Soorya Gopalakrishnan

CONTACT INFORMATION

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EDUCATION

University of California, Santa Barbara **Oct. 2014 – March 2020**
Ph. D., Electrical and Computer Engineering
Thesis: Signal Models for Robust Deep Learning
Advisor: Prof. Upamanyu Madhow
GPA: 4.0/4.0

Indian Institute of Technology Madras, India **July 2009 – Aug. 2014**
B. Tech. and M. Tech., Electrical Engineering
GPA: 9.08/10.0

DOCTORATE RESEARCH

Robustness to Adversarial Examples

- Worked on combating adversarial examples in deep networks using a front-end signal processing defense that exploits *sparsity* of natural data.
- Showed via both theory and experiments that a sparsity-based defense is effective at attenuating small ℓ_∞-bounded perturbations.

Robust Radio Frequency (RF) Signatures

- Goal is to distinguish between wireless RF devices sending exactly the same message. Showed the efficacy of complex-valued CNNs for learning such device signatures.
- Demonstrated major pitfalls due to confounding features that vary over days and locations, e.g. wireless channel, clock drift. Developed techniques to achieve robustness to these effects.

PUBLICATIONS

- M. Cekic, **S. Gopalakrishnan**, U. Madhow, "Robust Wireless Fingerprinting: Generalizing Across Space and Time", arXiv:2002.10791.
- **S. Gopalakrishnan**, Z. Marzi, U. Madhow, R. Pedarsani, "Robust Adversarial Learning via Sparsifying Front Ends", arXiv:1810.10625.
- C. Bakiskan, **S. Gopalakrishnan**, M. Cekic, U. Madhow, R. Pedarsani, "Polarizing Front Ends for Robust CNNs", to appear in *IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, 2020.
- **S. Gopalakrishnan**, M. Cekic, U. Madhow, "Robust Wireless Fingerprinting via Complex-Valued Neural Networks", in *IEEE Global Communications Conference (Globecom)*, 2019.
- **S. Gopalakrishnan**, Z. Marzi, U. Madhow, R. Pedarsani, "Combating Adversarial Attacks Using Sparse Representations", in *International Conference on Learning Representations (ICLR) Workshop Track*, 2018.
- Z. Marzi, **S. Gopalakrishnan**, U. Madhow, R. Pedarsani, "Sparsity-based Defense Against Adversarial Attacks on Linear Classifiers", in *IEEE International Symposium on Information Theory (ISIT)*, 2018.
- **S. Gopalakrishnan**, T. Moy, U. Madhow, N. Verma, "Compressive Information Acquisition with Hardware Impairments and Constraints: A Case Study", in *IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, 2017.

WORK EXPERIENCE

Stealth Startup, San Francisco Bay Area, CA **June - Sep. 2019**
Engineering Intern

- Interned at stealth startup on "perception for autonomous systems".
- Developed and benchmarked new approaches for machine learning tasks, including scene classification and out-of-distribution detection.

Research Internships

University of Erlangen-Nuremberg, Germany **May – July 2012**

Mentor: Prof. Dr.-Ing. Walter Kellermann

- Worked on detecting double-talk in acoustic echo cancellation systems. Evaluated detection algorithms based on the number of loudspeaker channels present.

University of Wisconsin-Madison, USA **May – July 2013**

Mentor: Prof. Parmesh Ramanathan

- As part of a 7-member team of CS, EE and chemical engineers, worked on design automation tools to describe a desired biological function in a high-level language similar to Verilog.

Programming Experience

Languages: Python, Matlab

Libraries: TensorFlow, PyTorch, Keras

Teaching

TA experience at UCSB and IIT Madras:

- *Graduate courses*: Machine Learning: A Signal Processing Perspective.
- *Undergraduate courses*: Signal Analysis and Processing; Circuits, Devices and Systems; Analog Communication Systems; Optical Communications Lab.

Relevant Coursework

- Machine Learning
- Pattern Recognition
- Optimal Estimation and Filtering
- Convex Optimization in Signal Processing
- High Dimensional Probability
- Matrix Analysis and Computation
- Game Theory and Multiagent Systems
- Adaptive Signal Processing

Academic Achievements

- Awarded the S. N. Bose scholarship by the Indo–US Science & Technology Forum (IUSSTF) for a research internship at the University of Wisconsin-Madison, USA in 2013.
- Awarded the WISE scholarship by the German Academic Exchange Service (DAAD) for a research internship at the University of Erlangen-Nuremberg, Germany in 2012.
- Secured all India rank 662 (out of 400,000 students) in the Indian Institutes of Technology Joint Entrance Examination (IIT-JEE) 2009.
- Qualified for Indian National Olympiads in Mathematics, Physics, Chemistry and Astronomy in 2009 – placed in national top 300 in all four olympiads.