ZHENGE JIA

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EMPLOYMENT

University of Notre Dame Notre Dame, Indiana
Postdoctoral Research Associate, Computer Science and Engineering *Aug. 2022 - Now*
Advisor: Prof. Yiyu Shi
Focus: Co-Exploration of Neural Network and Embedded System Design for Personalized TinyML in Healthcare

University of Pittsburgh Pittsburgh, Pennsylvania
Teaching Assistant *Jan. 2018 - Dec. 2020*
Courses: ECE 0142 (Computer Organization), ECE 0132 (Digital Logic), ECE 0501 (Digital Logic Laboratory), CoE 1502 (Advanced Digital Design Concepts)

EDUCATION

University of Pittsburgh Pittsburgh, Pennsylvania
Ph.D., Electrical and Computer Engineering *Jan. 2018 - Aug. 2022*
Advisor: Prof. Jingtong Hu
Dissertation: Personalized Deep Learning for IoT-Enabled Health Monitoring

Australian National University Canberra, Australia
B.S., Engineering and Computer Science (Honours) *Jan. 2014 - Dec. 2017*
Advisor: Prof. Weifa Liang
THESIS: The Efficient Rule Caching and Replacement of TCAM in Software-Defined Networking

RESEARCH INTERESTS

Personalized Deep Learning in Healthcare

- Meta-learning algorithm design to improve model generalization
- Prior-incorporated learning in regulating model personalization
- Personalized Meta-Federated learning for health monitoring

On-Device Deep Learning in Health

- Computing framework design for on-device model personalization
- Deep learning framework exploration for on-device inference

SELECTED PUBLICATIONS

Journal:

The Importance of Resource Awareness in Artificial Intelligence for Healthcare
Zhenge Jia, Jianxu Chen, Xiaowei Xu, John Kheir, Jingtong Hu, Han Xiao, Sui Peng, Sharon Hu, Danny Chen, Yiyu Shi

Nature Machine Intelligence, 2023 (Impact Factor: 25.9).

Life-Threatening Ventricular Arrhythmia Detection Challenge in Implantable Cardioverter Defibrillators
Zhenge Jia, Dawei Li, Xiaowei Xu, Na Li, Feng Hong, Lichuan Ping, Yiyu Shi
Nature Machine Intelligence, 2023 (Impact Factor: 25.9).

Low-Power Object-Detection Challenge on Unmanned Aerial Vehicles
Zhenge Jia, Xiaowei Xu, Jingtong Hu, Yiyu Shi
Nature Machine Intelligence, 2022 (Impact Factor: 25.9).

Personalized Neural Network for Patient-Specific Health Monitoring in IoT: A Meta-Learning Approach
Zhenge Jia, Yiyu Shi, Jingtong Hu
IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (TCAD), 2022 (Impact Factor: 2.8).

Cooperative Communication Between Two Transiently Powered Sensor Nodes by Reinforcement Learning
Yawen Wu, **Zhenge Jia**, Fei Fang, Jingtong Hu
IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (TCAD), 2021 (Impact Factor: 2.8).

Conference:

On-Device Prior Knowledge Incorporated Learning for Personalized Atrial Fibrillation Detection
Zhenge Jia, Yiyu Shi, Samir Saba, Jingtong Hu
Proc. International Conference on Compilers, Architecture, and Synthesis for Embedded Systems (CASES) in conjunction with (ESWEEK). Also appears as part of the ESWEEK-TECS Special Issue, ACM Transactions on Embedded Computing Systems (ACM TECS), 2021 (Acceptance rate: 25%).

Learning to Learn Personalized Neural Network for Ventricular Arrhythmias Detection on Intracardiac EGMs
Zhenge Jia, Zhepeng Wang, Feng Hong, Lichuan Ping, Yiyu Shi, Jingtong Hu
Proc. The 30th International Joint Conference on Artificial Intelligence (IJCAI), 2021 (Acceptance rate: 13.9%).

Enabling On-device Model Personalization for Ventricular Arrhythmias Detection by Generative Adversarial Networks
Zhenge Jia, Feng Hong, Lichuan Ping, Yiyu Shi, Jingtong Hu
Proc. IEEE/ACM Design Automation (DAC), 2021 (Acceptance rate: 22.4%).

Personalized Deep Learning for Ventricular Arrhythmias Detection on Medical IoT Systems

Zhenge Jia, Zhepeng Wang, Feng Hong, Lichuan Ping, Yiyu Shi, Jingtong Hu
Proc. IEEE/ACM International Conference on Computer-Aided Design (ICCAD), 2020.

Q-learning Based Routing for Transiently Powered Wireless Sensor Network: Work-in-progress
Zhenge Jia, Yawen Wu, Jingtong Hu
Proc. International Conference on Hardware/Software Codesign and System Synthesis (CODES+ISSS) in conjunction with ESWEEK, 2019.

ICD-BAS: Detecting Ventricular Arrhythmia using Binary Architecture Search for Implantable Cardioverter Defibrillators
Qing Lu, **Zhenge Jia**, Jingtong Hu and Yiyu Shi
Proc. of IEEE/ACM international conference on Connected Health: Applications, Systems and Engineering Technologies (CHASE), 2022.

Opportunistic Communication with Latency Guarantees for Intermittently-Powered Devices
Kacper Wardega, Wenchao Li, Hyoseung Kim, Yawen Wu, **Zhenge Jia** and Jingtong Hu
Proc. The ACM/IEEE Design, Automation and Test in Europe (DATE), 2022.

Lightweight Run-Time Working Memory Compression for Deployment of Deep Neural Networks on Resource-Constrained MCUs
Zhepeng Wang, Yawen Wu, **Zhenge Jia**, Yiyu Shi, Jingtong Hu
The 26th Asia and South Pacific Design Automation Conference (ASP-DAC 2021), 2021.

Intermittent Inference with Non-uniformly Compressed Multi-Exit Neural Network for Energy Harvesting Powered Devices
Yawen Wu, Zhepeng Wang, **Zhenge Jia**, Yiyu Shi, Jingtong Hu
Proc. The 57th IEEE/ACM Design Automation Conference (DAC 2020), 2020 (Acceptance rate: 23.2%).

Oral Presentations:

Demo: Addressing Inter-Intra Patient Variability via Personalized Meta-Federated Learning in IoT-Enabled Health Monitoring
Zhenge Jia, Yiyu Shi
IEEE/ACM International Conference on Connected Health: Applications, Systems and Engineering Technologies (CHASE), 2023.

INTERNSHIP EXPERIENCE

Algorithm Engineer, Singular Medical (USA) Inc. (2020.04 - 2020.08)
- ❖ Investigated and explored the feasibility of deep learning in ventricular arrhythmia detection.
- ❖ Performed research work advancing the understanding of ventricular arrhythmia detection

working flow and logic in the ICDs manufactured by Boston Scientific and Medtronic. Emulated ventricular arrhythmia detection algorithms on off-the-shelf ICDs.

RESEARCH EXPERIENCE

Personalized Meta-Federated learning for IoT-enabled health monitoring **2022**

- ❖ Cross-patient learning and model aggregation with patient-clustering based weighting strategy.
- ❖ Neighbor-assisted personalization.

Learning to learn personalized neural network for health monitoring **2022**

- ❖ Model-Agnostic Meta-Learning (MAML) with novel patient-wise tasks formatting strategy to accommodate patient-specific detection scenarios.
- ❖ Optimizations on inner- and outer-loop update of MAML.

Prior-incorporated learning for personalized atrial fibrillation detection **2021**

- Prior knowledge incorporated learning for proper model personalization.

Self-supervised and on-device model personalization **2020**

- Generative adversarial network (GAN) for self-supervised patient-specific data synthesis.
- Computing framework design for on-device model personalization for ventricular arrhythmia.

Personalized deep learning for ventricular arrhythmia on medical IoT system **2019**

- ❖ Cooperative inference on surface and intracardiac rhythm signal.
- ❖ Dynamic model personalization via fine-tuning.

SERVICES

- **TPC Member**
  - ❖ International Conference on Computer-Aided Design (ICCAD'23)
- **Journal Reviewer**
  - ❖ Nature Scientific Report
  - ❖ IEEE Trans. On Circuits and System II (TCAS)
  - ❖ ACM Trans. on Cyber-Physical Systems (TCPS)
  - ❖ ACM Journal on Emerging Technologies in Computing Systems (JETC)
  - ❖ IEEE Embedded Systems Letters (ESL)
  - ❖ IEEE Access
- **Competition Organizer**
  - ❖ 1st TinyML contest collocated at ICCAD'22 (150+ registered teams).
- **Judge**
  - ❖ Intel International Science and Engineering Fair (ISEF), 2018

ACHIEVEMENTS AND AWARDS

- 2022, Ph.D. Forum, ASP-DAC
- 2021, Student Grant, IJCAI
- 2021, Young Student Fellow Award, DAC
- 2020, Young Student Fellow Award, DAC