

Vinayak Gupta

CONTACT INFORMATION

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INTERESTS

Language Models for Sequential Data: Multi-Modal Time-Series and Recommender Systems.

WORK EXPERIENCE

University of Washington, Seattle

Apr. 2023 – Present

Postdoctoral Researcher

Designing LLMs that can *reason* with multi-modal data, including time-series and text. The framework and the crafted datasets show the major difference in time-series reasoning ability between humans, text LLMs (such as GPT-4), and multi-modal LLMs (such as LLaVA and GPT-4-vision). 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

Created time-sensitive coupon distribution methods for customers with the Amazon Pay ML team.

Indian Institute of Technology Delhi

Jul. 2017 – Jan. 2022

Research Scholar

Designed recommender systems with minimal data using point processes and graph networks.

Siemens Healthcare

May 2016 – Jan. 2017

Research Intern

Developed computer vision models to improve the radiography imaging quality in Multimobil 5C.

EDUCATION

Indian Institute of Technology (IIT) Delhi

2017 – 2022

Ph.D. in Machine Learning.

Title: “*Modeling Time-Series and Spatial Data for Recommendations and Other Applications*”.

· Institute Nominee for ACM SIGKDD and ACM India Doctoral Dissertation Awards.

Indian Institute of Information Technology (IIIT) Jabalpur

2013 – 2017

B.Tech. in Computer Science & Engineering.

HONORS AND AWARDS

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

ONGOING PROJECTS

M. Merrill, M. Tan, **V. Gupta**, T. Hartvigsen, and T. Althoff. *Language Models Still Struggle to Zero-shot Reason about Time Series*. 2024.

R. Sharma, **V. Gupta**, and D. Grossman. *Defending LLMs Against Injection Attacks*. 2024.

P. Chakraborty, R. Katariya, **V. Gupta**, A. De, and S. Bedathur. *Adversarial Learning of Neural Models on Continuous-Time Event Sequences*. 2024.

CONFERENCE AND
JOURNAL
PUBLICATIONS

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

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

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

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

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

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

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

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

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

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

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

S Maurya*, **V. Gupta***, and V. K. Jain. *LBRR: Load balanced ring routing protocol for heterogeneous sensor networks with sink mobility*. IEEE Wireless Communications and Networking Conference (**WCNC**). 2017.

POSTERS,
WORKSHOPS,
SYMPOSIUMS,
AND TUTORIALS

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

V. Gupta et al. *IBM Tutorial on Advances in NLP Research for Automated Business Intelligence*. International Conference on Natural Language Processing (**ICON**). 2022.

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

V. Gupta. *Learning Neural Models for Continuous-Time Sequences*. International Conference on AI-ML Systems (**AI-ML Systems**). 2021. [🏆 Outstanding Doctoral Paper Award]

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

GRANTS

Microsoft Accelerate Foundation Models Research Program
Enabling Large Language Models to Reason about Time Series.
Principal Investigator(s): Tom Hartvigsen and Tim Althoff.

UW eScience Institute: Azure Cloud Credits for Research
Enabling Large Language Models to Reason about Time Series.
Principal Investigator(s): Tim Althoff.

MEDIA COVERAGE

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

Oct. 2022

SKILLS	<ul style="list-style-type: none"> • Proficient: Python, Pytorch, Tensorflow, HuggingFace, Azure, and IBM Cloud. • Intermediate: Keras, C++, MATLAB, PySpark, and AWS. 	
SELECTED TALKS	<p>“Modeling Time Series for Recommendation and Other Applications”</p> <ul style="list-style-type: none"> • 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 <p>“Large Scale Retrieval of Continuous-Temporal Sequences”</p> <ul style="list-style-type: none"> • NASSCOM AI Game-Changers of India Ceremony. Jun. 2022 • Amazon Research Days. Dec. 2021 <p>“Learning Neural Models for Temporal Sequences with Missing Events”</p> <ul style="list-style-type: none"> • ACM India Research and Careers for Students Symposium. [🏆 Oral] Feb. 2022 • Doctoral Symposium: Conference on AI-ML Systems. [🏆 Outstanding Paper Award] Nov. 2021 • MIT-IBM Watson Research Lab, Boston. Sep. 2021 <p>“Thinking Beyond Complete Data with Neural Temporal Point Processes”</p> <ul style="list-style-type: none"> • Research Symposium: IIT Delhi. Dec. 2019 • PhD Seminar: CSE IIT Delhi. Jul. 2019 <p>“Maxima: Electronic Mask for Patients with Exercise-Induced Asthma”</p> <ul style="list-style-type: none"> • Siemens Innovation Research Lab Exhibition at Erlangen, Germany. Jul. 2016 • Make-In-India Quality Improvement Programme (QIP). Dec. 2015 	
STUDENT MENTORING	<ul style="list-style-type: none"> • Mike A. Merill PhD Student, UW CSE. 2023 – Present • Reshabh Sharma PhD Student, UW CSE. 2023 – Present • Pritish Chakraborty M.S. Student, IIT Bombay CSE. 2023 – Present • Rohit Katariya PhD Student, IIT Delhi CSE. 2023 – 2024 • Rajat Singh PhD Student, IIT Delhi CSE. 2021 – 2023 • Ritvik Vij M.S. Student, IIT Delhi CSE → Applied Scientist @ Amazon. 2021 – 2022 • Abhishek Singh B.S. Student, IIT Delhi → Software Engineer @ Standard Chartered. 2021 – 2022 • Siddhant Arora M.S. Student, IIT Delhi CSE → PhD Student @ CMU LTI. 2019 – 2020 • L. Hari Narayanan Intern, IIT Delhi CSE → Software Engineer @ Microsoft. 2019 – 2020 	
REVIEWER	AAAI 2022-24, IJCAI 2022-2024, ECML-PKDD 2024, SIGIR 2022, WSDM 2022, WebConf 2022, CODS-COMAD 2023-24, ACM TOIS, IEEE TPAMI, and Workshops at ICML and CIKM 2022.	
TEACHING EXPERIENCE	<ul style="list-style-type: none"> • 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. 	
MISCELLANEOUS	<ul style="list-style-type: none"> • System administrator of four high-performance GPU servers at IIT Delhi (2018 – 2022). • Member of the Ph.D./M.S. Graduate Admissions Committee for Fall 2020 and Spring 2021. 	