VISH RAO

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EDUCATION

UNIVERSITY OF PENNSYLVANIA, PERELMAN SCHOOL OF MEDICINE — **Philadelphia, PA**
MD/PhD in Bioengineering — **Expected May 2032**
- AI for medicine and biology; computer science

TSINGHUA UNIVERSITY, SCHWARZMAN COLLEGE — **Beijing, China**
Master of Global Affairs and Leadership — **June 2024**
- Selected as one of 141 candidates (5000+ applicants) for the Schwarzman Scholars Program
- **GPA:** 3.89/4.00; **Awards:** Tsinghua Outstanding Graduate Student (3 Awarded), Schwarzman Outstanding Capstone

COLUMBIA UNIVERSITY, SCHOOL OF ENGINEERING AND APPLIED SCIENCE — **New York, NY**
Bachelor of Science (BS) Biomedical Engineering — **May 2023**
- **GPA:** 4.09 /4.00; **Awards:** *Summa Cum Laude, Tau Beta Pi*
- **Classes:** Neural Networks and Deep Learning, Machine Learning, Deep Learning in Biomedical Imaging, Natural Language Processing, Biostatistics, Differential Equations, Quantitative Physiology I/II, Physics Quantum Waves

AWARDS AND ACHIEVEMENTS

- First author articles published in *Nature* and *Nature Biotechnology*, first author article in press at *Nature BME*
- Co-author of 16 peer reviewed publications and 19 conference proceedings, Ad hoc reviewer for *The Laryngoscope*
- Schwarzman Scholarship recipient (<3% acceptance rate)
- Rhodes Scholarship Finalist, Tau Beta Pi Fellowship recipient (<10% acceptance)
- John Kirkpatrick Young Investigator Award (Best Paper Award) from the *Society of Pediatric Radiology*
- 2025 *PRS* best paper award for "Color Match Following Free Flap Surgery in Head and Neck Reconstruction: A Colorimetric and Aesthetic Analysis"
- 3x recipient of the MEEI-HMS Neuro-Laryngology Grant, 2x Recipient of ISMRM Educational Stipend

RESEARCH EXPERIENCE

HARVARD MEDICAL SCHOOL – RAJPURKAR LAB — **Boston, MA**
Research Fellow – Professors Pranav Rajpurkar and Eric Topol — May 2022 – Present
- Designed a novel method to generate a dataset of 1M+ annotated sentences for training AI report generation tools; released as ReXErr-v1 (*Pacific Symposium on Biocomputing*, *PhysioNet*)
- Led technical development of a deep-learning framework to verify correct endotracheal tube placement
- First-authored reviews on multimodal generative AI for medical image interpretation (*Nature*) and on generalist biological AI (*Nature Biotechnology*)
- Built and led an analysis over an international consortium of 30 hospitals across 19 countries, adapting adult computer vision models for pediatric and neonatal care (*Nature BME*, in press)

UNIVERSITY OF PENNSYLVANIA SCHOOL OF MEDICINE — **Philadelphia, PA**
Rotation Student – Professor Katalin Susztak — March 2025 – September 2025
- Worked on developing a new foundation model (1B+ parameters) to jointly learn/predict histology and spatial single-cell omics across 20+ million cells
- Helped construct and benchmark NephroBase (3B+ parameters), a single-cell foundation model specialized for nephrology trained on over 40+ million cells (*bioRxiv*)

MASSACHUSETTS EYE AND EAR / HARVARD MEDICAL SCHOOL — **Boston, MA**
Research Project Leader - Professors Phillip Song and Allen Feng — March 2019 – September 2024
- Developed a new machine learning tool to screen for vocal disease using voice recordings (*PLOS Digital Health, European Archives of Oto-Rhino-Laryngolog*)
- Helped design and prospectively test a medical device to monitor and minimize force applied during surgery (*Journal of Voice, Otolaryngol Head Neck Surg, Am. J. Otolaryngol*)
- Constructed statistical models to analyze disease outcomes and treatment protocols from retrospective data (*Head and Neck, OTO Open, PRS*)

COLUMBIA DEPARTMENT OF BIOMEDICAL ENGINEERING **New York, NY**
Research Project Leader - Professor Jia Guo January 2021 – September 2024

- Created novel transformer-based deep learning architecture for brain tissue segmentation, currently being applied to several downstream tasks including schizophrenia disease classification and MRI contrast enhancement (*Frontiers in Neuroimaging*)
- Devised new deep learning architecture to screen for schizophrenia using MRI scans (*Scientific Reports*)
- Developed deep learning framework to artificially generate contrast-enhanced MRI from T1w structural scans

PUBLICATIONS AND PRESENTATIONS

Peer Reviewed Publications:

1. Feng AL, Puka E, Ciaramella A, **Rao VM**, Sataloff RT, Naunheim MR, Song PC. Force Metrics and Suspension Times for Microlaryngoscopy Procedures. *J Voice*. 2019 Nov 29. DOI: 10.1016/j.jvoice.2019.10.017.
2. Feng AL, Puka E, Ciaramella A, **Rao VM**, et al. Laryngeal Force Sensor for Suspension Microlaryngoscopy: A Prospective Controlled Trial. *Otolaryngol Head Neck Surg*. 2021 Jan 5. DOI: 10.1177/0194599820982635.
3. Minaya NJ, **Rao VM**, Naunheim NR, Song PC. Laryngeal Subsite Analysis of Granulomatosis with Polyangiitis (Wegener's). *OTO Open*. 2021 July 15. DOI: 10.1177/2473974X211036394.
4. Wang AA, Feng AL, **Rao VM**, Naunheim MR, Juliano AF, Song PC. Clinical, Radiologic, and Endolaryngeal Findings in Laryngeal Fractures. *OTO Open*. 2022 Feb 25. DOI: 10.1177/2473974X221080164.
5. Rao GM, **Rao VM**, et al. Design, Development, and Face Validation of an Intubation Simulation Training Using Real-Time Force Data Feedback. *LIO*. 2022 Sep 15. DOI: 10.1002/lio2.916.
6. **Rao VM**, Wan Z, Ma DM, Lee P, Tian Y, Guo J. Improving Across-Dataset Brain Tissue Segmentation Using Transformer. *Frontiers in Neuroimaging.* 2022 Nov 11. DOI: 10.3389/fnimg.2022.1023481.
7. Wang TV, Feng AL, Puka E, **Rao VM**, et al. Reproducibility of Laryngeal Force Sensor Measurements. *Am. J. Otolaryngol*. March 2023. DOI: 10.1016/j.amjoto.2022.103782.
8. **Rao VM**, Feng AL, Deschler DG, et al. Surgical Factors Affecting Regionally Metastatic Cutaneous Squamous Cell Carcinoma to the Parotid Gland. *Head and Neck*. 2023 Mar 8. DOI: 10.1002/hed.27304.
9. Zhang J, **Rao VM**, et al. Detecting Schizophrenia with 3D Structural Brain MRI Using Deep Learning. *Sci. Rep*. 2023 September 2. DOI: 10.1038/s41598-023-41359-z.
10. Dermody SM, Kahng PW, **Rao VM**, et al. Color Match Following Free Flap Surgery in Head and Neck Reconstruction: A Colorimetric and Aesthetic Analysis. *PRS.* May 2024. DOI: 10.1097/PRS.0000000000010807.
11. Low DM, **Rao VM**, Randolph G, Ghosh SS*, Song PC*. Uncovering the important acoustic features for detecting vocal fold paralysis with explainable machine learning. *PLOS Digit. Health.* 2024 May 30. DOI: 10.1371/journal.pdig.0000516.
12. **Rao VM**, et al. ReXErr: Synthesizing Clinically Meaningful Errors in Diagnostic Radiology Reports. *Pacific Symposium on Biocomputing*. January 2025. DOI: 10.1142/9789819807024_0006.
13. **Rao VM**, Hla M, Moor M, Adithan S, Kwak S, Topol EJ*, Rajpurkar P*. Multimodal Generative AI for Medical Image Interpretation. *Nature*. 26 March 2025. DOI: 10.1038/s41586-025-08675-y.
14. **Rao VM**, Zhang S, Plosky B, Hsu PD, Wang B, Zou J, Zitnik M, Topol EJ*, Rajpurkar P*. Generalist Biological AI in Modeling the Language of Life. *Nature Biotechnology.* March 2026. DOI: 10.1038/s41587-026-03064-w.
15. Soylu S*, Okose O*, Chen Y*, Wang B, Kamani D, **Rao VM**, et al. Prospective Case-Control Pilot Study of a Smartphone Application as a Potential Screening Tool for Vocal Fold Paresis/Paralysis. *European Archives of Oto-Rhino-Laryngolog*. March 2026. DOI: 10.1007/s00405-025-09994-6.
16. **Rao VM**, et al. Repurposing Adult AI Radiograph Interpretation Models for Neonatal Care Through Continual Learning: An International Multi-Center Study. *Nature Biomedical Engineering.* In Press.

Preprints:

1. **Rao VM***, Karinshak E*, Hu A*, Kong K*, Wang J*, Wang J, Zeng Y. LLM-globe: A benchmark evaluating the cultural values embedded in LLM output. *arXiv*. 9 Nov 2024. DOI: arXiv:2411.06032.
2. Cao A, **Rao VM**, Liu K, Liu X, Laine AF, Guo J. Tabsurfer: a hybrid deep learning architecture for subcortical segmentation. *arXiv*. 13 Dec 2023. DOI: arXiv:2312.08267.
3. Li C, Ziyadeh E, Sharma Y, Dumoulin B, Levinsohn J, Ha E, Pan S, **Rao VM**, Subramaniyam M, Szegedy M, Zhang N, Susztak K. Nephrobase Cell+: Multimodal Single-Cell Foundation Model for Decoding Kidney Biology. *bioRxiv*. 30 Sep 2025. DOI: 10.1101/2025.09.30.679471.

Databases:

1. Rao VM, Zhang S, Acosta J, Adithan S, Rajpurkar P. ReXErr-v1: Clinically Meaningful Chest X-Ray Report Errors Derived from MIMIC-CXR (version 1.0.0). 2025 Mar 19. *PhysioNet*. RRID:SCR_007345. DOI: 10.13026/9dns-vd94.

Oral Presentations:

1. Feng AL, Puka E, Ciaramella A, Wang TV, **Rao VM**, Naunheim MR, Song PC. The Laryngeal Force Sensor Reduces Intraoperative Forces and Postoperative Complications: A Prospective Controlled Trial. *AAO-HNSF.* 2020. Boston, MA.

2. Low DM, Randolph G, **Rao VM**, Ghosh SS*, Song PC*. Uncovering the important acoustic features for detecting vocal fold paralysis with explainable machine learning. *MEE Machine Learning Symposium.* 2020. Boston, MA
3. **Rao VM**, et al. Improving Across-Dataset Brain Tissue Segmentation Using Transformer. *ISMRM.* 2022. London, UK.
4. Stevenson LA, **Rao VM**, Feng AL, Song PC. Sex-Based Differences in Force Metrics During Suspension Micolaryngoscopy. *AAO-HNSF.* 2023. Nashville, TN.
5. **Rao VM**, et al. ReXErr: Synthesizing Clinically Meaningful Errors in Diagnostic Radiology Reports. *Pacific Symposium on Biocomputing*. 2025. Hawaii, USA.

Poster Presentations:

1. Minaya NJ, **Rao VM**, Song PC. Presenting Voice and Airway Manifestations in Granulomatosis with Polyangiitis. *AAO-HNSF.* 2020. Boston, MA.
2. **Rao VM**, Feng AL, Deschler DG, et al. Surgical Factors Affecting Regionally Metastatic Cutaneous Squamous Cell Carcinoma to the Parotid Gland. *AHNS*. 2021. Chicago, IL
3. Wang AA, Feng AL, **Rao VM**, et al. Clinical, Radiologic, and Endolaryngeal Findings in Laryngeal Fractures. *AAO-HNSF.* 2021. Los Angeles, CA.
4. Wang TV, Feng AL, Puka E, **Rao VM**, Song PC. Reproducibility of Laryngeal Force Sensor Measurements. *AAO-HNSF.* 2021. Los Angeles, CA.
5. Rao GM, **Rao VM**, Feng AL, Juang J, Benoit J, Song PC. Design, Development, and Face Validation of an Intubation Simulation Training Using Real-Time Force Data Feedback. *ABEA*. 2022. Dallas, TX.
6. **Rao VM**, Zhang J, Guo J. Exploring Hybrid CNN-Transformer for Schizophrenia Classification using Structural MRI. *ISMRM.* 2022. London, UK.
7. Tian Y, Zhang J, Zhu X, Lee P, **Rao VM**, Xin Z, Guo J. Classification of Schizophrenia with Structural MRI Using 3D-MIGR Transformer. *ISMRM.* 2022. London, UK.
8. Zhang J, Acosta N, **Rao VM**, Lee P, Gjerswold-Selleck S, Wan Z, Feng X, Liberman JA, Small SA, Guo J. Detecting schizophrenia using structural and synthetic cerebral blood volume MRI with deep learning. *ISMRM.* 2022. London, UK.
9. **Rao VM** et al. Pitfalls and Promises of Patient Reported Outcome Measures. *ALA*. 2023. Boston, MA.
10. Rao GM, Kim M, **Rao VM**, et al. Differences in force metrics between novices and experts during intubation simulation. *ABEA*. 2023. Boston, MA.
11. Low DM, Randolph G, **Rao VM**, et al. Uncovering the important acoustic features for detecting vocal fold paralysis with explainable machine learning. *ALA.* 2023. Boston, MA.
12. Xin Z, **Rao VM**, et al. Synthesizing CT Image from Single-echo UTE-MRI using Multi-Task Framework Neural Network. *ISMRM*. 2023. Toronto, Canada.
13. Tian Y, Zhang J, **Rao VM**, et al. Improving Across-Dataset Schizophrenia Classification with Structural Brain MRI Using Multi-Scale Transformer. *ISMRM*. 2023. Toronto, Canada.
14. **Rao VM**, et al. 3D Artificial Cerebral Blood Volume Generation from T1W Structural MRI. *ISMRM*. 2023. Toronto, Canada.