SHUBHAM LOHIYA

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RESEARCH INTERESTS

Generative AI, Natural Language Processing, Reinforcement Learning, Knowledge Graphs, AI in Healthcare

EDUCATION

Georgia Institute of Technology   Atlanta, GA, USA
Master of Science in Computer Science – Machine Learning Specialization, **GPA: 4.0/4.0**   *Aug 2022 – May 2024*
- **Key Coursework:** Limited Supervision in ML, Natural Language Processing, DL for Robotics, ML in Comp. Bio.

Indian Institute of Technology Bombay   Mumbai, India
Bachelor of Technology in Mechanical Engg with Minors in CS and AI, **GPA: 9.59/10.0**   *July 2018 – May 2022*
- **Rank 1 – Institute Silver Medal**; **Institute Academic Prize** [2020, 2021, and 2022]
- **Key Coursework:** Intelligent Agents, Digital Image Processing, Web Search and Text Mining, Algorithms, OS

PROFESSIONAL EXPERIENCE

Amazon | Applied Scientist Intern   *Fall 2023*
*Building scalable **Mulimodal** systems for **Automated Item Mapping** for Amazon's Product Catalog*   *Seattle, WA*
- Leveraging **LoRA** fine-tuned **BLIP-2** with a **Flan-T5** language model for external catalog product matching

Adobe | Machine Learning Engineer Intern   *Summer 2023*
*Developed a **Generative AI** system for KPI-optimized **personalized marketing content***   *San Jose, CA*
- Fine-tuned **Llama2** via **RLHF** using a reward model that learns from past consumer-content interaction data
- Designed an automatic qualitative evaluation protocol for generated marketing content using a GPT-4 expert

Anheuser-Busch InBev | Data Scientist Intern   *Summer 2021*
*Engineered a ML Framework for Accounts Receivable **Forecasting**, delivering **$40 million+** in working capital benefits*
- Developed trend and seasonal features from historical data, and data from Sales, Collections and the Economy
- Trained ensembles of models like **ARIMAX**, **XGBoost**, **Random Forest**, and **MLP** achieving $< $ **5%** dispersion

Python Developer | Avrio Energy   *May 2020 – Sep 2020*
The firm is developing AI and IoT powered technology to improve the energy efficiency of businesses
- Designed Schema, Models, and APIs in **Django** for version 1 of Avrio Energy's Outlet Manager android app
- Worked with raw time series data in **InfluxDB** from **1300+** appliances to perform feature-extraction for **ML**

RESEARCH EXPERIENCE

Graduate Research Assistant | NLP | Pathology Dynamics Lab   *Aug 2022 - Present*
Guide: Prof. Cassie S. Mitchell, Department of Biomedical Engineering   *Georgia Tech*

    Document Filtering for Drug Repurposing and Clinical Meta-Analysis
- Involved in development of **BioSift**, a new human-annotated document classification dataset for drug repurposing
- Implemented a suite of **NLI-based Zero-shot Multi-label Classifiers** for a document classification benchmark

    Biomedical Entity Linking Survey
- **Introduction:** *Biomedical entity linking (BioEL) is the identification of biomedical concepts in text using **NLP***
- Conducted a comprehensive survey of BioEL models on a **new benchmark** of uniformly formatted datasets

MARBLER: Multi-Agent RL Benchmark & Learning Env for the Robotarium   *Spring 2023*
An Open Platform for Standarized Evaluation of Multi-Robot Reinforcement Learning Algorithms   *Georgia Tech*
- Created an **open-source MRRL framework** enabling training in simulation and evaluation on physical robots
- Benchmarked popular learning algorithms and included functionality for **rapid prototyping** of new experiments

Joint Completion and Alignment of Multilingual Knowledge Graphs   *Aug 2021 - July 2022*
Bachelor's Thesis, Guide: Prof. Soumen Chakrabarti, Department of Computer Science   *IIT Bombay*
- **Problem Statement:** *For multilingual KGs, AlignKGC attempts to study whether Knowledge Graph Completion or fact prediction adds valuable information for Relation Alignment and Entity Alignment tasks, and vice versa.*
- Developed AlignKGC, a new **SOTA framework** for joint completion and alignment of Multilingual KGs

Online Reinforcement Learning for Lane Following   *Mar 2021 - Apr 2021*
Guide: Prof. Shivaram Kalyanakrishnan, Department of Computer Science and Engineering   *IIT Bombay*
- Extracted left & right distance features from dashboard camera feed using Semantic Segmentation and masking
- Employed **Tile Coding** to encode continuous state-variables like velocity, steer and throttle in discrete form

Publications

1. Harkanwar Singh, Soumen Chakrabarti, **Shubham Lohiya**, Prachi Jain, Mausam, **Joint Completion and Alignment of Multilingual Knowledge Graphs**, *accepted at The 2022 Conference on Empirical Methods in Natural Language Processing (EMNLP), 2022*

2. Reza J. Torbati, **Shubham Lohiya**, Shivika Singh, Meher Shashwat Nigam, Harish Ravichandar, **MARBLER: An Open Platform for Standarized Evaluation of Multi-Robot Reinforcement Learning Algorithms**, *accepted at The International Symposium on Multi-Robot & Multi-Agent Systems (MRS), 2023*

3. David Kartchner, Jennifer Deng, **Shubham Lohiya**, Tejasri Kopparthi, Prasanth Bathala, Daniel Domingo Fernández, Cassie S. Mitchell, **A Comprehensive Evaluation of Biomedical Entity Linking Models**, *accepted at The 2023 Conference on Empirical Methods in Natural Language Processing (EMNLP), 2023*

4. David Kartchner, Irfan Al-Hussaini, Haydn Turner, Jennifer Deng, **Shubham Lohiya**, Prasanth Bathala, Cassie Mitchell, **BioSift: A Dataset for Filtering Biomedical Abstracts for Drug Repurposing and Clinical Meta-Analysis**, *Resource Paper, accepted at the 46th International ACM SIGIR Conference, 2023*

Scholarships

- Awarded the prestigious **OPJEMS Scholarship** for displaying academic and leadership excellence (2021)
- Recipient of the **NSF UG Engineering Scholarship** for demonstrating scholastic excellence (2022)
- Recipient of the Narotam Sekhsaria Foundation's **PG Scholarship** for pursuing graduate studies (2022)

Key Technical Projects

Web corpus indexing and compression | *CS635: Information Retrieval and Web Mining*   *Fall 2021*
- Developed an **inverted index** for a corpus of 50,000+ web documents by encoding **D-gaps** for each token
- Conducted a comparative analysis of Index Compression methods by encoding the D-gap posting lists using various techniques like **Elias Gamma** Coding, **Golomb** Coding, and **Arithmetic** Coding

Profile Recommendation System for Online Dating | *ME781: Statistical ML and Data Mining*   *Fall 2021*
- Devised heuristics to construct **compatibility feature vectors** for pairs of dating profiles using profile content
- Synthesized supervision signals using **Proxy Labeling** for learning models like Logistic Regression, SVM, and MLP
- Generated profile recommendations by ranking pair-wise scores, achieved a relevancy score of **79.94%** on test data

Mastering Atari Games using Deep Reinforcement Learning | *CS419: Introduction to ML*   *Spring 2021*
- Trained a Deep Reinforcement Learning agent capable of surpassing human performance on classic Atari games like Pong, Breakout and Boxing using **high-level sensory information** in the form of game screen pixels
- Compared the performance of **off-policy** frameworks like **Deep Q-Network (DQN)** and **Double-DQN**

Automatic Raga Recognition in Indian Classical Music | *IE643: Deep Learning*   *Fall 2020*
- Leveraged **tonic** normalized **pitch-tracked** frequencies of a music sample as features for raga classification
- Trained a model based on **LSTM**s with **attention** on random subsequences from the Carnatic Music Dataset
- Achieved a testset accuracy of **96.67%** with 60% majority voting, and **100%** with 50% majority voting

Shortest Path in a Maze | *CS747: Foundations of Intelligent and Learning Agents*   *Fall 2020*
- Modelled given 2D mazes as **MDP**s with appropriate states, actions, rewards and transition probabilities
- Compared Howard's Policy Iteration, Value Iteration and Linear Programming algorithms to find shortest path

Image Quilting for Texture Synthesis and Transfer | *CS663: Digital Image Processing*   *Fall 2020*
- Implemented a **patch-based algorithm** to synthesize a texture of any desired size from the given sample
- Used a modified quilting algorithm to transfer any given texture to any target image and obtained good results

Other Projects

- Designed a smart **Modular Vertical Farming** unit for climate-independent agriculture in compact spaces (2021)
- Analyzed data of Indian macro-economic indicators to **forecast Consumer Price Index** (CPI) using ML (2021)
- Trained a deep learning framework to perform **Camouflaged Object Detection** in nature images (2020)
- Developed a web-app to do **facial sentiment recognition** on a live video feed using a **CNN** architecture (2020)
- Created a Star Wars themed shooting game using **PyGame** to render graphics, animation, and sound (2020)
- Built sequence model for **Trigger Word Detection**, trained using synthetically generated audio data (2020)
- Constructed an autonomous Line-Following bot using **Arduino UNO**, IR sensors, and a **PID** controller (2019)

Technical Skills

Programming Languages	Python, C++, Scala, SQL, HTML, CSS, JavaScript, Bash, R, MATLAB, Java
Technologies/Frameworks	PyTorch, TensorFlow, OpenCV, Docker, Git, Databricks, Spark, WandB, MLFlow

Teaching Experience

Graduate Teaching Assistant | Georgia Institute of Technology
- **CS 6601 - Artificial Intelligence**, Prof. Thomas Ploetz, School of Interactive Computing *Fall 2022*

Teaching Assistantships | IIT Bombay
Facilitating smooth course organization, grading papers, mentoring students, conducting tutorials and help sessions
- **CS 419 - Introduction to Machine Learning**, Prof. Abir De, CSE Department *Spring 2022*
- **CS 101 - Computer Programming and Utilization**, Prof. S Akshay, CSE Department *Spring 2022*
- **IE 643 - Deep Learning**, Prof. P. Balamurugan, IEOR Department *Fall 2021*
- **ME 119 - Engineering Drawing**, Prof. Deepak Marla, Department of Mechanical Engineering *Fall 2021*
- **MA 106 - Linear Algebra**, Prof. Sudhir Ghorpade, Department of Mathematics *Spring 2021*
- **MA 108 - Differential Equations**, Prof. Prachi Mahajan, Department of Mathematics *Spring 2021*
- **PH 107 - Quantum Physics**, Prof. Shankaranarayanan S, Department of Physics *Fall 2020*

Python is Cool, Kids | Student-run Summer Course ⬀ *Summer 2021*
- Spearheaded a team of students to conduct a summer course for **Practical Python Programming**, consisting of interactive live lectures and guided projects, with **1000+ enrollments**

Key Mentoring and Leadership Roles

Institute Secretary Technical Affairs | Institute Technical Council, IIT Bombay *Apr 2020 – Mar 2021*
Head of the Electronics and Robotics Club and part of a 23-member core team catering to 5000+ students
- Elected to lead and manage a team of **15+ members** to organize **20+** events, competitions and hackathons and mentor 1200+ electronics and robotics enthusiasts with an annual budget of over **INR 300,000**
- Coordinated the Institute Technical Summer Project program with **70% y-o-y** increase in completed projects
- Initiated the development of **'ERC Wiki'** - a repository of easily accessible resources for enthusiastic learners

Student Mentor | Student Mentorship Programme, IIT Bombay *May 2021 – Aug 2022*
Selected based on overall performance in a rigorous process comprising of interviews, SOP and peer reviews
- **Institute Student Mentor:** Guiding a group of **12 freshmen** through their first year at IIT Bombay
- **Department Academic Mentor:** Mentoring a group of **7 sophomores** with their academics and research

Extra Curricular Activities and Other Achievements

Achievements	**Winner** of the Prospect 100 Global Tech Challenge – Covid-19 Hackathon judged by **Steve Wozniak**. - Selected among the four **delegates from India** to the 5-day virtual "Humanizing Digital 2021" **AI and Data Science** conference at **Chulalongkorn University, Thailand** - Ranked **4** in India's Best Student Contest 2015 organized by RaoIIT amongst **0.3** million participants - Selected among **top 30** students in a Nationwide Aptitude Test conducted by VNIT, Nagpur
Mentorship	- Mentored **9 freshmen** on a project to create an AI agent for mastering the snake game using **RL** - Guided 6 students with reading projects on **Deep Learning** and **Reinforcement Learning**
Technical	- Led a team of **4** to build a radio-controlled trainer aircraft capable of dropping payloads - Constructed an all-terrain obstacle manoeuvring bot controlled using a mobile application
E-Cell, IIT Bombay	Led a team of **5** organizers during the **Entrepreneurship Summit 2020**, to successfully execute **20+** talks, interviews, and lectures as a **Corporate Relations Coordinator**