Vishweshwar Tyagi

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Research Interests

Bayesian and variational inference, Monte Carlo methods, probability and stochastic processes, analysis and partial differential equations, machine learning

Education

Columbia University — New York, NY
MS Data Science – GPA 3.97 / 4.0 — Sep 2021 – Dec 2022
Courses: Statistical Inference, Algorithms, Machine Learning, Deep Learning, Computer Systems
Teaching Assistant: Analysis and Optimization, Reinforcement Learning, Applied Machine Learning & Deep Learning

IIT Kanpur — India
MS Mathematics – GPA 9.0 / 10.0 — Aug 2019 – May 2021
Courses: ODE, PDE, Differential Geometry, Real Analysis, Complex Analysis, Topology, Probabilistic Programming
Honors: Academic Excellence Award 2019, 2020

University of Delhi — India
BS Mathematics – GPA 9.41 / 10.0, Math GPA 9.61 / 10.0 — Aug 2016 – May 2019
Courses: Multivariate Calculus, Probability & Statistics, Differential Equations, Numerical Methods, Series of Functions

Research Experience

Data Scientist — Jan 2023 – Present
Movement Recovery Lab, Department of Neurology, Columbia University — New York, NY

- Developed hierarchical Bayesian models to estimate neural recruitment curves from sparse data of brain and spinal stimulation, improving efficiency and reducing experiment duration
- Implemented mixture models to identify and downweight outlier observations for robust inference
- Developed Bayesian mixed models to detect changes in motor threshold, reducing number of participants required to assess treatment effects in intervention studies
- Published first-author paper and open-source Python package that received NIH R03 award for extension to real-time adaptive stimulation

Publications

Tyagi, V., Murray, L. M., Asan, A. S., Mandigo, C., Virk, M. S., Harel, N. Y., Carmel, J. B., McIntosh, J. R. *Hierarchical Bayesian estimation of motor-evoked potential recruitment curves yields accurate and robust estimates.* Brain Stimulation (2025). https://doi.org/10.1016/j.brs.2025.09.008

(Under review) Pascual-Leone, A.*, **Tyagi, V.***, Asan, A.S.*, Rocha-Flores, P.E., Rodriguez-Lopez, O., Voit, W.E., McIntosh, J.R.†, Carmel, J.B.† *Electrode position, size, and orientation determine efficacy of cervical epidural stimulation to recruit forelimb muscles in rats.* bioRxiv (2025). https://doi.org/10.1101/2025.09.05.674051

(In preparation) **Tyagi, V.**, Carmel, J.B., McIntosh, J.R. *Bayesian adaptive design for motor-evoked potential recruitment curves.* Expected 2026.

Industry Experience

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

- Fine-tuned large language model BERT on clinical notes to identify high-risk patients for mental health conditions, increasing F2-score by 13% over XGBoost baseline
- Built data pipeline on Amazon Redshift using dbt and SQL to automate transformation of medical claims data, added unit tests to validate pipeline output
- Utilized data pipeline to evaluate insurance network quality and identify network gaps, reducing claim denial rates by 7% through outlier detection and saving $20K in referral costs

Software

Maintainer hbMEP (https://hbmep.github.io/hbmep/)

Teaching

Teaching Assistant, Columbia University

- Applied Deep Learning (CS W4995) Fall 2022
- Applied Machine Learning (CS W4995) Spring 2022
- Analysis and Optimization (MATH V2500) Spring 2022
- Reinforcement Learning (EE E6885) Fall 2021
- Calculus I (MATH UN1101) Fall 2021

Technical Skills

Programming: Python, R, C/C++, SQL (Postgres)

Machine Learning: NumPy, scikit-learn, JAX, PyTorch, XGBoost, Hugging Face, OpenAI

Bayesian: NumPyro, Pyro, Stan

Big Data: dbt, Spark, BigQuery, Redshift

Developer Tools: Git, Bash, Linux, SSH, Vim, VS Code, Docker, Google Cloud Platform

Conferences

Talk: *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.

Poster: *Hierarchical Bayesian estimation of motor-evoked potential recruitment curves yields accurate and robust estimates.* 11th Annual Minnesota Neuromodulation Symposium – Neuromodulation of Spinal Cord Injury: Translational Opportunities, April 2024, Minneapolis, Minnesota. 3rd Place Poster Award.

Other Publications

Murray, L.M.*, McIntosh, J.R.*, Goldsmith, J.A., Wu, Y.-K., Liu, M., Sanford, S.P., Joiner, E.F., Mandigo, C., Virk, M.S., **Tyagi, V.**, Carmel, J.B.†, Harel, N.Y.† *Timing-dependent synergies between noninvasive motor cortex and spinal cord stimulation in chronic cervical spinal cord injury.* Clinical Neurophysiology (2025). https://doi.org/10.1016/j.clinph.2025.2111372