AHMAD REZAEI

Advances in AI Research and Explainable Deep Learning Solutions

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PROFESSIONAL EXPERIENCE

Full-time Research Associate

Faculty of Computer Science and Automation, Technische Universität Ilmenau

12.2021 - 03.2024 Ilmenau, Germany

- Research on optical inspection of printed circuit boards (PCBs) aiming to explain AI predictions of PCB defects using deep learning (DL).
- Development of approaches for the global selection of explainable models.
- A total of 3 publications at ISI conferences.

Research Associate

Reliable & Smart Systems Lab.

01.2019 - 07.2021 Kerman, Iran

- Research on applied machine learning (ML) in bioinformatics.
- Conducted research on hardware design and deep learning accelerators.
- A total of 1 ISI journal publication, 1 Arxiv paper.

EDUCATION

MSc, Research in Computer and Systems Engineering

Technische Universität Ilmenau

09.2020 - (11.2024) Ilmenau, Germany

- Grade: 1.54[1]

BSc, Electrical Engineering - Electronics

Shahid Bahonar University

09.2014 - 09.2019 Kerman, Iran

- Grade: 15.14/20

INVOLVED PROJECTS

Explainable Cognitive Optical Inspection in Electronics Manufacturing

TAB Project

2021 - 2023 Ilmenau, Germany

* Additional academic projects[2] on my **personal website**

[1] Current grade excluding the thesis (as stated in M.Sc. transcripts)
[2] https://ahmadr75.github.io/

RESEARCH INTERESTS

Machine Learning, Explainable AI, Large Language Models, Digital Design

RELEVANT EXPERIENCE

Research

Explainable Training: Training CNNs with Explanations as Feedback | tf.Graph, tf.Data

01.2023 - 03.2024

- Using explanations to improve localization in CNN models.

ApplyCam: Interactive Explainable Software for Image Modification | PyQt5-tools, Docker

07.2022

- Software for Windows and Linux that allows image settings adjustments and provides explanations through a deep learning model.

Implementation and Evaluation of Explanation Methods for CNNs | Tensorflow 2

03.2022 – 07.2022

- Selection and implementation of understandable explanation methods for end-users with performance evaluation of the model.

Cross-Layer Optimization of Mauler ML Network on Kintex-7 FPGA Device | C++, Vivado HLS

11.2020 - 07.2021

- Improving energy consumption and efficiency through software and hardware techniques such as quantization and pipelining.

Selected M.Sc. Projects

Facial Data Fusion for Predicting Crosswalk Behaviour of Pedestrians | Imblearn, Dlib

11.2022 - 07.2023 Group Studies Project

Implementation of CAN-bus Protocol on Two Arduino-Uno Devices | C++

04.2022 – 07.2022 Embedded Systems Lab.

Feature Processing and Time-Series Energy Prediction on Wafer Production Facility | Pandas, Tensorflow 2

PUBLICATIONS

Rezaei, A., Nau, J., Streitferdt, D., Schambach, J., & Vangelov, T. (2023, October). ***ReProInspect: Framework for Reproducible Defect Datasets for Improved AOI of PCBAs.*** In 8th International Conference on Engineering of Computer-based Systems (ECBS), Västeras, Sweden (pp. 205-214). Cham: Springer Nature Switzerland.

Rezaei, A., Nau, J., Richter, J., Streitferdt, D., & Schambach, J. (2023, June). ***FACEE: Framework for Automating CNN Explainability Evaluation***. In 2023 IEEE 47th Annual Computers, Software, and Applications Conference (COMPSAC), Torino, Italy, (pp. 67-78). IEEE.

Rezaei, A., Richter, J., Nau, J., Streitferdt, D., & Kirchhoff, M. (2023, February). ***Transparency and Traceability for AI-Based Defect Detection in PCB Production***. In Modelling and Development of Intelligent Systems: 8th International Conference, MDIS 2022, Sibiu, Romania, October 28–30, 2022, Revised Selected Papers (pp. 54-72). Cham: Springer Nature Switzerland.

Rezaei, A., Taheri, M., Mahani, A., & Magierowski, S. (2023). ***LRDB: LSTM Raw data DNA Base-caller based on long-short term models in an active learning environment***. arXiv preprint arXiv:2303.08915.

Rezaei, A., Mahani, A. (2021). ***Noise-based logic locking scheme against signal probability skew analysis***. IET Computers & Digital Techniques, Wiley Online Library.

AWARDS

C++ Programming Course

Certificate of successful completion of the course "Beginning C++ Programming-From Beginner to Beyond"

04.2020 Course by Frank J. Mitropoulos

VLSI CAD Part I: Logic

Certificate of successful completion; overall grade achieved: 81.03%

06.2021 Coursera

Xilinx Vivado HLS Course

Certificate of successful completion of the course "FPGA Design with High Level Synthesis Tool (Vivado HLS)"

02.2020 Course by Digitronix Nepal

Top 7 qualified for the second round of the Synopsys Olympiad

13th Synopsys Microelectronics Olympiad in Iran

09.2018

LANGUAGES

English - C1 | German - C1 | Persian - Native

04.2022 – 07.2022 Database Laboratory

Enhancement of Tiny Defect Detection through Modified YOLO for Tiny Objects | YOLOv5, Wandb

12.2021 – 02.2022 Research Project

Regularization Techniques against Image Reconstruction | Pytorch, Sklearn, Skimage

06.2021 – 07.2021 Deep Learning Course

COVID-19 Analysis of UK Government and Health Institutions on Twitter | Pandas, Datetime, Tweepy

04.2021 – 09.2021 Data Science Seminar

Co-Supervisor

Student Research Assistant

01.2023-06.2023

- Development of models for continuous learning for DL.

2 Research Projects for M.Sc.

05.2022-04.2023, 09.2023-03.2024

- Title: "Methods and Techniques of Class Imbalance Learning in Deep Learning".
- Title: "3D Simulation of Fluids and Their Interaction with Objects".

Lab and Teaching Assistance

Digital System Design II Lab

09.2019-01.2021

- Guiding students in design, synthesis, and implementation on FPGA devices.

Test and Testable Design Course

10.2019

- Atalanta software workshop.

SKILLS

Python | C++/C | MATLAB

TensorFlow 1&2 | PyTorch | PyQt5 | Scikit, Matplotlib, NumPy | Pandas, HDFS, Oracle

Blender Plugin Development | Fluid Simulation

Xilinx Vivado Design Suite, ChipScope | Design Compiler | Cadencee SoC Encounter | Modelsim | Espresso Logic Minimizer | H-Spice