

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

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

New 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>