

# Ajay Krishna Vajjala

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## EDUCATION

- **PhD in Computer Science** Aug 2021 - Present  
*George Mason University - Advised by Dr. David S. Rosenblum* Fairfax, VA
- **B.S. & M.S. in Computer Science** Aug 2017 - Dec 2021  
*George Mason University* Fairfax, VA

## RESEARCH INTERESTS

- I am broadly interested in machine learning, data mining, and information retrieval, with an emphasis on transfer learning for recommender systems, such as cross-domain recommendation, to provide relevant and personalized recommendations for users.

## PUBLICATIONS

- **A. Krishna Vajjala**, D. Meher, S. Pothagoni, Z. Zhu, and D. Rosenblum. "Vitoris-Rips Complex: A New Direction for Cross-Domain Cold-Start Recommendation." In Proceedings of the *SIAM International Conference on Data Mining (SDM 2024)*, Houston, TX, U.S. 18th-20th April, 2024. (29.2% acceptance rate).
- **A. Krishna Vajjala**, Ar. Krishna Vajjala, Z. Zhu, and D. Rosenblum. "Analyzing the Impact of Domain Similarity: A New Perspective in Cross-Domain Recommendation." (**In Review**)

## RESEARCH EXPERIENCE

- **Graduate Research Assistant** May 2022 - Present  
*George Mason University* Fairfax, VA
  - (**Research Project**) **Large Language Models (LLM) for Transfer Learning in Recommender Systems**
    - \* Introduced zero-shot and few-shot prompting methods tailored for LLMs to optimize cross-domain recommendation.
    - \* Employed GPT-3.5 and GPT-4, and fine-tuned open-source models such as LLaMA-2 across 7B, 13B, and 70B parameters to evaluate their cross-domain recommendation performance using parameter-efficient fine-tuning (PEFT) methods.
    - \* Used QLoRA for fine-tuning LLMs on dual-domain data to enhance cross-domain recommendation capabilities.
  - (**Research Project**) **Vitoris-Rips Complex for Cross-Domain Cold-Start Recommendation**
    - \* Leveraged the Rips Complex, from computational geometry, and deep learning to transfer user preferences across domains, resulting in new user profiles for personalized recommendations.
    - \* Achieved a performance increase of over 20% in extreme cold-start scenarios, surpassing leading methods.
    - \* Employed 5-fold cross-validation for hyper-parameter tuning to improve model performance on unseen data.
    - \* Utilized Python and Tensorflow for algorithm development, executing computations on the Nvidia A100 GPU.
  - (**Research Project**) **Domain Similarity for Cross-Domain Recommender Systems**
    - \* Used Python, GloVe pre-trained embeddings, and BERT from NLP to develop domain similarity metrics.
    - \* Developed baseline cross-domain recommendation algorithms using the open-source Recbole-CDR library and conducted a comprehensive evaluation across 18 domain combinations with three leading cross-domain algorithms.
    - \* Findings indicated recommendation performance wasn't significantly affected by domain combinations, using a paired t-test.
- **NSF National Research Trainee Fellow** May 2021 - May 2022  
*George Mason University - Center of Adaptive Systems of Brain and Body Interaction* Fairfax, VA
  - (**Research Project**) **Reentry and Corrections**
    - \* Led an interdisciplinary team to develop a web application for incarcerated individuals to access reentry services information.
    - \* Managed web application development with React (front-end), Node/Express (back-end), and MySQL (database).
    - \* Initiated and led pivotal partnership discussions with both the Director of DC Jail and the Vice President of American Prison Data Systems (APDS). This collaboration aims to trial the app on APDS tablets, with a planned 2024 launch.

## PERSONAL PROJECTS

- **GitChat**
  - Developed a GPT-4 powered tool letting developers ask questions and query their GitHub repository for code insights.
  - Built using Python, and integrated the OpenAI API, DeepLake Vector Store, and Langchain for enhanced querying.
  - Offered developers a user-friendly command line tool to easily ask, understand, and clarify doubts directly within their codebase.
- **Amazon User Review Sentiment Analysis**
  - Leveraged BERT pre-trained embeddings, a transformer-based NLP technique, to fetch embeddings for product reviews.
  - Represented each review as an average of its word embeddings and used K-Nearest Neighbors (KNN) to predict sentiment.
  - Achieved 80% accuracy in predicting sentiment of product reviews using the BERT and KNN approach.

## SKILLS SUMMARY

- **Languages:** Python, Java, PySpark, React, Node, Express, SQL
- **Tools:** Tensorflow, Scikit-Learn, RecBole, GIT