Val Balaban

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Solid system design, software and hardware knowledge – developed 10+ projects (PCB design, embedded and real-time software, back end, machine learning, and GUI). Devised computer vision algorithms for detection, tracing, and tracking of biological bodies. Published two papers on organizational properties of bacteria and neuron cells. Published two machine learning papers on methods for optimizing robustness and fairness of the trained models. Devised algorithms for hardware and software design using machine learning.

- ✔ *Programming Languages:* **Python, Matlab, C++, C**
- ✔ *Machine Learning:* **Pytorch, Pytorch Lightning, W&B**
- ✔ *Image processing:* **OpenCV, Scikit-Image, SciPy**
- ✔ *Operating Systems:* **Linux, Embedded Linux, ROS**
- ✔ *Firmware design:* **C/ASM for ARM, AVR, 8051**
- ✔ *Hardware design:* **Verilog, KiCAD, Altium**

University of Southern California · Electrical and Computer Engineering — **2016 – present**

PhD Candidate (Final Year) · *Cyber Physical Systems Research Group* · *Annenberg Fellowship* — *Los Angeles, CA*

- Devised new algorithms for identifying cells from images and investigated their "social network". Related publications:
  - *Network science characteristics of brain-derived neuronal cultures deciphered from images.* Accepted in Scientific Reports (2020)
  - *Quantifying emergence and self-organisation of Enterobacter cloacae microbial communities.* Accepted in Scientific Reports (2018)
- Investigated methods for improving robustness and group fairness of machine learning models. Related publications:
  - *Improving Robustness: When and How to Minimize or Maximize the Loss Variance.* Accepted in ICMLA (2022)
  - *Optimizing for Individual and Group Fairness using Variance Penalization.* Under review in AAAI (2023)
- Founded Race On – a competition where students build and race self-driving cars, 1/10 scale models. More info below.
- Instructed (TA) "Introduction to Embedded Systems" and "Software Design Optimization" classes for 7 semesters. Covered modern C++ concepts (C++20 standard). Implemented an automated grading system using GitHub Actions.

Infineon Technologies · Leader in automotive electronic parts — **2014 – 2016**

Software/Hardware Engineer · *Technology and Methodology Department* — *Bucharest, Romania*

- Developed machine learning based strategies for IC design and lab testing that reduced the task time by 15-fold.
- Investigated software controlled power converters which compensate for component degradation or load change.
- Researched and developed motor controllers for lightweight electric vehicles using Matlab/Simulink.

D&D Technologies · Specialists in tax reporting automation — **2012 – 2014**

Embedded Software Engineer (part-time) — *Bucharest, Romania*

- Devised and built a distributed jackpot system with real-time constraints and communication over CAN bus.
- Developed a secure network optimized for real-time data exchange to monitor slot machines for tax reporting purposes.
- Built from scratch a custom-made Linux system optimized for secure monetary transactions.

University "Politehnica" of Bucharest — **2009 – 2015**

MS in Microelectronics · *BS in Electrical Engineering* — *Bucharest, Romania*

Race On – A Self-Driving Car Competition – Founder *January 2019 – present*

Founded and organized a competition for three consecutive semesters that engages students in hardware-software development to build and race a self-driving car. Each semester, we organize a series of workshops that introduce around 40 teams of 2 to 4 graduate students to ROS, control algorithms, real-time image processing techniques, localization and mapping strategies.

Freescale Embedded Challenge – First Place *June – September 2014*

Led a team that developed a car safety system able to scan and classify objects near the driving road, notifying for potential dangers. The deployed Linux system was built from scratch using Yocto, and optimized for real-time video processing.

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