Ryan Dreifuerst

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Education

The University of Texas at Austin — Austin, Texas
M.S./Ph.D. in Electrical Engineering — Aug. 2019 - Expected Aug. 2024
Advisor: Prof. Robert W. Heath Jr.

Technische Hochschule Lübeck — Lübeck, Germany
B.S. in Electrical and Communications Engineering — Aug. 2017 - May 2019
GPA: 4.0

Milwaukee School of Engineering — Milwaukee, Wisconsin
B.S. in Electrical Engineering — Aug. 2015 - May 2019
GPA: 4.0
Ranking: 1/500

Graduate Courses

Digital Communications, Data Mining, Statistical Machine Learning, Probability and Stochastic Processes I, Statistical Estimation Theory

Academic Experience

Graduate Research Assistant — Sponsor: Samsung
Supervisor - Prof. Robert W. Heath Jr. — Jan. 2020 - Present

- **Low Resolution Sinusoid Detection and Frequency Estimation using Deep Learning**
  - End-to-end detection and estimation of sinusoid frequencies from noisy, few-bit samples
  - Jointly optimized recurrent neural network detector and residual neural network estimator

Graduate Research Assistant — Sponsor: Samsung
Supervisor - Prof. Robert W. Heath Jr. — Aug. 2019 - Jan. 2020

- **Deep Learning-based Carrier Frequency Offset Estimation with One-Bit ADCs**
  - Quantized, low resolution training strategy proposed for single sinusoid frequency estimation from one-bit quantized data
  - Outperforms traditional signal processing techniques with fewer samples, lower signal to noise ratios, and faster execution time

Undergraduate Tutor

- **Lead tutor** Aug. 2018 - May 2019
  - Upper division tutor for courses in DSP, embedded systems, and wireless propagation
  - Oversaw and mentored new electrical engineering tutors

Work Experience

Digital Hardware Design Intern, Plexus Corp. *Neenah, Wisconsin*

- **MRI communication protocol** July. 2018 - Sept. 2018
  - Designed a communication protocol based on the first four layers of the OSI model
  - Constructed data aggregatation, packetization and serdes system in Verilog for 2 Gbps MRI data

Digital Hardware Design Intern, Plexus Corp. *Neenah, Wisconsin*

- **Medical device schematic capture** May. 2018 - Aug. 2018
  - Created an ISO 13485 certified medical device schematic in Altium
  - Led two customer schematic reviews and one internal review

Journal Papers

- **R.M. Dreifuerst**, Robert W. Heath Jr., Mandar Kulkarni, Jianzhong Charlie Zhang, "Low resolution sinusoid detection and estimation using deep learning", *in preparation for submission*, Jul. 2020.

Conference Papers

- **R.M. Dreifuerst**, Robert W. Heath Jr., Mandar Kulkarni, Jianzhong Charlie Zhang "Deep Learning-based Carrier Frequency Offset Estimation with One-Bit ADCs", *in Proc. IEEE SPAWC 2020 (Accepted)*, Apr. 2020.

- **R.M. Dreifuerst**, A. Graff, C. Unger, Sidharth Kumar, D. Bray "Radio Fingerprinting with Complex Neural Networks", *in preparation of submission*, Jul. 2020.

Projects

- **Wrist Rescue** - wearable fall detection and assistance Aug. 2018 - May 2019
  - Led a team of four through the product development lifecycle
  - Implemented random forest algorithm on real-time 9 axis sensor data
  - Served as primary data scientist, system programmer, and PCB designer

- **One Shot Whale Fluke Classification** Nov. 2018 - Jan. 2019
  - Designed a neural network to classify over 5000 different whales by their tails (flukes)
  - Used image augmentation and Siamese neural networks to learn from only a few samples per whale while achieving over 70% accuracy

- **FPGA Climate Control System** Oct. 2016 - Jan. 2017
  - Controlled a fan, windows, and VGA output based on environment sensors and user input
  - Implemented on soft core FPGA combining C and VHDL software

Honors and Awards

- MSOE class of 2019 Valedictorian, Summa Cum Laude May 2019
- Second place Cypress Bluetooth Design Competition Jul. 2019
- First place Senior Design Competition Apr. 2019

Professional Activities

- Tau Beta Pi Honor Society
- IEEE Eta Kappa Nu Honor Society
- IEEE Communication Society
- HAM radio technician class (KD9IGM)

Technical Skills

- **Programming languages:** Python, C++, Matlab, VHDL, Verilog, TCL
- **Frameworks:** Tensorflow, PyTorch, Numpy, Sci-kit learn, Jax, Numba, GNU Radio
- **Design tools:** Altium, Cadence, Simulink, Quartus, Pspice
- **Hardware:** SDRs, embedded linux devices, DSPs