Abhilash Neog

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Research Interests

- Foundation Models • Time-Series Modeling • AI4Science • LLM Reasoning • Multimodal Models

Education

Virginia Tech   **Aug 2022 - Present**
Ph.D., Computer Science. Advisor: Anuj Karpatne. GPA: 4.0/4.0   Blacksburg, USA

Virginia Tech   **Aug 2022 - Dec 2024**
M.S., Computer Science. Advisor: Anuj Karpatne. GPA: 4.0/4.0   Blacksburg, USA

Birla Institute of Technology and Science (BITS), Pilani   **July 2016 – July 2020**
Bachelor of Engineering (B.E.), Computer Science, GPA: 8.08/10   Pilani, India

Research Experience

Virginia Tech | **Graduate Research Assistant**   **Jan 2023 – Present**

- Developed a robust **Time-series** modeling approach for handling partially observed data
- Working on effective knowledge-guided **LLM alignment** with continuous unbounded time-series data
- Developing a TS **Foundation Model** for aquatic sciences for 2D depth-wise forecasting, cross-frequency learning capturing time-invariant domain characteristics
- Built ML models with Modular Compositional Learning for Lake Hydrodynamics prediction
- Benchmarked zero-shot effectiveness & reasoning ability of SOTA Vision-Language Models (VLMs) like **GPT-4, LlaVa**

Industry Experience

ThinkSense Inc. | **Machine Learning Engineer Intern**   **May 2023 – Aug 2023**

- Developed an outlier detection model for denoising sensor-based Human Activity Recognition (HAR) **Time Series** data
- Built & deployed a CNN-based HAR model achieving 82% F-1 score on an android app using Keras & TensorFlow Lite

Oracle | **Data Scientist**   **Sep 2020 – July 2022**

- Built & deployed predictive applications (Demand Forecasting, AR Delay prediction) on the ETL pipeline, using Spark systems
- Designed and deployed a *Demand Prediction* application for **Time series** forecasting using the DeepAR model
- Developed an unsupervised classification algorithm (utilizing HuggingFace, FastText models, NLP techniques like NER, POS tagging) achieving 40% higher accuracy than then SOTA LLMs on a 71k-label dataset.

VMware | **Software Development Engineer Intern**   **Jan 2020 – June 2020**

- Streamlined the process of fetching & filtering raw data from Workspace ONE Cloud using Spring Boot REST APIs
- Contributed to an end-user federation app on Workspace ONE Cloud, and wrote unit tests using JUnit and Mockito

Samsung Research Institute | **Summer Intern**   **May 2019 – July 2019**

- Performed a feasibility study of Multi-frame Noise Reduction solutions' deployment in Live Focus for Low light conditions
- Optimized the existing HAL call flow, in C++, with considerable noise reduction in the first phase of live focus capture

Publications

1. KS Mehrab, M. Maruf, Arka Daw, **Abhilash Neog**, HB Manogaran, et al. "Fish-Vista: A Multi-Purpose Dataset for Understanding Identification of Traits from Images". *CVPR 2025*

2. **Abhilash Neog**, Arka Daw, Sepideh Fatemi, Anuj Karpatne. "Masking the Gaps: An Imputation-Free Approach to Time Series Modeling with Missing Data". *Time-Series in the Age of Large Models, NeurIPS 2024*

3. M. Maruf, Arka Daw, KS Mehrab, HB Manogaran, **Abhilash Neog**, M. Sawhney, et al. "VLM4Bio: A Benchmark Dataset to Evaluate Pretrained Vision-Language Models for Trait Discovery from Biological Images". *NeurIPS 2024*

4. Baviskar, A., Ramanathan, K., **Abhilash, N.**, Pawar, D. and Bangalore, K., Oracle International Corp, 2024. "Machine Learning Based Spend Classification." *U.S. Patent Application 17/903,161.*

5. R. Ladwig, A. Daw, E.A. Albright, C. Buelo, A. Karpatne, M.F. Meyer, **A. Neog**, P. C. Hanson, and H. A. Dugan. "Modular Compositional Learning Improves 1D Hydrodynamic Lake Model Performance by Merging Process-Based Modeling With Deep Learning." *Journal of Advances in Modeling Earth Systems (JAMES) 16, no. 1 (2024)*

6. Lavika Goel, **Abhilash Neog**, Ashish Aman, and Arshveer Kaur. "Hybrid Nature-Inspired Optimization Techniques in Face Recognition." *Transactions on Computational Science XXXVI, Springer LNCS, 2020.*

Selected Projects

Can Large Vision Language Models Ground Fine-grained Attribute? ⬀PDF   **Aug '24 – Dec '24**
- Developed a novel dual-scale attention framework for fine-grained attribute localization in Large Vision-Language Models (LLaVa), incorporating entropy-based head selection, maximally connected component filtering, and hierarchical constraints

Evaluating Model Reasoning & Hallucinations in Medical LLMs ⬀Code ⬀PDF   **Jan '24 – April '24**
- Analyzed and evaluated factual error propagation in open-source medical LLMs such as BioMistral, Asclepius, Alpacare, and PMC-LLaMA to identify variations in their efficacy and ensure reliable information dissemination in medical settings.

Convergence analysis of PINN for solving inverse PDEs ⬀Code ⬀PDF   **Aug '23 – Dec '23**
- Performed adaptive weighing of physics-based and data-driven loss terms in Physics-informed Neural Networks
- Achieved 50% average error reduction in PDE (Partial Differential Eq.) parameter estimation of Burgers & Allen-Cahn eq.

Mathematical Reasoning in Large Language Models (LLMs) ⬀Code ⬀PDF   **Aug '23 – Dec '23**
- Worked on the problem of numerical headline generation and numeral masked-fill as part of NumEval @ SemEval 2024
- Adapted Llama, T5, BART & RoBERTa models by Direct Fine-tuning & Prompt tuning for the respective tasks

Text Summarization of Electronic Theses and Dissertations (ETD) ⬀PDF   **Sept '22 – Dec '22**
- Developed a text summarization pipeline, integrating both Transformer-based abstractive algorithms (pre-trained Pegasus & RoBERTa) and traditional extractive algorithms like TextRank, LexRank & LSA, within an ETD Info. Retrieval system

Technical Skills

Languages: Python, Java, C++, SQL, R
Frameworks: PyTorch, Tensorflow Keras, Git, Spark

Miscellaneous

- ICLR 2025 Workshop Reviewer
- Received NSF NAIRR (National AI Research Resource) Pilot Award, 2024
- Gave a talk on Transfer Learning in Lake Ecosystems at "NSF Macrosystems Biology Meeting", 2024.
- Gave a Lightning Talk at the "Frontiers in Ecological Forecasting" event at Virginia Tech, 2023.
- Awarded "Star of the Month (Dec 2021)" within the Oracle Analytics Cloud Organization, Oracle India