Dennis Jacob
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EDUCATION

2020 - 2024 **Princeton University**, Princeton, New Jersey
B.S.E. in Electrical and Computer Engineering (*magna cum laude*)
Cumulative GPA: 3.92 | Certificate in Applied and Computational Mathematics

Selected coursework

ORF 309: Probability and Stochastic Systems	COS 375: Computer Architecture
COS 487: Theory of Computation	ECE 462: Design of VLSI
COS 429: Computer Vision	COS 418: Distributed Systems
ECE 434: Theoretical Machine Learning	COS 432: Information Security
ECE 435: Machine Learning and Pattern Recognition	ECE 539B: Security and Performance Challenges in Networked Systems

RESEARCH/WORK EXPERIENCE

Aug 2024 - Present **University of California, Berkeley**, Berkeley, California
Research Assistant under Prof. David Wagner
Research on trustworthy machine learning, trustworthy AI, and robustness for large language models (LLMs). Identified ideas for research directions, developed novel techniques for robustness of LLMs, implemented candidate techniques, communicated results via research papers, etc.

Summer 2023 **Princeton University**, Princeton, New Jersey
Summer research under Prof. Prateek Mittal
Research on adversarial machine learning (ML). Proposed a method for designing a certifiably robust defense for multi-label classifiers against the adversarial patch threat model. Demonstrated non-trivial robustness and clean performance on the MS-COCO dataset.

Summer 2022 **Princeton University**, Princeton, New Jersey
Summer research under Prof. Sharad Malik
Research on hardware verification methods. Modeled components of the NVDLA machine learning accelerator for convolutional neural networks. Used ILAng methodology to create abstractions of hardware design.

Summer 2021 **Corning Incorporated**, Corning, New York
Research Intern
Designed, developed, and implemented a Raspberry PI-based control system for cellular ceramic filter testing in diesel engine pollution control applications. Additionally improved legacy MATLAB code through GUI development, and designed a HMI + PLC programming interface for a burner rig testing suite. Documented the work via Corning Internal Research Reports.

Summer 2019 **Corning Incorporated**, Corning, New York
Highschool Research Intern
Developed and optimized a convolutional neural network (CNN) based tool for cellular ceramic manufacturing process improvement. Resulted in a Corning Internal Research Report.

RESEARCH COLLABORATIONS

June 2023 – Present **Karlsruhe Institute of Technology**, Karlsruhe, Germany
Research Collaborator with Dr. Sven Banisch
Investigating the causes and structure of polarization in online platforms. We leverage agent-based modeling (ABM) to model individual preferences and a combination of reinforcement learning (RL) and dynamical systems techniques to understand underlying opinion dynamics.

RESEARCH

2024 PatchDEMUX: A Certifiably Robust Framework for Multi-label Classifiers Against Adversarial Patches
***Dennis Jacob**, Chong Xiang, and Prateek Mittal*, Technical Report (submitted - under review).

2024 A dynamical model of platform choice and online segregation
*Sven Banisch, **Dennis Jacob**, Tom Willaert, and Eckehard Olbrich*, Preprint (arXiv).

2024 Towards a Certifiably Robust Defense for Multi-label Classifiers Against Adversarial Patches
***Dennis Jacob**, Chong Xiang, and Prateek Mittal*, NDSS 2024 Workshop on Artificial Intelligence System with Confidential Computing (AISCC 2024), Distinguished Paper Award.

2023 Polarization in Social Media: A Virtual Worlds-Based Approach,
***Dennis Jacob** and Sven Banisch*, Journal of Artificial Societies and Social Simulation (JASSS) 26 (3) 11.

PATENTS

2024 US11969051B2: (*method patent*) Internet connected adjustable structural support and cushioning system for footwear
Dennis George Jacob (April 30, 2024).

2022 US11464286B2: (*system patent*) Internet connected adjustable structural support and cushioning system for footwear
Dennis George Jacob (Oct. 11, 2022).

TEACHING and MENTORING

Spring 2023 Teaching Assistant for ECE 432: *Information Security*: held weekly office hours/graded

Fall 2022 Teaching Assistant for ECE 206: *Contemporary Logic Design*: held weekly office hours

Fall 2021 Teaching Assistant for COS 324: *Introduction to Machine Learning*; co-wrote lecture notes available at https://princeton-introml.github.io/index.html

HONORS and AWARDS

2024 Princeton University: G. David Forney, Jr. Prize (Outstanding Senior Thesis in ECE)

2024 Sigma Xi Honor Society

2024 Tau Beta Pi Honor Society

2022 Princeton University: Shapiro Prize for Academic Excellence

2020 - 2024 National Merit Scholarship award

2019 National Finalist in Young Entrepreneurs Academy (YEA!) competition

LEADERSHIP

2023 - 2024 Appointed officer at the Colonial Club in Princeton University. Helped plan social events, recruit members, and arrange weekly orders of food and beverages.

2021 - 2024 Vice President and founding member of the Hoagie Club at Princeton, a student developer group. Co-led development of HoagieStuff, the exchange platform for Princeton students.

2019 Founded an IoT technology start up, "bAIR Technologies" in association with the YEA! Program. Invented and developed an internet-connected smart sole that can be adjusted for custom comfort and support; technology covered by 2 US patents (US11464286B2 and US11969051B2).