EDUCATION

2023 IIT Kanpur, CPI - 9.66/10
- MS(R), Cognitive Science

2021 IIT Bombay, CPI - 8.57/10
- BTech, Computer Science

2017 Anglo Urdu Boy's High School, 89.85%
- Class 12th, Maharashtra HSC

Name: Shubhamkar Bajrang Ayare
Gender: Male
DOB: 09 MAY 1999

RESEARCH EXPERIENCE

Non-indexed based Computational Model of Multiple Object Tracking in humans 2022-ongoing

Prof. Nisheeth Srivastava *MS Thesis*

Work presented as a 15-minute talk in Cognitive Science Conference (2023) in Sydney, Australia

- Developed an index-less model of Multiple Object Tracking by using two retinotopic maps
- Accounted for previously known patterns of tracking performance in literature without making an apriori commitment to ID performance, and provided **an in-principle answer to a question open since 2004**
- Developed a **heuristic for ID performance** and obtained the empirical pattern of tracking vs ID performance

Investigating the disruption of Same-Object Advantage Spring 2022

Prof. Devpriya Kumar (self-study course project)

- Performed a **power analysis** and **designed an experiment** to tease apart whether the disappearance of same-object advantage was due to a **disruption of object-representations** or due to **competing reaction times**.
- Conducted a **pilot study** to check the effectiveness of the design

Tangram Solver using CSP Spring 2021

Prof. Shivaram Kalyanakrishnan *RnD Project Course*

- Worked in a **team of two** to formulate Tangram Solving as a **Constraint Satisfaction Problem**
- Used **opencv** to obtain contours from noisy grayscale tangram images for use in further stages of processing
- Solved **77% of the 78 contours in at most 1 second** by employing **heuristics** in the split-search procedure

KEY PROJECTs

Adversarial Attacks on Graphs Autumn 2020

Prof. Abir De (Course Project) *Learning with Graphs*

- Compared link-prediction algorithms such as **Adamic Adar, Katz** against adversarial attacks like **Closed Triad Removal, Open Triad Creation** using common evaluation metric like **mean average precision (MAP)**
- **Identified a recurring problem** in attack algorithms wherein targeting the similarity score not affecting MAP

Analysis of Bakery Algorithm using nuSMV Spring 2021

Prof. Ashutosh Gupta *Analysis of Concurrent Programs*

- Implemented **n-threaded** Lamport's Bakery Protocol in nuSMV to study simultaneous access of critical section
- Checked **safety** & **liveness** for 2, 3 and 4 threads; studied various sections of the algorithm by introducing bugs

Satellite to non-Satellite Image Conversion using cGANs Autumn 2019

Prof. Ganesh Ramakrishnan (Course Project) *Foundations of Artificial Intelligence and Machine Learning*

- Trained a **cGAN** comprising of a **patchGAN discriminator** and a **U-net generator** to achieve the conversion
- Using **Inception Score** as the metric to compare & analyze the performance of **different variants** of the model

Conditional Random Field for Named Entity Recognition Spring 2020

Prof. Soumen Chakrabarti (Course Project) *Organization of Web Information*

- Implemented **inferencing** to obtain the best label sequences corresponding to the **named entities**
- Using **softmax**, attempted to improve **macro averaged F1 score** by introducing an auxiliary loss term

py4cl2-cffi – python libraries for common lisp June 2019 – present

- Used **Python C-API** to provide a foreign function interface to call python functions from common lisp
- Handled **reference counting** in conjunction with **finalizers** to eliminate memory leaks
- Enabled **asynchronous output** through a combination of **multithreading, named pipes** and **locks**

Numerical Computing Library for common lisp: dense-numericals Spring 2021

Prof. Shivasubramanian Gopalakrishnan (Course Project) *High Performance Scientific Computing*

- Implemented C functions to efficiently operate on **strided representations of vectors** using **SIMD operations including transcendental functions** like sin, cos, tan provided by **sleef** and **intel intrinsics**
- Used foreign function interface to access these from **Common Lisp** to operate on multidimensional strided arrays
- Obtained **performance comparable to numpy** and **torch** using **lparallel** for comparing with torch

BodhiTree Django Migration (under Prof. Kameswari Chebrolu) Spring 2020

- Worked on an ongoing effort towards migrating a **40k LoC codebase** from **Django** 1 to 2, and python 2 to 3, qualifying url names by namespaces, removing deprecated functions, and managing the semantic change of strings
- Used **magit, grep** and **find** to aid code merges that arose with the parallel development of the main branch

Secure Personal Cloud Autumn 2018

Prof. Soumen Chakrabarti (course project) *Software Systems Lab*

- Developed an encrypted cloud storage with client-only keys stayed to provide true data privacy using **Django**
- Used **node.js**, and **browserify** to implement decryption on the webclient using **CryptoJS** library.
- Used the bash tools – **curl, inotifywait** to create a linux-client, with **single-client livesync** capabilities

Contention Resolution and Switching Spring 2019

Prof. Ashwin Gumaste (course project) *Digital Logic Design*

- Implemented Contention Resolution and Switching module of a router in VHDL using Xilinx ISE
- Created and implemented state diagrams for reading and writing data to FIFO based **Virtual Output Queues**
- Used Separate Virtual Output Queues for each input port to avoid head of line blocking
- Implemented **round-robin** based state diagrams for **Arbiter** for scheduling while accounting for **express ports**

Sentiment Prediction from Movie Reviews Summer 2019

- Used **word embeddings** to obtain user sentiments from movie reviews using keras and numpy
- Obtained **88% accuracy** on **IMDB movie review dataset** using a **multi-layer perceptron**

ACADEMIC ACHIEVEMENTS

- Within national **top 1%** in **Cognitive Science Joint Entrance Test (COGJET)** (2021)
- Selected for **Chennai Mathematical Institute**'s B. Sc. (Honours) Mathematics Course (2017)
- Secured AIR 700 amongst 2 lakh candidates in JEE (Advanced) (2017)
- Within national **top 1%** in **National Standard Examination in Physics** (2017)
- Selected for the award of scholarship in **National Talent Search Examination** (2015)
- Selected for the award of scholarship in **Kishore Vaigyanik Protsahan Yojana** (2015)

KEY COURSES

Cognitive Science	Introduction to Psychology, Human Cognitive Processes, Cognitive Psychology, Cognitive Neuroscience, Neuroscience of Learning & Memory, Computational Cognitive Science, Topics in Visual Perception, Philosophical Investigations (Philosophy of Mind)
Machine Learning	Data Analysis & Interpretation, Learning with Graphs, Organization of Web Information, Artificial Intelligence & Machine Learning, Foundations of Intelligent & Learning Agents, Introduction to Computer Vision*, Natural Language Processing with Deep Learning*
System & Softwares	Software Systems Lab, Design & Analysis of Algorithms, Analysis of Concurrent Programs, Operating Systems, Foundations of Network Security & Cryptography, Computer Architecture

*These courses were pursued through MOOCs (online)

OTHERS

- Poster Presentation on Multiple Object Tracking without Indexes at the ACCS-10 conference (2022)
- Teaching Assistant for a Programming Course at the Cognitive Science Department: conducted tutorial sessions and evaluated assignments while accounting for students with diverse technical and non-technical background (2022)
- Discovered RAM Manager for Magisk to **fix aggressive app killing** on android (2019)
- 1200+ Karma on r/lisp; 466 reputation on Stackoverflow; 171 reputation on AskUbuntu (2017-ongoing)
- Created a repository of free **JEE Advanced Unsolved papers** – solved are available everywhere (2017-19)
- Studied **myopia** to understand its cause and methods of prevention / cure (2017)