Statement of Purpose

The Research Internship program will provide me with an opportunity to learn more about Application based machine learning and prepare me to be a good student. My subjects are mostly Application based machine learning in which I worked on four different projects such as mouse automation, multitarget drug discovery, Smart E-commerce etc. also I'm quite interested in Internet Of Things, Blockchain Development, Entrepreneurship etc. I believe this will provide me with an opportunity to continue to be a catalyst not only within research, but my community as well.

My first research project was about mouse automation using machine learning algorithms. I researched about human-computer interaction and came to know that automation of human-computer interaction is a good field to start with such as mouse automation. The Three Mile Island accident occurred on March 28, 1979, in reactor number 2 of Three Mile Island Nuclear Generating Station. where investigations concluded that the design of the human-machine interface was at least partly responsible for the disaster. Similarly, accidents in aviation have resulted from manufacturers' decisions to use non-standard flight instrument or throttle quadrant layouts: even though the new designs were proposed to be superior in basic human-machine interaction, pilots had already ingrained the "standard" layout and thus the conceptually good idea actually had undesirable results. For decreasing such accidents I thought of automating the main component of the computer which interacts with humans that is, mouse. My main aim was to generate a safe sequence in the machine to use the mouse by itself in-case of extreme disasters. I started by programming a code which can collect the mouse locations every 500 microseconds and collected data of x and y-axis for 2 hrs. now my problem was to detect both x and y Axes at the same time but using different operation to make both targets a single value and generating the result in two different values was not possible. So, I broke the project into two parts one was to calculate x-axis and other was to calculate y-axis. I started by giving features of past locations, for example, I gave the feature to be past 5 seconds locations and used different algorithms. I found out the linear regression model to be best with around 72% accuracy by taking mean(abs(Actual-Predicted) <= 40 pixels for y-axis and 80 pixels for x-axis). Now It was a good news accuracy was also pretty good but I again tried with a few more features such as rate of change of y with respect to x in past 2 seconds, rate of change of x with respect to time in past 2 seconds and rate of change of y with respect to time in past 2 seconds. When I used feature selection algorithms the best feature was slope than the rate of change of axis with respect to time than past records and accuracy achieved was about 88% with same linear regression model and same accuracy formula. By this we were able to predict what a human may do in next 3 or 4 seconds with the mouse pointer and machine will do the same before human does that and in case of extreme disasters, the machine can run itself without human interaction.

In last summer I got Inspired by the idea of making E-commerce site behave like a human shopkeeper. My Idea was to make the prediction of people who can buy which products at which costs. Which normally shopkeepers do to vary the price of the same product to different customers. In the physical world, we can see this by a site which decides the price of a product for each customer differently and in such a way that customer buys it surely. Price may be high or low decided by the machine. So I started with a short survey in college by making an E-commerce site prototype on Invision app. It was having a large range of products with prices people needed to record the screen during running our prototype site after that there was a short survey for the same people with different products and they were asked to say at what price they can buy the product from E-commerce portal. After all the steps of data collection, it was time to clean the data we did all the step of the cleansing of data. At last, I used few models like SVM, Linear, Ada-boost, Decision tree and a few others the accuracy or score for Decision tree was the highest with around 52% we tried with every method like feature selection, optimization, and few others but we were not able to increase it over 58%. When we decreased our data-set for training, accuracy came down rapidly by which we came to a conclusion that we had not sufficient data to train and test the models successfully now we are planning to again pick this project up in next summers.

These days I'm working on my own startup ApproApp. I started working on this from February 2017. I have applied for Patent for two novel steps. ApproApp is digital signing platform with its own online portal that links organizations, Executives, and Applicants on a single platform. Organization platform: organization will be able to create or build online forms which will be used by applicants to apply for a specific task in the organization like fee reimbursement etc. The organization will also be capable of publishing documents which will carry all the necessary information of required digital signatures by officials for the approval of an application. They will also publish information for the last stakeholder who will collect that document and process it. Applicant platform: individuals can fill those forms online and send them to officials for approval using our platform, they will be notified at each step of processing the document, like when it will proceed to the next official and what comments did last official make. Official platform: officials will be required to digitally signed the documents and approve them through their pfx files provided to them on behalf of ApproApp. Approval information platform: every document processed on our website will be having a QR code on it, Scanning this QR anyone can reach the approval information published on our website if an executive wants to change his decision he can write to ApproApp for changing the status of the online copy of approval from approved to disapprove. In today's digital signing system no one can disapprove once the application is approved by an executive but our platform will provide service to disapprove it later on. Also, our system is Fraud proof as QR code contains the real copy of approval. This Idea got qualified for smart fifty challenge which is India's largest innovation challenge. Also, I'm researching about adding Block-chain technology at signature verification step.

I want to join The Robotics Institute Summer Scholars (RISS) Program For my overall development as these days I'm in mostly software part of researches I want to increase my boundaries to limitless knowledge of software as well as hardware-based systems and embedded technologies. I'm looking at this opportunity for making technologies which can make our world a better place to live. This 11 weeks program will make give me an opportunity to meet world-class researchers, developers, and technologists.

I am interested in joining the CMU because of its world-class alumina networks. I saw the profiles of Professors and Ph.D. scholars of the University and got fascinated with a lot of profiles and research works. I loved the Profile of Dr. Mor Harchol-Balter. She is having a lot of experience in her area 'performance analysis and design of computer systems' I wish if I could at least meet her during the program. Also, there is a lot of research works going on on the campus I hope I will be getting help on my project from different faculties at college. At last, I would like to say that I will be a Sincere and Hardworking candidate at the university to achieve my goals and make the program successful.

Ripudaman Singh

Digitally signed by Ripudaman Singh
Date: 2018.03.08 15:20:48 +05'30'

Ripudaman Singh

Digitally signed by Ripudaman Singh
Date: 2018.03.08 15:20:01 +05'30'