# YIFENG XIAO

3740 McClintock Ave, Los Angeles, CA, USA, 90007
yifengx@usc.edu +1 (213)271-8231

## EDUCATION

**University of Southern California** (USC), Los Angeles, CA, U.S. Jan. 2021 - Present
Ph.D. in Ming Hsieh Department of Electrical and Computer Engineering

- GPA: 3.90/4.00; work with Prof. Pierluigi Nuzzo.
- Research interests: Design and verification of learning-based cyber-physical system (CPS), Machine Learning.
- Relevant coursework: Machine Learning, Probability, Stochastic Process, Linear Algebra, Optimization, Nonlinear Control System, Analysis of Algorithms, Learning and Control for Safety-Critical Robotic Systems, etc.

**Fudan University** (FDU), Shanghai, China Aug. 2016 - Jul. 2020
B.E. in Microelectronic Science and Engineering

- GPA: 3.64/4.00; worked with Prof. Jianli Chen and Prof. Bei Yu.
- Research interests: Electronic design automation (EDA), Machine Learning.

**University of Sudney** (USYD), Sydney, Australia Feb. 2019 - Jun. 2019
Exchange Student in the Department of Information and Computer Engineering

## RESEARCH EXPERIENCE

**Verification Guided Fairness Repairing of Neural Networks** Dec. 2023 - Present
*Advisor: Prof. Pierluigi Nuzzo, Viterbi School of Engineering, USC*

- Develop a framework for fairness verification with satisfiability modulo convex programming (SMC).
- Repair neural networks with counterexamples and sensitive neurons.

**Efficient Exploration of CPS Architectures Using Contracts and Subgraph Isomorphism** Oct. 2023 - Sep. 2023
*Advisor: Prof. Pierluigi Nuzzo, Viterbi School of Engineering, USC*

- Formulated design space exploration problem with mixed-integer linear program (MILP) coded in Gurobi.
- Formally modeled diverse design viewpoints using assume-guarantee (A/G) contracts and leveraged contract-based decomposition to enhance scalability.
- Conducted refinement checking and subgraph isomorphism to exclude infeasible architectures efficiently.

**Machine Learning-Based Circuit Block Identification for Comparative Analysis** May. 2023 - Aug. 2023
*Project Leader, Supervisor: Kim-Fung Chan, Micron Technology*

- Designed an efficient feature extraction method on layout images with the Sobel filter.
- Constructed an image segmentation model to identify functional circuit blocks achieving $90\%$ accuracy.
- Computed area of different circuit blocks on layout images for comparative analysis.

**Robustness Verification of Neural Network-Enabled CPS** Apr. 2021 - Sep. 2021
*Advisor: Prof. Pierluigi Nuzzo, Viterbi School of Engineering, USC*

- Formally modeled the input-output robustness of neural networks (NNs) using A/G contracts.
- Developed a framework for robustness verification with SMC.
- Conducted robustness verification for NN-based perception on the MNIST dataset and applied compositional verification and sensitivity analysis in a reinforcement learning-enabled mountain car system.

**Low-Cost Hotspot Detection with Active Entropy Sampling** Dec. 2019 - Apr. 2020
*Advisor: Bei Yu, Department of Computer Science and Engineering, The Chinese University of Hong Kong (CUHK)*

- Processed layout data into clips and performed feature extraction using principal component analysis.
- Developed an entropy-based selection technique combining model uncertainty with calibration and data diversity.
- Applied an active learning framework for hotspot detection to achieve higher accuracy and less overhead.

## TEACHING AND INTERNSHIPS

**USC Viterbi School of Engineering** Jan 2024 - Present
*Teaching Assistant for EE581: Mathematical Foundations for System Design: Modeling, Analysis, and Synthesis*

**Micron Technology** May 2023 - Aug 2023
*Machine Learning Intern*
- Cooperated with the analog team on circuit block identification for comparative analysis.

**USC AutoDrive Lab** Sep. 2021 - Present
*Mentor for USC Viterbi Center for Undergraduate Research in Viterbi Engineering (CURVE) Program*
- Build simulation-based and experimental testbeds to emulate realistic scenarios for self-driving vehicles.

**DesCyPhy Lab** Jun. 2022 - Jul. 2022
*Mentor for 2022 USC Viterbi Summer High School Intensive in Next-Generation Engineering (SHINE) Program*
- Conduct robustness verification for the traffic sign classification system with Z3.

**USC Viterbi Graduate Mentorship Program** Aug. 2022 - Nov. 2022

## PUBLICATION

**Conference Papers**

1. Xiao, Y., Oh, C., Lora, M. & Nuzzo, P. (2023), "Efficient Exploration of Cyber-Physical System Architectures Using Contracts and Subgraph Isomorphism", DATE 2024 (Best Paper Award).
2. Su, M., Xiao, Y., Zhang, S., Su, H., Xu, J., He, H., ... & Chang, Y. W. (2022), "Late Breaking Results: Subgraph Matching Based Reference Placement for PCB Designs", DAC 2022. [PDF]
3. Xiao, Y., Su, M., Yang, H., Chen, J., Yu, J., & Yu, B. (2021, December), "Low-Cost Lithography Hotspot Detection with Active Entropy Sampling and Model Calibration", DAC 2021. [PDF]
4. Ma, C., Xiao, Y., Wang, S., Yu, J., & Chen, J. (2021, October), "CongestNN: A Bi-Directional Congestion Prediction Framework for Large-Scale Heterogeneous FPGAs", ASICON 2021. [PDF]

## AWARD

2024 Best Paper Award, Design Automation and Test Conference in Europe 2024 (4/996)
2023 DAC Young Fellowship
2020 Outstanding Graduates of Shanghai (2nd place of 122)
2019 National IC Design Competition - First Prize for Undergraduate Group
2018 SCSK Corporation Scholarship (1/122)
2018 Undergraduate Excellence Scholarship of FDU

## TECHNICAL SKILLS

**Languages:** English (Proficient), Chinese (Native)
**Programming:** Python, C/C++, Verilog, Java, Perl
**Software & Platforms:** Pytorch, Robot Operating System (ROS), MATLAB, Tensorflow, Gurobi, Z3, Latex, Cadence, Vivado