SAYANTAN KUMAR

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Personal homepage ◇ Google Scholar ◇ Linkedin ◇ Twitter

EDUCATION

Washington University in St. Louis — St. Louis, Missouri, USA
PhD in Computer Science and Engineering — Aug 2019 - Dec 2024 (expected)
- *GPA = 3.97 (till Fall 2023)*

Indian Statistical Institute — Kolkata, West Bengal, India
M.Tech in Computer Science — Aug 2017 - July 2019
- *First Class Honors with Distinction*

Jadavpur University — Kolkata, West Bengal, India
B.E in Electrical Engineering — Aug 2013 - May 2017
- *CGPA = 8.6, First Class Honors*

WORK EXPERIENCE

Graduate Research Assistant, Washington University in St. Louis — March 2020 - Present
- *Advisors*: Dr Philip Payne, Dr Aristeidis Sotiras
- *Thesis*: Multimodal representation learning for interpretable disease progression modeling

M.Tech Research Student, Indian Statistical Institute, Kolkata — May 2018 - July 2019
- *Advisor*: Dr Swagatam Das
- *Dissertation*: On the Choice of Appropriate Combination of Classifier and Decomposition Scheme for Multiclass Imbalanced Data Classification : A Comparative Analysis.

Summer Research Fellow, Technische Universität Darmstadt, Germany — May 2018 - Aug 2018
- *Advisor* : Dr. Heinz Koeppl
- *Project*: Modeling communication in social networks by approximating Markov Chains

Summer Internship, Indian Institute of Technology, Kharagpur, India — May 2016 - Aug 2016
- *Advisor* : Dr Ashish Dhara
- *Project* : Using deep learning to detect diabetic retinopathy from retinal fundus images.

PUBLICATIONS

Journal articles (* indicates under review)

1. * Lou, S, **Kumar, S**, Goss, C., Avidan, M., Kheterpal. S., Kannampallil, T. *Multi-center validation of a machine learning model for surgical transfusion risk at 45 US hospitals.* [NEJM-AI, **under preparation**]
2. * **Kumar, S**, Oh, I, Schindler. S., Ghoshal. N., Abrams, Z., Payne, P. *Examining heterogeneity in dementia using data-driven unsupervised clustering of cognitive profiles.* [PLOS One, **minor revision**] [BioRXiv]
3. * Yang, B, Earnest, T, **Kumar, S**, Kothapalli, D, Gordon, B, Soritas, A. *Evaluation of ComBat harmonization for reducing across-tracer biases in regional amyloid PET analyses.* [Human Brain Mapping, **under review**] [medRxiv]
4. **Kumar, S**, Yu, S, Michelson, A, Kannampallil, T, Payne, PRO. *HiMAL: A Multimodal Hierarchical Multi-task Auxiliary Learning framework for predicting and explaining Alzheimer disease progression.* [JAMIA Open, **accepted**] [ArXiv]
5. * **Kumar, S**., Earnest, T., Yang, B.,... Sotiras, A. *Analyzing heterogeneity in Alzheimer Disease using multimodal normative modeling on imaging-based ATN biomarkers.* [Alzheimer's & Dementia, **under review**] [BioRXiv]
6. * Lou Y., **Kumar S.**, O Inez., Puri V.,... and Michelson A. *Developing Approaches to Incorporate Donor Lung CT Images into Machine Learning Models to Predict Severe Primary Graft Dysfunction after Lung Transplantation.* [American Journal of Transplantation, **under review**]

7. **Kumar, S.**, Oh, I., Schindler, S., Lai, A. M., Payne, P. R., and Gupta, A. (2021). *Machine learning for modeling the progression of Alzheimer disease dementia using clinical data: a systematic literature review.* JAMIA open, 4(3), ooab052. [Paper]

Conference articles (* indicates working and under review papers)

1. *Qiu, P, Yang, J, **Kumar, S**, Ghosh, S, Sotiras, A. *AgileFormer: Spatially Agile Transformer UNet for Medical Image Segmentation.* IEEE WACV 2025, **under review** [ArXiv] [Code]
2. **Kumar, S**, Payne, PR, and Sotiras, A. (2023, April). *Improving Normative Modeling for Multi-modal Neuroimaging Data using mixture-of-product-of-experts variational autoencoders.* 2024 IEEE International Symposium on Biomedical Imaging (**ISBI**). IEEE, 2024. [Paper] [Code]
3. **Kumar, S**, Payne, PR, and Sotiras, A. (2023, April). *Normative modeling using multimodal variational autoencoders to identify abnormal brain volume deviations in Alzheimer's disease.* In **SPIE Medical Imaging** 2023: Computer-Aided Diagnosis (Vol. 12465, p. 1246503). [**Oral**][**Best paper award finalist**] [Paper] [Code]
4. **Kumar, S**, Yu, S, Kannampallil, T, Abrams, Z, Michelson, A, and Payne, PR. (2022, August). *Self-explaining neural network with concept-based explanations for ICU mortality prediction.* In Proceedings of the 13th ACM International Conference on Bioinformatics, Computational Biology and Health Informatics (pp. 1-9) (**ACM BCB)**[**Oral**] [Paper] [Code]

Peer-reviwed workshops and abstracts

1. **Kumar, S.**, Kannampallil, T., Sotiras, A., and Payne, P. (2023, October). *Explaining Longitudinal Clinical Outcomes using Domain-Knowledge driven Intermediate Concepts.* In XAI in Action: Past, Present, and Future Applications Workshop **NeurIPS 2023**. [**Poster**] [Paper] [Code]
2. **Kumar, S.**, Payne, P., and Sotiras, A. (2023, October). *mmNormVAE: Normative Modeling on Multimodal Neuroimaging Data using Variational Autoencoders.* In Deep Generative Models for Health Workshop **NeurIPS 2023**. [**Poster**] [Paper] [Code]
3. **Kumar, S**, Yu, S, Kannampallil, T, Abrams, Z, Michelson, A, and Payne, PR. *Explaining Neural Network with Plausible Explanations.* Symposium on Artificial Intelligence in Health (**SAIL 2022**).[**Poster**]
4. **Kumar, S**, Abrams, Z, Oh, I, Gupta, A, Schindler SE, Ghoshal, N, Lai, AM, Payne, PRO. *Identifying Interpretable Clinical Subtypes within Heterogeneous Dementia Clinic Population.* **AMIA 2022 Informatics Summit**.[**Oral**]
5. **Kumar, S**, Oh, I, Gupta, A, Oh, I, Lai, AM, Payne, PRO. *Leveraging Electronic Health Records Data for Predicting Alzheimer's Disease Progression.* **AMIA 2021 Informatics Summit**.[**Poster**]
6. **Kumar, S**, Gupta, A, Oh, I, Schindler, S, Lai, AM, Payne, PRO. *Simplified Form of Recurrent Neural Networks for Predicting Alzheimer Disease Progression.* **Pacific Symposium on Biocomputing (PSB 2021)**. [**Poster**]

TALKS/PRESENTATIONS

- Department of Neurology, Washington University in St Louis - **Invited Talk**
- IEEE ISBI 2024, Athens, Greece - **Poster**
- XAI in Action: Past, Present, and Future Applications Workshop NeurIPS 2023, New Orleans, USA - **Poster**
- Deep Generative Models for Health Workshop NeurIPS 2023, New Orleans, USA - **Poster**
- SPIE Medical Imaging 2023, San Diego, USA - **Oral**
- Symposium on Artificial Intelligence on Health (SAIL) 2022, Bermuda - **Poster**
- Interpretable Machine Learning in Healthcare (IMLH) Workshop ICML 2022 [Virtual] - **Poster**
- ACM International Conference on Bioinformatics, Computational Biology and Health Informatics 2022 - **Oral**
- AMIA Informatics Summit 2022, Chicago, USA - **Oral**

- AMIA Informatics Summit 2021 [Virtual] - **Poster**

AWARDS AND HONORS

- **Student Travel Award**, SPIE Medical Imaging 2023
- **Robert F. Wagner All-Conference Best Paper Award Finalist** - Computer-Aided and Diagnosis track, SPIE Medical Imaging 2023
- **Honors (top 5%)** - Annual Review of Doctoral Students (PRODS) **2024**, **2023** and **2022**, Department of Computer Science and Engineering, Washington University in St. Louis
- **Prize money** for **outstanding academic performance (>90% aggregate marks)** in 3rd and 4th semesters of M.Tech, Indian Statistical Institute, Kolkata
- **State Rank of 422 (99.6 percentile)** in West Bengal Joint Entrance Examination (WBJEE) 2013, among 427196 participants applicants.

PROFESSIONAL SERVICE

- **Conference co-organizer**: Machine Learning for Health (ML4H 2022)
- **Member**: SPECTRA, SPIE Student Chapter, Washington University in St. Louis
- **Reviewer (journal)**: Journal of Biomedical Informatics (JBI), IEEE Access, JAMIA Open
- **Reviewer (conference/workshops)**: MICCAI 2024, ISBI 2024, MICCAI 2023, IJCNN 2023, ML4H 2022, ICLR Workshop TS4H 2024, 2022, EMNLP 2022 Workshop BlackboxNLP, ICML 2022 Workshop IMLH, AMIA Annual Symposium 2020-2023, AMIA Informatics Summit 2020-2023

TEACHING EXPERIENCE

Washington University in St. Louis **Aug 2021 - Dec 2021**
Assistant Instructor, ***Introduction to Machine Learning***

- Supervised undergraduate graders with grading assignments and held weekly office hours to help students in assignments.

Washington University School of Medicine **Aug 2020 - Dec 2020**
Teaching Assistant, ***Introduction to Biomedical Data Science II***

- Presented tutorials on dimensionality reduction and feature extraction algorithms on electronic health records and imaging data, supervised and unsupervised models for predictive modeling.
- Guided students in homeworks and final projects on machine learning with real-world healthcare datasets.

TECHNICAL SKILLS

- **Programming**: Python, MATLAB, R, C/C++
- **Deep Learning & Computer Vision**: Supervised, Unsupervised and Self-supervised Learning, Deep Generative Models, GAN, VAE, U-Net
- **Frameworks and Tools**: PyTorch, Tensorflow, Keras, Sklearn
- **Databases**: MySQL, PostgreSQL

RELEVANT COURSES

Natural Language Processing, Data Mining, Bayesian Machine Learning, Introduction to Machine Learning, Human-in-the Loop Computation, Artificial Intelligence, Cognitive Science, , Computer Vision, Pattern Recognition and Image Processing, Advanced Pattern Recognition

REFERENCES

- Dr Philip Payne, Director, Institute for Informatics, Data Science and Biostatistics (I2DB), Associate Dean for Health Information and Data Science, School of Medicine and Affiliated Faculty in CS, Washington University.
- Dr Aristeidis Sotiras, Assistant Professor, Department of Radiology and affiliated faculty at Institute for Informatics, Data Science and Biostatistics (I2DB), Washington University School of Medicine.
- Dr Thomas Kannampallil, Associate Professor of Anesthesiology, Washington University School of Medicine.
- Dr Suzanne Schindler, Associate Professor of Neurology, Washington University School of Medicine.