

While public awareness of sleep related disorders is growing, Sleep Apnea Syndrome remains a public health and economic challenge. Although various devices have proved useful to measure physiological signals in apneic events, significant opportunities remain unexplored to enhance quality and affordability of sleep apnea care. It was during my internship at MIT Media Labs that I had a chance to employ complex Machine Learning (ML) algorithms in this real-time problem solving. As a part of 'Sleep Apnea Project', I was responsible for snore detection and breath monitoring of patients, using sensors to build breathing profiles. Making use of multiclass classifier using Supervised Learning methods, I collected data to identify sleep patterns and experimented with new technologies like MATLAB, Arduino, Python, and Scikit-learn. As the project concluded, I successfully developed a low-cost diagnostic sleep mask for detection of Obstructive Sleep Apnea, which was well appreciated for its ingenuity, portability and ease of use. This experience significantly piqued my interest in engaging technological tools to alleviate a physical disability and seamlessly amalgamated with one of my life goals – to solve a conundrum affecting a large subset of people.

The success of my internship also translated in the successful execution of my final year project on Automated Surveillance System using Computer Vision. The main objective here was to monitor and track people's activities from CCTV footage, for which I proposed a person-classifier using HOG descriptors. It made use of algorithms like SVM and Convolutional Neural Network supported by KCF trackers and data association techniques, to address the problem of partial occlusion and multi-object tracking. As the recorded HD-video required high computational time, we put forth a GPU implementation of our solution using CUDA, reducing time to nearly one tenth. This project earned me extensive experience in Machine Learning and formally introduced me to the convoluted interdependency of hardware with software. My laudatory effort for this study was published in a leading national daily and motivated me further to delve deeper into core concepts of intelligent machines.

In order to gain exposure to work on large datasets, I am currently employed at Credit Suisse's (CS) Algorithmic Trading hub, the Systematic Market-making Group. Starting out as an intern, I worked on Linux shell scripting and Exchange Simulator using WCF Service, which became my training ground on web development. In my current profile as a developer on strategic trade-entry applications, Toolkit and Finscreen, I am instrumental in creating a new feature for auto-loading of baskets to streamline the process for traders who want to execute basket orders. For efficient low-latency trading, I built an Asynchronous Logging system by using wait-free producer-consumer system, which allowed logging in nanosecond times. Working on these assignments significantly honed my proficiency in Data Structures and Operating Systems concepts like multithreading, synchronization, and queuing using spin-locks and ring-buffers. My lucrative experience at CS also enhanced coding abilities and developed flexibility to work with a number of tools and technologies, opening my eyes to Software Development Process, use of Design Patterns and large-scale code collaboration.

Through several trainings received as a part of Analyst program at CS, the one on Risk and Compliance introduced me to Money Laundering. Taking cue from them, I decided to implement a POC for Detection of Money Laundering using Behavior Analytics. This was done by analyzing transaction details of different customers using parameters like total amount or number of cumulative transactions, spanning over a certain time frame, in a domestic or foreign account. Using K-means Clustering, the customers were segregated into different segments as per the velocity and volume trends in their transactions, thus enabling accurate fraud detections.

With such myriad experiences in employing ML on medium scale, I now wish to leverage my knowledge to build intelligent systems having cognitive abilities, that have a wider societal impact. That is my prime consideration why I want to pursue my Masters in Data Science at UPenn. Owing to my sustained interest in financial domain, I want to work in Investment Banks like Morgan Stanley and Goldman Sachs, to develop quant models for equities and derivatives algorithmic trading, using

ML and Big Data technologies. Other interesting avenues in healthcare to identify solutions in disease control and redesigning existing diagnostics excite me to the core.

Since it has been my endeavor to use my engineering skills to alleviate dynamic, real-world challenges, I collaborated with students from Seth G.S. Medical College (KEM), Mumbai, to develop a wearable solution for patients of Dementia and Alzheimer's, which helps them navigate correctly in case of memory loss. Besides sending out SMS notifications in case a patient crosses a pre-defined geo-fence, the device also helps in real time tracking of the patient and is smart to learn their daily routine, making use of Graph-based semi-supervised variation in SVM. With our work getting recognized by leading newspapers like DNA and Asian Age, I realized the potential of ML in solving other practical problems. This led me to collaborate with a research team at IIT-Bombay, on designing a non-invasive, portable device used as a mass-screening tool for Cardiovascular Autonomic Neuropathy (CAN), a major complication in Diabetes. Taking into consideration features like pulse rate and transit time along with body temperature, heart to finger-tip distance and blood pressure variability detected from ECG and PPG (Photoplethysmogram) sensors, I trained an ID3 decision tree to screen how susceptible a patient is to CAN.

My academics have always been my top priority, but I do engage in activities, which contribute positively to my personality. I am quite adept at solving advanced Rubik's puzzles like 6x6, 7x7, Pyraminx, Megaminx, Mirror Cube, and have been a part of several such workshops to teach its modality to underprivileged children. My solutions oriented approach made me winner at several hackathons, including the ones by MediaTek Labs and Texas Instruments, with themes aligned to my research. My leadership skills refined during my roles of social media manager at University festival and TPO Coordinator of my class. Since it has always been my endeavor to contribute positively to our community, I have led a recycling drive in association with Green Yatra, devoted towards protection, conservation and improvement of nature.

Although my experiences with data science to downsize a real world problem have been versatile, I want to pursue Master of Data Science at UPenn to significantly advance my knowledge in this domain. The core courses are essential for my career growth as a data scientist. The possibility of collaborating with distinguished faculty members like Dr. Michael Kearns, to gain valuable insights in computational finance, seems extremely exciting. With innovative groups like Penn Research in Machine Learning (PRiML) and their research on Computer Vision and Natural Language Processing, I intend to become an active member of the ML community by organizing seminars and annual spotlight sessions. Besides academic, I intend to work closely with global peers in the Office of Diversity and Inclusion, to widen my perspective on the concept of inclusive environment. I hope that the admission committee reviews my application in a positive light and invites me to be a part of the prestigious network of incoming graduate students for Fall-2016.