Vinayak Gupta

CONTACT

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RESEARCH INTERESTS

AI for Health Time Series: Designing algorithms and benchmarks with strong empirical performance, including large language models (LLMs), for time series derived from medical records, wearable health devices, and digital health platforms. Also exploring foundation models for biological sequences such as amino and nucleic acids for genomics and drug discovery.

WORK EXPERIENCE

Lawrence Livermore National Laboratory Aug. 2024 – Present
Machine Learning Researcher
Working on two domains: (i) developing foundational models for bio-sequences (DNA, RNA, and proteins) and (ii) modeling health records to uncover temporal patterns in patient histories. The EHR project involves modeling sequential and time series data to analyze trends in patient conditions over time. Both projects focus on genome and health data analysis, evaluating genomic foundation models, and training large-scale models on GPU clusters, including national lab supercomputers.

University of Washington Apr. 2023 – May 2024
Postdoctoral Researcher in Paul G. Allen School of Computer Science
As a member of the Behavioral Data Science group, I designed language models that can *understand* and *reason-with* medical time-series data, including text. I also worked on defending LLMs against a wide range of hijacking and prompt-injection attacks.

IBM Research Aug. 2022 – Mar. 2023
Research Scientist
With the Data & AI team, I worked on enabling Watson-Core to perform business intelligence tasks such as data denoising, feature aggregation, etc., using only text commands over IBM cloud.

Amazon Jan. 2022 – Jun. 2022
Applied Scientist-II Intern
Analyzed purchase records of Amazon Pay customers to model user-item preferences and forecast future purchases, enabling personalized coupon recommendations at optimal times.

Siemens Healthcare May 2016 – Jan. 2017
Research Intern
Developed computer vision models, such as super-resolution on video frames, to enhance radiographic imaging quality in Siemens Multimobil 5C X-Ray equipment.

EDUCATION

Indian Institute of Technology (IIT) Delhi
Ph.D. in Computer Science & Engineering.
Institute Nominee for ACM SIGKDD and ACM India Doctoral Dissertation Awards.

Indian Institute of Information Technology (IIIT) Jabalpur
B.Tech. in Computer Science & Engineering.

AWARDS AND HONORS

Spotlight Award at NeurIPS - Top 5% of all submissions.	2024
Distinction for Doctoral Research: Institute-wide recognition for top 10% of all PhDs.	2023
IIT Delhi's Nominee for ACM SIGKDD and ACM India Doctoral Dissertation Awards.	2023
NASSCOM AI Game-Changers of India: Runner-Up in ML Fundamentals Category.	2022
Expert Talk at IndiaAI: Organized by NASSCOM and Ministry of IT – Govt. of India.	2022
Microsoft and Google (Declined) Travel Grant to attend ACM SIGKDD.	2022
Outstanding Doctoral Paper Award: The First Intl. Conference on AI-ML Systems.	2021
ACM SIGIR Student Grant for CIKM.	2021
Siemens Healthcare R&D Tech-Intern Rating of 1 (Highest Possible).	2017
All India 9th Rank in ABU Asia-Pacific Robocon.	2015

Project selected for 'Make In India' – Govt. of India's Flagship Manufacturing Initiative. 2015

A1 (Highest Possible) Grade for All Subjects and Merit Award in Senior High School. 2013

Under Review

Efficient and Responsible Adaptation of Large Language Models for Robust and Equitable Top-k Recommendations.
K. Kaur, M. Chadha, **V. Gupta**, and C. Shah.

SPML: A DSL for Defending Language Models Against Prompt Attacks.
R. Sharma, **V. Gupta**, and D. Grossman.

Conference and Journal Publications

Differentiable Adversarial Attacks for Marked Temporal Point Processes.
P. Chakraborty*, **V. Gupta***, R. Rahul, S. Bedathur, and A. De.
AAAI Conference on Artificial Intelligence (**AAAI**), 2025.

Are Language Models Actually Useful for Time Series Forecasting?
M. Tan, M. Merill, **V. Gupta**, T. Althoff, and T. Hartvigsen.
Neural Information Processing Systems (**NeurIPS**), 2024. **(Spotlight)**

Language Models Still Struggle to Zero-shot Reason about Time Series.
M. Merill, M. Tan, **V. Gupta**, T. Hartvigsen, and T. Althoff.
Empirical Methods in Natural Language Processing (**EMNLP**) Findings, 2024.

Tapestry of Time and Actions: Modeling Human Activity Sequences using Temporal Point Process Flows.
V. Gupta and S. Bedathur.
ACM Transactions on Intelligent Systems and Technology (**TIST**), 2023.

Retrieving Continuous Time Event Sequences using Neural Temporal Point Processes with Learnable Hashing.
V. Gupta, S. Bedathur, and A. De.
ACM Transactions on Intelligent Systems and Technology (**TIST**), 2023.

Modeling Spatial Trajectories using Coarse-Grained Smartphone Logs.
V. Gupta and S. Bedathur.
IEEE Transactions on Big Data (**TBD**), 2023.

Teaching Old DB Neural Tricks: Learning Embeddings on Multi-tabular Databases.
G. Gaur, R. Singh, S. Arora, **V. Gupta**, and S. Bedathur.
International Conference on Data Science & Management of Data (**CODS-COMAD**), 2023.

Learning Temporal Point Processes for Efficient Retrieval of Continuous Time Event Sequences.
V. Gupta, S. Bedathur, and A. De.
AAAI Conference on Artificial Intelligence (**AAAI**), 2022.

ProActive: Self-Attentive Temporal Point Process Flows for Activity Sequences.
V. Gupta and S. Bedathur.
ACM SIGKDD Conference on Knowledge Discovery and Data Mining (**KDD**), 2022.

Modeling Continuous Time Sequences with Intermittent Observations using Marked Temporal Point Processes.
V. Gupta, S. Bedathur, S. Bhattacharya, and A. De.
ACM Transactions on Intelligent Systems and Technology (**TIST**), 2022.

Doing More with Less: Overcoming Data Scarcity for POI Recommendation via Cross-Region Transfer.
V. Gupta and S. Bedathur.
ACM Transactions on Intelligent Systems and Technology (**TIST**), 2022.

Learning Temporal Point Processes with Intermittent Observations.
V. Gupta, S. Bedathur, S. Bhattacharya, and A. De.
Conference on Artificial Intelligence and Statistics (**AISTATS**), 2021

Region Invariant Normalizing Flows for Mobility Transfer.
V. Gupta and S. Bedathur.
Conference on Information and Knowledge Management (**CIKM**), 2021.

Modeling Implicit Communities from Geo-tagged Event Traces using Spatio-Temporal Point Processes.
A. Likhyani*, **V. Gupta***, P. K. Srijith, P. Deepak, and S. Bedathur.
Conference on Web Information Systems Engineering (**WISE**), 2020.

LBRR: Load Balanced Ring Routing Protocol for Heterogeneous Sensor Networks with Sink Mobility.
S Maurya*, **V. Gupta***, and V. K. Jain.
IEEE Wireless Communications and Networking Conference (**WCNC**), 2017.

Workshops and Tutorials

Enhancing Biological Insights with Knowledge-Driven Multi-Modal RNA Models.
M. Qiu, ..., **V. Gupta**, B. Bartoldson, B. Kailkhura, T. Chen.
US DOE Workshop on Envisioning Frontiers in AI and Computing for Biological Research, 2025.

Defending Language Models Against Image-Based Prompt Attacks via User-Provided Specifications.
R. Sharma, **V. Gupta**, and D. Grossman.
Workshop on Security Architectures for Gen. AI (**SAGAI**), co-located with IEEE S&P 2024.

Are Language Models Actually Useful for Time Series Forecasting?
M. Tan, M. Merill, **V. Gupta**, T. Althoff, and T. Hartvigsen.
1st UVA Workshop on Large Language Models for Science and Engineering. **(Lightning Talk)**

IBM Tutorial on Advances in NLP Research for Automated Business Intelligence.
V. Gupta, C. Rajmohan, R. Chaudhuri, A. Gupta, B. Ganesan, A. Agarwal, S. Mehta.
International Conference on Natural Language Processing (**ICON**). 2022.

Modeling Human Actions in Time-Stamped Activity Sequences.
V. Gupta and S. Bedathur.
Workshop on Applied ML for Time-Series Forecasting (**AMLTS**), colocated with CIKM 2022.

Learning Neural Models for Continuous-Time Sequences.
V. Gupta.
International Conference on AI-ML Systems (**AI-ML Systems**). 2021. **(Best Doctoral Paper)**

Neural Approach for Modeling Continuous Time Sequences with Missing Observations.
V. Gupta.
ACM India Academic Research and Careers for Students (**ARCS**). 2021. **(Oral)**

Grants

Microsoft Accelerate Foundation Models Research Program
Principal Investigator(s): Tom Hartvigsen and Tim Althoff.

UW eScience Institute: Azure Cloud Credits for Research
Principal Investigator(s): Tim Althoff.

Government Recognition

AI Experts at IndiaAI: Initiative by Ministry of IT, Govt. of India. Oct. 2022
Article: "Read and Watch Lectures to Build a Foundation".

Skills

- **Proficient**: Python, Pytorch, Tensorflow, HuggingFace, Azure, and IBM Cloud.
- **Intermediate**: Keras, C++, MATLAB, PySpark, and AWS.

Selected Talks

"Do we need Large Language models for Time Series"
- Computational Engineering Seminar at LLNL. Dec. 2024
- AI Seminar: University of Southern California, LA. (▶ Video Link) Nov. 2024

"Time Series Mining with and without Language Models"
- Allen Institute, Seattle. Apr. 2024
- Lawrence Livermore National Laboratory. May 2024
- Snap Inc. Jun. 2024
- UW Data Science Group Meeting. Nov. 2023

"Modeling Time Series for Recommendation and Other Applications"
- Georgia Institute of Technology, Atlanta. Oct. 2022
- University of Michigan, Ann Arbor. Oct. 2022

- University of Washington, Seattle. Sep. 2022
- University of California, San Diego. Sep. 2022
- University of Notre Dame, Indiana. Sep. 2022
- IBM India Research Lab, Bangalore. Jun. 2022
- Technical University of Munich, Germany. Jun. 2022

"Large Scale Retrieval of Continuous-Temporal Sequences"
- NASSCOM AI Game-Changers of India Ceremony. Jun. 2022
- Amazon Research Days. Dec. 2021

"Learning Neural Models for Temporal Sequences with Missing Events"
- ACM India Research and Careers for Students Symposium. Feb. 2022
- Doctoral Symposium: Conference on AI-ML Systems. Nov. 2021
- MIT-IBM Watson Research Lab, Boston. Sep. 2019

"Thinking Beyond Complete Data with Neural Temporal Point Processes"
- Research Symposium: IIT Delhi. Dec. 2019
- PhD Seminar: CSE IIT Delhi. Jul. 2019

"Maxima: Electronic Mask for Patients with Exercise-Induced Asthma"
- Siemens Innovation Research Lab Exhibition (IRLE) at Erlangen, Germany. Jul. 2016
- Make-In-India Quality Improvement Programme (QIP). Dec. 2015

Invited Panelist for Discussions
- Career Mentorship Program at Machine Learning for Health (ML4H). Dec. 2023

Mentoring

- Reshabh K Sharma 2023 – 2024
  PhD Student, UW CSE.
- Pritish Chakraborty 2023 – 2024
  PhD Student, IIT Bombay CSE.
- Mike A. Merill 2023 – 2024
  PhD Student, UW CSE.
- Rajat Singh 2021 – 2023
  PhD Student, IIT Delhi CSE.
- Ritvik Vij 2021 – 2022
  M.S. Student, IIT Delhi CSE → Applied Scientist @ Amazon.
- Abhishek Singh 2021 – 2022
  B.S. Student, IIT Delhi → Software Engineer @ Standard Chartered.
- Siddhant Arora 2019 – 2020
  M.S. Student, IIT Delhi CSE → PhD Student @ CMU LTI.
- L. Hari Narayanan 2019 – 2020
  Intern, IIT Delhi CSE → Software Engineer @ Microsoft.

PC Member

AAAI, IJCAI, SIGIR, WSDM, WWW, ECML-PKDD, ACM TOIS, IEEE TPAMI, IEEE TSP, NeurIPS-W, and ICML-W.

Teaching Experience

- **Graduate Instructor**: Information Retrieval, Machine Learning, Data Mining, Data Structures, Computer Networks, and Intro. to Programming.
- **Grader**: Reinforcement Learning, Deep Learning, Computer Architecture, Network Security, Software Engineering, and Applied Game Theory.

Services

- System admin of four high-performance GPU servers at IIT Delhi.
- IIT Delhi CSE Ph.D./M.S. Graduate Admissions Committee.
- U.G. Counseling Committee.