Harsh Deshpande

B.E in Computer Science

Birla Institute of Technology and Science, Pilani, Pilani campus

2021A7PS2225P B.E. CS

Examination	University	Institute	Year	Major	CGPA/%
Graduation	BITS Pilani	BITS Pilani	10/2021-05/2025	Computer Science	8.77/10

PORTFOLIO

Portfolio site: https://harshsdeshpande.github.io/

PUBLICATIONS

1. CultureShift: Mapping Temporal Cultural Evolution in Vision-Language Models [PDF] Gautam Jajoo, Harsh Deshpande, Hamna, Pranjal A Chitale VLMs-4-All Workshop, Conference on Computer Vision and Pattern Recognition (CVPR '25)

RESEARCH PROJECTS

- Multimodal Learning for Knowledge Based Visual Question Answering (Guide: Prof. Poonam Goyal)
 - Tasked with implementing the architecture which was based on the REVIVE model (Regional Visual Representation Matters in Knowledge Based Visual Question Answering)
 - Found the results on a self-curated OK-VQA like dataset which was pertinent to advertisements. Assisted in obtaining the results for the paper to be published and comparing them with other SOTA models
 - Learnt about Regional Visual Representations and Multimodal Learning in general. Specifically spent time learning about GLIP, CLIP as well as various Image Captioning models. Studied the REVIVE, KAT and PiCA architectures.
 - Created a Thermal Image Dataset for Concealed Weapon Detection.
 - Developed strong implementation skills in PyTorch.

Contrastive Learning Methods on Point Cloud Data

(Guide: Prof. Vinay Chamola)

- Studied various self-supervised methods including Contrastive learning techniques such as SimCLR, SimCLR v2, as well as other representation learning methods such as BYOL for the use case of object detection by UAVs using 3D LIDAR data in low-light conditions
- Applied SimCLRv2 with a DynamicEdgeConv model on the standard ShapeNet Point Cloud Dataset

WORK EXPERIENCE & INTERNSHIPS

- Intern | Capital One
 - Intern in the Customer Solutions Team. Working with the **Data Pipeline** as well as internal models for sentiment analysis of customer complaints.
 - Gained exposure to MLOps.
 - Tech stack: Python, Snowflake

• Summer Intern | Eightfold.ai

- Intern in the **Data Platform Team**. Worked on File Ingestion as part of a summer internship
- Developed and implemented an end-to-end ingestion solution for specific entities in the database schema. Generated detail reports in the parsing of the files, ensuring comprehensive data analysis. Developed and executed unit tests to validate the ingestion and transformation process.
- Assisted in creating the file ingestion page, implementing front-end changes as well. Added debugging tools to the same page which enhanced real-time error detection and troubleshooting.
- Refactored code and deprecated fields, improving maintainability and performance. Conducted configuration migrations for notification settings to support new ingestion workflows and system updates
- Gained exposure to MLOps
- Tech stack: Python, React, Flask, AWS S3

TECHNICAL SKILLS

- Programming Languages: C, C++, Java, Python, Prolog, JavaScript
- Frameworks & Tools: Proficient: PyTorch Familiar: TensorFlow, CUDA, Pandas, JAX

RELEVANT COURSEWORK

- Computer Science Natural Language Processing, Artificial Intelligence, Operating Systems, Discrete Structures for Computer Science, Data Structures and Algorithms, Logic in Computer Science, Theory of Computation, Design and Analysis of Algorithms, Computer Architecture
- Mathematics Graph Theory, Game Theory, Multivariate Calculus, Probability and Statistics, Linear Algebra and Complex Analysis

(*May*'23-Jul'23)

(Jan'24-Dec'24)

(Jan'25-Present)

(May'24-Jul'24)

RELEVANT COURSE PROJECTS

• Automated Pipeline to Generate Posters for Welfare Schemes,

(Natural Language Processing Course Project) Code

• Designed and implemented a pipeline to generate posters for a welfare scheme given a thorough description of the welfare scheme.

(Sep'24-Nov'24)

- Implemented the PRISM method within the pipeline as introduced in the paper He, Y., Robey, A., Murata, N., Jiang, Y., Williams, J., Pappas, G. J., Hassani, H., Mitsufuji, Y., Salakhutdinov, R., & Kolter, J. Z. (2024). Automated black-box prompt engineering for personalized text-to-image generation.
- The pipeline consisted the following stages: (a) Generation of topic-specific write-ups given the description of the welfare scheme, (b) Generation of character context to ensure consistency of characters between posters of the same welfare scheme, (c) PRISM method to enhance the image generation prompt.
- Ensured that the entire pipeline was **interpretable** and helpful for a human-in-the loop to **mitigate bias** in the generated posters. This was done by generating interpretable logs and character contexts which could be read by a human in the loop. Any bias could be eliminated on the basis of this.
- Observed an increase in CLIP score from **0.626 to 0.677** post integrating the PRISM method to the pipeline.
- Novel Accuracy Metrics for Object Detection Models, (Artificial Intelligence Course Project) Code (Feb'23-Mar'23)
 - As part of the Artificial Intelligence (CS F407) Course, modified existing metrics and came up with 3 accuracy metrics for specific use cases namely: Biased Accuracy, Weighted CPDI, and Directional Weighted Accuracy
 - Applied Techniques such as **Gaussian Kernel Density Estimation** and studied various other accuracy metrics such as **Cohen's Kappa, Matthews Correlation Cofficient** and others.

• Compiler for a Toy Language, (Compiler Construction Course Project) Code (Apr'24-May'24)

- Implemented the front-end of a compiler, from scratch using only C, which supports static arrays, arithmetic and boolean operations, block scoping, input/output statements, and declarative, conditional, iterative and function call statements.
- Includes a DFA based lexer and a top-down LL(1) predictive parser with panic mode error recovery
- Applied techniques from Finite Automata Theory and learnt about Lexical Analysis, Syntax Analysis, Panic Error Mode Recovery, and Programming Language Theory in general.
- Hilbert R Tree Implementation, (Data Structures and Algorithms Course Project) Code (Apr'23-May'23)
 - C Implementation of the Hilbert R Tree Data Structure:Designed an efficient implementation of the Hilbert R Tree, a spatial access method that improves upon the standard R-Tree by using Hilbert space-filling curves to better preserve spatial locality.
 - Applied techniques from **Spatial Data Indexing, Hilbert Space-Filling Curves** and learnt about **R-Tree Data Structures and Query Optimization for organizing spatial data using Minimum Bounding Rectangles**. Spent time learning about other R-Tree variants, specifically **R+-Trees**, **X-Trees and STR trees**.

ACADEMIC ACHIEVEMENTS

 Kishore Vaigyanik Protsahan Yojana (SA) Fellow Issued by IISc Bangalore All India Rank 623 	(2019)
 Kishore Vaigyanik Protsahan Yojana (SX) Fellow Issued by IISc Bangalore All India Rank 1680 	(2020)

TEACHING ASSISTANT POSITIONS

• Teaching Assistant for the course, CSF222 : Discrete Structures for Computer Science,

Led weekly tutorial sessions to reinforce and elaborate on the topics covered in the lectures. Facilitated group discussions and collaborative problem. Designed and prepared comprehensive tutorial sheets that aligned with the course curriculum. (*Aug'23-Dec'23*)

• Teaching Assistant for the course, CSF301 : Principles of Programming Languages

Currently working with Prof. Dhruv Kumar to create bots to assist on instructing as well as evaluating students in the Principles of Programming Languages course. We are working towards understanding the impact as well as limitations of LLMs in assisting the students' process of learning in the course. (*Aug'24-Dec'24*)