# Darpan Aswal

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## Academic Qualifications

**Indian Institute of Technology, Kharagpur**                                     **2020 - 2024**
Bachelor Of Technology (Hons.), Electronics and Electrical Communication Engineering          CGPA: 8.00/10.0

**Eklavya International Academy, Jaipur**                                          **2017 - 2019**
All India Senior School Certificate Exam, CBSE                                     Percentage: 80.6%

**St. Xavier's Sr. Sec. School, Jaipur**                                          **2007 - 2017**
All India Senior Secondary Exam, CBSE                                              CGPA: 8.8/10

## Research Experience and Projects

**Red Teaming Large Language Models** (Prof. Animesh Mukherjee)
**Objective:** *Identifying Security flaws and exploits in LLMs to strengthen robustness & reliability*          *Nov '23 - Present*
- Simulating **Adversarial Attacks** to evaluate resilience of **Commercial LLMs** against generation of hateful content
- Utilizing **Prompting** & **Supervised Learning** strategies to generate potentially harmful outputs from target LLMs
- Researching test case generation methods to develop **Safety Interventions for LLMs** from exposing sensitive data

**Hierarchical Representation Learning** (Dr. Manjira Sinha, Bachelor's Thesis Project)
**Objective:** *Adopting established Deep Learning techniques to Non-Euclidean Data*          *Mar '23 - Present*
- Developing mathematical tools that leverage the underlying Low Dimensional structure in High Dimensional data
- Utilizing **Group Theory** to construct symmetry groups that integrate deformations of signals and their domains
- Researching **Riemannian Graph Embedding** models for efficient learning of the **Hierarchical structure** in trees
- Improving Embedding models using **Dependency Graphs** to learn **local syntactic relationships** at sentence level

**Debiasing Algorithms for Multi-Modal Models** (Prof. Niloy Ganguly, Term Project, AI and Ethics)
**Objective:** *Evaluating and Optimizing Debiasing techniques to enhance Model Fairness*          *Jan '24 - Present*
- Comprehensive survey on Transparency in models and **XAI**, analyzing ethical and risk factors in deploying AI models
- Experimenting with **In-processing Bias Mitigating Loss functions** for Stereotype Detection in LLMs and VLMs
- Investigating reproducibility of **Prompting-based** and **RL** guided frameworks across open-source models & datasets

**Computer Vision Aided Classroom Monitoring System** (Prof. Subhadip Mukherjee, Design Laboratory)
**Objective:** *Automated Classroom Monitoring using Multi-Task Cascaded CNNs*          *Jan '24 - Present*
- Developing a robust facial recognition pipeline using **Google's FaceNet** embeddings for efficiency under low resources
- Synchronizing multiple **ESP32 CAM** modules to enhance attendance accuracy with sequential calls to pipeline API
- Seamless integration with institute portals to re-train embeddings classifier for quick adaptation to any classroom

**Retrieval Augmented Generation using LLMs**
**Objective:** *Personalized QnA Chatbot for Pdf documents with Google-Flan-T5-XXL*          *Sept '23 - Oct '23*
- Loaded and split the pdf documents into **1000-sized** queryable chunks using HuggingFace Instructor Embeddings
- Created vector database using **ChromaDb** to run similarity-search queries on the embeddings for Question-Answering
- Quantized the **Google-Flan-T5-XXL** model into **4-bits** using BitsandBytes and loaded into a Langchain pipeline

**Multi GPU Training with PyTorch Lightning**
**Objective:** *Adopting best practices in MLOps to train Deep Learning workflows on cloud*          *Feb '22 - Mar '22*
- Built and trained a CNN model, extracting model parameters from **YAML** files for **configurability** via **CLI**
- Trained the PyTorch-Lightning model on **AWS cloud** with up to **4 GPUs** using **DDP training** and GPU accelerator
- Performed model logging using MLOps platform **Weights and Biases** to version data and track experiment metrics

# Internships and Industrial Training

**JPMorgan Chase & Co.** (Software Engineering Intern)
**Objective:** *Automated Records Management System for seamless Sqoop, Archival and Purge*          *May '23 - Jul '23*
- Configured **Post-Trade Data Sqoop** in Postgres via **RestAPI** for AWS migration of Records Management System
- Constructed the Relational Database to Post, Fetch and Update Sqoop configurations using JDBC RowMapper
- Automated Sqoop and Archival runs with **Airflow DAGs** fetching data configurations from Postgres database

**Amazon ML Summer School**                                                                                          *Jul '22*
- Selected among top candidates nationwide for a workshop in Causal Inference, PGMs, Dimensionality Reduction, etc.

# Technical Skills

**Programming Languages and Tools:** Python, Java, C, C++, Kubernetes, PostgreSQL, JDBC, RestAPI
**ML Libraries:** Pandas, NumPy, Matplotlib, Scikit-Learn, TensorFlow, Keras, TorchVision, PyTorch, PyTorch Lightning

# Relevant Coursework

- **Core/Specialization Courses:**
  Deep Learning, Pattern Recognition and Machine Intelligence, Reinforcement Learning, Foundations of Learning Theory,
  Computer Architecture, Probability and Statistics, Linear Algebra, Network Theory, Programming and Data Structures
- **Computer Science/AI Courses:**
  Natural Language Processing, AI and Ethics, Machine Learning Foundations and Applications, Algorithms 1
- **Massive Online Open Courseware:**
  Machine Learning Specialization, ML in Production (MLOps), Linear Algebra for Data Science (deeplearning.ai),
  CS224n, Introduction to Statistics (Stanford), Generative AI with LLMs, Deep Learning (Nptel), Python for Data Science

# Positions of Responsibility

**Governor, Eastern Technology Music Society, IIT Kharagpur**                                      *Apr '23 - Apr '24*
- Coordinated multiple live productions with an average footfall of **900** students, managing a budget of **INR 1.5 lakhs**
- Organized the Introductory Seminar and Auditions for ETMS, with **100+** in attendance and **60+** auditionees
- Trained **10+** novice musicians through **5+** workshops and daily practices on hand-picked playlists of **25+** songs

**Vice Captain, Music Cup, Radhakrishnan Hall of Residence, IIT Kharagpur**                        *Mar '22 - Apr '23*
- Mentored musicians in RK Hall for TSG events and achieved overall **Gold** in Music-Cup, So-Cult 2023, IIT Kharagpur

**Team Leader, Outgoing Global Volunteer, AIESEC in IIT Kharagpur**                                *Jan '21 - Jan '22*
- Organized diverse events, hosted **International Guests**, and led team audits for AIESEC India's national entity

# Extra-Curricular Activities

- Secured **gold medal** between **20+** IITs as a multi-instrumentalist in Music Cup, Inter IIT Cultural Meet 5.0 and 6.0
- Secured **gold medal** as a multi-instrumentalist in Music Cup, So-Cult GC 2023 organised by TSG, IIT Kharagpur
- Secured **silver medal** as a vocalist in Open IIT, Western Vocals Competition 2022 organised by TSG, IIT Kharagpur
- Secured **silver medal** as a guitarist in Inter-Hall Music (Band) Championship 2022 organised by TSG, IIT Kharagpur
- Participated in **7 music productions** as part of Western and Eastern Technology Music Societies as a guitarist