Shivvrat **Arya**

Newark NJ 07102

✉ shivvrat.arya@njit.edu | 🏠 shivvrat.github.io/ | 💻 Shivvrat | in shivvrat | 🎓 Shivvrat Arya

Professional Summary

Assistant Professor of Computer Science at the New Jersey Institute of Technology (NJIT) specializing in Artificial Intelligence and Machine Learning. Research centers on Neuro-Symbolic AI, Probabilistic Reasoning, Explainable AI, and Combinatorial Optimization, with applications in Computer Vision, Video Understanding, and Natural Language Processing. Recognized with Best Paper Awards and spotlight/oral presentations at premier venues including NeurIPS and AAAI. Experienced in federally funded projects through DARPA, NSF, and AFOSR, with a strong record of advancing interpretable and trustworthy AI. Committed to building an innovative research program, mentoring students, and fostering collaborations in academia and industry.

Educational Background

Ph.D. in Computer Science   *May 2025*

THE UNIVERSITY OF TEXAS AT DALLAS, RICHARDSON, TEXAS   *GPA: 4.0/4.0*

- **Dissertation Title:** Neural Solvers for Fast, Accurate Probabilistic Inference
- **Advisor:** Dr. Vibhav Gogate
- **Co-Advisor:** Dr. Yu Xiang

M.S. in Computer Science   *May 2021*

THE UNIVERSITY OF TEXAS AT DALLAS, RICHARDSON, TEXAS   *GPA: 4.0/4.0*

B. Tech. in Computer Science and Engineering   *May 2019*

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY VADODARA, INDIA   *GPA: 8.39/10.0*

Research Interests

Artificial Intelligence, Machine Learning, Deep Learning, Probabilistic Graphical Models, Neuro-Symbolic AI, Tractable Probabilistic Inference, Combinatorial Optimization, Explainable and Interpretable AI, Computer Vision, Video Understanding

Employment History

Department of Computer Science, Ying Wu College of Computing, NJIT   *Newark, NJ*

ASSISTANT PROFESSOR   *September 2025 – Present*

Center for Machine Learning, The University of Texas at Dallas   *Richardson, TX*

RESEARCH ASSISTANT   *August 2021 - May 2025*

- Developed and optimized real-time inference algorithms for probabilistic models in collaboration with faculty and research associates, achieving notable improvements in model accuracy and computational efficiency. These contributions earned Best Paper Awards, spotlight, and oral presentations at leading AI/ML conferences, including NeurIPS and AAAI.
- Played a key role in the **DARPA Perceptually-enabled Task Guidance (PTG)** program, advancing Neuro-Symbolic Dynamic Probabilistic Models for improved task representation and reasoning. Enhanced user performance in complex physical tasks by expanding skillsets and reducing error rates, leading to increased versatility and proficiency.
- Contributed to the **DARPA Explainable Artificial Intelligence (XAI)** program, developing interpretable AI systems to support transparent, reliable decision-making. Delivered high-performance, explainable models that preserved prediction accuracy, enabling human users to better understand, trust, and manage the next generation of AI partners.
- Participated in the **DARPA Assured Neuro Symbolic Learning and Reasoning (ANSR)** program, focusing on secure and reliable neuro-symbolic learning approaches. Engineered hybrid AI algorithms that integrate symbolic reasoning with data-driven learning, resulting in robust, assured, and trustworthy systems.
- Contributed to research grants funded by **National Science Foundation (NSF)** and **Air Force Office of Scientific Research (AFOSR)**.

Indian Institute of Technology Indore   *Indore, India*

RESEARCH INTERN   *Jan. 2019 to May 2019 & May 2018 to July 2018*

- Researched and benchmarked deep learning architectures for multi-label classification.
- Developed the Kernelized Random Vector Functional Link (KRVFL) network for multi-label classification.

Professional Recognition and Honors

Certificate of Academic Excellence (PhD): Awarded for Outstanding Academic Performance in the Computer Science Graduate PhD Program	**UTD**
Certificate of Academic Excellence (MS): Awarded for Outstanding Academic Performance in the Computer Science Graduate Masters Program	**UTD**
*Recognized as **Top Reviewer** (among the **top 8%** of reviewers) for NeurIPS 2024*	**NeurIPS 2024**
*"A Neural Network Approach for Efficiently Answering Most Probable Explanation Queries in Probabilistic Models" selected as **Spotlight: top 3% papers***	**NeurIPS 2024**
*"Neural Network Approximators for Marginal MAP in Probabilistic Circuits" selected for **oral presentation : top 3% papers***	**AAAI 2024**
***Best Paper Award** for "A Neural Network Approach for Efficiently Answering Most Probable Explanation Queries in Probabilistic Models"*	**TPM 2024**
Awarded the Jonsson School Graduate Study Scholarship (2019)	**UTD**
Awarded the Central Sector Scheme of Scholarships for College and University Students (2015), covering the full duration of Undergraduate and Graduate studies	**Department of Higher Education, India**

Publications

HIGHLY REFEREED CONFERENCE PAPERS

- **Shivvrat Arya**, Tahrima Rahman, Vibhav Gogate, "SINE: Scalable MPE Inference for Probabilistic Graphical Models using Advanced Neural Embeddings", *28th International Conference on Artificial Intelligence and Statistics*, **AISTATS**, 2025
- **Shivvrat Arya**, Tahrima Rahman, Vibhav Gogate, "A Neural Network Approach for Efficiently Answering Most Probable Explanation Queries in Probabilistic Models", *The Thirty-eighth Annual Conference on Neural Information Processing Systems*, **NeurIPS Spotlight: top 3% papers**, 2024
- Rohith Peddi, **Shivvrat Arya**, Bharath Challa, Likhitha Pallapothula, Akshay Vyas, Bhavya Gouripeddi, Qifan Zhang, Jikai Wang, Vasundhara Komaragiri, Eric Ragan, Nicholas Ruozzi, Yu Xiang, Vibhav Gogate , "CaptainCook4D: A Dataset for Understanding Errors in Procedural Activities", *The Thirty-eight Conference on Neural Information Processing Systems, Datasets and Benchmarks Track*, **NeurIPS: D&B**, 2024
- **Shivvrat Arya**, Tahrima Rahman, Vibhav Gogate, "Learning to Solve the Constrained Most Probable Explanation Task in Probabilistic Graphical Models", *27th International Conference on Artificial Intelligence and Statistics*, **AISTATS**, 2024
- **Shivvrat Arya**, Yu Xiang, Vibhav Gogate, "Deep Dependency Networks and Advanced Inference Schemes for Multi-Label Classification", *27th International Conference on Artificial Intelligence and Statistics*, **AISTATS**, 2024
- **Shivvrat Arya**, Tahrima Rahman, Vibhav Gogate, "Neural Network Approximators for Marginal MAP in Probabilistic Circuits", *The 38th Annual AAAI Conference on Artificial Intelligence*, **AAAI Oral Presentation: top 6% papers**, 2024
- Vikas Chauhan, Aruna Tiwari and **Shivvrat Arya**, "Multi-Label classifier based on Kernel Random Vector Functional Link Network", *International Joint Conference on Neural Networks*, **IJCNN**, 2020

REFEREED WORKSHOP PAPERS

- **Shivvrat Arya**, Tahrima Rahman, Vibhav Gogate, "A Neural Network Approach for Efficiently Answering Most Probable Explanation Queries in Probabilistic Models", *UAI Tractable Probabilistic Modeling*, **TPM: Best Paper Award**, 2024
- **Shivvrat Arya**, Tahrima Rahman, Vibhav Gogate, "Neural Network Approximators for Marginal MAP in Probabilistic Circuits", *UAI Tractable Probabilistic Modeling*, **TPM**, 2024
- Benjamin Rheault, **Shivvrat Arya**, Akshay Vyas, Jikai Wang, Rohith Peddi, Brett Benda, Vibhav Gogate, Nicholas Ruozzi, Yu Xiang, Eric Ragan, "Predictive Task Guidance with Artificial Intelligence in Augmented Reality", *IEEE Conference on Virtual Reality and 3D User Interfaces*, **IEEE VR**, 2024
- Rohith Peddi, **Shivvrat Arya**, Bharath Challa, Likhitha Pallapothula, Akshay Vyas, Qifan Zhang, Jikai Wang, Vasundhara Komaragiri, Nicholas Ruozzi, Eric Ragan, Yu Xiang, Vibhav Gogate, "Put on your detective hat: What's wrong in this video?", *DMLR Data-centric Machine Learning Research*, **DMLR Workshop**, 2023

JOURNAL PAPERS

- Chiradeep Roy[*], Mahsan Nourani[*], **Shivvrat Arya**[*], Mahesh Shanbhag, Tahrima Rahman, Eric D. Ragan, Nicholas Ruozzi, Vibhav Gogate, "Explainable Activity Recognition in Videos using Deep Learning and Tractable Probabilistic Models", *ACM Transactions on Interactive Intelligent Systems*, **TiiS**, 2023; ([*]These authors contributed equally)

Student Mentorship

Department of Computer Science, The University of Texas at Dallas   *Richardson, TX*
RESEARCH MENTOR   *August 2022 - Present*

- **Graduate Level:** Guided Ph.D. and Master's students in artificial intelligence, machine learning, and computer vision research, resulting in conference and journal publications, as well as successful thesis completions.
- **Undergraduate Level:** Mentored undergraduate students in artificial intelligence, machine learning, and computer vision research projects.
- **Responsibilities:** Provided technical guidance, reviewed research manuscripts, conducted regular progress meetings, and assisted in experimental design and implementation.

Classroom Teaching

Department of Computer Science, The University of Texas at Dallas   *Richardson, TX*
TEACHING ASSISTANT   *August 2020 - August 2021*

- **Courses:** Statistical Methods in AI and Machine Learning, Database Systems, Discrete Mathematics for Computing II
- **Responsibilities:** Graded assignments, held office hours, conducted project demonstrations, and developed supplementary materials and homework solutions for the courses.

Department of Computer Science, The University of Texas at Dallas   *Richardson, TX*
GUEST LECTURER   *Jan. 2024 - May 2024*

- **Course:** Artificial Intelligence (Senior Level)
- **Responsibilities:** Delivered lectures and facilitated class activities, with a focus on core topics in Artificial Intelligence.

Department of Computer Science, The University of Texas at Dallas   *Richardson, TX*
GUEST LECTURER   *August. 2024 - December 2024*

- **Course:** Artificial Intelligence (Graduate Level)
- **Responsibilities:** Taught lectures and guided class discussions, concentrating on advanced topics in Artificial Intelligence.

Department of Computer Science, The University of Texas at Dallas   *Richardson, TX*
GUEST LECTURER   *August. 2024 - December 2024*

- **Course:** Machine Learning (Graduate Level)
- **Responsibilities:** Delivered instructional content and moderated discussions, focusing on advanced Machine Learning concepts.

Summer School Programs   *India*
HIGH SCHOOL TEACHER   *Summer 2015, 2016, 2017*

- **Subjects:** Mathematics (2015), Computer Science and Mathematics (2016, 2017)
- **Responsibilities:** Taught 80 to 100 students with varying familiarity levels, simplified complex concepts, utilized interactive discussions and hands-on examples, and created an inclusive learning environment.

CERTIFICATES

Center for Teaching and Learning, The University of Texas at Dallas   *Richardson, TX*
GRADUATE TEACHING CERTIFICATE RECIPIENT   *2025*

- Completed formal training in instructional pedagogy through the UTD Center for Teaching and Learning.
- Fulfilled four core components: Epigeum coursework, faculty teaching observation, reflective essays, and semester-long teaching experience.
- Certificate awarded upon demonstrating teaching effectiveness and commitment to professional development in higher education.

Professional Service

I regularly review papers for the following venues:

JOURNAL REVIEWER

Artificial Intelligence **(AIJ)**
Transactions on Machine Learning Research **(TMLR)**
IEEE Robotics and Automation Letters **(RA-L)**

Conference Reviewer

Neural Information Processing Systems **(NeurIPS: Recognized as a Top Reviewer in 2024)**
International Conference on Machine Learning **(ICML)**
International Conference on Learning Representations **(ICLR)**
Conference on Uncertainty in Artificial Intelligence **(UAI)**
International Conference on Artificial Intelligence and Statistics **(AISTATS)**

Work Experience

TechnoUniverse *Indore, India*
Android Development Intern *May 2017 to July 2017*

- Developed a full-featured Android application for InvestoCafe, a financial services firm, ensuring seamless design alignment with their existing website.

Technical Skills

Programming Languages:	Python, R, SQL, Java, C, Cython
Machine Learning Tools:	TensorFlow, PyTorch, scikit-learn, Keras
Data Analysis:	Pandas, NumPy, SciPy, Matplotlib, Seaborn
Cloud Platforms:	AWS, Google Cloud Platform, Azure
Version Control:	Git, GitHub
Productivity Suite:	MS Office, LaTeX, Libre Office, Movie Maker
Other:	Docker, Kubernetes

Academic Projects

Completed at The University of Texas at Dallas

- **Parameter and Structure Learning Algorithms for Bayesian Networks**   **Statistical Methods in AI and ML**, *Spring 2020*
  Implemented several structure learning algorithms for Bayesian Networks, including FOD-Learn (fully observed data, known structure), POD-Learn (partially observed data, known structure), and Mixture-Random-Bayes (fully observed data, unknown structure). Conducted a comparative analysis of these algorithms based on different data and structure conditions.

- **Sampling-based Variable Elimination and Conditioning**   **Statistical Methods in AI and ML**, *Spring 2020*
  Implemented Sampling-based Variable Elimination and Conditioning algorithm for performing inference on probabilistic graphical models.

- **Learning Algorithms for Bayesian Networks**   **Machine Learning**, *Fall 2019*
  Implemented four algorithms: Independent Bayesian Networks, Tree Bayesian Networks (using Chow-Liu), Mixtures of Tree Bayesian Networks using EM, and Mixtures of Tree Bayesian Networks using Random Forests.

- **Non-Iterative Neural Networks**   **Machine Learning**, *Fall 2019*
  Implemented two non-iterative neural network models for classification and regression tasks across multiple datasets.

- **Collaborative-Filtering**   **Machine Learning**, *Fall 2019*
  Implemented collaborative filtering algorithms using a subset of the Netflix Prize movie ratings data. Evaluated model performance using Mean Absolute Error and Root Mean Squared Error metrics.

- **DART Database System**   **Database Design**, *Fall 2019*
  Designed and implemented the DART system's complete database, from EER diagram creation to relational schema design, SQL-based database construction, and query/view generation.

Completed at Indian Institute of Information Technology Vadodara, India

- **Compressed Sensing**   **Computer Vision**, *Fall 2018*
  Developed and evaluated an algorithm for multi-view tracking and 3D voxel reconstruction using 2D images.

- **Kakuro Puzzle Solver**   **Artificial Intelligence**, *Spring 2018*
  Designed and implemented a bot to solve Kakuro puzzles by applying derived rules to handle diverse puzzle instances.

- **Autoencoder for Anomaly Detection**   **Deep Learning**, *Spring 2018*
  Developed an autoencoder-based anomaly detection method, successfully tested on a credit card fraud dataset.

- **LEARN: A Programming Language**   **Compiler Design**, *Spring 2018*
  Designed and implemented a beginner-friendly programming language LEARN using yacc and lex, aiming to ease the learning curve for new programmers.

- **Fatal Disease Detector Using Twitter Data**   **IIITV Hackathon**, *Fall 2018*
  Implemented a k-means clustering algorithm to detect disease spread patterns using Twitter data.

- **SoT (Security of Things)**   **Cryptography**, *Fall 2017*
  Developed an Android application to monitor real-time environmental temperature changes with AES encryption for secure data transmission.

- **Hatsphere: E-commerce Platform**   **Software Development**, *Fall 2017*
  Developed a platform to enable traditional craftsmen to sell their products online and reach a broader market.

- **Cocktail Party Effect Algorithm**   **Speech Science and Technology**, *Fall 2017*
  Implemented an algorithm to separate human voice from noise in audio recordings.

- **Movie Recommendation System**   **Database Design**, *Spring 2016*
  Developed a user interface and managed a database system for a movie recommendation engine, utilizing PostgreSQL and C for backend management.

Organizational Responsibilities

COMPLETED AT THE UNIVERSITY OF TEXAS AT DALLAS

Associate Officer
Internal Projects   **Research Club**

COMPLETED AT INDIAN INSTITUTE OF INFORMATION TECHNOLOGY VADODARA, INDIA

Head   **Sports Committee**

Core Member   **Organizing Team – Krieva 2016, Ventura 2016, Krieva 2017, Cerebro 2018, Ventura 2018**

Core Member   **Pensive (Literary Society)**

Member   **Hostel Executive Committee**

Class Representative   **Vidya Sagar School**

Certifications

COURSERA COURSE CERTIFICATES

- Mathematics for Machine Learning: Linear Algebra - *Present License* E5PBMECK8B4M   Apr 2019
- What is Data Science? - *Present License* 5WS64BF2G2SY   Feb 2019
- Introduction to Programming with MATLAB - *Present License* VGPWCM8WH73K   Feb 2019
- Deep Learning Specialization - *Present License* J9V32CC6VTB5   Nov 2018
- Sequence Models - *Present License* 5E9VFH59THG4   Nov 2018
- Convolutional Neural Networks - *Present License* G888N3WXPXLN   Sep 2018
- Python Programming Essentials - *Present License* TZXYYXTF796L   Jun 2018
- Structuring Machine Learning Projects - *Present License* JJNYAQTVFUPR   May 2018
- Neural Networks and Deep Learning - *Present License* JSAR6KKVC5Y7   Apr 2018
- Improving Deep Neural Networks - *Present License* MRVNDFNWUHPQ   Apr 2018
- Machine Learning - *Present License* FPWNJ39A5LWQ   Mar 2018
- Python Data Structures - *Present License* DS5N3NM69PQ6   Mar 2018
- Programming for Everybody - *Present License* XS6H2XUBJ66U   Jan 2018

UDEMY COURSE CERTIFICATES

- The Top 5 Machine Learning Libraries in Python   Jan 2019
- MATLAB for scientists: a beginner's course   Jan 2019

References

Dr. Vibhav Gogate

Professor

Department of Computer Science
The University of Texas at Dallas
Richardson, TX
972-883-4245
Vibhav.Gogate@utdallas.edu

Dr. Guy Van den Broeck

Professor

Computer Science
University of California, LA
Los Angeles, CA
310-206-6552
guyvdb@cs.ucla.edu

Dr. Yu Xiang

Assistant Professor

Department of Computer Science
The University of Texas at Dallas
Richardson, TX
972-883-3891
Yu.Xiang@UTDallas.edu

Dr. Nicholas Ruozzi

Associate Professor

Department of Computer Science
The University of Texas at Dallas
Richardson, TX
972-883-4918
Nicholas.Ruozzi@utdallas.edu

Dr. Sriraam Natarajan

Professor

Department of Computer Science
The University of Texas at Dallas
Richardson, TX
972-883-4163
Sriraam.Natarajan@utdallas.edu