

# Vishweshwar Tyagi

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## RESEARCH INTERESTS

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

## EDUCATION

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### 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 Deep Learning

### IIT Kanpur

India

MS Mathematics (GPA 9.0 / 10.0)

Aug 2019 – May 2021

Courses: Partial Differential Equations, Several Variable Calculus & Differential Geometry, Linear Algebra, Topology

Honors: Academic Excellence Award 2019, 2020

### University of Delhi

India

BS Mathematics (GPA 9.4 / 10.0)

Aug 2016 – May 2019

Courses: Probability & Statistics, Real Analysis, Metric Spaces, Riemann Integration & Series of Functions

## RESEARCH EXPERIENCE

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### 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
- Applied Bayesian mixed-effects 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, which received NIH R03 award for extension to real-time application for optimizing adaptive stimulation and experimental design

## PUBLICATIONS

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**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.<sup>\*</sup>, **Tyagi, V.**<sup>\*</sup>, Asan, A.S.<sup>\*</sup>, Rocha-Flores, P.E., Rodriguez-Lopez, O., Voit, W.E., McIntosh, J.R.<sup>†</sup>, Carmel, J.B.<sup>†</sup> *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

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### 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

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

## TEACHING

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### 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

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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

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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. 3<sup>rd</sup> Place Poster Award.

## OTHER PUBLICATIONS

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Murray, L.M.<sup>\*</sup>, McIntosh, J.R.<sup>\*</sup>, Goldsmith, J.A., Wu, Y.-K., Liu, M., Sanford, S.P., Joiner, E.F., Mandigo, C., Virk, M.S., **Tyagi, V.**, Carmel, J.B.<sup>†</sup>, Harel, N.Y.<sup>†</sup> *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>