Shashank Kirtania

Research Fellow, PROSE Team
Microsoft

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Education

Thapar Institute of Engineering and Technology 2019 - 2023
Bachelors of Engineering in Computer Engineering *3.24/4*

Experience

Microsoft Research, Inida Sep. 2023 – Present
Research Fellow (Predoctoral) with the PROSE group *Remote / Bengaluru*
Projects: StackFeed, MetaReflection, Logic-LM++

Wadhwani AI Jan. 2023 - July 2023
Machine Learning Research Intern *Remote / Bengaluru*
Project: Oral Reading Fluency for Indic languages

Google Summer of Code, PyMC May 2022 - Sep 2022
Open Source Contributor *Remote*
Project: APIs for probabilistic models.

Indian Institute of Information Technology June 2021 - May 2022
Research Intern *Remote*
Project: Classification of images using DWT coefficients

Publications And Preprints

* = Equal Contribution

- ***Activation Steering in Neural Theorem Provers***
  Shashank Kirtania
  Under Review **[preprint]**

- ***STACKFEED: Structured Textual Actor-Critic Knowledge Base Editing with Feedback***
  Shashank Kirtania*, Naman Gupta*, Priyanshu Gupta, Krishna Kariya, Sumit Gulwani, Arun Iyer, Suresh Parthasarathy, Arjun Radhakrishna, Sriram K. Rajamani, Gustavo Soares
  Under review **[preprint]**

- ***MetaReflection: Learning Instructions for Language Agents using Past Self-Reflections***
  Shashank Kirtania*, Priyanshu Gupta*, Ananya Singha*, Sumit Gulwani, Arjun Radhakrishna, Sherry Shi, Gustavo Soares.
  The 2024 Conference on Empirical Methods in Natural Language Processing **[EMNLP'24]**

- ***Logic-LM++: Multi-Step Refinement for Symbolic Formulations***
  Shashank Kirtania, Priyanshu Gupta, Arjun Radhakrishna.
  NL Reasoning and Structured Reasoning Workshop at ACL **[NLRSE@ACL'24]**

- ***DWT-CompCNN: Deep Image Classification Network for High-Throughput JPEG2000 Compressed Documents.***
  Tejasvee Bisen, M Javed, **Shashank Kirtania**, P Nagabhushan.
  Pattern Analysis and Applications Journal **[Springer 2023]**

Selected Projects And Collaborations

Repository Level Code Repair Nov. 2024 - Present
Advisor: Dr. Yufan Huang, Dr. Gustavo Soares *MSR Redmond*

- Working on Java version migration at repository level, Using agents to understand build errors while migrating with OpenRewrite to do reliable edits.

External Knowledge Editing with Compiler Feedback Apr. 2024 - Oct. 2024
Advisor: Dr. Arun Iyer, Dr. Arjun Radhakrishna *MSR India*

- Worked on agent based state search approach modeled as Markov Decision Process (MDP) for knowledge editing.
- Worked on automated editing of code-documentations converting it to knowledge base for code generation.
- Built pipeline to use compiler feedback to generate edits in knowledge bases for code migration and generation.

Feedback Driven LLM Agents Sep. 2023 - May 2024

Advisor: Dr. Gustavo Soares, Dr. Sumit Gulwani *Microsoft PROSE*

- Built pipeline for using LLMs as psuedo-domain experts that learn from failures to detect code vulnerability.
- Employed novel strategy of automatic instruction learning to optimize performance of LLM agents trajectories.
- Used this technique to improve performance of smaller LLMs in code & ReAct pipelines.
- Worked on repairing symbolic formulations to align with natural language intent through multi-step refinement.

Repo Level Code Repair Jan. 2024 - June 2024

Advisor: Dr. Gustavo Soares, Dr. Arjun Radhakrishna *Microsoft PROSE*

- Worked on fixing component governance issues from the alerts for C# using tool aided LLM system. Used roslyn based tools to improve code understanding for LLMs to manage large code bases.
- Working on automatic bug reproduction for Github issues in repositories to improve bug localization.
- Using multi-agent based state search approach to make continual edits in a knowledge base in code repair RAG pipeline to improve performance of native LLMs.

Phonetically Aware Word Recommendation Jan. 2023 - Mar. 2023

Advisor: Dr. Soma Dhavala *Wadhwani AI, blog*

- Curated dataset for English and Gujarati for students from grade 2 to grade 10 for phonetic assessment.
- Created RICE translation Scheme for Gujarati to breakdown words phonetically at unicode level.
- Trained encoder to cluster words using unicodes for English & Gujarati for phonetic similarity across languages.

Contactless Biometric Verification Jan. 2022 - Dec. 2022

Advisors: Prof. Shalini Batra, Prof. Prashant Rana *Undergraduate Capstone*

- Created custom filters in image processing pipeline for image refinement for fingerprints maintaining quality.
- Worked on remote fingerprint verification systems that uses specialised encoder model to breakdown fingerprint photos and fingerprint scans to a shared embedding space for biometric verification.
- Trained U-net styled architecture to create dense embedding, achieved an EER of 4.7% competitive to other deep learning methods for fingerprint verification.

Classification of Images in Semi-compressed domain June 2021 - May 2022

Advisors: Dr. Mohammad Javed *IIIT*

- Implemented Hight-Throughput JPEG2000 compression algorithm in MATLAB to compress document images.
- Used DWT coefficients with different bands for classifying semi-compressed images with getting 94.3% accuracy.
- Implemented and benchmarked state of the art CNNs for semi-compressed image classification on curated dataset.

Autofill for data manipulation Aug 2023

Julia, Programming by Example *github*

- Implemented PBE based approach same as FlashFill, to generate programs from input-output examples in Julia.
- Developed directed acyclic graphs with iterative intersection and unification functions for data process optimization.

Technical Skills

Languages: Python, C++, Shell, MATLAB, Julia, C#, Rust* * = Elementary Proficiency
Software and Tools: PyTorch, AutoGen, Langchain, TreeSitter, Fairseq*, Flask, Git, Docker, Postman

Achievements and Position of Responsibilities

- Student Volunteer at ACM SIGPLAN Programming Languages Design and Implementation 2024.
- Positioned **6th nationally among 5000 + teams** in Amazon Machine Learning challenge 2023.
- **Bronze Medal** in American Express Time Series Forecasting Challenge 2022.
- TIET CCS highlight talk on "Speech Processing using Deep Learning".
- PyData Delhi talk on "Introduction to Probabilistic Programming".
- **Top 5 percentile** in Facebook Hackercup 2020 Qualifiers