Vishweshwar Tyagi

Curriculum Vitae

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Education

2021–2022 **MS in Data Science**, *Columbia University*, USA — GPA: 3.97/4

2019–2021 **MS in Mathematics**, *IIT Kanpur*, India — GPA: 9.0/10

2016–2019 **BS in Mathematics**, *University of Delhi*, India — GPA: 9.4/10

Research Interests

hierarchical Bayesian mixed-effects models, probabilistic programming, Monte Carlo methods, statistical machine learning, stochastic processes

Experience

Research Experience

2023–Present **Data Scientist**, *Department of Neurology, Columbia University*, New York, USA

- Developed hierarchical Bayesian models to improve estimation of motor recruitment curves and motor threshold from sparse neurophysiological data of brain and spinal cord stimulation
- Integrated mixture modeling to automatically detect and handle outlier observations, including fasciculations, improving robustness of curve estimates
- Designed hierarchical Bayesian mixed-effects models for intervention studies, demonstrating increased statistical power for detecting small changes in motor threshold compared to frequentist testing
- First-authored paper and released open-source Python package `hbMEP`
  - Formed basis of successful NIH R03 grant for real-time adaptive stimulation using `hbMEP`
  - Used in preliminary analysis of successful $1.25M CDMRP grant on optimization of stimulation parameters in human and rodent studies

Industry Experience

Summer 2022 **Data Science Intern**, *Quartet Health*, New York, NY

- Improved identification of high-risk patients for mental health conditions by fine-tuning large language model BERT on clinical notes using transfer learning in PyTorch
  - Increased F2-score by 13% over XGBoost baseline
- Built end-to-end pipeline on Amazon Redshift using dbt and SQL to automate transformation of medical claims data and added unit tests to validate pipeline output
- Leveraged pipeline to evaluate insurance network quality
  - Reduced claim denial rates by 7% through outlier detection
  - Identified network gaps, saving $20K in referral costs

Publications

2024 **Tyagi, V.**, Murray, L. M., Asan, A. S., Mandigo, C., Virk, M. S., Harel, N. Y., Carmel, J. B., & McIntosh, J. R. (2024). *Hierarchical Bayesian estimation of motor-evoked potential recruitment curves yields accurate and robust estimates.*

Python Software

Maintainer `hbMEP` (hbmep.github.io/hbmep/)

Awards and Honors

2019, 2020 Academic Excellence Award, IIT Kanpur

2019 All India Rank 113 (top 0.3%), IIT JAM Mathematics

Teaching

Teaching Assistant, Columbia University

Fall 2022 COMS W4995: Applied Deep Learning (Prof. Joshua Gordon)

Spring 2022 COMS W4995: Applied Machine Learning (Prof. Vijay Pappu)

Spring 2022 MATH V2500: Analysis and Optimization (Prof. Yash Jhaveri)

Fall 2021 ELEN E6885: Reinforcement Learning (Prof. Chong Li)

Fall 2021 MATH UN1101: Calculus I (Prof. Akash Sengupta)

Conferences

2024 **Tyagi, V.**, Murray, L. M., Asan, A. S., Mandigo, C., Virk, M. S., Harel, N. Y., Carmel, J. B., & McIntosh, J. R. (2024). *Hierarchical Bayesian estimation of motor-evoked potential recruitment curves yields accurate and robust estimates.* Society for Neuroscience (SfN) Nanosymposium on Analytical Computational Tools, October 2024, Chicago, Illinois.

Technical Skills

Programming Languages

Proficient Python, C++, R, SQL

Frameworks & Libraries

Bayesian Pyro, NumPyro, Stan, TensorFlow Probability

ML & DL scikit-learn, PyTorch, Hugging Face, Transformers, XGBoost

CLI Tools Git, Bash, Linux, SSH, Docker

Data Infrastructure

Databases PostgreSQL, MySQL

Cloud BigQuery, Redshift