Ravi Ghadia

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EDUCATION

Indian Institute of Technology, Kharagpur | West Bengal | India — Jul, '17 – Jun, '21

Bachelor of Technology in Electronics and Electrical Comm. Engg | GPA: 9.35/10

Coursework: Probability and Stochastic Processes, Advanced Calculus, Machine Learning, Linear Algebra for ML, Natural Language Processing, Algorithms in C/C++, Information Retrieval, Machine Intelligence and Expert Systems, Accelerated Data Science, Computer Architecture and OS

B.Tech Thesis: ***Training Generative Dialog Models using Reinforcement Learning with Learned Reward Systems***

Advisor: Prof. Pawan Goyal, Department of Computer Science and Engg., IIT Kharagpur

EXPERIENCE

GPU Power Architect | NVIDIA | Bangalore — Jul,'21 - Present

- Responsible for analyzing and modelling power and performance for different GPU workloads by building **Stochastic Models**
- Python Developer responsible for the development, maintenance and updating the **LWPE**, company's in-house **power estimation tool**
- Worked on **DLSS power and performance** for different DLSS versions and identified scopes of improving the GPU/Software Architecture
- Applied Research: Solving major bottlenecking components in the current flow using unsupervised ML for scalability and efficiency

Certified Instructor | NVIDIA Deep Learning Institute — Mar,'22 - Present

- Instructor for courses on **Fundamentals of Deep Learning** and **Building Transformer based Natural Language Processing applications**
- Responsible for instructing courses during AI workshops as well as assist other instructors during their workshops as a teaching assistant

Research Assistant | H2 Lab | University of Washington — Oct,'22 - Present

Training Language Models with Human Feedback using Reinforcement Learning

- Devising a reward function to translate human feedback to a scalar reward, while preserving the relevant information from the feedback

INTERNSHIPS

GPU Power Intern | NVIDIA | Bangalore — Apr,'20 – July,'20

- Worked as a GPU Power Architect, to analyze the power consumption of a GPU chip with respect to different application and optimize it
- Used **Reinforcement Learning** to solve the Combinatorial Optimization of the discrete GPU state parameters to achieve the best config
- Maximized GPU performance at given power budget by finding the most optimal configuration of the given GPU chip family/application

AI Developer | Karomi Technology Pvt. Ltd. | Chennai — May,'19 – July,'19

- Worked as AI Developer, developing a computer vision algorithm for detecting certain symbols on packaging images of food products
- Used OpenCV tools to make **morphological transformations and augmentation** to the images as well as templates for better matching
- Applied Template matching on test set images to detect different symbols such as Vegan, Gluten Free etc. with an accuracy of **85%**

PUBLICATIONS

CORAL: Contextual Response Retrievability Loss Function for Training Dialog Generation Models — May,'22

- Behavioral Analysis of Several Large-Scale **Dialog Generation** models showed degeneration in terms of response quality
- Proposed a novel training algorithm using **Reinforcement Learning** that considers the context while assigning loss value to the response

Arxiv Preprint: ***https://arxiv.org/abs/2205.10558***

Energy Inspector: Integrating Perf and Energy Profiling | NTECH US 2022 | NVIDIA — Oct,'22

- Submitted to NTECH '22, NVIDIA's internal peer-reviewed technology conference for disseminating novel ideas throughout the company
- Worked with several teams to integrate end-to-end power profiling with perf, increasing the efficiency of modelling flow by manifolds

Bin Optimization as a Deep Learning Knapsack | NTECH India 2022 | NVIDIA — Nov,'22

- Served as one of the two major runtime bottlenecks in the existing modelling flow due to brute force approach with scalability issues
- Solved as an unsupervised knapsack problem using a DL network with constrained optimization while maximizing the preference value

MaxQ Optimization using Reinforcement Learning | NTECH India 2022 | NVIDIA — Nov,'22

- Another major runtime bottleneck in the current flow, due to brute force implementation with exponential runtime complexity
- Modelled as a multi-discrete combinatorial optimization constrained on the use-case requirements, deriving most optimal configuration.

AWARDS AND ACHIEVEMENTS

- Received **Top Contributor** badge at NVIDIA, for outstanding performance during the first year; awarded to top 10% performers
- Received the **Merit Cum Means Scholarship** offering **full tuition waiver and a stipend**, offered to academically consistent students
- Achieved **All India Rank 862** in the **JEE Advanced 2017** Examination among an overall of ~150,000 students taking the examination
- **All India Topper** in Chemistry for Class 12 Central Board of Secondary Education Examination among ~10,00,000 students

PROJECTS AND COMPETITIONS

Training Generative Dialogue Systems using RL | Prof. Pawan Goyal | CSE, IIT Kharagpur **Jan,'21 – June,'21**

- Trained transformer based generative dialogue systems using Reinforcement Learning with Learned Retrievers as the reward systems
- Distributed reward among the tokens based on attention weights from the retriever allowed better flow of the backpropagation signal
- The final model showed better response quality in terms of diversity due to reduced redundancy compared to conventional models

Nationals Finalist | Maverick 2.0 Hackathon | AbInBev **Apr,'21 – May,'21**

- Developed an application to recommend customized discounts basis product data across various sectors, demographics and purchases
- Trained a pipeline of classifier-regressor end-to-end for predicting the discount components; added derived features for better learning
- Achieved an RMSE of **119.54 units** on the total discounts using ensemble of GBMs. Competed against **750+ teams** to reach the finals

SemEval-2021: Lexical Complexity Prediction | Prof. Pawan Goyal | CSE, IIT Kharagpur **Mar,'21 – May,'21**

- Task was to predict the lexical complexity of a word given the sentence in which it occurs, thus providing context for the word
- Used an ensemble model to account for two categories: words that are inherently difficult, and words whose context make it difficult
- Crafted features such as num. of hypernyms/hyponyms by parsing the word dependency tree, thereby extracting implicit information

Behavioral Analysis of Generative Dialogue Models | Prof. Pawan Goyal | CSE, IIT Kharagpur **Sept,'20 – Dec,'20**

- Implemented Transformer baseline: Seq2Seq and LM generative dialogue models referring from ***Attention is All you Need, Vaswani et.al***
- Evaluated each model across 2 datasets (DailyDialog / PersonaChat) and metrics: correlating with the expert scoring of the USR dataset
- Inferred from pretrained model responses: generic bland responses; model artifact theory: response generated as an artifact to inputs

Imposter Detection | Prof. Sudipta Mukhopadhyay | E&ECE, IIT Kharagpur **Aug,'20 – Nov,'20**

- Authenticated users based on their usage profile for mouse activity characterized by click time, pause time, velocity of the cursor etc.
- Used an unsupervised self-organizing map for reducing the dimensionality of the data to 2-D for better interpretability of clusters
- Finally used **Supervised Self Organizing Map** over the lower dimensional data to detect imposter from system usage data with **83%** recall

Probabilistic Sequential Models | Prof. Pabitra Mitra | CSE, IIT Kharagpur **Nov,'20**

- Performed an analytical literature survey of several state-of-the-art models (Transformers, RNNs, LSTMs) used for sequential modelling
- Implemented a Transformer based Seq2Seq model performing ablation on probabilistic components involved in autoregressive decoding

COMMUNITY SERVICE

Volunteer Mentor | Mentor Together | Bengaluru **June,'21 – Present**

- Volunteered to provide free mentorship to underprivileged college students regarding their academic and career queries/decisions
- Currently mentoring a sophomore student to help her decide courses, extra-curricular involvements etc. that will help her be a great software engineer (her aspiration) as well as lead a life with informed decisions

EXTRA CURRICULAR

Alumni Committee Chairman | Patel Hall of Residence | IIT Kharagpur **Jul,'20 – June,'20**

- Led the Alumni and Web Committee to devise yearly proposals for hall infrastructure development through alumni funds of INR 95,000
- In charge of the organization of annual Alumni Meet as well as the yearly Orphanage Donation Drive on the occasion of Patel Jayanti

Entertainment Secretary | Patel Hall of Residence | IIT Kharagpur **Sept,'18 – Sept,'19**

- Responsible for music events of the hall such as Entertainment Night, Rangoli presentation, as well as events of General Championship
- Handled total budget of INR 45,000 for purchase and maintenance of hall music instruments as well as maintenance of the music room
- Organized practices and coordinated meetings for preparing for the events of Open IIT and General Championship Social and Cultural

SPORTS AND CULTURAL PARTICIPATION

- Lead role in State Dramatics Contingent for National Science Dramatics; reached the **Nationals** to compete against **20+ teams Pan India**
- Part of the **Gold Winning Short Film team** representing IIT Kharagpur at Hunkaar'21, the annual Cultural Festival of NIT Rourkela
- Part of the **Silver winning Street Play team** representing Patel Hall in the General Championship Social and Cultural '21
- **Vocalist** and **Guitarist** in the Hall Music team participating in the entertainment events of the General Championship Social and Cultural
- Part of the Hall Athletics team, participated and completed a 10Km marathon organized by the Alumni Cell, IIT Kharagpur