# Chanukya Vardhan Reddy Gujjula

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## Education

**Indian Institute of Technology Bombay, India** **GPA - 8.71**
*Bachelor of Technology in Computer Science & Engineering with Minor in Mathematics* *Jul 2014 - May 2018*

## Interests

- **Computer Vision, Deep Learning**, Machine Learning, Computer Graphics

## Professional Experience

**Goldman Sachs** **Bengaluru, India**
*Associate, Marquee Portfolio Analytics* *Feb 2021 - Feb 2022*

- Built **Carbon Analytics tool** to estimate carbon emissions of portfolios using **RESTful web services** in python and modeled scalable datasets for vendor data from **Bloomberg** and **Factset** and integrated it to **gsquant** library in python
- Implemented various analytical metrics like MCTR, Active Risk with benchmark, Attribution Analysis, Hedge turnover Constraint and optimized compute on Factor Risk calculations for Risk and Thematic Analysis
- Through **risk as a service** and **BARRA** risk factor model data, the Risk Analytics tool is currently generating revenue of **$505K/year** from four clients, with more potential clients trialling the product
- Came up with **SLOs** by defining **SLIs** such as availability, latency, correctness that measure reliability of the service
- Worked with an intern in developing a monitoring job as part of the offering to premium clients, deployed on **Kubernetes** which monitors the factor risk and performance analytics reports of their portfolios and sends out **PagerDuty Alerts**

**Goldman Sachs** **Bengaluru, India**
*Analyst, Market Risk Strats* *Jun 2018 - Feb 2021*

- Developed an enhanced risk engine, through **GSRisk** initiative to converge on a unified risk engine across divisions, leveraging Griffin and Market Data API, which enabled expressing scenarios on-the-fly and declaratively
- Saved initial compute of ~**$5MM/year** reducing ~0.5MM peak CPU hours every day by migrating Topsheet models to GSRisk and ~**$3MM/year** for IR models to MDAPI with potential savings of ~**$20MM/year** for other Market Risk models
- Developed risk models for Commodities through **Sensitivity Based Approach** as part of **FRTB** and Interest Rate Stress Test models for **Comprehensive Capital Analysis and Review** and **Firm Data Submission Framework** submissions
- Enhanced pricing models by onboarding basis nodes on the price graph to MDAPI for Real Estate Discount Spreads, Hazard Rate Volatility and Funding Spreads in collaboration with Merchant Banking, Credit and Equity Derivative desk strats
- Developed a new **asset data model** for sourcing Market Risk curated EOD timeseries with improved SLA, data quality and the ability to provide market risk data as a service to clients via the Marquee platform
- Developed a recalibration model for **LMM** and **MEE** window parameters under IR Scenarios for **Bermudan Swaptions**

**Goldman Sachs** **Bengaluru, India**
*Summer Analyst, Market Risk Strats* *May 2017 - Jul 2017*

- Optimized convergence steps of **EM Algorithm** in finding the maximum likelihood of **Gaussian Mixtures** for backfilling
- Developed a framework for maintaining domain knowledge of backfilled data in the stress period by pseudofilling
- Received a **Pre-Placement Offer** in Market Risk Strats Team as a full time Analyst

## Projects

**Image-to-Image Translation**

- Implemented **CycleGAN** in tensorflow for an image to image translation with a U-Net based architecture with additional residual layers as a generator, and a PatchGAN discriminator to generate Monet-esque style
- Trained the model using a custom **TPU** strategy with MSE loss along with gradient penalty for the discriminator, while the generator is optimized with the Adversarial Loss, Cyclic Consistency Loss and Identity Loss

**Wasserstein GAN**

- Trained a Convolutional Generative Adversarial Network on the simple MNIST dataset to generate hand-written images of digits with improved stability by implementing **Gradient Penalty** on **Wasserstein Loss** for the critic to avoid modal collapses
- Updated the critic multiple times for every update to the generator to prevent the generator from overpowering the critic

**Automatic Image Colorization**

- Trained a Deep Neural Network with **CNNs** and **Inception-ResNet-v2** using the luminate component of an image by first extracting the mid and high-level features from the encoder and inceptionnet(trained on ImageNet dataset) and merging them before passing to the decoder to estimate the ab components as described in Baldassarre et.al's **Deep Koalarization** paper
- Colored the image using this model by converting the predicted ab channels combined with input l channel to RGB space

**Neural Style Transfer**

- Implemented a **Neural Style Transfer** Algorithm to generate artificial images by manipulating the content image using the appearance or visual style of the style image as described in Gatys et al

- Minimized cost with the content image(as the distance between activations) and the style image(as the distance between the gram matrices) on multiple layers using a pre-trained **VGG-19** CNN on ImageNet dataset

**Image Segmentation**

- Implemented the **U-Net** architecture of the encoder and decoder blocks with convolutional layers in tensorflow and trained on the **CARLA self-driving car** dataset with sparse categorical crossentropy for pixelwise prediction

**Real Time Face Mask Detection**

- Trained a CNN model using sample data from a Kaggle dataset with Convolution and Max Pooling layers to extract features, and finally classify using dense layers with softmax activation function with an accuracy of ~97%
- Classified images by detecting faces using **Haar Cascade Frontal Face** classifier and predict whether mask is present or not

**Invisibility Cloak**

- Developed an invisibility cloak application using simple vision techniques in OpenCV
- Transformed the image from RGB space to **Hue-Saturation-Value**(HSV) space accounting for different shades and intensities of a specific shades to detect the red color cloth, and replaced the segmented red cloth with initial background

**Keyframe Animation** **IIT Bombay**
*Guide: Prof. Parag Kumar Chaudhuri* *Autumn-2017*

- Designed an interactive modeling tool in C++ OpenGL to create **3D models** from triangle meshes
- Implemented **modeling-viewing pipeline** to convert the scene from 3D perspective to 2D planar view along with clipping
- Created 3D models using **hierarchical modeling** from scratch and animated them using **Keyframe Interpolation**

**Regret Minimisation Algorithms** **IIT Bombay**
*Guide: Prof. Shivaram Kalyanakrishnan* *Autumn-2017*

- Implemented various **Upper Confidence Bound**(UCB) algorithms namely UCB, $\beta$-UCB, Adaptive $\beta$-UCB, UCB-tuned for a **Stochastic Multi Arm Bandit** setting to analyze the regret and cumulative regret and compare performance of algorithms which take empirical variance of arms also into account to those which only consider mean

**Similar Language Detection** **IIT Bombay**
*Guide: Prof. Ganesh Ramkrishnan* *Spring-2017*

- Followed a hierarchical way to divide languages into groups using **cosine similarity** with features from word frequencies
- Trained different **Support Vector Machines**(SVM) for each group with features from character and word n-grams
- Used **tf-idf-qf scoring** for elements in feature vector and **ensemble methods** with **mean confidence** to merge classifiers

**Optical Character Recognition & The Pac-Man Projects** **IIT Bombay**
*Guide: Prof. Shivaram Kalyanakrishnan* *Spring-2017*

- Implemented various classifiers like Perceptron, MIRA, neural networks for extracting text from scanned handwritten images
- Implemented various **search algorithms** for pacman agent to find paths namely DFS, BFS, Uniform Cost Search, A* Search, Minimax Search, Expectimax Search
- Implemented particle filter algorithm that tracks individual and multiple ghost agents simultaneously in Dynamic Bayes Net

**Compiler for C-like Language** **IIT Bombay**
*Guide: Prof. Uday Khedker* *Spring-2017*

- Developed a compiler for fundamental **C constructs** along with live variable analysis for **dead code elimination**
- Incorporated features like lexical analysis, parsing, symbol table creation, intermediate code generation and assembly level code generation using **FlexC++** and **BisonC++**

**Project Database Management** **IIT Bombay**
*Guide: Prof. S. Sudarshan* *Autumn-2016*

- Built a java based web portal that assists in searching and applying for projects in certain areas of interest using **servlets**, **PostgreSql**, **Ajax** in JavaScript queries
- Implemented instructor and student portals where instructor can add new projects along with descriptions and accept requests from students, student can review the projects based on their experience with the instructor

**xv6 Operating System** **IIT Bombay**
*Guide: Prof. Mythili Vutukuru* *Autumn-2016*

- Introduced **Copy-on-Write** fork and priority based process scheduling into the xv6, a Unix-like teaching operating system
- Built a multi-threaded client with a **bash-like shell** and a multi-process server for file transfer. Supported features like IO redirection, signal handling, foreground and background processes

**SAT Solver** **IIT Bombay**
*Guide: Prof. Supratik Chakraborthy and Prof. Ashwin Gumaste* *Spring-2016*

- Developed a **VHDL** based module for checking the satisfiability of 64 bit clauses
- Implemented **Davis Putnam Logemann Loveland**(DPLL) algorithm along with Maximum Occurrences in clauses of Minimum Size(MOMs) Heuristic for checking the satisfiability of a formula

**Distributed Password Cracker** **IIT Bombay**
*Guide: Prof. Kameswari Chebrolu* *Spring-2016*

- Created a module that cracks password using **Socket Programming** in C++ by distributing job among multiple workers
- Handled multiple client requests across different machines to a single server with multiple worker machines reliably using TCP while maintaining fairness by preventing clients from hogging resources

**Branch Change Portal** **IIT Bombay**
*Guide: Prof. Sharat Chandran* *Autumn-2015*

- Implemented modified **Gale Shapley** algorithm for handling branch change applications in Python
- Developed a web application using **Django** framework with authentication and preference selection

**PinBall Simulation** **IIT Bombay**
*Guide: Prof. Sharat Chandran* *Autumn-2015*

- Designed a **Rube Goldberg Machine** that served the purpose for simulation of the game by using multiple physics situations like spring forces, collisions using **Box2D**(a physics simulation for C++ platform)

**Tic-Tac-Toe & Quantum-Tic-Tac-Toe** **IIT Bombay**
*Guide: Prof. Supratik Chakraborthy and Prof. Deepak B Phatak* *Autumn-2014*

- Designed a complex version of classic Tic Tac Toe game blending the concepts of Quantum Mechanics using **Simple Cpp** graphics library. Used a recursive **backtracking** algorithm to find a circuit and collapse it

## Scholastic Achievements

- Secured **All India Rank 18** in **IIT-JEE Advanced** among 150,000 candidates *2014*
- Awarded **AP grade** for outstanding performance in Principles of Data and System Security, Engineering Drawing and Geodesy courses(given to top 1% of the class) *2014-18*
- Secured **100 percentile** in **IIT-JEE Mains, B.Tech** among 1.3 million candidates *2014*
- Secured **99.98 percentile** in **IIT-JEE Mains, B.Arch** among 1.5 million candidates *2014*
- State Rank **2** in **Andhra Pradesh EAMCET** among 400,000 candidates *2014*
- Among the **top 35** and qualified to India finals in Indian National Junior Science Olympiad(INJSO) *2012*
- Among the **top 300** students in Indian National Astronomy Olympiad(INAO) *2014*
- Awarded certificate of merit for **top 1%** in National Standard Examination in Physics(NSEP) *2014*
- State Rank **3** in Maths Olympiad by Andhra Pradesh Association of Mathematical Teachers(APAMT) *2011*

## Relevant Coursework

- **Computer Science**: First Principles of Computer Vision, Deep Learning, Generative Adversarial Networks, Artificial Intelligence, Foundations of Intelligent and Learning Agents, Foundations of Machine Learning, Computer Graphics
- **Mathematics**: Linear Algebra, Real & Complex Analysis, General Topology, Numerical Analysis, Differential Equations

## Technical Skills

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|---|---|
| **Proficient** | Python, TensorFlow, Keras, PyTorch, C++, Java, Slang, Bash, SQL, MS Excel |
| **Reasonably Experienced** | OpenCV, OpenGL, MATLAB, LaTeX, JavaScript, React |

## Extracurricular Activities

- Runnerup in the **Institute Badminton League** and **Badminton General Championship**, IIT Bombay *2015*
- Awarded Hostel Sports **Special Mention** and **Passing Out Color** for performances in inter hostel sports *2015-18*
- Organized sports events promoting interaction among students while working as **Department Sports Secretary** *2015-16*
- Organized a **lean methodology** workshop as part of **e-summit** in IIT Bombay for young entrepreneurs *2015*
- Through **Community Team Works** at Goldman Sachs, volunteered to plant trees in Bengaluru *2017*
- Attended **Vigyan Jyoti Shivir**(Vijyoshi Camp) at Indian Institute of Science, Bangalore *2013*
- Secured **district 3rd** in Eenadu Pratibha tenth class mock test *2012*
- Secured **High Distinction** twice in **Australian National Chemistry Quiz** *2010-11*