

# 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 Corporation | 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: **Bin optimization** using **Reinforcement Learning** and scaling it across different chip families/use-cases for production

**Certified Instructor | NVIDIA Deep Learning Institute | NVIDIA Worldwide Field Ops**

**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

## INTERNSHIPS

**GPU Power Intern | NVIDIA Corporation | 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
- Allows training of generative dialog models using a pool of responses as well, thus resulting in more diverse outputs during inference

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

## AWARDS AND ACHIEVEMENTS

- Received **Top Contributor** badge at NVIDIA, for outstanding performance during the first year; awarded to top 0.1% performers
- Graduated with a GPA of 9.35 being among the **top 2%** of all the students in the Institute graduating in the year 2021
- 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 | AblnBev**

**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

<b>SemEval-2021: Lexical Complexity Prediction   Prof. Pawan Goyal   CSE, IIT Kharagpur</b>	<b>May,'21 – June,'21</b>
<ul style="list-style-type: none"> <li>• Task was to predict the lexical complexity of a word given the sentence in which it occurs, thus providing context for the word</li> <li>• Used an ensemble model to account for two categories: words that are inherently difficult, and words whose context make it difficult</li> <li>• Crafted features such as num. of hypernyms/hyponyms by parsing the word dependency tree, thereby extracting implicit information</li> </ul>	
<b>Behavioral Analysis of Generative Dialogue Models   Prof. Pawan Goyal   CSE, IIT Kharagpur</b>	<b>Sept,'20 – Dec,'20</b>
<ul style="list-style-type: none"> <li>• Implemented Transformer baseline: Seq2Seq and LM generative dialogue models referring from <i>Attention is All you Need, Vaswani et.al</i></li> <li>• Evaluated each model across 2 datasets (DailyDialog / PersonaChat) and metrics: correlating with the expert scoring of the USR dataset</li> <li>• Inferred from pretrained model responses: generic bland responses; model artifact theory: response generated as an artifact to inputs</li> </ul>	
<b>Metropolis Hastings for Gaussian Mixture Models   Prof. Pabitra Mitra   CSE, IIT Kharagpur</b>	<b>Oct,'20 – Nov,'20</b>
<ul style="list-style-type: none"> <li>• Implemented a Metropolis Hastings Algorithms to approximate a mixture of K different Gaussian Mixtures with known statistics</li> <li>• Experimented with different values of variance for proposal distribution; yielded better results with higher variance (ie more exploration)</li> </ul>	
<b>Imposter Detection   Prof. Sudipta Mukhopadhyay   E&amp;ECE, IIT Kharagpur</b>	<b>Oct,'20 – Nov,'20</b>
<ul style="list-style-type: none"> <li>• Authenticated users on the basis of their mouse activity using features like click time, pause time, velocity of the cursor etc.</li> <li>• Used an unsupervised self organizing map for reducing the dimensionality of the data to 2-D for better interpretability of clusters</li> <li>• Finally used <b>Supervised Self Organizing Map</b> over the lower dimensional data to detect imposter from system usage data with <b>83%</b> recall</li> </ul>	
<b>Probabilistic Sequential Models   Prof. Pabitra Mitra   CSE, IIT Kharagpur</b>	<b>Nov,'20</b>
<ul style="list-style-type: none"> <li>• Performed an analytical literature survey of several state-of-the-art models (Transformers, RNNs, LSTMs) used for sequential modelling</li> <li>• Implemented a Transformer based Seq2Seq model performing ablation on probabilistic components involved in autoregressive decoding</li> </ul>	

COMMUNITY SERVICE

<b>Volunteer Mentor   Mentor Together   Bengaluru</b>	<b>June,'21 – Present</b>
<ul style="list-style-type: none"> <li>• Volunteered to provide free mentorship to underprivileged college students regarding their academic and career queries/decisions</li> <li>• 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</li> </ul>	

EXTRA CURRICULAR

<b>Alumni Committee Chairman   Patel Hall of Residence   IIT Kharagpur</b>	<b>Jul,'20 – June,'20</b>
<ul style="list-style-type: none"> <li>• Led the Alumni and Web Committee to devise yearly proposals for hall infrastructure development through alumni funds of INR 95,000</li> <li>• Incharge of the organization of annual Alumni Meet as well as for the yearly Blood Donation camp on the occasion of Patel Jayanti</li> </ul>	
<b>Entertainment Secretary   Patel Hall of Residence   IIT Kharagpur</b>	<b>Sept,'18 – Sept,'19</b>
<ul style="list-style-type: none"> <li>• Responsible for music events of the hall such as Entertainment Night, Rangoli presentation, as well as events of General Championship</li> <li>• Handled total budget of INR 45,000 for purchase and maintenance of hall music instruments as well as maintenance of the music room</li> <li>• Organized practices and coordinated meetings for preparing for the events of Open IIT and General Championship Social and Cultural</li> </ul>	

SPORTS AND CULTURAL PARTICIPATION

- Part of the 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