Ben **Hardy**

000-000-0000 | benjamin.mi.hardy@gmail.com | Ben Hardy PhD | Google Scholar | Portfolio

SKILLS

LANGUAGES | Python● Matlab ● C++ ● Bash ● C ● JavaScript ●SLURM● git ● Qt
SOFTWARE | Jupyter Notebook ●TensorFlow ● Pandas ● PyInstaller ● Python Image library ● Blender
SIMULATION | XFdtd ● WaveFarer ● Wireless Insite ● ANSYS HFSS ● CST
HARDWARE | Solidworks ● Eagle ● KiCad ● LPKF systems ● FormLabs ● KeySight Network Analyzers ● RF electronics
SOFT SKILLS | Negotiations ● Customer Centric Approach ● Presentations
RF & MICROWAVE ENGINEERING | Waveguides ● Array Optimization ● Receiver Chains ● On Body Antennas (phone, watch, earbuds) GPS, Bluetooth, U-NII bands

EXPERIENCE

Remcom | FDTD and Ray Tracing Simulation Company

Electromagnetic Application Engineer | June 2023 – Present, Nashville, TN (Remote)

Neural Network for Predicting Breathing Patterns from Radar Backscatter

☑ Built and evaluated various neural networks using TensorFlow to predict breathing waveforms from returned phase from complex radar received power.

☑ automatized the workflow using python, windows batch scripting, and JavaScript to generate massive training data set.

☑ Achieved under 5% mean-squared error between ground truth and predicted waveform by adjusting network parameters such as learning rate, batch size, and architecture.

☑ Invited to give a talk at the International Symposium on Antennas and Propagation (ISAP 2025).

Synthetic Aperture Radar (SAR) Imaging Application

☑ Engineered a highly parallelized SAR imaging workflow, improving run time by 900x.

☑ Created JavaScript macro for dynamic resource allocation and automated simulation.

☑ Designed a Slurm system for executing parallel processes across a GPU cluster.

☑ Implemented advanced reconstruction algorithm in python on ray tracing data.

Blender Animation Import Application

☑ Engineered JavaScript workflow to automate Blender animations and integrate animated objects inside ray tracing software.

☑ Developed Python .exe using PyInstaller to interface with Blender's backend, enabling programmatic control of animation parameters.

☑ Implemented, OS agnostic, seamless pipeline for importing animated results from Blender into a ray tracer, streamlining the visualization & simulation process.

Software Training, Testing, and Presentations

☑ Present weekly software demos to RF engineers of major (Apple, Meta, Amazon, Google, Rohde & Shwarz etc.) and minor players showcasing software features.

☑ Constructed 50+ page customized tutorials for MRI RF engineers.

☑ Detailed bug reports, tests, and research objectives for new software features.

☑ Documented 30+ feature requests and bug reports.

☑ Garnered 45k+ total impressions on LinkedIn advertising software abilities.

EDUCATION

Vanderbilt University

PhD, Physics
Dissertation Title: *Advancing Ultra High Field Magnetic Resonance Microscopy*
June 2023 | Nashville, TN

Bowling Green State University

Double B.S., Mathematics & Physics
Honors Project: *Silver Nanoparticles as a Potential Solar Absorber*
May 2017 | Bowling Green, OH

Teaching & Tutoring Experience

Private Tutor |
2021 – 2025
ACT test preparation, Math (Algebra – Calculus), Chemistry, and Physics
Teaching Assistant at Vanderbilt |
2017 – 2018
Introductory Physics I and II Lab Instructor

COURSEWORK

Intro to Deep Learning ● Quantum Mechanics ● Microwave Engineering ● Number theory

INTERESTS

Chess ● Frisbee ● Woodworking

EXPERIENCE CONT'D

Vanderbilt University | Magnetic Resonance Imaging, Research, and Hardware Development

Research Assistant | Aug 2017 – June 2023, Nashville, TN

☑ Customized pulse sequence programming (C) on a Bruker 15.2 Tesla MRI scanner measuring the effects of diffusion on signal and the point spread function at spatial resolution beyond 8 µm in phantoms and cell samples (10.1016/j.jmr.2023.107479).

☑ Designed and built a cryogenic chamber housing a Tx/Rx surface loop for imaging resulting in an SNR improvement by a factor of 2 (10.1016/j.jmro.2024.100147).

☑ Authored 3 original 1st author publications. Coauthored 4 publications and authored 9 conference proceedings.

SELECT ACADEMIC MANUSCRIPTS

1. **ANIMATING VITAL SIGNS IN RADAR SIMULATIONS: COMPARING PHYSICAL OPTICS AGAINST 28.5 GHZ CHANNEL MEASUREMENTS** | PROCEEDINGS OF IEEE RADARCONF 2024
   S Mukherjee, **BM Hardy**, GJ Skidmore, T Chawla, J Bang, J Chuang, J Senic, S Berweger, S Blandino, C Gentile 10.1109/RadarConf2458775.2024.10548317
2. **A CRYOGENIC TUNE AND MATCH CIRCUIT FOR MAGNETIC RESONANCE MICROSCOPY AT 15.2T** | JOURNAL OF MAGNETIC RESONANCE OPEN 2024
   BM Hardy, G Drake, S Chai, B Dhakal, JB Martin, J Xu, MD Does, AW Anderson, X Yan, JC Gore *https://doi.org/10.1016/j.jmro.2024.100147*
3. **EXPERIMENTAL DEMONSTRATION OF DIFFUSION LIMITATIONS ON RESOLUTION AND SNR IN MR MICROSCOPY** | JOURNAL OF MAGNETIC RESONANCE July 2023 **BM Hardy**, Y Zhu, KD Harkins, B Dhakal, JB Martin, J Xie, J Xu, MD Does, AW Anderson, JC Gore. Journal of Magnetic Resonance. 2023. *https://doi.org/10.1016/j.jmr.2023.107479*
4. **BENCH TO BORE RAMIFICATIONS OF INTER-SUBJECT HEAD DIFFERENCES ON RF SHIMMING AND SPECIFIC ABSORPTION RATES AT 7T** | MAGNETIC RESONANCE IMAGING 2022
   BM Hardy, R Banik, X Yan, AW Anderson. Magnetic Resonance Imaging. 2022. *https://doi.org/10.1016/j.mri.2022.07.009*

PRESENTATIONS

1. **Noise Considerations for a Microsolenoid at 15.2T Designed for MR Microscopy** Proc. Intl. Soc. Mag. Reson. Med. 31 London, England 2022 1543 Watch on YouTube
2. **Effects of Intersubject Differences on Scattering Parameters, SAR, and B1+ in a 7T 8ch. Head Coil** Proc. Intl. Soc. Mag. Reson. Med. 31 London, England 2022 2546 Watch on YouTube
3. **RF Shim Flexibility with Multi-Surface-Loop Arrays Over Varying Head Geometries.** Proc. Intl. Soc. Mag. Reson. Med. 28 (2020) 4076 Watch on YouTube