Project Plan

LIMElight: Life Insurance Made Easy

The Capstone Experience

Team USAA

Ibrahim Ahmed
Michael Ronayne
Nathaniel Finley
Dong-Hyun Lee
Xingchi Zhou

Department of Computer Science and Engineering
Michigan State University
Spring 2018
Functional Specifications

• Generate accurate life insurance quote using machine learning
• Improve experience of receiving a insurance quote by creating a responsive mobile-friendly web application
• Demonstrate practicality of storing and accessing health record data on a blockchain for general underwriting purposes
Design Specifications

• Provide a web application for users to answer questions and receive a life insurance quote instantly

• Provide a separate web application to allow underwriters to query health record data via a Blockchain web API
Screen Mockup: Quoting Process

Get a Term Life Insurance Quote

M  F

Age  37
Weight  180
Height  6’1”

Do you smoke?  Y  N
Do you exercise?  ✔

GET A QUOTE
Screen Mockup: Quoting Process
Screen Mockup: Underwriter Login
Screen Mockup:
Underwriter Patient Selection
Screen Mockup: Underwriter's Medical Record View
Screen Mockup: Patient Login
Screen Mockup: Patient Login

Manage Who Can View Your Health Records

<table>
<thead>
<tr>
<th>Entity</th>
<th>Permission</th>
</tr>
</thead>
<tbody>
<tr>
<td>USAA</td>
<td>Y N</td>
</tr>
<tr>
<td>Sparrow Health</td>
<td>Y N</td>
</tr>
</tbody>
</table>
Technical Specifications

• Build the web application using React web framework.
• Use Scikit-learn to train and test insurance- quoting model.
• Construct REST APIs to expose the different services provided by the system.
• Build a simple blockchain that can be used to store and retrieve health record data while allowing users to set access permissions to their data.
System Architecture

Blockchain Backend (Azure)

REST API

Ethereum

Execute Smart Contract

Data

Machine Learning Backend (Azure)

REST API

Azure Functions

Machine Learning

Execute Smart Contract

Data

Result

Frontend Web Application (Azure)

React

React

User Input

Quote

• Get Health Record
• Modify Permissions
System Architecture: Machine Learning

RAW DATA
- Standardization
- Normalization

PRE PROCESSED DATA
- Visualization

PRE PROCESSED DATA
- Identify most important features

SMALLER DATASET
- Grid search
- Cross validation

CHOSEN MODEL
- Save trained model to file for API calls

FINAL ESTIMATOR
Blockchain Crash-Course

Traditional Web App Architecture

- Web Browser
- API Caller

HTML/CSS/Javascript

Server Code (API) running Ruby, Python, Java, etc

- Database
- Cache

Web app hosted on Azure/AWS etc
Blockchain Crash-Course

Storing Health Records: **Cons**

1. Centralized
2. Inaccessible
3. Single point of failure
Blockchain Crash-Course

Ethereum Blockchain Web App Architecture

- Dapp Web Browser
- HTML/CSS/Javascript
- RPC
- EVM - Ethereum Virtual Machine
- Blockchain
- Ethereum Dapp - Instance 1
- Ethereum Dapp - Instance 2
1. Decentralized
2. Fully Accessible
3. Distributed

Storing Health Records: Solutions
System Components

• Hardware Platforms
  ▪ All hardware will be hosted on Microsoft Azure

• Software Platforms / Technologies
  ▪ Python for Machine Learning
    o Scikit-learn, Pandas, Matplotlib
  ▪ React for the web apps
  ▪ JAX-RS for the REST APIs
  ▪ Ethereum Consortium Blockchain
  ▪ Microsoft Azure SQL Database
Risks

• Blockchain Implementation
  ▪ Complexity of implementation using smart contract
  ▪ Enrolled in Ethereum Udemy course, utilizing online Ethereum tutorials

• Accurate Life Insurance Quotes
  ▪ Model may struggle to produce an accurate life insurance quote with minimal applicant input
  ▪ Review academic research about most significant factors affecting an applicant's riskiness

• Lack of Knowledge in Life Insurance
  ▪ Group does not have any experience with life insurance industry
  ▪ Connect with underwriters and actuaries at USAA
Questions?