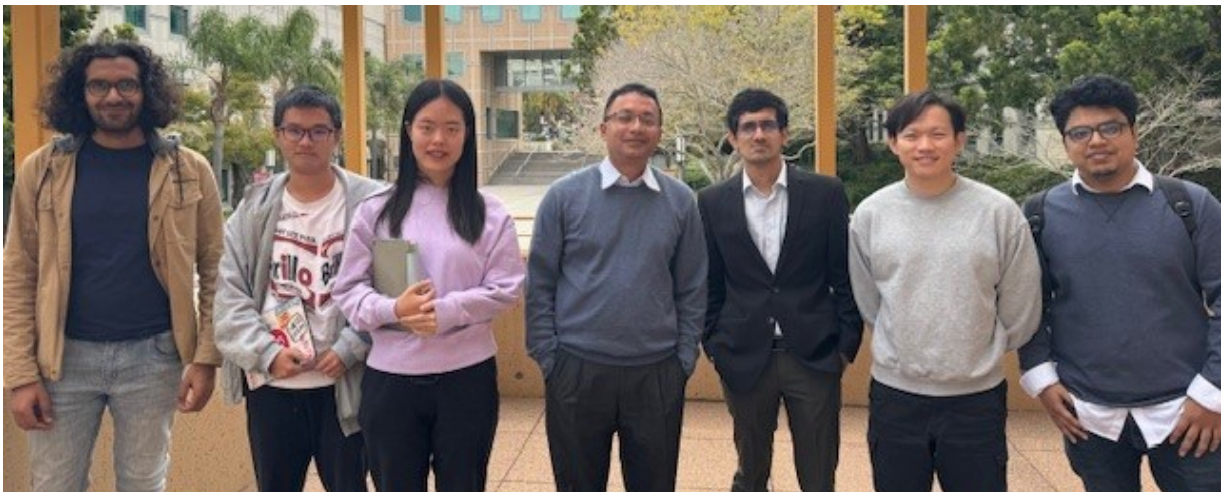
Title: Towards Self-Sustainable Wearable IoT Devices for Reliable Mobile Health Applications

Speaker: Prof. Ganapati Bhat

Date and Time: Thursday, April 25, 10:a.m.

Location: EH 2430

Hosted By: Prof. Mohammad Al Faruque



Yun (Eric) Liang - "Agile Hardware Specialization"

Title: Agile Hardware Specialization

Speaker: Prof. Yun (Eric) Liang

Date and Time: Wednesday, May 1, 11:a.m.

Location: ISEB 4020

Hosted By: Prof. Sitao Huang

Michail Maniatakos - "Dissecting the Software Supply Chain of Modern Industrial Control Systems"

Title: Dissecting the Software Supply Chain of Modern Industrial Control Systems

Speaker: Prof. Michail Maniatakos

Date and Time: Thursday, April 23, 10:a.m.

Location: Virtual/Zoom

Hosted By: Prof. Mohammad Al Faruque

Visitor Profile: Lars Luchterhandt

Lars Luchterhandt is a Master's student in Computer Engineering at Paderborn University, Germany, with a strong interest in Digital/VLSI Design. He is passionate about Systems on Chips (SoCs), the RISC-V ISA, FPGAs, and the potential of high-level Hardware Description Languages (HDLs).

During his Bachelor's studies at Paderborn University, Lars gained valuable teaching experience as a teaching assistant for multiple undergraduate courses. He is currently contributing as a research assistant to the System and Circuit Technology (SCT) group and the Computer Engineering (DATE) group at Paderborn University.

As a visiting scholar at UCI, Lars collaborates with Prof. Rainer Doemer (CECS, UCI) and Prof. Wolfgang Mueller (SCT, UPB) on a Chisel-based SoC RTL generator for Grids of Processing Cells. Outside of his academic and research activities, he enjoys outdoor activities such as running, hiking, scuba diving, and bouldering.

Publications

The following papers were published by CECS affiliates from April 2024 through June 2024 (and unreported papers from previous eNews).

Author, Title, Publication **Conference Proceedings**

Ildi Alla, Hervé B. Olou, Valeria Loscrì, Marco Levorato: **From Sound to Sight: Audio-Visual Fusion and Deep Learning for Drone Detection**. WISEC 2024: 123-133, May 27-29, 2024, Seoul, Republic of Korea

Jian Yang, Hongcheng Guo, Yuwei Yin, Jiaqi Bai, Bing Wang, Jiaheng Liu, Xinnian Liang, Linzheng Chai, Liqun Yang, Zhoujun Li: **m3P: Towards Multimodal Multilingual Translation with Multimodal Prompt**. LREC/COLING 2024: 10858-10871, May 20-25, 2024, Torino, Italy

Shun Zhang, Jian Yang, Jiaqi Bai, Chaoran Yan, Tongliang Li, Zhao Yan, Zhoujun Li: **New Intent Discovery with Attracting and Dispersing Prototype**. LREC/COLING 2024: 12193-12206, May 20-25, 2024, Torino, Italy

Kun Wu, Mert Hidayetoglu, Xiang Song, Sitao Huang, Da Zheng, Israt Nisa, Wen-Mei Hwu: **Hector: An Efficient Programming and Compilation Framework for Implementing Relational Graph Neural Networks in GPU Architectures.** ASPLOS (3) 2024: 528-544, April 27-May 1, 2024, La Jolla, CA, USA

Juan-David Guerrero-Balaguera, Josie E. Rodriguez Condia, Marco Levorato, Matteo Sonza Reorda: **Evaluating the Reliability of Supervised Compression for Split Computing.** VTS 2024: 1-6, April 22-24, 2024, Tempe, AZ, USA

Hanning Chen, Yang Ni, Wenjun Huang, Mohsen Imani: **Scalable and Interpretable Brain-Inspired Hyper-Dimensional Computing Intelligence with Hardware-Software Co-Design**. CICC 2024: 1-8, April 21-24, 2024, Denver, CO, USA

Mohamad Fakih, Rahul Dharmaji, Yasamin Moghaddas, Gustavo Quiros, Oluwatosin Ogundare, Mohammad Abdullah Al Faruque: **LLM4PLC: Harnessing Large Language Models for Verifiable Programming of PLCs in Industrial Control Systems**. ICSE-SEIP 2024: 192-203, April 14-20, 2024, Lisbon, Portugal

Giuseppe Esposito, Juan-David Guerrero-Balaguera, Josie E. Rodriguez Condia, Marco Levorato, Matteo Sonza Reorda: **Assessing the Reliability of Different Split Computing Neural Network Applications.** LATS 2024: 1-6, April 9-12, 2024, Maceio, Brazil

Mahyar Abbasian, Taha Rajabzadeh, Ahmadreza Moradipari, Seyed Amir Hossein Aqajari, Hongsheng Lu, Amir M. Rahmani: **Controlling the Latent Space of GANs through Reinforcement Learning: A Case Study on Task-based Image-to-Image Translation**. SAC 2024: 1061-1063, April 8-12, 2024, Avila, Spain

Matteo Mendula, Paolo Bellavista, Marco Levorato, Sharon Ladron de Guevara Contreras: **Furcifer: a Context Adaptive Middleware for Real-world Object Detection Exploiting Local, Edge, and Split Computing in the Cloud Continuum**. PerCom 2024: 47-56, March 11-15, 2024, Biarritz, France

Xiaoyu Niu, Yanjun Zhang, Yifan Zhang, Hongzheng Tian, Bo Yu, Shaoshan Liu, Sitao Huang: **Accelerating Autonomous Path Planning on FPGAs with Sparsity-Aware HW/SW Co-Optimizations**. FPGA 2024: 42, March 3-5, 2024, Monterey, CA, USA

Hongcheng Guo, Jian Yang, Jiaheng Liu, Jiaqi Bai, Boyang Wang, Zhoujun Li, Tieqiao Zheng, Bo Zhang, Junran Peng, Qi Tian: **LogFormer: A Pre-train and Tuning Pipeline for Log Anomaly Detection**. AAAI 2024: 135-143, February 20-27, 2024, Vancouver, Canada

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Conference Proceedings

Ying Mo, Jian Yang, Jiahao Liu, Qifan Wang, Ruoyu Chen, Jingang Wang, Zhoujun Li: **MCL-NER: Cross-Lingual Named Entity Recognition via Multi-View Contrastive Learning**. AAAI 2024: 18789-18797, February 20-27, 2024, Vancouver, Canada

Junyao Wang, Arnav Vaibhav Malawade, Junhong Zhou, Shih-Yuan Yu, Mohammad Abdullah Al Faruque: **RS2G: Data-Driven Scene-Graph Extraction and Embedding for Robust Autonomous Perception and Scenario Understanding**. WACV 2024: 7478-7487, January 3-8, 2024, Waikoloa, HI, USA

Journal Articles

Ahmed Nasser, Asmaa Abdallah, Abdulkadir Celik, Ahmed M. Eltawil: **Rendezvous of ISAC and NOMA: Progress and Prospects of Next-Generation Multiple Access**. IEEE Commun. Stand. Mag. 8(2): 44-51, June, 2024

Alexander A. Nguyen, Luis Guerrero-Bonilla, Faryar Jabbari, Magnus Egerstedt: **Scalable, Pairwise Collaborations in Heterogeneous Multi-Robot Teams**. IEEE Control. Syst. Lett. 8: 604-609, May, 2024

Soobum Kim, Ruoyu Lin, Samuel Coogan, Magnus Egerstedt: **Area Coverage Using Multiple Aerial Robots With Coverage Redundancy and Collision Avoidance**. IEEE Control. Syst. Lett. 8: 610-615, May, 2024

Mojtaba Taherisadr, Mohammad Abdullah Al Faruque, Salma Elmalaki: **ERUDITE: Human-in-the-Loop IoT for an Adaptive Personalized Learning System**. IEEE Internet Things J. 11(8): 14532-14550, April, 2024

Junyao Wang, Haocheng Xu, Yonatan Gizachew Achamyeleh, Sitao Huang, Mohammad Abdullah Al Faruque: **HyperDetect: A Real-Time Hyperdimensional Solution for Intrusion Detection in IoT Networks**. IEEE Internet Things J. 11(8): 14844-14856, April, 2024

Jinane Bazzi, Jana Sweidan, Mohammed E. Fouda, Rouwaida Kanj, Ahmed M. Eltawil: **Variability-Aware Design of RRAM-Based Analog CAMs**. IEEE Access 12: 55859-55873, April, 2024

Nasir Khan, Sinem Coleri, Asmaa Abdallah, Abdulkadir Celik, Ahmed M. Eltawil: **Explainable and Robust Artificial Intelligence for Trustworthy Resource Management in 6G Networks**. IEEE Commun. Mag. 62(4): 50-56, April, 2024

Madi Makin, Sultangali Arzykulov, Abdulkadir Celik, Ahmed M. Eltawil, Galymzhan Nauryzbayev: **Optimal RIS Partitioning and Power Control for Bidirectional NOMA Networks**. IEEE Trans. Wirel. Commun. 23(4): 3175-3189, April, 2024

Hamza Errahmouni Barkam, Sanggeon Yun, Paul R. Genssler, Che-Kai Liu, Zhuowen Zou, Hussam Amrouch, Mohsen Imani: **In-Memory Acceleration of Hyperdimensional Genome Matching on Unreliable Emerging Technologies**. IEEE Trans. Circuits Syst. I Regul. Pap. 71(4): 1794-1807, April, 2024

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The following papers were published by CECS affiliates from April 2024 through June 2024 (and unreported papers from previous eNews).

Author, Title, Publication

Journal Articles

Francesco Malandrino, Giuseppe Di Giacomo, Armin Karamzade, Marco Levorato, Carla-Fabiana Chiasserini: **Tuning DNN Model Compression to Resource and Data Availability in Cooperative Training**. IEEE/ACM Trans. Netw. 32 (2): 1600-1615, April, 2024

Bo-Lung Tsai, Kwei-Jay Lin: **Object-Oriented and Visual-Based Localization in Urban Environments**. Sensors 24 (6): 2014, March, 2024

Other Publications

Mike Heddes, Igor Nunes, Tony Givargis, Alex Nicolau: **Convolution and Cross-Correlation of Count Sketches Enables Fast Cardinality Estimation of Multi-Join Queries**. CoRR abs/2402.15953, May, 2024

Sanggeon Yun, Hanning Chen, Ryozo Masukawa, Hamza Errahmouni Barkam, Andrew Ding, Wenjun Huang, Arghavan Rezvani, Shaahin Angizi, Mohsen Imani: **HyperSense: Accelerating Hyper-Dimensional Computing for Intelligent Sensor Data Processing**. CoRR abs/2401.10267, May, 2024

Sanggeon Yun, Ryozo Masukawa, Sungheon Jeong, Mohsen Imani: **Spatial-Aware Image Retrieval: A Hyperdimensional Computing Approach for Efficient Similarity Hashing**. CoRR abs/2404.11025, May, 2024

Lars Niedermeier, Jeffrey L. Krichmar: **An Integrated Toolbox for Creating Neuromorphic Edge Applications**. CoRR abs/2404.08726, April, 2024

Harrison Espino, Robert Bain, Jeffrey L. Krichmar: **A Rapid Adapting and Continual Learning Spiking Neural Network Path Planning Algorithm for Mobile Robots**. CoRR abs/2404.15524, April, 2024

Rachid Karami, Hemanth Kota, Sheng-Chun Kao, Hyoukjun Kwon: **NonGEMM Bench: Understanding the Performance Horizon of the Latest ML Workloads with NonGEMM Workloads**. CoRR abs/2404.11788, April, 2024

Chetna Singhal, Yashuo Wu, Francesco Malandrino, Marco Levorato, Carla-Fabiana Chiasserini: **Resource-aware Deployment of Dynamic DNNs over Multi-tiered Interconnected Systems**. CoRR abs/2404.08060, April, 2024

Shun Zhang, Chaoran Yan, Jian Yang, Changyu Ren, Jiaqi Bai, Tongliang Li, Zhoujun Li: **RoNID: New Intent Discovery with Generated-Reliable Labels and Cluster-friendly Representations**. CoRR abs/2404.08977, April, 2024

Chenhao Cui, Yufan Jiang, Shuangzhi Wu, Zhoujun Li: **Transfer Learning Enhanced Single-choice Decision for Multi-choice Question Answering**. CoRR abs/2404.17949, April, 2024

Ziyu Wang, Zhongqi Yang, Iman Azimi, Amir M. Rahmani: **Differential Private Federated Transfer Learning for Mental Health Monitoring in Everyday Settings: A Case Study on Stress Detection**. CoRR abs/2402.10862, April, 2024

Zhongqi Yang, Yuning Wang, Ken S. Yamashita, Maryam Sabah, Elahe Khatibi, Iman Azimi, Nikil D. Dutt, Jessica L. Borelli, Amir M. Rahmani: **Integrating Wearable Sensor Data and Self-reported Diaries for Personalized Affect Forecasting**. CoRR abs/2403.13841, March, 2024

CECS—*promoting creativity and pursuing discovery!*

Center for Embedded and Cyber-Physical Systems, University of California, Irvine

***CECS** Mission Statement:*

To conduct leading-edge interdisciplinary research in embedded systems emphasizing automotive, communications, and medical applications, and to promote technology and knowledge transfer for the benefit of the individual and society.

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