

Ibrahim Ahmed

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Education

Vanderbilt University

PhD - Electrical Engineering

Expected May 2021

Adaptive fault-tolerant control of hybrid systems using reinforcement learning.

MS - Electrical Engineering

August 2018

Neural Networks, Pattern Recognition, High-Performance Computing, Algorithms, Real-time Systems, Image Processing, Computer Vision, Embedded Systems, Digital Electronics, Semiconductor Physics

BS - Electrical Engineering and Physics

May 2016

FPGA Design, VLSI Design, Micro-controllers, Modeling and Simulation, Applied Machine Learning, Galactic and Stellar Astrophysics

Research Experience

Vanderbilt University Department of Electrical Engineering

Aug 2016 - Present

Graduate Researcher/Teaching Assistant

- Build a reinforcement learning library to study fault-tolerant control on aircraft and smart buildings.
- Process clinical surveys by feature selection, clustering, and classification to diagnose genetic disorders.
- Generate data-driven models of systems using history of control and output measurements for model-based control.

Vanderbilt University Department of Physics & Astronomy

Jun 2016 - Aug 2016

Research Assistant

- Studied formation of dark matter halos in galaxies via high performance computer simulations.
- Developed algorithms to fit particle clouds to ellipsoids to verify Cold Dark Matter models of halo formation.
- Wrote a multiprocessor compatible data mining library to visualize 3.7TB of n-body physics simulation output.

Institute for Space and Defense Electronics, Vanderbilt University

Jun 2014 - Aug 2014

Research Intern

- Researched effects of solar and cosmic radiation on memory chips in space.
- Designed an interface in VHDL on a FPGA to test SRAM chips for single event upsets after irradiation.
- Documented code and interface operation procedures for use by researchers.

Professional Experience

Schneider Electric

Jun 2015 - Aug 2015

Business Intelligence Intern

- Programmed SQL procedures to consolidate 40 million overlapping transactions into 1.5 million records.
- Rewrote periodic table back-up procedures to eliminate redundancies and reduced backup sizes by 75%.

Vanderbilt University Office of Residential Education

Aug 2015 - May 2016

Resident Adviser

- Identified residents facing academic or personal challenges and provided support through campus resources.
- Arranged funding and logistics for movie nights, faculty talks, and carnivals to serve a community of 700 residents.

Skills

Programming: Python, C, C++, Java, JavaScript, SQL, Go, Assembly, VHDL, Bash, Powershell

Frameworks: PyTorch, Pandas, Nltk, Scipy, Scikit-Learn, Flask, OpenMP, CUDA, PETSc, AngularJS, D3.js

Applications: MATLAB/Simulink, Mathematica, \LaTeX 2 ϵ , SPICE, Cadence

Projects

Agents

<https://github.com/hazrmard/Agents>

- A user-friendly library of reinforcement learning controllers compatible with OpenAI Gym.
- Uniform, documented, and tested interface for discrete and continuous spaces across algorithms.

SatTrack

<https://github.com/hazrmard/SatTrack>

- A satellite communications application using software-defined radios.
- Visualizes and tracks satellite trajectories using a python and Arduino backend and a web app front end.

PoorMansNN

<https://github.com/hazrmard/PoorMansNN>

- A modular and extensible neural network library in Python with minimal dependencies.
- Dimension-agnostic: supports fully connected layers of any dimension.

Leadership and Teamwork

Vanderbilt Institute for Digital Learning

Aug 2017 - May 2018

Graduate Fellow

- Explored novel uses of digital media (virtual reality, data visualization) to promote learning in classrooms.
- Produced videos and presentations to convey academic research to a broad audience.
- Maintained an online repository of digital learning resources across campus.

Vanderbilt Student Volunteers for Science

Jan 2014 - May 2014

Volunteer

- Taught 8th graders in Nashville public schools fundamentals of robotics using LEGO Mindstorms kits.
- Hosted interactive sessions with students on university education and careers in engineering.

Publications

Conference Papers

Ibrahim Ahmed, Gautam Biswas, Hamed Khorasghani. "Comparison of model predictive and reinforcement learning methods for fault tolerant control" in IFAC-PapersOnLine, Warsaw, Poland, 2018.