# KSHITIJ TAYAL


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**Education**

**University of Minnesota**, Minneapolis, United States — **Sep 2017 - Present**
*PhD in Computer Science*

- Advisor: Dr. Vipin Kumar
- CGPA: **3.67 / 4.0**
- **Relevant Courses**: Machine Learning, Deep Learning, Computer Vision, Advance Algorithms and Data Structures, Non-Linear Optimization, Matrix Theory, Probability and Statistics.

**University of Hyderabad**, Hyderabad, India — **July 2013 - July 2015**
*Masters in Information Technology* (**Gold Medalist)**

- Advisor: Dr. Vadlamani Ravi
- CGPA: **9 / 10**

**Brief Profile**

I am a final-year Ph.D. student in Computer Science at the University of Minnesota looking for full-time opportunities starting September 2023. I have worked for almost one year with the Amazon search science team and two years of industry experience as RD Researcher at Tata Innovation Labs, Hyderabad. My research interests are in the area of Machine Learning, Deep Learning, and spatiotemporal modeling.

**Employment**

**Graduate Research Assistant** — **Fall 2017 - Present**
**Mentors:** *Dr. Vipin Kumar, Dr. Ju Sun*
University of Minnesota, Twin Cities

- Extensive experience in developing and implementing advanced machine learning and deep learning algorithms, with a focus on neural networks, NLP, and computer vision. Expert at using data insights to create and improve predictive models. Skilled at managing large datasets, feature engineering, and applying a wide range of machine learning algorithms to solve complex problems.
- Engineered and implemented various state-of-the-art NLP models for relevant information extraction by applying latest advancements in transformers and other sequence models for temporal modeling in various language tasks. Proficient in troubleshooting and optimizing models to improve performance and accuracy.
- Spearheaded a key initiative in the DARPA World Modelers program, contributing to the development and deployment of state-of-the-art computer vision models in remote sensing technologies focusing particularly on image segmentation, object detection, and classification. I've developed advanced deep learning models for spatial modeling like CNNs and GANs for different imaging systems using open source libraries such as OpenCV, PIL and Pytorch.
- With a focus on Environmental Data Science, I also tackled key challenges in the areas of aquatic science and hydrology by devising better ML models to accurately capture spatiotemporal relationships and simultaneously handle various diverse forms of data, including those characterized by noise, uncertainty, and incompleteness.
- Proficient in Python, PyTorch, Keras, and other ML/DL libraries. Familiar with cloud platforms like AWS, Google Cloud, and Azure for scalable model deployment and handling of large data sets.
- Co-authored 10+ research papers in renowned scientific journals based on the findings from the machine learning models developed during my PhD tenure.

**Applied Scientist Intern** **Summer 2019, 2020, 2022**
**Mentors:** *Dr. Nikhil Rao, Dr. Shan Kang, Dr. Karthik Subbian*
Amazon Science, Palo Alto, California

- Leveraged expertise in natural language processing, information retrieval, and graph neural networks to develop sophisticated deep learning models. This resulted in a significant enhancement in tail query matching and ranking results, improving product relevancy for end-users.
- Contributed to the Amazon Advertisement platform by developing machine learning models for precise user demographic forecasting, increasing forecast accuracy significantly. This in turn optimized budget planning and allocation for third parties placing advertisements on Amazon and its subsidiaries.
- Published pioneering research on graph-based machine learning models for enhancing search result quality at internal Amazon Machine Learning Conference (AMLC).

**Research Scientist** **Aug 2015 - July 2017**
**Mentors:** *Dr. Naveen Sivadasan, Dr. Rajgopal Srinivasan*
Tata Innovation Labs, Hyderabad

- Developed efficient software tools for genomics big data analysis, improving data processing speed and reducing storage needs by 30%.
- Created a cutting-edge greedy approximation algorithm for haplotype pair reconstruction, which increased speed drastically due to its linear time and space complexity.
- Streamlined genomics data analysis process through developing graph alignment tools in C++, resulting in overall process efficiency.

## Selected Publications

1. **Kshitij Tayal**, Xiaowei Jia, Rahul Ghosh, Jared Willard, Jordan Read and Vipin Kumar. Unified Forward/Inverse Framework for Lake Temperature Modeling with Invertibility aware Integration of Static and Time-series data. Proceedings of the 2022 SIAM International Conference on Data Mining (SDM). 2022. Best Paper Award

2. Yolanda Gil et al. **Kshitij Tayal**, Vipin Kumar. Artificial Intelligence for Modeling Complex Systems: Taming the Complexity of Expert Models to Improve Decision Making. In ACM Transactions on Interactive Intelligent Systems, 2021.

3. **Kshitij Tayal**, Raunak Manekar, Zhong Zhuang, David Yang, Vipin Kumar, Felix Hofmann, and Ju Sun. Phase Retrieval using Single-Instance Deep Generative Prior. Proceedings of the OSA Imaging and Applied Optics Congress. 2021.

4. **Kshitij Tayal**, Rahul Ghosh, and Vipin Kumar. Model-agnostic Methods for Text Classification with Inherent Noise. Proceedings of the 28th International Conference on Computational Linguistics (COLING). 2020.

5. **Kshitij Tayal**, Nikhil Rao, Saurabh Agarwal, Xiaowei Jia, Karthik Subbian, and Vipin Kumar. Regularized Graph Convolutional Networks for Short Text Classification. In Proceedings of the 28th International Conference on Computational Linguistics (COLING). 2020.

6. **Kshitij Tayal**, Chieh-Hsin Lai, Raunak Manekar, Zhong Zhuang, Vipin Kumar, and Ju Sun. Unlocking inverse problems using deep learning: Breaking symmetries in phase retrieval. In NeurIPS Workshop on Deep Learning and Inverse Problems. 2020.

7. **Kshitij Tayal**, Chieh-Hsin Lai, Vipin Kumar, and Ju Sun. Inverse problems, Deep learning, and Symmetry Breaking. In ICML Workshop on ML Interpretability for Scientific Discovery. 2020.

8. Kavya, Vaddadi, **Kshitij Tayal**, Rajgopal Srinivasan, and Naveen Sivadasan. Sequence Alignment on Directed Graphs. Journal of Computational Biology (JCB). 2019

9. **Kshitij Tayal**, Nikhil Rao, Saurabh Agarwal, and Karthik Subbian. Short text classification using Graph Convolutional Network. In NIPS workshop on Graph Representation Learning. 2019.

10. **Kshitij Tayal** and Vadlamani Ravi. Fuzzy association rule mining using binary particle swarm optimization: Application to cyber fraud analytics. In IEEE International Conference on Computational Intelligence and Computing Research. 2015

11. **Kshitij Tayal** and Vadlamani Ravi. Particle swarm optimization trained class association rule mining: Application to phishing detection. In Proceedings of the International Conference on Informatics and Analytics. 2016.

12. Neeti Pokhriyal, **Kshitij Tayal**, Ifeoma Nwogu, and Venu Govindaraju. Cognitive-Biometric Recognition From Language Usage: A Feasibility Study. IEEE Transactions on Information Forensics and Security. 2016

## Honors & Awards

- **Best Paper Award - 2022** — Received Best Paper Award at the 2022 Society for Industrial and Applied Mathematics (SIAM) *International Conference on Data Mining*.
- **Best Poster Award - 2017** — Received Best Poster Award at the 21st Annual International Conference on *Research in Computational Molecular Biology*
- **Gold Medalist - 2015** — Received University Gold Medal for outstanding academic excellence during *M.tech Information Technology*
- **Travel Awards** NeurIPS 2019 and 2020, KDD 2020, ICML 2020.

## Services

- Reviewer: Transactions on Knowledge Discovery from Data.
- Reviewed Papers for Remote Sensing of Environment, ACM SIG Knowledge Discovery and Data Mining (KDD), IEEE International Conference on Data Mining (ICDM), International Joint Conference on Artificial Intelligence (IJCAI) and ACM Computing Surveys

## References

- Dr. Vipin Kumar
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- Dr. Ju Sun
  Department of Computer Science, University of Minnesota
  E-mail: jusun@umn.edu, Phone: 917-855-8091
- Dr. Rajgopal Srivasan
  Chief Scientist, Tata Innovation Labs
  E-mail: raj@atc.tcs.com