School of Computing

Year 4 Project Proposal Form

SECTION A – Proposal Details

Project Title: MDsmrt (Smart Medical Data)
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Stream: CASE
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SECTION B – Proposal Description

Area Covered
This project covers the portability of patients scan images through the blockchain creating a decentralised platform and analysing them through a convolutional neural network.

Outline
The idea of this project came from a combination of internships at MasterCard and Optum. Both very different areas of software engineering as Mastercard is a worldwide payment processor, whereas Optum powers modern health care to create a healthier world. Two of the main problems in the health care system is the loss of data, such as MRI and CT scans, and the accurate reading of these scans by doctors. Scan images are given to patients on a CD which are unreadable, and can be lost very easily, meaning if you go to a new hospital or doctor your previous scan results are unknown. My idea stemmed from here, if a doctor can see previous scan results of a patient and accurately read them quickly, it will benefit both parties resulting in the saving of valuable time.

The functionality of this platform will have two sides, a patient side and a doctor side.

Patient:
A patient generated, patient owned platform where a patient can store and retrieve their scan images, which are being stored on the blockchain. This will create a decentralised digital public record of transactions (images) that are secure, anonymous, tamper proof and unchangeable. Therefore, it will improve the portability of images that often fail or are given to the patient through a CD. The main functions of the patient side of the app, is to store and retrieve images.

Doctor:
After a patient has an MRI or CT scan, the images are sent to their doctor to be read. In most cases the reading of these scans is prolonged and takes time. The doctor side of this platform will have four main functions, upload, store, retrieve and analyse. After each patent has their scan, the doctor will then upload all images to the blockchain where they will be stored. He/she can then analyse the image, giving the percentage of a tumour present through a convolution neural network. This platform will be aimed towards doctors specialised in treating lung cancer.

This platform will act as an extension to each doctor who uses it, resulting in more secure and tamper proof medical records while also resulting in more accurate result readings. In Ireland today, there are massive problems surrounding medical data privacy, costing the government a lot of money and time. With this new platform, if it gained some publicity I can’t see why it could not replace everything that is in place now, which is a more secure, robust and scalable solution.

Programming Languages
This project will be a full end to end solution featuring both patient and doctor web-based front-ends and a backend to connect it all together. This web-based application will be done through python using the Django framework alongside React. The block chain implementation will be done through React and will be an extension of the open source Ethereum blockchain, a decentralised platform which runs smart contracts, resulting in applications that run exactly as programmed without the possibility of fraud or third-party interference. The backend solution and convolutional neural network will be also done through python.

Programming Tools
Web development will be done through React and hosted on a WSGI server. Backend work will be a Django application also using React. The block chain implementation will use the Ethereum blockchain and its supporting documentation and will run through a Docker container. I will also be making use of ADAPT's GPU service to train my convolutional neural network on open source datasets.

Learning Challenges
The biggest challenge in this project is understanding how the Ethereum blockchain works. This is quite a new field of technology with many concepts that I have not been exposed to before. Thankfully, I got to understand the basics of blockchain technology on my INTRA placement in MasterCard. I will spend most of my time looking at the overall structure of the blockchain and its abilities. I have worked previously with CNN's which gives me a good head start, but I will also spend a lot of time researching different deep learning methodologies and libraries in order to develop an accurate CNN.

Hardware/Software Platform
The platform is made up of 4 components:

- Web-based application
  - A Django based application using React ran on a WSGI server
- Backend Server
  - Django service ran on a WSGI server
- Blockchain
  - React through a Docker container
- Convolutional Neural Network
  - Python ran through ADAPT's GPU service

Special Hardware/Software Requirements
I will be using ADAPT's GPU service to train my CNN which I have been given access to by my mentor Andy Way.