Yingying Fan

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EDUCATION

Rice University *Houston, TX*
Ph.D. Candidate in Electrical and Computer Engineering Sept. 2019 – Dec. 2024

- Advisor: Taiyun Chi
- Thesis: Interfacing the Brain: High-Channel-Count Neural Recording and Multimodal Minimally Invasive Neural Stimulation
- Committee members: Taiyun Chi, Chong Xie, Behnaam Aazhang, Gang Bao

University of Michigan *Ann Arbor, MI*
Master of Science in Electrical and Computer Engineering (**GPA**: 4.0/4.0) Sept. 2017 – May 2019

- Advisor: Al-Thaddeus Avestruz

Southeast University *Nanjing, China*
Bachelor of Engineering in Information Engineering (**GPA**: 3.91/4.0) Sept. 2013 – June 2017

RESEARCH INTEREST

Analog/RF/mmWave application-specific integrated circuit (ASIC) and system design for biomedical applications, including but not limited to implantable, wearable and wireless biomedical devices, miniaturized neural interface implants.

SELECTED AWARDS

- Rising Stars in EECS hosted by MIT EECS 2024
  - *~19% acceptance rate, only one in ASIC*
- Rising Star in IEEE Solid-State Circuits Society (SSCS) 2024
- Future Faculty Fellowship by Rice University 2024
- Nettie S. Autrey Fellowship by Rice University 2024
  - *Sole recipient from School of Natural Science and Engineering*
- 2024 Circuit and Systems Society (CASS) Pre-Doctoral Grant 2024
  - *3 awardees worldwide*
- ISSCC 2023 Student Travel Grant 2023
- IEEE Solid-State Circuits Society (SSCS) Predoctoral Achievement Award 2022
  - *Highest honor for Ph.D. students from the IEEE SSCS*
- IEEE MTT-S Graduate Fellowship Award for Medical Applications 2021
  - *2 awardees worldwide*
- Cadence Women in Technology Scholarship 2021
- NSF Student Registration Award for IEEE RFIC 2021
- Loewenstern Fellowship by Rice University 2019
  - *3 awardees across 1st year Ph.D. students in ECE*

- Second Prize of IEEE Energy Conversion Congress and Expo (ECCE) Demo 2018
- Outstanding Graduate of Southeast University (Top 2%) 2017
- Outstanding Undergraduate Thesis Award from Southeast University 2017
- ADI Innovative Scholarship (Top 2%) 2016
- National Scholarship by China Ministry of Education 2015
    - *Highest honor for undergraduates*

RESEARCH EXPERIENCE

Graduate Research Assistant Sept. 2019 – Present

Advisor: Dr. Taiyun Chi, Rice University

- Designed a high-channel-count neural recording ASIC, integrating ultra-flexible neural probes (developed by Prof. Chong Xie's lab) for in-vivo rodent experiments, with human trials currently underway. Additionally, developed a wireless data transfer ASIC to support the high data bandwidth required by the neural recording system.
- Developed multimodal, minimally invasive brain stimulation ASICs, including magnetic nanoparticle (MNP)-assisted magnetic heating (in-vitro cell-based experiments conducted), magnetic field stimulation (in-vivo mice experiments conducted), and temporal interference electromagnetic wave techniques.
- Designed non-invasive methods for detecting and restoring glymphatic flow including using ultrasound to measure intracranial pressure.

Graduate Research Assistant March 2018 – May 2019

Advisor: Dr. Al-Thaddeus Avestruz, University of Michigan

- Low-Loss Power IC for Solar Cell-Level Balancing Using Diffusion Charge Redistribution

Undergraduate Research Assistant

Advisor: Dr. Fei Li, Southeast University Feb. 2017 – Aug. 2017

- Design of 3rd-Order Sigma-Delta ADC with CIFF Structure

Advisor: Dr. Fengyi Huang, Southeast University March 2016 – Aug. 2016

- Design of Micro-scale 3D Helix Inductor and Antenna for THz Applications

MENTORING EXPERIENCE

Research Mentor for Ph.D.

- Eric Wang (Sept. 2023 - present):
    - Project1: Characterization of customized beamforming board and in-vivo pig experiment for minimally invasive brain stimulation using EM waves
    - Project2: High-data-rate and low-power IR-UWB TX for neural recording IC verification
- Gerald Topalli (Sept. 2021 - present):
    - Project1: Noninvasive intracranial pressure monitor (ISSCC 2024)
    - Project2: Low-distortion low noise amplifier design for neural recording (BioCAS 2023)

Research Mentor for Undergraduate

- Jiyuan Duan (Aug. 2024 – present)
  - Project: Neural interface analog front-end ASIC design with high noise-efficiency-factor
  - Current status: visiting student at Rice
- Didi Zhou (Dec. 2023 – present)
  - Project: High-channel-count neural recording asic testing
  - Current status: undergraduate research assistant at Rice
- Yan Xu (Sept. 2022 – May 2023)
  - Project: High-data-rate and low-power IR-UWB TX for neural recording
  - Current status: Ph.D. at MIT
- Elise Gibney (June 2021 – May 2022)
  - Project: Phantom experiment for minimally invasive brain stimulation using EM waves
  - Current status: M.S. at Rice
- Madeline Stern (Sept. 2020 – May 2021)
  - Project: Backend PCB and script development for high-channel-count neural recording
  - Current status: hardware engineer at Alarm.com

TEACHING EXPERIENCE

- **Teaching Assistant for Undergraduate Courses** Rice University, TX
  - Spring 2022: Electronic Measurement Systems
  - Spring 2020 and 2021: Intro Physical Electronics
  - Fall 2020: Fund Computer Engineering
  - Fall 2019: Digital Logic Design (with FPGA lab session)
- **Teaching Assistant for Graduate Courses** Rice University, TX
  - Fall 2023: Pre-thesis Project Exploration
  - Fall 2021: Wireless IC

PUBLICATIONS

Conferences:

- **Yingying Fan**[#], Yuxuan Liu[#], Gerald Topalli, Roy Lycke, Lan Luan, Chong Xie, Taiyun Chi, "A 24V Mini-Coil Magnetic Neural Stimulator with Closed-Loop Deadtime Control and ZCS Control Achieving 99.76% Charge Recovery Efficiency", *IEEE International Solid-State Circuits Conference (ISSCC)*, 2024. ([#] equal contribution)
- Gerald Topalli, **Yingying Fan**, Matt Y. Cheung, Ashok Veeraraghavan, Mohammad Hirzallah, Taiyun Chi, "9mW Ultrasonic Through Transmission Transceiver for Non-Invasive Intracranial Pressure Sensing", *IEEE International Solid-State Circuits Conference (ISSCC)*, 2024.
- Gerald Topalli, **Yingying Fan**, Rongkang Yin, Chong Xie, Lan Luan, and Taiyun Chi, "A Complementary Pseudo-Resistor with Leakage Current Self-Compensation for Biopotential

Amplifiers", *IEEE Biomedical Circuits and Systems Conference (BioCAS)*, 2023

- **Yingying Fan**, Linlin Zhang, Qingbo Zhang, Gang Bao, and Taiyun Chi. "An Integrated Thermal Actuation/Sensing Array with Stacked Oscillators for Efficient and Localized Heating of Magnetic Nanoparticles with Sub-Millimeter Spatial Resolution", *IEEE International Solid-State Circuits Conference (ISSCC)*, 2021.
- **Yingying Fan**, Z. Li, X. Wang, and X. Tang, "A novel design of micro-scale 3D helix inductor for terahertz applications", *2016 International Conference on Integrated Circuits and Microsystems (ICICM),* 2016.

Journals:

- Yuhang Ma[#], **Yingying Fan**[#], Chong Xie, Taiyun Chi, "A High-Density High-Channel-Count Neural Probe-ASIC Platform with 5376 Simultaneous Recording", In preparation. ([#] equal contribution)
- Gerald Topalli[#], **Yingying Fan**[#], Matt Y. Cheung, Ashok Veeraraghavan, Mohammad Hirzallah, Taiyun Chi, "An Ultrasonic Transceiver for Non-Invasive Intracranial Pressure Sensing", in *IEEE Transactions on Biomedical Circuits and Systems*, 2024. ([#] equal contribution)
- **Yingying Fan**, L. Zhang, Q. Zhang, G. Bao and T. Chi, "An Integrated Microheater Array with Closed-Loop Temperature Regulation Based on Ferromagnetic Resonance of Magnetic Nanoparticles," in *IEEE Transactions on Biomedical Circuits and Systems*, 2021.
- William Schmid, **Yingying Fan**, T. Chi, E. Golanov, A. Regnier, R. Austerman, K. Podell, P. Cherukur, T. Bentley, C. Steele, S. Schodrof, B. Aazhang, G. Britz. "Review of Wearable Technologies and Machine Learning Methodologies for Systematic Detection of Mild Traumatic Brain Injuries", *Journal of Neural Engineering*, 2021.
- L. Luan, J. Robinson, B. Aazhang, T. Chi, K. Yang, X. Li, H. Rathore, A. Singer, S. Yellapantula, **Yingying Fan**, Z. Yu, C. Xie. "Recent Advances in Electrical Neural Interface Engineering: Minimal Invasiveness, Longevity, and Scalability", *Neuron*, 2020.

Patents:

- US Provisional Patent: Taiyun Chi, **Yingying Fan**, Chong Xie, Yuxuan Liu, "A Minimally Invasive Mini-Coil Magnetic Neural Stimulator", No. 63/554,673, 2024.
- US Patent: **Yingying Fan**, Qingbo Zhang, Linlin Zhang, Gang Bao, and Taiyun Chi, "An Integrated Microheater Array for Efficient and Localized Heating of Magnetic Nanoparticles at Microwave Frequency", US17/650,982, 2022.

Posters:

- **Yingying Fan**, "Interfacing the Brain: multimodal neural stimulation and high-channel-count neural recording", MIT Rising Stars in EECS Workshop, 2024.
- **Yingying Fan**, "Minimally Invasive Brain Stimulation", Rising Stars in SSCS Workshop, 2024.
- Gerald Topalli[#], **Yingying Fan**[#], Taiyun Chi, "A 9mW Ultrasonic Through Transmission Transceiver for Non-Invasive Intracranial Pressure Sensing", *IEEE Sensor Interfaces Meeting (SIM)*, 2024. (Invited) ([#] equal contribution)

- **Yingying Fan**, Yuhang Ma, Chong Xie, and Taiyun Chi, "A Neural Interface ASIC with 5376 Simultaneous Recording Channels, 32 Stimulation Channels, and Impedance Sensing," *Interface Rice*, 2022. (Invited for oral presentation, 6 out of 51 accepted posters)

SELECTED RESEARCH PROPOSAL EXPERIENCE

- A Nanoelectronics Strategy for Reliable, Large-scale Chronic Neural Recording ($2.9M funded by NIH R01)
- Optimizing Ultra flexible Electrodes and Integrated Circuits for High-Resolution, Large-Scale Intraspinal Recording and Modulation ($6.2M funded by NIH U01)
- Translational Technologies for Detection and Treatment of Mild Traumatic Brain Injury and their Impact on Glymphatic Flow ($2.8M funded by MTEC)
- Towards High-Channel-Count Invasive and High-Resolution Non-Invasive Electrical Neural Interfaces ($0.5M funded by NSF CAREER)

PROFESSIONAL SERVICE

- Reviewer for IEEE Journal of Solid State Circuit (JSSC), IEEE Transactions on Circuits and Systems I (TCAS-I), Transactions on Microwave Theories and Technologies (TMTT), Transactions on Biomedical Circuits and Systems (TBCAS)

SKILLS

Software	Cadence, ADS, MATLAB/Simulink, Altium Designer, LTSpice, HFSS, COMSOL
Circuit Design	Transistor level design, simulation, and layout of fundamental RF and analog building blocks such as LNAs, mixer, oscillators, ADCs, and power management
Biology	Basic photolithography process and cell culture for neuron and astrocyte cell