Naren Sivakumar

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Education

University of Maryland, Baltimore County **May 2025 - May 2030 (expected)**
Doctor of Philosophy, Computer Science *Baltimore, Maryland*

University of Maryland, Baltimore County **May 2023 - May 2025 (expected)**
Master of Science, Computer Science *Baltimore, Maryland*

Sri Sivasubramaniya Nadar College of Engineering **August 2019 - May 2023**
Bachelor of Engineering in Computer Science *Chennai, India*

Technical Skills

Languages: Python, C++, C, Java, Rust, SQL, Javascript, Golang
Developer Tools: VS Code, Jupyter Notebooks, JetBrains, Anaconda, Android Studio, Expo
Technologies/Frameworks: PyTorch, Tensorflow, Flask, Linux, Git, MongoDB, Kubernetes, Docker, AWS

Publications

[1] **Sivakumar, N.**, Chen, L. K., Papasani, P., Majmundar, V., Feng, J. H., Yarnall, L., Gong, J. (2024). Show and Tell: Exploring Large Language Model's Potential in Formative Educational Assessment of Data Stories. *IEEE Gen4DS*.
[2] Pravinkrishnan, K., **Sivakumar, N.**, Jebaraj, A., Padma, C. P., Sridhar, S., Balasundaram, P., Kalinathan, L. (2022). Classification of Plant Species Using AlexNet Architecture. *CLEF Working Notes 2087–2093.*

Research Experience

Graduate Research Assistant **January 2024 - Present**
UMBC *Baltimore, Maryland*

- Developed a predictive model for conflict resolution using Monte Carlo Tree Search and Large Language Models, using country data, governmental structures, and rule systems to mirror real-world scenarios closely.
- Integrated sentiment analysis and web scraping tools to enhance data collection, improving model reliability and accuracy.
- Designed and implemented a framework pitting LLMs against MCTS algorithms to simulate scenarios, achieving 70% accuracy by mapping results to real-world events.
- Designed an adaptable AI-driven framework with broad applications across various real-world scenarios, enabling decision-making and counterfactual thinking across multiple verticals.

Graduate Research Assistant **May 2024-December 2024**
UMBC *Baltimore, Maryland*

- Designed and deployed ML models to evaluate large language models (LLMs) for data storytelling.
- Led research efforts to gauge performance of traditional ML techniques with LLMs for data story coherence.
- Developed end-to-end ML pipelines using Python and PyTorch, reducing experimentation time by 30%.
- Conducted A/B tests on over 20 combinations of 30+ data samples, leading to a 15% improvement in model performance.
- Studied various prompting techniques to further improve outputs during inference time.

Industry Experience

Software Development Intern **Aug 2022 - Dec 2022**
IBM *Chennai, India*

- Developed and deployed an AI-powered calorie tracking web application using Flask, MongoDB, Kubernetes, and Docker.
- Was a part of engineers in an agile environment, ensuring sprint deadlines were met and documentation was maintained.
- Optimized user experience, increasing interaction by 20% and retention by 50% through improved UI and quality-of-life features.
- Implemented and fine-tuned machine learning models, increasing food recognition accuracy by 25%.
- Deployed the application to 100+ users, handling 50+ daily queries.

Projects

AutoMate – Navigate your phone easily | *Python* | *Github* **January 24-26, 2025**

- Leveraged the power of LLMs to easily navigate mobile phone interfaces.
- Developed an app in React Native and integrated LLMs designed for mobile use to create a smooth unhindered experience. Reconciled issues with Javascript/Python meshing through APIs.
- When provided with a plain English command, the LLM would navigate the phone automatically and perform tasks for the user.
- Received a special mention at HoyaHax 2025 for our efforts.

Towards Truthful (and Honest) Language Models | *Python* | *Github* **Oct - Nov 2024**

- Developed novel benchmarks for Llama 3.2 3B and Gemma2-2B to evaluate fact-checking capabilities.
- Attempted to improve information retrieval and quality of answers by applying pre-training and post-training techniques to improve fact-checking.
- Applied various NLP methodologies to enhance model reliability, improving answering and retrieval accuracy from 0% to 40% on datasets like SimpleQA and TruthfulQA.
- Compiled findings into a research paper currently pending publication.

Data Story Metric Comparison | *Python* | *Github* **Aug - Nov 2024**

- Collaborated with the University of Alabama to address the lack of data coherence standards for LLMs.
- Worked in a team of postdocs to create data story coherence standards from existing story coherence metrics.
- Studied metrics like Kendall's Tau and Log Probability to establish baselines and explore possible inter-dependencies.
- Created robust gold standard datasets by scraping the web for data stories and evaluating them in a reusable pipeline.

Valkyrie: Voice Activated Keypresses | *Python* | *Github* **Sep 28 – 29, 2024**

- Developed an innovative system to assist individuals with difficulties in performing timely keypresses in fast-paced scenarios, such as gaming or work, by leveraging GPT-4o to automate the key-mapping process.
- Addressed limitations of existing voice-activated controls, which often require exact key identification or manual mapping. Implemented a system where voice commands and application frame grabs are processed by an LLM to execute the necessary keypresses. Improved performance by up to 20% by fine-tuning voice models
- Awarded "Best First Hack" for our efforts.

Automatic Polar Annotation Approaches | *Python* | *Github* **Oct - Nov 2023**

- Studied automatic evaluation for auto annotation of polar ice sheets as part of the iHARP project.
- Developed and optimized ML models for Radar and LiDAR data (XGBoost, Neural Networks, SVM) for automated annotation of polar ice sheets.
- Improved model performance by 15%, increasing automatic annotation accuracy from 10% to 40% through advanced data augmentation techniques.
- Published findings as part of a master's thesis, setting baselines for future research in automatic annotation.

Analysis of Large Language Models' Storytelling Capabilities | *Python* | *Github* **Oct - Nov 2023**

- Conducted a small-scale analysis of LLMs to evaluate and assess their storytelling capabilities.
- Acquired knowledge of assessment metrics to accurately evaluate narratives used for assessing the comprehensive capabilities of humans and LLMs.
- Synthesized three complex stories using prompt engineering and tested LLM understanding using the same stories across different channels.
- Analyzed the capabilities of LLMs in object tracking, character tracking, and visual scene changes by evaluating their performance across three complex and confusing stories.
- Used chain-of-thought and prompting techniques to improve LLM performance by upto 30% on character tracking.

White Papers & Technical Reports

- **Sivakumar, N.** (2024). *Lifelong and Continual Learning – A Survey.* University of Maryland, Baltimore County. A survey of state-of-the-art continual learning approaches and challenges, with a focus on Class, Domain and . [PDF]
- **Sivakumar, N.** (2024). *Machine Unlearning and Model Editing.* University of Maryland, Baltimore County. Explores privacy-preserving ML methods and survey of algorithms enabling selective data forgetting under GDPR-like mandates.
  [PDF]