Rachneet Kaur

Vice President, AI Research Lead | JPMorgan Chase & Co.

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Google Scholar rachneet-kaur-a1ba5354

Education

Dec 2022 | **University of Illinois at Urbana Champaign (UIUC)** **Illinois, USA**
Aug 2016 | Ph.D. in Industrial Engineering (Data Analytics Track), *GPA*: 4.0/4.0
Advisor: Prof. Richard Sowers, Industrial Engineering and Mathematics

May 2015 | **Indian Institute of Technology (IIT), Delhi** **Delhi, India**
July 2013 | Master of Science in Mathematics, *GPA*: 9.22/10.0 (Rank: 2)
Thesis Advisor: Prof. Aparna Mehra, Mathematics

May 2013 | **Ramjas College, University of Delhi** **Delhi, India**
July 2010 | Bachelor of Science (Honours) Mathematics, *GPA*: 87.6% (Rank: 2)
Honors: Academic Excellence Awards

Experience

Professional Experience

Present | **JPMorgan Chase & Co. [🌐] | Multimodal AI Agents** **New York, USA**
Feb 2025 | *Vice President, AI Research Lead*
Sep 2022 | *Senior Associate, AI Research Scientist*
Projects: - Drive end-to-end AI research, encompassing the design, development, and deployment of advanced AI models and applications, with a primary focus on multimodal learning across vision, language, and time series modalities.
- Current work emphasizes large language models (LLMs) and multimodal AI agents, targeting innovative applications such as automated web and computer interactions, tool integration, automated visualization generation, and visual foundation agent capabilities using multimodal LLM adaptations.
- Actively contribute to developing multimodal foundational models for time series analysis and pioneering the use of LLMs/multimodal LLMs in the time series domain.
- Collaborate closely with internal and external researchers and applied engineering teams to translate cutting-edge research into tangible business impact.
✯ **Published 10+ papers in top-tier AI venues**, including ACL, EMNLP, COLING, LREC, ACM ICAIF, and workshops at NeurIPS, ICLR, and AAAI.
✯ **10 filed patents** with the USPTO.
✯ **Organized 4 workshops & 1 tutorial at top AI venues,** including AAAI, & ACM ICAIF.

Aug 2022 – May 2022 | **JPMorgan Chase & Co. [🌐] | Vision & Multimodal Learning** **New York, USA**
AI Research Intern | *Mentors: Dr. Zhen Zeng, Dr. Tucker Balch, Prof. Manuela Veloso*
Project: Proposed and benchmarked two novel methods for time series forecasting: (1) combining CNN & transformer, and (2) employing time-frequency spectrograms with vision transformers for image-based forecasting through visual time series modeling.
✯ **AAAI'23 workshop paper & filed patent** on CNN & transformer-based forecasting.
✯ **ICAIF'23 paper & filed patent** on spectrogram & vision transformer-based forecasting.
✯ **Best Presentation** in the Image/Speech track at the JPMorgan Chase & Co. AI Summit 2023.

Aug 2022 – Aug 2016 | **University of Illinois at Urbana Champaign [🌐] | Applied AI** **Illinois, USA**
Graduate Research Assistant | *Advisor: Prof. Richard Sowers*
Topics: Multimodal Machine Learning, Computer Vision, AI for Digital Health

Aug 2019 – May 2019 | **VISA Research [🌐] | Multimodal AI Risk and Fraud Detection** **Austin-Texas, USA**
Machine Learning Scientist Intern | *Mentor: Dr. Carolina Barcenas*
Project: - Designed and developed a multimodal AI-driven Early Warning System leveraging diverse modality features to proactively detect rare and elusive fraudulent credit card testing activities, mitigating multimillion-dollar cashouts. - Conducted an in-depth analysis of business case studies, processed & analyzed TB-scale transactional data to identify & model characteristic features, and utilized supervised & unsupervised deep learning to generate real-time alerts, enabling rapid intervention.

Aug 2018 – May 2018 | **3M Electronics, Software & AI Research [🌐] | Computer Vision** **Minnesota, USA**
R&D Data Science Intern | *Mentors: Dr. Brian Stankiewicz, Dr. David Redinger*
Project: - Designed, developed, and deployed an intelligent deep learning framework using OpenCV on AWS Cloud to provide real-time situational awareness, object detection, and optimal route navigation for firefighters in low-visibility environments. - Also utilized sensor fusion techniques, including advanced noise filtration, bias removal, gap filling, and time synchronization.
✯ **2024 Granted Patent** on Methods and systems for path-based mapping and routing.

Aug 2017 – May 2017 | **Quantlab Financial [🌐] | AI for Algorithmic High-Frequency Trading** **Boston-MA, USA**
Quantitative Research Intern | *Mentors: Dr. Areez Mody, Dr. Matteo Nicoli*
Project: - Designed and implemented multiple AI- and statistical methods-based high-frequency trading strategies (in C++ and Python) on TB-sized price data to improve prediction accuracy. - Developed and applied diverse metrics to assess the quality of these strategies for stocks. - Combined multiple alphas using ML techniques, consistently improving strategy performance.

Aug 2015 – May 2015 | **Universite Paris I, Panthéon-Sorbonne [🌐] | Statistics, Analysis, & Multidisciplinary Modeling** | **Paris, France**
Graduate Research Intern | Mentor: Prof. Julien Randon-Furling
Project: Researched and developed dynamic variants of Schelling's spatial proximity model in economics to simulate population separation, implemented in Python.
✯ Internship sponsored by the **Charpak Research Intern Scholarship 2015**, awarded to 30 students across India by the French Embassy.

Aug 2014 – May 2014 | **Tata Institute of Fundamental Research (TIFR) [🌐] | Centre for Applicable Mathematics** | **Bangalore, India**
Graduate Research Intern | Mentor: Prof. Mythily Ramaswamy
Project: Theoretically advanced and computationally developed efficient finite element and finite difference schemes in Python for solving elliptic and heat differential equations, and analyzed their corresponding error bounds.

Academic Programs and Competitions

Summer 2016 | **World Quant LLC [🌐] | Quantitative Research Summer Training Program** | **Virtual, India**
Project: Conceptualized and developed mathematical and AI-based risk management models to predict price movements, and created 300+ high-return algorithmic trading strategies using advanced predictive techniques for stocks.
✯ Awarded a part-time Quantitative Research Consultancy position after ranking in the **Top 10 (Gold level)** in the challenge.
✯ **Invited to deliver two webinars** on Quantitative Finance and Algorithmic Trading.

Winter 2013 | **National Institute of Technology, Calicut [🌐] | National Program on Differential Equations** | **Kerala, India**
Graduate Student Intern | Mentors: Prof. Satyananda Panda, Prof. T. Suman Kumar
Project: Developed and analyzed differential population models and age-structured nonlinear models to forecast population trends in Indian cities, and implemented them using Python and computational techniques.

Awards & Honors

- **JPMorgan Chase & Co. Prolific Inventor, Class of 2025** 2025
  - *"Awarded for innovative contributions to the firm and a high number of patent applications for scientific advancements within JPMorgan Chase & Co."*

- **UIUC Sharp Outstanding Graduate Student Award** [announcement news | video] 2021
  - *"For outstanding academic excellence, distinguished research contributions & strong GPA"*
  - Award amount: $1500 | The annual award recognizes one student from the University of Illinois at Urbana-Champaign's Department of Industrial & Enterprise Systems Engineering

- **William A. Chittenden Graduate Fellowship Award [🔗]** (Awarded for three consecutive years: 2018-2019 | 2019-2020 | 2020-2021)

- *"To an outstanding graduate student in University of Illinois at Urbana-Champaign's Department of Industrial & Enterprise Systems Engineering"*
- Award amount: $15,000 | The annual award recognizes 1-2 students from the University of Illinois at Urbana-Champaign's Department of Industrial & Enterprise Systems Engineering

- **ACM Invitation & Travel Award for Grace Hopper Celebration (GHC) [🔗]** (2018 & 2020)
  - Award amount: $500 | Awarded to $\sim$ 20 students from all GHC poster applicants

- **Kanako Miura Award, IEEE RAS Technical Committee on Humanoid Robotics** 2019 [announcement news]
  - Award amount: CAD 500 | This travel award honors five female researchers in the field of humanoid robotics

- **UIUC Industrial & Enterprise Systems Engineering Graduate College Fellowship** 2019
  - Award amount: $1800

- **Illinois Geometry Lab (IGL) Research Award @ UIUC** [announcement news] 2018
  - *"For research exemplifying IGL's mission to facilitate vertical integration of research and expand research opportunities"*
  - Graduate Lead of the research team (mentoring 13 undergraduate students)
  - Award amount: $500 | This annual award honors one research team from the University of Illinois at Urbana-Champaign's Department of Mathematics

- **1st runner up, Graduate Student Poster Presentation Competition @ UIUC** 2018
  - Award amount: $150 | Awarded annually to top poster presentations across the University of Illinois at Urbana-Champaign's Department of Industrial & Enterprise Systems Engineering

- **1st runner up, Mottier Innovation Challenge in Systems Engineering Award @ UIUC** [announcement news] 2017
  - *"To stimulate innovation, foster teamwork, and develop financially and socially sustainable ideas"*
  - Graduate Lead of the research team (mentoring 2 undergraduate students)
  - Award amount: $1500 | Awarded annually to top research teams across University of Illinois at Urbana-Champaign's Department of Industrial & Enterprise Systems Engineering

- **Top 10 (Gold Level), World Quant Summer Challenge on Algorithmic Trading [🔗]** 2016
  - *"For outstanding performance in developing profitable trading algorithms for market prediction"*
  - Award amount: INR 50,000

- **All India Rank 218, IIT- GATE (Graduate Aptitude Test in Engineering) Mathematics & IIT GATE PhD Scholarship, 2015-2016** 2015
  - Award amount: INR 25,000

- **Charpak Research Intern Scholarship [🔗]** 2015
  - Award amount: €900 | Awarded to 30 students across India for research at a French lab

- **All India Rank 40 | 39, IIT- JAM (Joint Admission Test) Mathematics | Statistics** 2013

- **Winner, The Legacy of Srinivasa Ramanujan Coding Competition [🔗]** 2012

- Awarded at the International Conference on the Legacy of Srinivasa Ramanujan, 2012
- Award: £500 and a 10-day sponsored trip to London, Oxford, and Cambridge | Awarded to 3 teams from among all undergraduate students across 64 colleges of the University of Delhi
✢ *"DU Mathematics Students Visit King's College and Newton Institute, UK"* [DU Beat News]

- **Academic Excellence Awards by Ramjas College & University of Delhi** 2011
- 1st position at Ramjas College and 3rd position in the University of Delhi among 64 colleges

- **Merit Certificates in Mathematics & Computer Science** (2010) | **Mathematics & Social Science** (2008)
- Awarded to the top 0.1% of students in India by the Central Board of Secondary Education

- **Winner, Central-level Science Quiz, Directorate of Education** 2009
- Awarded to 4 teams from Delhi, India

Publications (🎓 Google Scholar | ResearchGate | Semantic Scholar | ORCID | DBLP)

Journals

[8] **Tai Chi Expertise Classification in Older Adults Using Wrist Wearables and Machine Learning** [PDF]
Yang Hu, Mengyue Huang, Jonathan Cerna, Rachneet Kaur, Manuel E Hernandez
MDPI Sensors, 2024 [Impact Factor: 3.7] **[Sensors 2024]**

[7] **Deep Learning for Multiple Sclerosis Differentiation Using Multi-Stride Dynamics in Gait** [PDF | code | slides]
Rachneet Kaur, Joshua Levy, Robert W Motl, Richard Sowers, Manuel E Hernandez
IEEE Transactions on Biomedical Engineering, 2023 [Impact Factor: 4.75] **[IEEE-TBME 2023]**

[6] **A Vision-Based Framework for Predicting Multiple Sclerosis and Parkinson's Disease Gait Dysfunctions—A Deep Learning Approach** [PDF | code | slides | poster]
Rachneet Kaur, Robert W Motl, Richard Sowers, Manuel E Hernandez
IEEE Journal of Biomedical and Health Informatics, 2023 [Impact Factor: 7.7] **[IEEE-JBHI 2023]**
- Also presented at *Conference on Neural Information Processing Systems (NeurIPS) Women in Machine Learning (WiML) Workshop, 2021*
✯ **Featured in the 50 Most Popular IEEE-JBHI Articles, 2023**
✍ **Media:**
✢ *"Team uses digital cameras, machine learning to predict neurological disease"* [Illinois News Bureau | Carle Illinois College of Medicine | EurekAlert! | Brighter Side of News | Medical Xpress]
✢ *"At-home Digital Cameras Monitor Gait, May Speed Diagnosis"* [Parkinson's News Today]
✢ *"New Gait Analysis Tool Found to Correctly ID MS Patients in Videos"* [Multiple Sclerosis News Today]
✢ *"Video and AI for the diagnosis of neurological diseases"* [Medilogy]

[5] **Application of Aligned-UMAP to longitudinal biomedical studies** [PDF | code | streamlit dashboard for interactive visualizations]

Anant Dadu, Vipul K Satone, Rachneet Kaur, Mathew J Koretsky, Hirotaka Iwaki, Yue A Qi, Daniel M Ramos, Brian Avants, Jacob Hesterman, Roger Gunn, Mark R Cookson, Michael E Ward, Andrew B Singleton, Roy H Campbell, Mike A Nalls, Faraz Faghri
Cell Press Patterns, 2023 [Impact Factor: 6.7] **[Patterns 2023]**
✍ **Media:**
✢ *"Application of Aligned-UMAP to longitudinal biomedical studies"* [Health & Medicine Week, NewsRx]

[4] **A Deep Learning Approach for Automatic and Objective Grading of the Motor Impairment Severity in Parkinson's Disease for Use in Tele-Assessments** [PDF]
Mehar Singh, Prithvi Prakash, Rachneet Kaur, Richard Sowers, James Robert Brašić, Manuel Enrique Hernandez
MDPI Sensors, 2023 [Impact Factor: 3.7] **[Sensors 2023]**
✍ **Media:**
✢ *"Wearable sensors for Parkinson's can improve with machine learning, data from healthy adults"* [Illinois News Bureau | Carle Illinois College of Medicine | Medical Xpress | Ground News]
✢ *"Small, inexpensive wearable sensors could improve Parkinson's treatment"* [Medical Design & Outsourcing]

[3] **Identification and prediction of Parkinson's disease subtypes and progression using machine learning in two cohorts** [PDF | code | streamlit dashboard for interactive visualizations]
Anant Dadu, Vipul Satone, Rachneet Kaur, Sayed Hadi Hashemi, Hampton Leonard, Hirotaka Iwaki, Mary B Makarious, Kimberley J Billingsley, Sara Bandres-Ciga, Lana J Sargent, Alastair J Noyce, Ali Daneshmand, Cornelis Blauwendraat, Ken Marek, Sonja W Scholz, Andrew B Singleton, Mike A Nalls, Roy H Campbell, Faraz Faghri
npj Parkinson's Disease, Nature Publishing Group, 2022 [Impact Factor: 7.3] **[npj PD 2022]**
✍ **Media:**
✢ *"Machine Learning Models Help Identify Subtypes of Parkinson Disease"* [Neurology Advisor]
✢ *"Predicting Parkinson's Disease with Machine Learning"* [Precision Medicine, Oxford Global]
✢ *"Machine Learning to Help Predict PD Progression?"* [NeuroDerm]

[2] **Machine learning and price-based load scheduling for an optimal IoT control in the smart and frugal home** [PDF | webpage | teaser video | slides]
Rachneet Kaur, Clara Schaye, Kevin Thompson, Daniel C Yee, Rachel Zilz, RS Sreenivas, Richard B Sowers
Elsevier Energy and AI, 2021 [Impact Factor: 9.6] **[Energy & AI 2021]**
- Also presented at *Institute for Operations Research and the Management Sciences (INFORMS) Annual Meeting, 2018 (Oral presentation)*
★ **1st Runner-Up in the Mottier Innovation Challenge, UIUC, 2017**
✍ **Media:**
✢ *"New model shows how to make smart homes more frugal"* [UIUC News]

[1] **Predicting Multiple Sclerosis From Gait Dynamics Using an Instrumented Treadmill: A Machine Learning Approach** [PDF | code | teaser video | slides]

Rachneet Kaur, Zizhang Chen, Robert Motl, Manuel E Hernandez, Richard Sowers
IEEE Transactions on Biomedical Engineering, 2021 [Impact Factor: 4.75] **[IEEE-TBME 2021]**
- Also presented at *Grace Hopper Celebration (GHC), 2020* and at *International IEEE EMBS Conference on Neural Engineering, 2019*

✍ **Media:**

✛ *"Machine learning helps spot gait problems in individuals with multiple sclerosis"* [Illinois News Bureau | Carle Illinois College of Medicine | Tech Briefs Magazine | News Medical | EurekAlert! | Neuroscience News | Medical Xpress | Neuro Daily]

✛ *"Machine Learning of Walking Patterns Could Help Predict MS Progression"* [Multiple Sclerosis News Today]

✛ *"Study Results from University of Illinois Provide New Insights into Multiple Sclerosis"* [Health & Medicine Week, NewsRx]

✛ *"Machine Learning Catches Multiple Sclerosis-Related Gait Issues"* [Informa TechTarget | India Next]

Peer-reviewed Conferences

[19] **ChartAgent: A Multimodal Agent for Visually Grounded Reasoning in Complex Chart Question Answering** [PDF | slides | poster]
Rachneet Kaur, Nishan Srishankar, Zhen Zeng, Sumitra Ganesh
Annual Meeting of the Association for Computational Linguistics, 2026 **[ACL 2026]**
- Also presented at *Conference on Neural Information Processing Systems (NeurIPS) Workshop on Multimodal Algorithmic Reasoning, 2025 (Oral presentation; ∼15% accepted papers)*

[18] **SlideAgent: Hierarchical Agentic Framework for Multi-Page Visual Document Understanding** [PDF | slides | webpage]
Yiqiao Jin, Rachneet Kaur, Zhen Zeng, Sumitra Ganesh, Srijan Kumar
Annual Meeting of the Association for Computational Linguistics, 2026 **[ACL 2026]**
- Also presented at *Conference on Neural Information Processing Systems (NeurIPS) Workshop on Multimodal Algorithmic Reasoning, 2025*

[17] **MM-BizRAG: Rethinking Multimodal Retrieval-Augmented Generation for General Purpose Enterprise Q&A** [PDF]
Hanoz Bhathena, Parin Rajesh Jhaveri, Rohan Mittal, Prateek Singh, Aymen Kallala, Rachneet Kaur, Yiqiao Jin, Zhen Zeng, Adwait Ratnaparkhi, Denis Kochedykov
Annual Meeting of the Association for Computational Linguistics (Industry Track), 2026 **[ACL 2026]**

[16] **Systematic Multi-Aspect Evaluation of Time Series-Based Report Generation: The Case of Financial Analysis from Stock Data** [PDF]
Elizabeth Fons*, Elena Kochkina*, Rachneet Kaur, Zhen Zeng, Berowne Hlavaty, Charese Smiley, Svitlana Vyetrenko, Manuela Veloso (* = equal contribution)
Language Resources and Evaluation Conference (LREC), 2026 **[LREC 2026]**

[15] **AdaptAgent: Adapting Multimodal Web Agents with Few-Shot Learning from Human Demonstrations** [PDF | slides | poster]
Gaurav Verma, Rachneet Kaur, Nishan Srishankar, Zhen Zeng, Tucker Balch, Manuela Veloso

Annual Meeting of the Association for Computational Linguistics, 2025 **[ACL 2025]**
- Also presented at *Conference on Neural Information Processing Systems (NeurIPS) Workshop on Adaptive Foundation Models (AFM), 2024*
✍ **Media:**
✛ *Featured in "Ep5: Multimodal AI Agents: Benchmarking, Adapting, and Adversarial attacks"* [Agents of Tomorrow Podcast]

[14] **LETS-C: Leveraging Language Embedding for Time Series Classification** [PDF | slides | poster]
Rachneet Kaur, Zhen Zeng, Tucker Balch, Manuela Veloso
Annual Meeting of the Association for Computational Linguistics, 2025 **[ACL 2025]**
- Also presented at *Conference on Neural Information Processing Systems (NeurIPS) Workshop on Time Series in the Age of Large Models (TSALM), 2024*

[13] **LAW: Legal Agentic Workflows for Custody and Fund Services Contracts** [PDF]
William Watson, Nicole Cho, Nishan Srishankar, Zhen Zeng, Lucas Cecchi, Daniel Scott, Suchetha Siddagangappa, Rachneet Kaur, Tucker Balch, Manuela Veloso
International Conference on Computational Linguistics Industry Track, 2025 **[COLING 2025]**

[12] **Evaluating Large Language Models on Time Series Feature Understanding: A Comprehensive Taxonomy and Benchmark** [PDF | slides | poster]
Elizabeth Fons, Rachneet Kaur, Soham Palande, Zhen Zeng, Tucker Balch, Manuela Veloso, Svitlana Vyetrenko
Conference on Empirical Methods in Natural Language Processing, 2024 **[EMNLP 2024]**
- Also presented at *International Conference on Machine Learning (ICML) Workshop on Data-centric Machine Learning Research (DMLR): Datasets for Foundation Models, 2024*

[11] **TADACap: Time-series Adaptive Domain-Aware Captioning** [PDF | slides]
Elizabeth Fons, Rachneet Kaur, Zhen Zeng, Soham Palande, Tucker Balch, Svitlana Vyetrenko, Manuela Veloso
ACM International Conference on AI in Finance, 2024 (Oral presentation; ∼18% submitted papers) **[ACM ICAIF 2024]**
- Also presented at *JPMorgan Chase & Co. AI Summit, 2023*

[10] **From Pixels to Predictions: Spectrogram and Vision Transformer for Better Time Series Forecasting** [PDF | slides]
Zhen Zeng, Rachneet Kaur, Suchetha Siddagangappa, Tucker Balch, Manuela Veloso
ACM International Conference on AI in Finance, 2023 (Oral presentation; ∼18% submitted papers) **[ACM ICAIF 2023]**
- Also presented at *JPMorgan Chase & Co. AI Summit, 2023* ***(⋆ Best Presentation award)***
✍ **Media:**
✛ *"Spectrograms & Vision Transformers for (Financial) Time Series Forecasting"* [Medium - Part 1 | Medium - Part 2]

[9] **A Deep Learning Approach for Grading of Motor Impairment Severity in Parkinson's Disease** [PDF | slides]
Prithvi Prakash, Rachneet Kaur, Joshua Levy, Richard Sowers, James Brašić, Manuel E Hernandez

Annual International Conference of the IEEE Engineering in Medicine & Biology Society, 2023 (Oral presentation) **[IEEE EMBC 2023]**

[8] **Feasibility of VR Technology in Eliciting State Anxiety Changes While Walking in Older Women** [PDF]
Liran Ziegelman, Abdulrahman Alkurdi, Yang Hu, Alka Bishnoi, Rachneet Kaur, Richard Sowers, Elizabeth T Hsiao-Wecksler, Manuel E Hernandez
Annual International Conference of the IEEE Engineering in Medicine & Biology Society, 2021 **[IEEE EMBC 2021]**

[7] **Exploration of Machine Learning to Identify Community Dwelling Older Adults with Balance Dysfunction Using Short Duration Accelerometer Data** [PDF | webpage | video | slides]
Yang Hu*, Alka Bishnoi*, Rachneet Kaur, Richard Sowers, Manuel E Hernandez
Annual International Conference of the IEEE Engineering in Medicine & Biology Society, 2020 (Oral presentation) **[IEEE EMBC 2020]**

[6] **Automatic Identification of Brain Independent Components in Electroencephalography Data Collected while Standing in a Virtually Immersive Environment - A Deep Learning-Based Approach** [PDF | webpage | video | slides]
Rachneet Kaur, Maxim Korolkov, Manuel E Hernandez, Richard Sowers
Annual International Conference of the IEEE Engineering in Medicine & Biology Society, 2020 (Oral presentation) **[IEEE EMBC 2020]**

[5] **Using Virtual Reality to Examine the Correlation between Balance Function and Anxiety in Stance** [PDF | slides]
Rongyi Sun*, Rachneet Kaur*, Liran Ziegelman, Shuo Yang, Richard Sowers, Manuel E Hernandez (* = equal contribution)
IEEE International Conference on Bioinformatics and Biomedicine (BIBM), 2019 (Oral presentation) **[IEEE BIBM 2019]**

[4] **Using Virtual Reality to Examine the Neural and Physiological Anxiety-Related Responses to Balance-Demanding Target-Reaching Leaning Tasks** [PDF | slides]
Rachneet Kaur, Rongyi Sun, Liran Ziegelman, Richard Sowers, Manuel E Hernandez
IEEE-RAS International Conference on Humanoid Robots (Humanoids), 2019 (Oral presentation) **[Humanoids 2019]**

[3] **Exploring Characteristic Features in Gait Patterns for Predicting Multiple Sclerosis** [PDF]
Rachneet Kaur, Sanjana Menon, Xiaomiao Zhang, Richard Sowers, Manuel E Hernandez
Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC), 2019 (Oral presentation) **[IEEE EMBC 2019]**

[2] **Using Virtual Reality to Examine the Neural and Physiological Responses to Height and Perturbations in Quiet Standing** [PDF]
Rachneet Kaur, Rongyi Sun, Liran Ziegelman, Richard Sowers, Manuel E Hernandez
Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC), 2019 **[IEEE EMBC 2019]**

[1] **Virtual Reality, Visual Cliffs, and Movement Disorders** [PDF | teaser video 1 | teaser video 2]
Rachneet Kaur, Xun Lin, Alexander Layton, Manuel Hernandez, Richard Sowers
Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC), 2018 **[IEEE EMBC 2018]**
- Also presented at *Grace Hopper Celebration (GHC), 2018* and at *Institute for Operations Research and the Management Sciences (INFORMS) Annual Meeting, 2017*
✯ **Illinois Geometry Lab Research Award by the Department of Mathematics, UIUC, 2018**
✍ **Media:**
✢ *"Mind-Reading Robots: ISE professors leap into the world of brain-computer interfaces"* [UIUC Newsroom]

Conference Workshops & Posters

[3] **Financial Time Series Forecasting using CNN and Transformer** [PDF]
Zhen Zeng, Rachneet Kaur, Suchetha Siddagangappa, Saba Rahimi, Tucker Balch, Manuela Veloso
AAAI Conference on Artificial Intelligence Bridge on AI for Financial Services, 2023 **[AAAI AI-Fin '23]**

[2] **Using Virtual Reality High Fall-Risk Condition Training to Improve Postural Control Accuracy and Speed** [abstract]
Rongyi Sun, Rachneet Kaur, Richard Sowers, Manuel Hernandez
Annual American Congress of Rehabilitation Medicine Conference (ACRM), 2019 **[ACRM 2019]**

[1] **Learning the progression and clinical subtypes of Alzheimer's disease from longitudinal clinical data** [PDF | full extended version | code | streamlit dashboard for interactive visualizations | code for interactive website | poster]
Vipul Satone, Rachneet Kaur, Faraz Faghri, Mike A Nalls, Andrew B Singleton, Roy H Campbell
Conference on Neural Information Processing Systems (NeurIPS) Workshop on Machine Learning for Health (ML4H), 2018 **[NeurIPS ML4H '18]**
- Also presented at *Illinois Health Data Analytics Summit, 2018*

Preprints (Under Review)

[2] **Creating a Causally Grounded Rating Method for Assessing the Robustness of AI Models for Time-Series Forecasting** [arXiv]
Kausik Lakkaraju, Rachneet Kaur, Parisa Zehtabi, Sunandita Patra, Siva Likitha Valluru, Zhen Zeng, Biplav Srivastava, Marco Valtorta

[1] **Rating Multi-Modal Time-Series Forecasting Models (MM-TSFM) for Robustness Through a Causal Lens** [arXiv]
Kausik Lakkaraju, Rachneet Kaur, Zhen Zeng, Parisa Zehtabi, Sunandita Patra, Biplav Srivastava, Marco Valtorta

Book Chapters

[1] **Virtual Reality and Movement Disorders** [Chapter PDF | Book PDF | Google Books]
Rachneet Kaur, Manuel Hernandez, Richard Sowers
Virtual Reality: Recent Advancements, Applications and Challenges, River Publishers, 2020

Academic Theses

[2] **Machine Learning for Digital Health: Transforming Clinical Data into Knowledge** [PDF | slides]
Rachneet Kaur. Doctoral Committee: Richard B. Sowers, Carolyn L. Beck, Thenkurussi Kesavadas, Manuel E. Hernandez
PhD Thesis. University of Illinois at Urbana Champaign, Dec 2022. **[UIUC 2022]**

[1] **Computing with Words** [PDF | slides]
Rachneet Kaur. Thesis Advisor: Aparna Mehra
Masters Thesis. Indian Institute of Technology - Delhi, May 2015. **[IIT-Delhi 2015]**
- Also presented at the *IIT-Delhi Annual Open House, 2015*

Patents (Granted & Applications)

[10] **Hierarchical Agentic Framework for Multi-Page Visual Document Understanding**
Yiqiao Jin, Rachneet Kaur, Nishan Srishankar, Zhen Zeng, Sumitra Ganesh
US Patent Application (Filed Dec 2025) | JPMorgan Chase Bank, N.A. **[Filed 2025]**

[9] **Multimodal Agent for Performing Tasks Associated with Charts**
Rachneet Kaur, Nishan Srishankar, Zhen Zeng, Sumitra Ganesh, Manuela Veloso
US Patent Application (Filed Oct 2025) | JPMorgan Chase Bank, N.A. **[Filed 2025]**

[8] **Method and System for Generating a Large Language Model Modular Framework That Constructs a Digital Time Series Analytics Report**
Elizabeth Fons, Elena Kochkina, Berowne Hlavaty, Svitlana Vyetrenko, Charese Smiley, Rachneet Kaur, Zhen Zeng, Manuela Veloso
US Patent Application (Filed July 2025) | JPMorgan Chase Bank, N.A. **[Filed 2025]**

[7] **Method and System for Generating a Multi-modal Large Language Model Web Agent For Autonomous Execution of a Virtual Action**
Gaurav Verma, Rachneet Kaur, Nishan Srishankar, Zhen Zeng, Tucker Balch, Manuela Veloso
US Patent Application (Filed Apr 2025) | JPMorgan Chase Bank, N.A. **[Filed 2025]**

[6] **Method and system for leveraging language embeddings for time series classifications** [PDF]
Rachneet Kaur, Zhen Zeng, Tucker Balch, Manuela Veloso
US Patent No. 2026/0044760, Filed Aug 2024 | JPMorgan Chase Bank, N.A. **[Filed 2024]**

[5] **Systems and method for evaluating large language models for time series feature understanding** [PDF]
Elizabeth Fons, Rachneet Kaur, Zhen Zeng, Svitlana Vyetrenko, Tucker Balch
US Patent No. 2025/0342353, Filed July 2024 | JPMorgan Chase Bank, N.A. **[Filed 2024]**

[4] **Method and system for using image analysis for time series forecasting** [PDF]
Zhen Zeng, Rachneet Kaur, Suchetha Siddagangappa, Tucker Balch, Manuela Veloso
US Patent No. 2025/0209049, Filed Dec 2023 | JPMorgan Chase Bank, N.A. **[Filed 2023]**

[3] **Method and system for time-series adaptive domain-aware captioning** [PDF]
Elizabeth Fons, Zhen Zeng, Rachneet Kaur, Tucker Balch, Svitlana Vyetrenko, Manuela Veloso
US Patent No. 2025/0111165, Filed Oct 2023 | JPMorgan Chase Bank, N.A. **[Filed 2023]**

[2] **Systems and methods for convolutional neural network and transformer-based time series modeling** [PDF]
Zhen Zeng, Rachneet Kaur, Suchetha Siddagangappa, Saba Rahimi, Tucker Balch, Manuela Veloso
US Patent No. 2025/0045566, Filed Aug 2023 | JPMorgan Chase Bank, N.A. **[Filed 2023]**

[1] **Methods and systems for path-based mapping and routing** [PDF]
Gautam Singh, John M. Kruse, Ronald D. Jesme, William J. Kelliher, Jr.Jacob E. Odom, Adam C. Nyland, Nicholas T. Gabriel, Jason L. Aveldson, Haleh Hagh-Shenas, Frank T. Herfort, Michael L. Gjere, Rachneet Kaur, Elias Wilken-Resman, Jae Yong Lee, Doug A. Addleman, Glenn E. Casner, James D. Carlson, Justin Tungjunyatham, Karl Battle, Steven G. Lucht
US Patent No. US12,031,826 | 3M Innovative Properties Co. **[Granted 2024]**

Academic Service

Conference & Workshop Organization

Core/Lead Organizing Committee Member

✧ AI for Social Impact: Bridging Innovations in Finance, Social Media, and Crime Prevention Workshop @ *AAAI Conference on Artificial Intelligence, 2025* [webpage] **[AAAI 2025]**

✧ Women in AI and Finance Workshop/Reception: Cultivating Mentorship, Encouraging Growth @ *ACM International Conference on AI in Finance, 2024* [webpage] **[ACM ICAIF 2024]**

✧ Evaluating and Rating AI Systems for Trust and Its Application to Finance Tutorial @ *ACM International Conference on AI in Finance, 2024* [webpage] **[ACM ICAIF 2024]**

✧ AI in Finance for Social Impact Workshop @ *AAAI Conference on Artificial Intelligence, 2024* [webpage | AI Magazine workshop report] **[AAAI 2024]**

✧ Women in AI and Finance Workshop @ *ACM International Conference on AI in Finance, 2023* [webpage] **[ACM ICAIF 2023]**

Session Chair

✧ AI Agents @ *Annual Meeting of Association for Computational Linguistics, 2026* **[ACL 2026]**

✧ 1) LLM Applications | 2) Graph Theory & Network Analysis @ *ACM International Conference on AI in Finance, 2023* **[ACM ICAIF 2023]**

Volunteer

✧ *JPMorgan Chase & Co. AI Summit, 2023 | 2022* **[JPM 2023, 2022]**

✧ *ACM International Conference on AI in Finance, 2023 | 2022* **[ICAIF 2023, 2022]**

Program Committee Member & Reviewer

Journals [Reviewer]

✧ *IEEE:* Transactions on Neural Systems & Rehabilitation Engineering (TNSRE) [🔗]

✧ *Elsevier:* Artificial Intelligence in Medicine [🔗] | Multiple Sclerosis & Related Disorders [🔗]

✧ *Springer:* Scientific Reports [🔗]

✧ *Frontiers:* Frontiers in Neuroscience [🔗]

✧ *Taylor & Francis:* Computer Methods in Biomechanics and Biomedical Engineering [🔗]

Journals [Review Editor]

✧ Applied Neuroimaging (specialty section of Frontiers in Neurology) [🔗]

Conferences [Program Committee & Reviewer]

✧ Association for Computational Linguistics (ACL) Rolling Review [2026] | Conference on Empirical Methods in Natural Language Processing (EMNLP) Industry Track [2026] | International Conference on Machine Learning (ICML) [2025] | International Conference on Learning Representations (ICLR) [2025] | Conference on Neural Information Processing Systems (NeurIPS) [2024] | ACM International Conference on AI in Finance (ICAIF) [2024] | Machine Learning for Health (ML4H) [2023, 2021]

Conference Workshops [Program Committee & Reviewer]

✧ *NeurIPS:* Workshop on Generative AI in Finance (GenAI-Fin) [2025] | Medical Imaging Meets NeurIPS (MedNeurIPS) [2023, 2021, 2019] | Machine Learning in Public Health (MLPH@NeurIPS) [2021] | Machine Learning for Health (ML4H@NeurIPS) [2020, 2019] | Machine Learning and the Physical Sciences (MLPS@NeurIPS) [2020] | Fair ML for Health (FMLH@NeurIPS) [2019] | Women in Machine Learning (WiML) [2018]

✧ *ACM ICAIF:* Women in AI and Finance Workshop (WAF@ICAIF) [2022]

Invited Talks & Panels

Multimodal AI Agents for Visual Intelligence and Reasoning

✧ *Carnegie Mellon University (CMU), Heinz College of Information Systems & Public Policy* Fall 2026-Virtual

✧ *University of Illinois at Urbana Champaign (UIUC), School of Information Sciences* Date: TBD

Rating Financial Time-series Forecasting Models for Robustness and Bias [slides]

✧ *Tutorial on Evaluating and Rating AI Systems for Trust and Its Application to Finance*, *ACM International Conference on AI in Finance (ICAIF), 2024* Nov 2024-New York

Mathematics and AI in the Financial Industry [slides]
✧ *Department of Mathematics, Punjab Engineering College, India* Mar 2024-Virtual

Panelist: Journey from Academic Research to Industry Research
✧ *Panel Discussion, ACM International Conference on AI in Finance, 2023* Nov 2023-New York

Predicting Multiple Sclerosis from Dynamics of Gait Variability [slides | video]
✧ *Graduate Seminar Series, Department of Industrial and Enterprise Systems Engineering, University of Illinois at Urbana Champaign* Nov 2020-Illinois

Virtual Reality, Visual Cliffs and Movement Disorders
✧ *Machine Learning in Hardware Session, Coordinated Science Laboratory Student Conference, University of Illinois at Urabana Champaign* Feb 2019-Illinois

Training Session on Quantitative Finance & Algorithmic Trading
✧ *Invited Webinar, World Quant Summer Alphathon, 2016* Aug 2016-Virtual
✧ *Invited Webinar, World Quant Summer Training Program, 2016* July 2016-Virtual

Retrieving the Playfair Matrix in Cryptography from Plain text and Cipher text
✧ *Presented the winning solution from The Legacy of Srinivasa Ramanujan Competition at the Universities of Cambridge and Oxford, United Kingdom* June 2013-Oxford

Teaching, Mentorship & Leadership

Teaching

Graduate Teaching Assistant | Computer Science, UIUC
✧ CS 547 Deep Learning [Spring 2022 | Fall 2021 | Spring 2021 | Fall 2019]
Taught by *Prof. Justin Sirignano* (Fall 2019), and *Prof. Richard Sowers* (Spring 2021- Spring 2022)

Graduate Teaching Assistant | Industrial and Enterprise Systems Engineering, UIUC
✧ IE 300 Analysis of Data [Fall 2020 | Fall 2018 | Spring 2018 | Fall 2017 | Spring 2017 | Fall 2016]
✧ IE 398 Simulation [Spring 2020]
✧ IE 361 Production Planning and Control [Spring 2019]

TA Duties:
✧ Led discussion sessions and office hours for graduate-level courses with 100+ students.
✧ Created and graded course content, including homework, exams, coding assignments, and semester-long projects; conducted lab sessions to support students, providing feedback.

Mentorship

Intern Mentorship Experience, JPMorgan Chase & Co. | *Mentor*
✧ Yiqiao Jin [PhD CS, Georgia Institute of Technology], AI Research Intern Summer 2025

Research Topic: Hierarchical Agentic Framework for Multi-Page Slide Deck Understanding; resulted in *co-authored ACL 2026 (main) and NeurIPS 2025 Workshop paper*

✧ Gaurav Verma [PhD CS, Georgia Institute of Technology], AI Research Intern Summer 2024
Research Topic: Adapting Multimodal Web Agents with Few-Shot Learning from Human Demonstrations; resulted in *co-authored ACL 2025 (main) and NeurIPS 2024 Workshop paper*

JPMorgan Chase & Co. AI Academy Capstone | *Lead Mentor* Mar–Oct 2023
✧ Led an AI Capstone project, mentoring 4 JPM associates & VPs from non-AI teams (e.g., investment banking, risk, & wealth management) through hands-on AI & multimodal learning.

Student Mentorship Experience, UIUC | *Mentor*
✧ Mehar Singh [BS CS, UIUC → Apple] May–Dec '22
Research Topic: Wearable Sensors, Self-Supervised Pretraining, and Transfer Learning for Motor Impairment Classification in Parkinson's Disease; resulted in a *co-authored journal paper*

✧ Prithvi Prakash [MS Data Science, UIUC → Bayer] Jan–Dec '22
Research Topic: Wearable Sensors and Supervised Learning for Classifying Multiple Motor Impairment Classes in Parkinson's Disease; resulted in a *co-authored IEEE conference paper*

✧ Joshua Levy [BS CS, UIUC → Capital One] 2021-2022
Research Topic: Deep Learning for Prediction of Neurological Disorders from Multi-Stride Gait Dynamics; resulted in a *co-authored IEEE journal paper*

✧ Mengyue Huang [BS Data Science, UIUC → MS, University of Pennsylvania] Jan–May '22
Research Topic: Wrist Wearables and Machine Learning for Tai Chi Expertise Classification; resulted in a *co-authored journal paper*

✧ Zizhang Chen [BS Statistics, UIUC → PhD CS, Brandeis University] Jan–May '20
Research Topic: Machine Learning for Prediction of Neurological Disorders from Gait Dynamics; resulted in a *co-authored IEEE journal paper*

✧ Vipul Satone [MS Industrial Engineering, UIUC → Vanguard] Jan–May '19
Research Topic: Machine Learning for Predicting Alzheimer's Disease Progression and Clinical Subtypes; resulted in a *co-authored NeurIPS 2018 Workshop paper*

✧ Rachel Zilz [BS Systems Engineering, UIUC → Boeing] Jan–May '18
✧ Kevin Thompson [BS CS, UIUC → State Farm] May–Dec '19
Research Topic: ML and Price-Based Load Scheduling for Optimal IoT Control in Smart Homes; resulted in a *co-authored Elsevier journal paper*

✧ Rongyi Sun [BS Molecular and Cellular Biology, UIUC → Medical Doctor, NewYork-Presbyterian Hospital] 2018-2019
Research Topic: ML and Virtual Reality to Analyze Neural Responses to Anxiety; resulted in *three co-authored IEEE conference papers: 1) Humanoids 2019, 2) EMBC 2019, and 3) BIBM 2019*

✧ Sanjana Menon [MS Industrial Engineering, UIUC → Western Digital] May–Dec '18
Research Topic: Feature Engineering in Gait Patterns; resulted in a *co-authored IEEE paper*

Illinois Geometry Lab (IGL), UIUC | *Lead Graduate Mentor* 2017–2019

✧ Mentored 10+ undergraduate students each semester from the Department of Mathematics and Computer Science on semester-long research projects with IGL.

✧ Won *2018 IGL Research Award*, with research also published as a *co-authored IEEE paper*.

Mottier Innovation Challenge, UIUC | *Lead Graduate Mentor* 2017

✧ Mentored 2 undergrads on research to develop financially & socially sustainable solutions.

✧ Won *1st Runner-Up*, with the research also published as a *co-authored journal paper*.

Leadership

JPMorgan Chase & Co. AI Research Faculty Research Awardees (FRA) | *Lead Collaborator* 2023–Present

✧ Collaborated with FRA awardees: 1) *Prof. Biplav Srivastava*, AI Institute, University of South Carolina; 2) *Prof. Gopala Krishna Anumanchipalli*, Berkeley Artificial Intelligence Research Lab (BAIR), University of California, Berkeley.

✧ Contributed to joint research resulting in 2 conference papers and 1 conference tutorial.

JPMorgan Chase & Co. AI Research Recruitment | *Core Member* 2023–Present

✧ Member of the recruitment team for JPMorgan Chase & Co. AI Research, conducting interviews for AIR intern and full-time candidates.

Commitment to Diversity, Equity, and Inclusion (DEI) | *Organizer* 2023–Present

✧ Organized Women in AI workshops at the ACM International Conference on AI in Finance.

Open House, Indian Institute of Technology (IIT) Delhi [🔗] | *Coordinator* Mar–Apr '16

✧ Led a team of 50+ volunteers managing 500+ schools participating in the event and organized the press conference, overseeing media coverage before and during the event.

✧ Strategized & executed the inaugural ceremony & talks for IITD's largest intraday events.

Rubic's Cube Indian Nationals, IIT Delhi [🔗] | *Event Management Volunteer* Feb–Mar '16

✧ Served as a judge for various tournaments and managed attendees during the sessions.

Spic Macay, IIT Delhi [🔗] | *Publicity Volunteer* Jan–Mar '16

✧ Coordinated offline and online journalistic activities during the 10-day cultural fest.

Tryst, IIT Delhi [🔗] | *Event Management Volunteer* Jan–Mar '15

✧ Managed mathematics department events for IITD's annual tech fest, one of India's largest.

Extra-curricular Activities

Indian Institute of Technology, Delhi

✧ Developed the *Grow Safe* Android app to help growers manage crop pests using a mathematical model, for the *NASA International Space Apps Challenge* Apr 2015

✧ Developed *ColorOManiac*, a Windows game based on the NP-hard graph coloring problem, for the *Microsoft Code.Fun.Do* hackathon Jan 2014

✧ Coordinated a team of 3 to design *HelpMeA(sa)pp*, an Android app focused on women's security, for the *Yahoo Hack U* hackathon — Aug 2013

University of Delhi

✧ Statistical analysis of milk surveys for Delhi University's innovation project — Dec 2015