**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 AND PREPRINTS**

**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***](https://arxiv.org/abs/2205.10558)

**Energy Inspector: Integrating Perf and Energy Profiling (Accepted) | 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 (Submitted) | 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 (Submitted) | 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.

**SKILLS AND PROFICIENCY**

* **Programming Languages:** Python, C, C++, MATLAB, Django (Beg.)
* **Frameworks:** Pytorch, Tensorflow, Keras, Streamlit
* **Libraries:** HuggingFace, stable-baselines, OpenAI Gym, RL4LMs
* **Utilities:** bash, vim, git-C

**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 | AB InBev 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