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BME 301 - Analysis of Physiological Systems,
 Instructor: Sri-Rajasekhar Kothapalli, Ph.D
 Department of Biomedical Engineering,
 Pennsylvania State University

Teaching Assistant

February 2019 to April 2019

NOC19-EE21 - Electromagnetic Waves in Guided and Wireless Media
 in National Programme on Technology Enhanced Learning,
 Instructor: Pradeep Kumar K., Ph.D
 Department of Electrical Engineering,
 Indian Institute of Technology Kanpur

Teaching Assistant

July 2018 to October 2018

NOC18-EE28 - Fiber-Optic Communication Systems and Techniques
 in National Programme on Technology Enhanced Learning,
 Instructor: Pradeep Kumar K., Ph.D
 Department of Electrical Engineering,
 Indian Institute of Technology Kanpur

- Gave lecture on *Pulse Propagation in Optical fibers* as part of the massive open online course lecture series
- Lab Demonstration of fiber optic devices as part of the massive open online course lecture series

Teaching Assistant

January 2018 to May 2018

NOC18-EE04 - Electromagnetic Theory
 in National Programme on Technology Enhanced Learning,
 Instructor: Pradeep Kumar K., Ph.D
 Department of Electrical Engineering,
 Indian Institute of Technology Kanpur

AWARDS

- Gordon Research Conference (GRC) Best Poster Award, at 2024 In Vivo Ultrasound Imaging GRC. 2024
- Penn State Neuroscience Institute Conference Travel Grant 2024
- Frieberg Rising Star Fellowship award funded by University of Frieberg Germany 2024
- Cross-disciplinary Neural Engineering (CDNE) training fellow funded by National Institute of Health (T32NS115667) 2024
- John C. and Joanne H. Villforth Graduate Scholarship in Bioengineering, Pennsylvania State University 2024
- Trainee Professional Development Award, Neuroscience 2023, Society for Neuroscience 2023
- IEEE Sensors Letters Best Paper Award Runner-Up at IEEE SENSORS, Dallas, TX, USA 2022
- Travel grant by Department of EE, IIT Kanpur to present in PHOTOPTICS, 7th International Conference on Photonics, Optics and Laser Technology 2019
- Support grant by organizers to present in PHOTOPTICS, 7th International Conference on Photonics, Optics and Laser Technology 2019
- Academic Excellence Award 2016

ACADEMIC PROJECTS

ApoE Transparent Ultrasound Transducer Based Devices for Ultrasound Neuromodulation and Imaging 2021-Ongoing

- Investigating a transparent ultrasound transducer platform to study the effects of ultrasound neuromodulation using multimodal imaging in both in vitro and in vivo settings.
- Demonstrated the feasibility of implanting the transparent ultrasound transducer on the mouse brain for multimodal optical and photoacoustic imaging while the mouse is awake.

- Currently examining the effects of ultrasound on various neuronal and non-neuronal cells at different stimulation parameters in both in vitro and in vivo settings.
- Supervisor: Sri-Rajasekhar Kothapalli

A Multi-Parametric Ultrafast Ultrasound and Photoacoustic Imaging Platform for Mice Brain Imaging 2022-Ongoing

- Proposed a combined multi-parametric ultrafast ultrasound and photoacoustic imaging platform to assess cerebrovascular and neural changes in rodent brains, with specific contributions in developing super-resolution ultrasound imaging methods, code development, and data analysis.
- Working towards utilizing the platform to understand cerebrovascular and neuronal changes in rodent models with neurological diseases.
- Supervisor: Sri-Rajasekhar Kothapalli

Development of Transparent Ultrasound Transducer 2021-Ongoing

- Proposed the use of lead magnesium niobate-lead titanate (PMN-PT) piezoelectric material, which has a higher d_{33} coefficient and could potentially improve sensitivity, with specific contributions in fabricating and characterizing the transducers.
- Conducted extensive performance and noise comparisons between PMN-PT and lithium niobate-based ultrasound transducers.
- The study indicates that PMN-PT is a viable alternative to lithium niobate for developing transparent ultrasound transducers for multimodal optical and photoacoustic imaging setups.
- Supervisor: Sri-Rajasekhar Kothapalli

Fiber-Optic Interferometer Hydrophone Sensor Array 2016-2020

- Investigated the two main sensor array design considerations: passive interrogation schemes and multiplexing approaches.
- For the passive interrogation scheme, a homodyne phase-generated carrier was experimentally implemented, demonstrating successful recovery of the acoustic signal.
- A passive path imbalance measurement technique for interferometers was proposed and experimentally demonstrated using the same homodyne PGC setup.
- A five-sensor interferometer array was multiplexed using Time Division Multiplexing.
- Part of Master's Thesis.
- Supervisor: Pradeep Kumar K., Ph.D

Chaos in Erbium-Doped Fiber Ring Lasers 2016-2017

- Experimentally demonstrated wide-bandwidth chaos in symmetric dual port erbium-doped fiber ring lasers.
- Implemented Rosenstein's algorithm to demonstrate the presence of chaotic dynamics in the ring laser.
- Supervisor: Pradeep Kumar K., Ph.D

Digital Communication Using Chaotic Signals 2014-2015

- MATLAB implementation of various modulation and demodulation schemes using chaotic signals.
- Evaluated schemes based on their jamming performance.
- Part of Bachelor's Thesis Project.
- Supervisors: Sujata Sengar, Ph.D and Shree Prakash Singh, Ph.D

NSIT Solar Car Concept 2012-2015

- Designed and developed a Solar Electric Vehicle.
- Involved in building the battery pack with a suitable management system, integrating solar panels, and DC motor.
- Supervisor: Ranjana Jha, Ph.D

and Optical Neuroimaging in Awake Mice using a Transparent Ultrasound Transducer Cranial Window. *BioRxiv*, doi:<https://doi.org/10.1101/2025.02.19.638722>.

Chen, H., **Mirg, S.**, Gaddale, P., Agrawal, S., Li, M., Nguyen, V., Xu, T., Li, Q., Liu, J., Tu, W., Liu, X., Drew, P.J., Zhang, N., Gluckman, B.J. and Sri-Rajasekhar Kothapalli (2024). Multiparametric Brain Hemodynamics Imaging Using a Combined Ultrafast Ultrasound and Photoacoustic System. *Advanced Science*, 11(31). doi: 10.1002/advs.202401467.

Lee, K., Davis, B., Wang, X., **Mirg, S.**, Wen, C., Abune, L., ...Wang, Y. (2023). Nanoparticle-Decorated Biomimetic Extracellular Matrix for Cell Nanoencapsulation and Regulation. *Angew. Chem. Int. Ed.*, e202306583.

Mirg, S., Turner, K. L., Chen, H., Drew, P. J., and Kothapalli, S.-R. (2022). Photoacoustic imaging for microcirculation. *Microcirculation*, 29(6-7), e12776.

Osman, M. S., Chen, H., Creamer, K., Minotto, J., Liu, J., **Mirg, S.**, ...Kothapalli, S.-R. (2022). A Novel Matching Layer Design for Improving the Performance of Transparent Ultrasound Transducers. *IEEE Trans. Ultrason. Ferroelectr. Freq. Control*, 69(9), 2672–2680.

Chen, H., Agrawal, S., Osman, M., Minotto, J., **Mirg, S.**, Liu, J., ...Kothapalli, S.-R. (2022). A Transparent Ultrasound Array for Real-Time Optical, Ultrasound, and Photoacoustic Imaging. *BME Front.*, 2022.

Mirg, S*, Chen, H*, Chen, H., Turner, K. L., Gheres, K. W., Gheres, K. W., ...Kothapalli, S.-R. (2022). Awake mouse brain photoacoustic and optical imaging through a transparent ultrasound cranial window. *Opt. Lett.*, 47(5), 1121–1124. (* **Co-first authors**)

Chen, H.*, **Mirg, S.***, Osman, M., Agrawal, S., Cai, J., Biskowitz, R., ...Kothapalli, S.-R. (2021). A High Sensitivity Transparent Ultrasound Transducer Based on PMN-PT for Ultrasound and Photoacoustic Imaging. *IEEE Sens. Lett.*, 5(11), 1–4. (* **Co-first authors**)

Mirg, S., Jain, A., Pandey, A., Krishnamurthy, P. K., and Landais, P. (2017). Experimental demonstration of 12.5 GHz wideband chaos in symmetric dual-port EDFRL. *Appl. Opt.*, 56(28), 7939–7943.

CONFERENCE PUBLICATIONS

Mirg, S., Samanta, K., Gaddale, P., Salehi, F., Ramiah, M. K., Hyunseok, L., Drew, P. J., and Kothapalli, S. R. (2025) Integrated Ultrasound Neuromodulation and Optical Neuroimaging in Awake Mice Using a Transparent Ultrasound Transducer Cranial Window. *Big Ten Neuroscience Annual Meeting*, 2025. (Talk and Poster).

Mirg, S., Nudell, V., Salehi, F., Brockway, D. F., Turner, K. L., Crowley, N. A., Drew, P. J., and Kothapalli, S. R. (2024). Transparent ultrasound transducer platform enables multimodal in-vitro and in-vivo investigations of ultrasound neuromodulation. In *Vivo Ultrasound Imaging Gordon Research Conference*, 2024. (Poster)

Mirg, S., Mitra, M., Jiang, J., Gaddale, P., Minter, J., Du, Y., He, P., and Kothapalli, S. R. (2024). Functional ultrasound and Photoacoustic platform for Imaging Carotid Hemodynamics in Atherosclerosis Mice Model. In *Vivo Ultrasound Imaging Gordon Research Seminar*, 2024. (Poster)

Minter, J., Du, Y., **Mirg, S.**, Gandhi, A., Rathnam Paluri, Jiang, Y., Ding, W., Sri-Rajasekhar Kothapalli, Bagchi, P., Kim, Y., and He, P. (2025). Atherosclerosis-induced vascular contributions to cognitive impairment. *Physiology*, 40(S1). doi: 10.1152/physiol.2025.40.s1.0938

Doody, N*, **Mirg, S***, Chen, H., Khandare, S., Mitra, M., and Kothapalli, S.-R. (2024). Improved performance of piezoelectric transparent ultrasound transducers using electrical impedance matching circuit. Proceedings Volume 12842, Photons Plus Ultrasound: Imaging and Sensing 2024. SPIE. doi: 10.1117/12.3003083 (* **Co-first authors**)

Mirg, S., Chen, H., Khandare, S., Osman, M., and Kothapalli, S.-R. (2022). Noise considerations in piezoelectric transparent ultrasound transducers for photoacoustic imaging applications. Proceedings Volume 11960, Photons Plus Ultrasound: Imaging and Sensing 2022.

Chen, H., Osman, M., **Mirg, S.**, Agrawal, S., Cai, J., Dangi, A., and Kothapalli, S.-R. (2021). Transparent ultrasound transducers for multiscale photoacoustic imaging. Proceedings Volume 11642, Photons Plus Ultrasound: Imaging and Sensing 2021. SPIE. doi: 10.1117/12.2579056

Mirg, S. and Krishnamurthy, P.K. “Passive Path Imbalance Measurement in Fiber Optic Interferometer using Homodyne PGC Scheme.” ,In Proceedings of the 7th International Conference on Photonics, Optics and Laser Technology: PHOTOPTICS, ISBN 978-989-758-364-3, pages 73-78, 2019.

HARDWARE AND SOFTWARE SKILLS **Hardware Skills**

- Electrical instrumentation, Transducer fabrication, High speed ADCs and DACs, Arduino, Raspberry Pi, Optical Instruments, Fiber-optic devices, PCB fabrication and others, Xilinx FPGA (Spartan 6 and Kintex 7),

Software Skills

- Proficient: MATLAB, Simulink, SPICE
- Familiar with: C, C++, VHDL, Altium Designer, Eagle, and others