Devansh Shah | Curriculum Vitae

Email: devanshshah7560@gmail.com
Phone: +91-9987757364
Homepage : www.cse.iitb.ac.in/~devansh

EDUCATION

Indian Institute of Technology, Bombay *May 2019*

- Bachelor of Technology with Honors in Computer Science and Engineering
- CGPA: 9.43/10.0

INTERESTS

Computer Vision, Reinforcement Learning, Machine Learning

RESEARCH EXPERIENCE

Large Query Optimization (Undergraduate Thesis) *Aug'18 - May'19*
Guide: Prof. S.Sudarshan IIT Bombay

- Presented a seminar on **join enumeration** & query optimization techniques in traditional database systems
- Developed a **priority** based graph enumeration of cross-product free join orders on large queries, which subsumes state of the art **Adaptive** algorithm
- Experimented with several heuristics for **implementing A* search** strategy to get a good join order in a reasonable time, and applied pruning strategies for incrementally optimizing the result
- Formulated robust algorithms to handle **cardinality estimation errors** for large join queries. We alternate between join execution and optimization to factor in the run-time cardinality of intermediate joins

Graph-based Semi-Supervised learning *May'17 - July'17*
Guide: Prof. Alex Pothen Purdue University, USA

- Studied b-Suitor, a **half approximation algorithm** to compute maximum weight b-Matching
- Successfully integrated the b-Suitor algorithm to semi-supervised **multiclass text-classification** problem
- Demonstrated that b-Matching **outperforms** conventional graph sparsification techniques like K-Nearest Neighbours(roughly 15% increase in accuracy) in the domain of graph-based learning procedures
- Compared performance of Gaussian Random field technique against transductive semi-supervised learning methods

Optimization Methods for Video Summarization *Jan'18 - Present*
Guide: Prof. Suyash Awate IIT Bombay

- Formulated the problem of finding a subset of frames summarizing a video as a sparse representation problem
- Implemented **projected gradient descent** algorithm to find optimal number of representatives for a video dataset
- Worked on proximal algorithms for the general **mixed matrix norm** minimization problem
- Currently exploring **hierarchical** dictionary learning methods with applications in image analysis

Location Security using Bluetooth *Aug'17 - Nov'17*
Guide: Prof. Bhaskar Raman IIT Bombay

- Developed a **Bluetooth** based algorithm to detect students giving online quiz outside of the permitted classroom
- Algorithm checks for **connectedness** in graph constructed from per device neighbourhood information that is obtained via bluetooth scanning, Connected components indicate student clusters giving the exam at same location
- Optimized for the number of packet collisions and battery consumption due to device discovery by thresholding the out-degree of a device in the graph.

INDUSTRY EXPERIENCE

Goldman Sachs *May'18 - July'18*
Summer Analyst, Investment Management Division

- Developed a framework for **automatic detection** of data inconsistencies in Primary and Private Equity Market Data. This achieved substantial speed up over the manual error detection and correction process used earlier
- Worked on a **Portfolio Manager** tool for comparing the performance of different portfolios over a horizon
- Received a Pre-Placement Offer in appreciation of my exemplary work during the internship

SCHOLASTIC ACHIEVEMENTS

- Recipient of **Institute Academic Award, IIT Bombay** in 2015-16 and 2017-18 for academic excellence
- Awarded **Advanced Performer** (AP) grade for exceptional performance in Linear Algebra & Automata Theory
- Secured **All India Rank 65** in **JEE Advanced** 2015 among 150,000 candidates
- Awarded Gold Medal in **Indian National Physics Olympiad** conducted by HBCSE for being among top 35 students across the country
- Recipient of KVPY scholarship instituted by Indian Institute of Science (IISc), Government of India
- Among top 300 students in National Standard Examinations in **Junior Science**, **Chemistry** & **Astronomy**

KEY PROJECTS

Multi-Content GAN for Few-Shot Font Style Transfer | *Prof. Arjun Jain* *Jan'19 - May'19*

- Implemented Multi content GAN architecture to generate unobserved glyphs given a few colored and stylized texts
- Architecture consists of two Conditional GAN's for modelling shape and texture respectively
- Results demonstrate a significant improvement when compared against direct image to image translation network.

Texture Optimization For Example Based Synthesis | *Prof. Suyash Awate* *Aug'17 - Nov'17*

- Implemented **EM Optimization** for texture synthesis at a patch level, based on minimizing the distance between nearest neighbour patches in target image and sample image
- The technique progressively refines the synthesized texture from coarse to fine by gradually decreasing patch size
- Achieved a **3x speedup** by performing optimization on Y channel and scaling the Cb & Cr channels

Erdos-Selfridge-Spencer(ESS) Games | *Prof.Shivaram Kalyanikrishnan* *Aug'18 - Nov'18*

- Evaluated performance of Deep Reinforcement Learning algorithms on **Shanon Switching Game**, an instance of ESS game where there is always a winning strategy for either player
- Demonstrated better generalization (performance against varied difficulty opponents) when trained using a **Self-Play** and **Multi-Agent** algorithm as opposed to training against an optimal opponent

Compiler for C type Language | *Prof.Uday Khedkar* *Jan'18 - April'18*

- Developed a compiler for a C like pointer language, in different stages like scanning, parsing, syntax analysis and assembly code generation using python **Lex** & **Yaac**
- Features include control flow statements, loops, nested function calls, arithmetic & boolean expressions

ATM Controller | *Prof. Supratik Chakraborty* *Jan'17 - April'17*

- Developed a fully functional ATM controller with a VHDL frontend on a Field-Programmable Gate Array, that communicates with a backend C program server
- Provided secure means of communication by encrypting user data using **Tiny Encryption** Algorithm
- Supported **frontend caching** to handle the case when server goes offline, with automatic syncing on restoration

Intelligent Pacman Agent | *Prof. Shivaram Kalyanikrishnan* *Jan'18 - April'18*

- Built an intelligent agent of Pacman and compared various heuristics like search, reflex agent, Minimax with pruning, Expectimax and use of evaluation functions to maximize the performance
- Explored the case wherein ghost position is unknown and is inferred using Particle Filters & Dynamic Bayes-Net

Categorization of news articles | *Prof. Ganesh Ramakrishnan* *Jan'17 - April'17*

- Trained a model to classify news headlines into news categories using **SVM** and **Neural Network** as classifiers
- Used TFIDF and word2vec for feature extraction and Compared performance of feature selection techniques: Chi square, Variance Threshold, Principal Component Analysis, Mutual information classification

Feeder, a university academic App | *Prof. Sharat Chandran* *Aug'16 - Nov'16*

- Developed a personal assistant **android application** that notifies the student of all important academic events
- Designed a **Django** based web application that can be used to add courses, enroll students in various courses and facilitate professors to add assignment deadlines and receive feedback on conducted classes

Institute Buy and Sell Application | *Prof. S.Sudarshan* *Aug'17 - Nov'17*

- Developed an android application with **PostgreSQL** backend as platform for buyers and sellers in an institution
- User can upload product details, request for a product, search for item by category/tag, provide customer feedback

Robotic Mapping using SLAM Algorithm *May'16 - June'16*

Institute Technical Summer Project *Students' Technical Activity Body, IIT Bombay*

- Developed a autonomous robot to simultaneously navigate and map an unknown environment via feedback from ultrasonic distance sensors
- Implemented **SLAM** (Simultaneous Localization & Mapping) on Raspberry Pi board for robot movement
- Built a interface using **Python Pygame** library for displaying bot's live movement on laptop screen

Multiclient Chat application | *Prof. Varsha Apte* *Jan'17 - April'17*

- Utilized **Socket programming & Multithreading** to create a client server model in Python to facilitate parallel exchange of text and multimedia
- Supported features like LDAP authentication, offline messaging, friend requests, group chats & message encryption
- Carefully designed proper protocol for messages exchanged between application and server

Connect-4 Simulation using Racket | *Prof. Amitabha Sanyal* *Jan'17 - April'17*

- Designed an automated Connect4 game with Artificial Intelligence using DrRacket, a Scheme based environment
- Implemented a **minmax algorithm** with alpha-beta pruning and bounded depth for enhanced efficiency

MENTORSHIP

Undergraduate Teaching Assistant

- Responsible for helping students with basic concepts of the subject and assisting in their evaluation
- **Calculus**, Prof. Amiya K Pani (MA105) Autumn 2016
- **Data Analysis and Interpretation**, Prof. Ajit Rajwade & Prof. Suyash Awate (CS215) Autumn 2018

Department Academic Mentor *April'18 - Present*

- Selected in a 20-member team in the Department Academic Mentorship program for Computer Science department
- Responsible for guiding a group of 7 students with their academics and curriculum

RELEVANT COURSE WORK

Machine Learning: Reinforcement Learning, Artificial Intelligence, Foundations of Machine Learning, Digital Image Processing, Advanced Machine Learning, Computer Vision

Systems: Database and Information Systems, Operating Systems, Computer Architecture, Compilers, Computer Networks, Network Security

Theory: Discrete Structures, Logic for CS, Automata Theory, Design and Analysis of Algorithms

EXTRA-CURRICULARS

- Completed a year long course for learning keyboard under NSO, IIT Bombay
- Received Certificate Of Appreciation from Tata Power Enery Club for efforts made to save energy and for spreading awareness in energy conservation and efficiency
- Successfully completed 10 levels of Abacus & Mental Arithmetic
- Developed an app that performs optimal **resource allocation** for disaster management, as part of code.fun.do, a 24-hour hackathon organised by Microsoft

REFERENCES

PROF. S. SUDARSHAN
Dept. of Computer Science
IIT Bombay
✉Available on Request

PROF. ALEX POTHEN
Dept. of Computer Science
Purdue University
✉Available on Request

PROF. SUYASH AWATE
Dept. of Computer Science
IIT Bombay
✉Available on Request