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 May 2023
Advisor: Prof. Robert W. Heath Jr.

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

Milwaukee School of Engineering — Milwaukee, Wisconsin
B.S. in Electrical Engineering — Sept. 2015 - May 2019
GPA: 4.0
Ranking: 1/647

Graduate Courses

Digital communications, Data mining, Statistical machine learning, Probability and stochastic processes I, Statistical estimation theory, Autonomous Robots, Convex optimization, Wireless Communications

Academic Experience

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

- **Universal Simulation Development Platform**
  - Developed a unified platform for simulating wireless networks
  - Integrated multiple tiers of statistical, ray-tracing, and geographic simulators
  - "Load Balancing and Handover Optimization in Multi-band Networks using Deep Reinforcement learning" accepted at Globecom 2021.

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

- **Frequency Synchronization in Low-Resolution Millimeter-wave**
  - Proposed a deep learning feedback network for generating pilot sequences for CFO estimators
  - Developed a jointly optimized neural network for one-bit CFO estimation in multi-tap channels
  - Presented at Asilomar Conference on Signals, Systems, and Computers 2020
  - "Optimizing Coverage and Capacity in Cellular Networks using Machine Learning" Accepted at ICASSP 2021.

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

- **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 spectral component detection and estimation
  - Proposed hierarchical algorithm utilizing time-frequency representations

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**
  - 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
  - Presented at Signal Processing Advances for Wireless Communications Workshop 2020

Undergraduate Tutor

- **Lead Tutor** Aug. 2016 - May 2019
  - Upper division tutor for courses in DSP, embedded systems, and wireless propagation
  - Oversaw and mentored new electrical engineering tutors

Work Experience

Modem Systems Intern, Qualcomm *Remote, Boulder*

- **Uplink Performance Analysis** June. 2021 - Aug. 2021
  - Characterized uplink control information and share channel performance in PUCCH and PUSCH
  - Optimized control information performance through LLR rescaling and algorithmic debiasing
  - Presented findings in two site-wide presentations to over 60 stakeholders

Research Assistant, Facebook *Remote, Menlo Park*

- **Intelligent Radio Access Network Algorithms** June. 2020 - Sept. 2020
  - Developed mobile coverage map simulator for open source radio access networks using Quadriga
  - Exponentially reduced simulation time for multi-sector networks
  - Designed a neural network for predicting live network coverage from limited information

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** June 2017 - Sept. 2017
  - Created ISO 13485 certified medical device schematic in Altium
  - Led two customer schematic reviews and one internal review

Journal Papers

- **Ryan M. Dreifuerst**, Robert W. Heath Jr., "SignalNet: A Low Resolution Network for Sinusoid Detection and Estimation", *submitted to IEEE Trans. on Signal Processing*, June 2021.

- Victor Hugo Lopes, Cleverson Nahum, **Ryan M. Dreifuerst**, Aldebaro Klautau, Kleber V. Cardoso, Robert W. Heath Jr., "Deep Reinforcement Learning-Based Scheduling for Multiband Massive MIMO", *submitted to IEEE Open Access*, Aug. 2021.

Conference Papers

- **Ryan M. Dreifuerst**, S. Daulton, Y. Qian, P. Varkey, M. Balandat, S. Kasturia, A. Tomar, A. Yazdan, V. Ponnampalam, R.W. Heath, "Optimizing Coverage and Capacity in Cellular Networks using Machine Learning", *In Proc. of IEEE ICASSP 2021.*

- **Ryan M. Dreifuerst**, Robert W. Heath Jr., Mandar Kulkarni, and Jianzhong Charlie Zhang, "Frequency Synchronization in Low-Resolution Millimeter-wave", *In Proc. of Asilomar Conference on Signals, Systems, and Computers*, Dec. 2020.

- **Ryan M. Dreifuerst**, A. Graff, C. Unger, Sidharth Kumar, and D. Bray, "End-to-End Radio Fingerprinting with Neural Networks", *Preprint available.*

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

- Manan Gupta, **Ryan M. Dreifuerst**, Ali Yazdan, Po-Han Huang, Sanjay Kasturia, Jeffrey G. Andrews, "Load Balancing and Handover Optimization in Multi-band Networks using Deep Reinforcement Learning", *Accepted at Globecom 2021.*

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 networks to achieve 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

- Second place Cypress Bluetooth Design Competition Jul. 2019
- First place Senior Design Competition Apr. 2019
- Theodore Batterman Foundation Scholar Oct. 2016-2019

Professional Activities

- Tau Beta Pi Honor Society
- IEEE Eta Kappa Nu Honor Society
- IEEE Communication Society
- HAM radio technician class (KD9IGM)
- UT SAVES Editor
- IEEE JSAC Reviewer
- IEEE Globecom Reviewer
- IEEE TWC Reviewer

Technical Skills

- **Programming languages:** Python, Matlab, C++, VHDL, Verilog, TCL
- **Frameworks:** Tensorflow, Numpy, Sci-kit learn, PyTorch, Jax, Numba, Quadriga
- **Design tools:** Altium, Cadence, Simulink, Quartus, Pspice
- **Hardware Experience:** SDR, embedded linux devices, DSP, FPGA