Kunal Chaturvedi

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Education

- **Indian Institute of Technology Kanpur** — Kanpur, India
  Bachelor Of Technology in Computer Science and Engineering; GPA: 7.5/10.0 — *Aug 2014 – July 2018*

Experience

- **Microsoft India R&D Pvt Ltd.** — Hyderabad, India
  Software Engineer, Software Engineer II — *May 2018 - Present*
  - Worked as a **backend engineer***(.Net/C#, Python)* on Azure Mgirate service, with the goal to discover(collecting on-premise server data), assess(recommending right-sized Azure SKUs), and migrate servers to Azure.
  - **Data Engineering**: Developed a robust data ingestion pipeline to fetch real time performance data from customers' servers at high scale, and Azure data aggregation service to regularly fetch Azure SKU metadata and pricing data.
  - **Machine Learning and Algorithms**: Developed machine learning models to power features for the Recommendation Engine, like classification into right-sized Azure SKUs using KMeans, decision trees and random forests, CPU performance prediction on Azure using classical regression models and RNNs. Developed algorithms for features like AVS Assessments(bin-packing) and network topology analysis(graph algorithms for fully connected components).
  - As an **owner** of Assessment Service, was involved in architecture/design discussions and **mentored** new employees.
- **CitiCorp India** — Pune, India
  Software Engineering Intern — *May 2016 - July 2016*
  - **Algorithms for Scalable Approximate Entity Extraction In Financial Name/Transaction Screening**:
    - Developed Trie Similarity Search based Algorithms to detect and extract terrorism & money laundering entities in real time financial systems at Citi. Presented research results in a white paper and POC/demo (in C++, python).
    - Applied algorithms like Trie Traverse Algorithm, Trie Dynamic and Trie Pathstack Algorithm along with Locality Sensitive Hashing(LSH), several pruning techniques and filtering methods.
    - Reduced index size by 3-5 times, query time by 10-40 times and reduced indexing time complexity to sub-linear limits.
  - **Citi Screening CW Configuration Portal**: As a full stack developer, developed an end-to-end workflow and a web-portal for onboarding Business Units to Citi Business Unit Hierarchy, using Java JEE, actimize and AngularJS.
  - Received a **Pre-Placement Offer** to work at CitiCorp at the end of the internship period.

Projects

- **Game Theoretic Formulation for an Online marketplace for marginal farmers** — CS698W, IITK
  Game thory and Mechanism Design, Prof. Swaprava Nath — *Jul. 2017 - Nov. 2017*
  - Introduced an novel **Extended Trade Reduction Mechanism** for a theoretical online marketplace to set up a double auction for multiple agents to trade directly with consumers by submitting bids for the trades.
  - Presented a formal modelling of the problem with proofs to preserve the desirable mechanism properties. Also proved that the mechanism tends to an equilibrium with the maximum asymptotic efficiency vs the number of agents
  - Developed a **simulation and experimentation framework** in Python/ C++ using libraries like SimPy, Bokeh etc to supplement our model. Presented our findings on market profits vs net quantity traded, agent trades etc and visualized our mechanism achieving an equilibrium in real time.
- **Comprehension based Question Answering** — CS671A, IITK
  Natural Language Processing, Prof. Harish Karnik — *Dec. 2017 - Apr. 2018*
  - Studied SOTA models like RNNs, LSTMs, Memory Networks, BiDAF, PointerNet, RaSoR, FastQA in solving the problem of comprehension based QnA on SQuAD and bAbI datasets.
  - Implemented MemNNs using keras against the 20 bAbI Q/A tasks on bAbI dataset, like Single Supporting Fact(96.9%), Positional Reasoning(66.9%), Path Finding(13.9%) etc with near state of the art levels of accuracy.
  - Implemented (in tensorflow) the FastQA model from the research paper, on SQuAD dataset with appreciable results.
- **Breaking a Visual CAPTCHA** — CS698O, IITK
  Computer Vision, Prof. V.P. Namboodiri — *Feb. 2017 - Apr. 2017*
  - Tackled the problem of Recognition and identification of words in severely cluttered and distorted environments of EZ-GIMPY and GIMPY CAPTCHA using classical Visual recognition techniques (vs Deep Learning techniques).

- Incorporated Lexical information of alphabets using Canny Edge Detection to prune location of letters.
- Implemented Shape Context Recognition from scratch(MATLAB) on character blimps and compared obtained measure with pre-processed templates , employing fast pruning to reduce time complexity, achieving an accuracy of 85%

- **AI Camera based Vision and Sensing for Robotic Systems** ME762A, IITK
  Computer Vision, Robitics, Prof. Bhaskar Dasgupta *Dec. 2017 - Apr. 2018*
  - Studied the feasibility of Computer Vision powered single camera systems, against a suite of sensors for robotics vision ans sensing tasks like object detection, identification, distance estimation and collision avoidance.
  - Employed and augmented the YOLO algorithm to execute these tasks in real time (with varying levels of success).
  - Compared the results against ultrasonic sensors and proposed how a combination of the two can be used effectively.
- **Stock Market Prediction** CS771A, IITK
  Machine Learning, Prof. Piyush Rai *May 2016 - Jun 2016*
  - Studied research on the use of algorithms like SVM, Logistic regression, RNNs and LSTMs to predict the rise/fall of stock market on the following day based on the data of the previous days.
  - Implemented and compared 3 ML models (RNN, SVM and ensemble) on stock price data from IOCL and Jubiliant Foodworks.
- **Combinatorial Games** CS201A, IITK
  Game Theory, Discreet Mathematics, Prof. Rajat Mittal *May 2015 - Jun 2015*
  - Studied the basics of Combinatorial Game Theory. Mathematically and algebraically analyzed combinatorial games and studied classification of combinatorial games based on specific properties and outcomes.
  - Studied general strategies for combinatorial games and specific strategies for nim, tic-tac-toe, hex, domineering etc.

Other projects and Competitions

- **NachOS++ (CS330A, Operating Systems)**: Implemented (in C++) parts of the Standard System Call Library, scheduling algorithms, virtual memory, dynamic page allocation strategies and analyzed their effectiveness in NachOS.
- **Movie recommendation system (Microsoft Code.Fun.Do Hackathon)**: Developed an android app in Microsoft Azure ML which provides personalized movie recommendations based on IMDB data and past user preferences.
- **VR Bowling Game (Google GDG Hackathon - 3^{rd} Position)**: Developed an immersive 3D VR bowling game using Unity, google cardboard and smartwatch accelerometer sensors as input for hand motion during bowling action.
- **IITK Email Auto Event creator (CS252- Comp Lab II, Software Development)**: Implemented an event parser to parse event date-time and location information from campus emails, create calendar events using Google Calendar APIs, and developed an AngularJS front-end for user configuration.
- **Other projects**: Swift in Python Compiler*(compiler design)*, Twitter Streaming and Analytics*(Database Systems)*, python HTTP proxy*(Computer Networks)*.

Relevant Coursework

Machine Learning Techniques	Visual Recognition	Introduction to Natural Language Processing
Data structures and Algorithms	Advanced Algorithms	Randomized algorithms
Topics in Game theory and Collective Choice	Introduction to Robotics	Principles of Database Systems

Computational Physics Computer Networks Operating Systems Computer Organization

Technical Skills

- **Programming Languages**: C#, Python, C/C++, MatLab, Java, JavaScript, Powershell, bash
- **Tools and Frameworks**: Tenserflow/keras, PyTorch, OpenCV, fast.ai, Scikit, SimPy, LaTeX, AzureML
- **Software Development (Advanced)**: .Net Framework/ .Net Core, Azure Stack, Java JEE, Spring MVC Framework
- **Software Development (Moderate)**: Android Studio, AngularJS, FastAPI, ExpressJS, MongoDB, Redis

Scholastic Achievements

- Secured **All India Rank 1075** (among 1.4 million students), in IIT JEE Mains 2014
- Secured **All India Rank 149** (among 200,000 students) in IIT JEE Advanced 2014
- Recipient of **Kishore Vaigyanik Protsahan Yojana Fellowship** with **All India Rank 139**, *2014*
- Recipient of the **National Talent Search Examination (NTSE) scholarship**., *2014*
- Scored **97.3%** in Class XII board exams,*2014*, and a CGPA of **10/10** in class X board exams,*2012*

Extracurriculars

- **Student Guide, Counselling service IITK (2015-2017)**: Provided mentoring and counselling to incoming students for 1 year, to help them acclimatize to college life and helped them connect to tutors for academic help.
- **Music Club, IITK (2015-2018)**: Played music at intra-college music festivals and competitions as a guitarist.
- **Squash Team, IITK (2015-2016)**: Played at intra-college and inter-college level competitions.