# Prakash Kumar

www.prakashk.com • prakashk@usc.edu • 248-882-2897 • www.linkedin.com/in/prakash1296 • www.github.com/pkash16

### **Professional Summary**

My research projects have required knowledge of medical imaging, deep learning experience (including CNN, RNN, and Transformers), computer vision, signal processing, MRI physics, and effective presentation/communication skills. I am very interested in working in interdisciplinary projects and translational research.

#### **Education**

**University of Southern California** PhD, Electrical Engineering. Ongoing. GPA: 3.69/4.0

## University of Michigan

B.S.E, Computer Engineering. Minor in Multidisciplinary Design. GPA: 3.67/4.0

#### **Experience**

## **Magnetic Resonance Engineering Laboratory**

*PhD Student (4<sup>th</sup> year)* 

- Designed MRI sampling and reconstruction techniques for dynamic imaging of the vocal tract during speech production and 3D dynamic cardiac imaging, resulting in superior image quality and framerates.
- Developed image reconstruction techniques, leading to novel 'physics-informed' deep learning approaches using GPU, enabling sub-100ms latency per frame and facilitating interactive MRI for applications such as speech therapy and heart catheterization.
- Improved software tools, which involved managing GitHub repositories, writing automation bash scripts, documenting code, and managing compute-servers, leading to streamlined communication and easier sharing of research with other institutions.
- Collaborated in interdisciplinary environments on grant-funded projects, communicated technical concepts to radiologists and patients using lay-people terms, and adapted projects to meet clinical needs.
- Two publications and twelve conference abstracts, with presented work at international meetings (ISMRM).

## **Keysight Technologies**

*R&D Intern, Automotive Engineering* 

- Developed signal separation algorithms, eliminating the need for specialized hardware and wire cutting by instead utilizing external current probes.
- Reverse-engineered an expired patent and developed an algorithm in MATLAB using 1D signal processing techniques and filter design.
- Created a real-time application that does signal separation on Keysight oscilloscopes as the signals appear with strict latency requirements (<200ms), and tested and validated performance.

#### **Texas Instruments**

Test Engineering Intern, Front Panel Display-Link (FPD-Link)

Developed software tools and scripts to reduce time spent on test floor, reducing costs.

Wrote cost reports for the implementation of the MIPI Alliance D-PHY communication protocol allowing the team to make correct purchasing decisions.

## **Skills & Interests**

**Technical:** MATLAB, Python, Pytorch, Julia, C++, Bash/Unix, Optimization Theory, Deep Learning, MR Physics **Interests:** Scientific Communication, Music Production, Signal/Image Processing

Ann Arbor, MI 2020

Los Angeles, CA

Expected 2025

Los Angeles, CA Aug 2020 – Present

Santa Clara, CA May 2019 – Aug 2019

Jan 2020 - Aug 2020

Novi. MI

# Prakash Kumar

## Activities

## IEEE K-12 Signal Processing Education

Instructor, Lesson Planner

- Taught signal processing and MRI physics concepts to several groups of high schoolers, condensing complicated language into interactive animations, props, and simple explanations.
- Led guided tours of the DISC MRI lab, including a live human scan and basic anatomy discussions.

## Minds Matter Southern California

Mentor

• Mentor for students by offering support, group instruction, and social-emotional learning to low-income high school students in the Southern California region. I helped craft college applications, application essays, financial-aid support, and other college application process support.

## **Publications**

In chronological order:

- 1. Ponrartana S, Nguyen HN, Cui SX, et al. Low-field 0.55 T MRI evaluation of the fetus. *Pediatr Radiol*. 2023;53(7):1469-1475. doi:10.1007/s00247-023-05604-x
- 2. Lim Y, **Kumar P**, Nayak KS. Speech production real-time MRI at 0.55 T. *Magnetic Resonance in Medicine*. 2024;91(1):337-343. doi:<u>10.1002/mrm.29843</u>

## **Conference Abstracts (Refereed)**

In chronological order:

- P Kumar, Y Lim, KS Nayak. "Feasibility of Super Resolution Speech RT-MRI using Deep Learning." Proc. ISMRM 29<sup>th</sup> Scientific Session, Online, May 21, p2196.
- 2. **P Kuma**r, KS Nayak. "Low latency real-time MRI at 0.55T using self-calibrating Through-Time GRAPPA." Proc. ISMRM 30<sup>th</sup> Scientific Session, London, May 21, p2348.
- 3. **P Kumar**, KS Nayak. "Real-time deep learning non-Cartesian image reconstruction using a causal variational network.". Proc. ISMRM 31st Scientific Session, Toronto, June 2023, p6387
- 4. **P Kumar**, B Tasdelen, KS Nayak. "Open-source dynamic MRI workflow for reproducible research". Proc. ISMRM 31st Scientific Session, Toronto, June 2023, p7625.
- 5. J Wong, **P Kumar**, KS Nayak, Y Tian. "Artifact reduction for real-time spiral MRI using out-in sampling at 0.55T". Proc. ISMRM 31st Scientific Session, Toronto, June 2023, p4882.
- C Hagedorn, P Kumar, B Villegas, M OuYoung, S Cui, M Sheth, S Narayanan, KS Nayak, U Sinha. "Role Of High-Performance Low Field Magnetic Resonance Imaging In Management Of Tongue Cancer". Proc. AHNS 11th International Conference, Montreal, July 2023. <u>https://ahns.jnabstracts.com/Detail?ID=129269</u>
- 7. **P Kumar**, R Ramasawmy, A Javed, Y Tian, AE Campbell-Washburn, KS Nayak. "Practical sampling strategies for volumetric cardiac RT-MRI at 0.55T". Accepted. ISMRM 32<sup>nd</sup> Scientific Session, Singapore, 2024.
- 8. K Lee, **P Kumar**, K Iskarous, KS Nayak. "Curation of Traning Data for Supervised Deep Learning Reconstruction of Real-Time Speech MRI". Accepted. ISMRM 32<sup>nd</sup> Scientific Session, Singapore, 2024.
- S Kapai, P Kumar, E Yagiz, Y Tian, R Kato, M Chen, M Ferrada, AE Campbell-Washburn, KS Nayak.
  "Real-Time Imaging of Lower Airway Collapse at 0.55T". Accepted. ISMRM 32<sup>nd</sup> Scientific Session, Singapore, 2024.
- 10. R Ramasawmy, A Javed, DA Herzka, **P Kumar**, KS Nayak, RJ Lederman, AE Campbell-Washburn. "Fourdimensional iterative motion correction (iMoCO) for isotropic stack-of-spirals cine imaging". Accepted. ISMRM 32<sup>nd</sup> Scientific Session, Singapore, 2024.
- C Bilgi, P Kumar, AN Moghaddam, N Pahlevan. "Quantitative Flow Visualization in a Patient-Specific Compliant Type B Aortic Dissection Phantom using 0.55T MRI". Accepted. ISMRM 32<sup>nd</sup> Scientific Session, Singapore, 2024.
- 12. NY Can, **P Kumar**, NG Lee, Y Tian, KS Nayak. "Improved Large-FOV Dynamic MRI at 0.55T with Concomitant Field Correction". Accepted. ISMRM 32<sup>nd</sup> Scientific Session, Singapore, 2024.

Los Angeles, CA

Los Angeles, CA

Sept 2021 - Present

Sept 2021 - Present