# Ryan Dreifuerst

(608)-807-7247
ryandry1st@utexas.edu
710 Franklin Blvd, Austin, Texas
https://ryandry1st.github.io/

## 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* — 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

## Graduate Courses

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

## Academic Experience

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

- **Waveform Design for Millimeter Wave Synchronization**
  - Proposing new waveform design and algorithm for low resolution millimeter wave synchronization
  - Presenting at Asilomar Conference on Signals, Systems, and Computers 2020

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

**Undergraduate Tutor**

- **Academic 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

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**Research Assistant,** Facebook *Austin, Texas*

- **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

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- **R.M. Dreifuerst**, Robert W. Heath Jr., Mandar Kulkarni, Jianzhong Charlie Zhang, "SignalNet: A Low Resolution Network for Sinusoid Detection and Estimation", *in preparation for submission to IEEE Trans. on Signal Processing*, Dec. 2020.

## Conference Papers

- **R.M. Dreifuerst**, Robert W. Heath Jr., Sanjay Kasturia, and Paul Varkey "Modeling Realistic Network Coverage with Autoencoders", *in preparation for submission to ICC 2021*, Oct. 2020.

- Max Balandat, Sam Daulton, **R.M. Dreifuerst**, Sanjay Kasturia, Paul Varkey, and Robert W. Heath Jr. "Coverage and Capacity Optimization in Open RAN", *in preparation for submission to ICASSP 2021*, Oct. 2020.

- **R.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. IEEE SPAWC 2020*, Apr. 2020.

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

- **R.M. Dreifuerst**, Robert W. Heath Jr., Mandar Kulkarni, and Jianzhong Charlie Zhang "Waveform Design for Millimeter Wave Synchronization", *Accepted at Asilomar Conference on Signals, Systems, and Computers*, Dec. 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 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
- MSOE class of 2019 Summa Cum Laude — May 2019
- Theodore Batterman Foundation Scholar — Oct. 2016

## Professional Activities

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

## Technical Skills

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