DAVID VILLARREAL

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Software Engineer and Electrical Engineer – Physicist by training. I am diversely educated and can solve problems with coding. My core software work has been in technical and mathematical solutions for the semiconductor industry.

EXPERIENCE

Senior Engineer, GlobalFoundries **May 2020 – Nov 2020** **Aug 2022 – Present**

Physical rules and software solutions team. This team provides yield-improving design for manufacturing solutions, and works on software solutions to automate the design enablement process of GlobalFoundries.

- Accomplished innovation projects as measured by new engineering products and delivering three publications at industry-leading Silicon Valley conferences (SPIE and Cadence Live).
- Led machine learning project that is better than traditional workflows for yield-improving algorithms.
- Derived new patterns for our software decks to improve the yield of customers.
- Integration of DFM software in all major electronic design automation tool vendors Calibre, Synopsys and Cadence.
- Extensive software testing to find problematic code and solutions.
- **Skills: Linux, Python, Tensorflow, Pytorch, Numpy, Pandas, Calibre, SynopsysICV, Cadence, Documentation, Version Control, Software Testing**

Machine Learning Researcher, Fritz Haber Institute of the Max Planck Society **May 2021 – July 2022**

Part of a PhD program to use equivariant graph neural networks for the study of phase transitions and the corrugated potential energy surface of perovskites and liquid silicon phase transition dynamics

- Developed my own Python package to study molecular dynamics data to perform complicated geometrical operations, time series analysis, and optimization. Code was developed using team feedback.
- My software and workflow aided my teammates projects by providing machine learned data.
- Extensive automation and streamlining of data analytics code for model creation, inference and testing.
- Selected for presentations to the Max Planck Society; projects will appear in pending publications and conferences
- **Skills: Computational Physics, Engineering, Python, Mathematics, Machine Learning, Pytorch, CUDA, High Performance Computing, Linux, Data Analysis, Pandas, Numpy, Scipy, Numerical Methods**

PUBLICATIONS

Machine learning solutions for semiconductor industry

- Two publications using machine learning techniques to expedite traditional algorithms with equal accuracy.
- Uwe Paul Schroeder, Janam Bakshi, and David Villarreal “Machine-learning assisted fast critical area analysis”, Proc. SPIE 11614, Design-Process-Technology Co-optimization XV, 116140V (22 February 2021); https://doi.org/10.1117/12.2582844
- Yi Lee, Uwe Paul Schroeder, Pouya Rezaeifakhr, Lynn Wang, and David Villarreal “Machine learning architecture evaluation for fast and accurate weak point detection”, Proc. SPIE 12495, DTCO and Computational Patterning II, 1249519 (28 April 2023); https://doi.org/10.1117/12.2657156

New tools for Electronic Design Automation:

- One publication of a new tool in collaboration with Cadence Design Systems. The new tool allows DFM rule checking in the Virtuoso Design Environment.
- David Villarreal, Rohit Karmarkar, Lynn Wang, Jac Condella, Ya-Chieh Lai, Philippe Hurat. “Automated PDK Validation Based on Pattern Enumeration Applied to Physical DFM Signoff”. CadenceLIVE Silicon Valley 2023.

University of Illinois at Urbana-Champaign **Jun 2017 – Dec 2017**

- Part of a group analyzing earthquake data in the context of modern statistical physics (renormalization group and scaling theories).
- Machine learning algorithms to the problem of many body localization. Research available at https://www.ideals.illinois.edu/bitstream/handle/2142/98888/SROP_report.pdf?sequence=2&isAllowed=y
- Skills: Computational Physics, Machine Learning, Python, Data Analysis

EDUCATION

University of Texas at Austin, MS Electrical and Computer Engineering **2018 – 2020**

- GPA 3.87
- James William Stewart, Jr. Endowed Scholarship in Electrical and Computer Engineering
- Data mining, Semiconductor Physics, VLSI, Numerical Methods, High Performance Computing

Monterrey Insitute of Technology, BS Engineering Physics **2014 – 2018**

- GPA 4.0, First Place

University of Illinois at Urbana Champaign, BS Engineering Physics **2017 – 2018**

- Exchange program.
- Graduate level coursework on numerical methods and high performance computing

Code Academy, Full Stack Development **2022 – 2023**

- I am completing a coding bootcamp on Full Stack Development. This course covers Front End and Back End Development. I am 25% done as of April 2023.

SKILLS

- Web development: HTML, CSS, JavaScript
- General Programming: Python, Pytorch, Tensorflow, Numpy, Scipy, Matlab, C and C++