SDoH-Ku

CS6440 Final Project

Enoch Kang (Solo)

Introduction

- Problem: social determinants of health (SDoH) do not receive the attention they deserve in most of the currently available electronic health records (EHR) systems

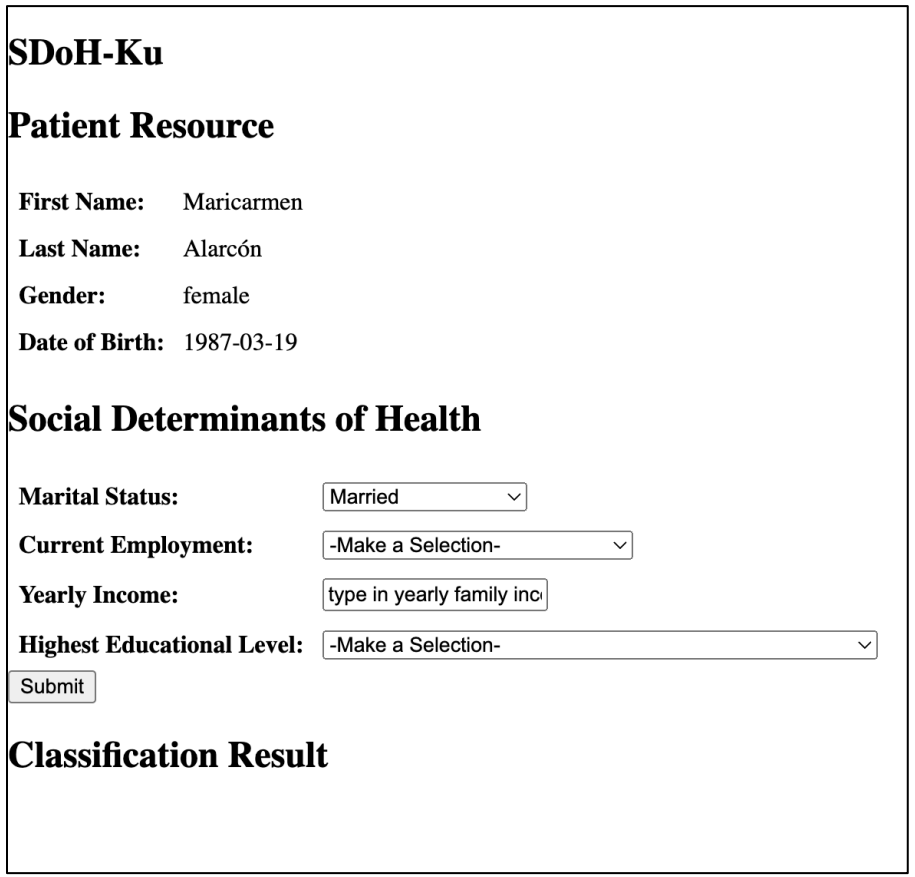
- Goal: Make a SMART on FHIR application that allows medical providers to incorporate a patient's SDoH information into their medical decision making
    1) Retrieve the sporadically located information about a patient's SDoH
    2) Provide classification of the patient's SDoH level through a model trained by machine learning
    3) Display all results in an intuitive, organized, readily usable manner

Research

- Clinically relevant socioeconomic factors
  - Marital status, income, employment status, educational level

- How these factors are stored in FHIR
  - Marital status: as a CodeableConcept in Patient resource
  - Yearly family income: as a quantitiy value in Observation resource (LOINC code: 63586-2)
  - Employment status: as a CodeableConcept value in Observation resource (LOINC code: 67875-5)
  - Educational level: as a CodeableConcept value in Observation resource (LOINC code: 82589-3)

Project Implementation Status (1): Retrieving the SDoH Information

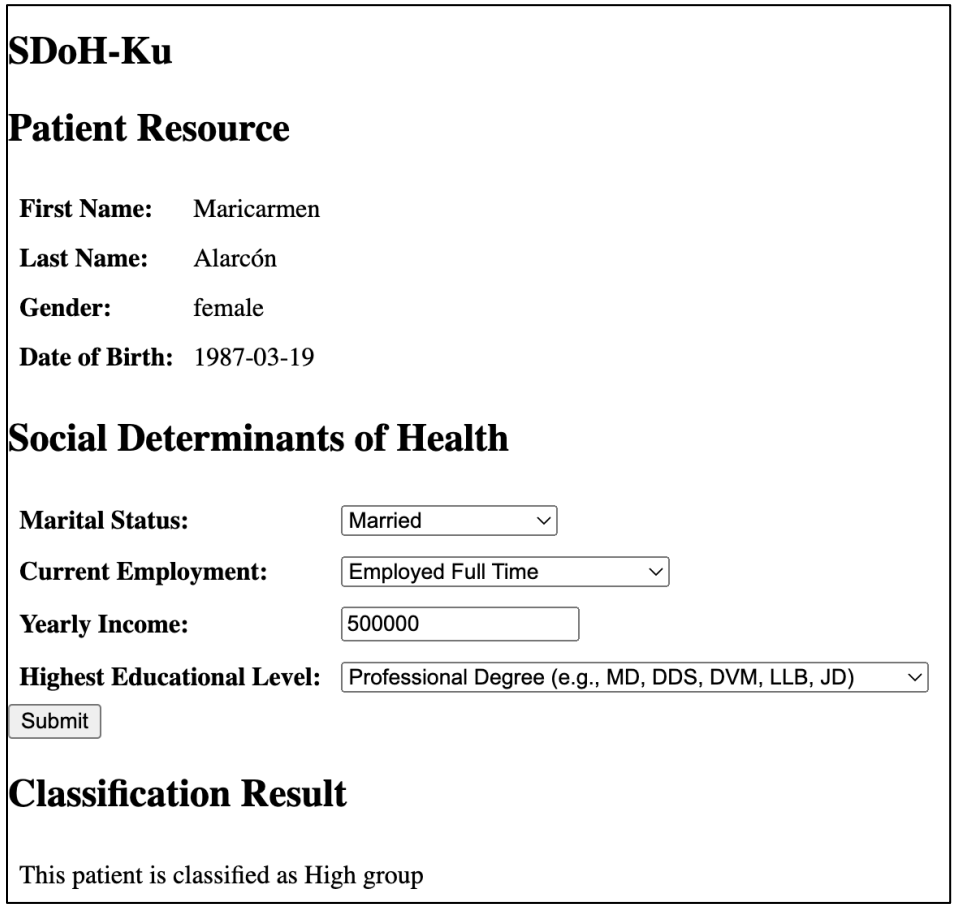


- Retrieve available information
- Encourage user inputs for missing information

Project Implementation Status (2): Classification of the SDoH level

- A decision tree model to classify a given patient's SDoH level
- A sample synthetic patient records provided by Synthea is used to train the model
  - Clustering is used to obtain pseudo-labels of the dataset
  - Inspection of the resulting clusters was done to determine labels
- Unique element of the project

Project Implementation Status (3): Organized Display of the Results



- Functions real-time on Submit button
- Displays all components in an intuitive manner

Demonstration

Future Work

- Potential clinical research on the significance of the SDoH classifications
- Optimization of the classification model
  - Use of non-synthetic datasets
  - Use of datasets with ground truth labels
- Ethical considerations

CS 6440 Project Final Submission

Project/Application Name – Final Submission
Term: Fall 2023
Enoch Kang

Section I: Project Overview

Project Title: *SDoH-Ku*
Team Members and Roles/Responsibilities (If Applicable)

- *Enoch Kang – everything (Solo)*

TA Mentor: *Mike Romano*

Project Task Status

- Literature review to select relevant socioeconomic factors: DONE
- Find an appropriate dataset: DONE
- Develop a result screen: DONE
- Develop an application that has access to necessary resources: DONE
- *Learn the general workings of ClarityNLP: ABORTED*
- Select the appropriate classification algorithm for this project: DONE
- Prepare the training and testing datasets for the learning model: DONE
- *Apply ClarityNLP to organize SDoH information: ABORTED*
    - Switched to: retrieve relevant SDoH information through LOINC codes: DONE
- Train and test the learning model: DONE
- Learn to use Flask: DONE
- Make it so that the application can access the classification model: DONE
- Incorporate the trained model into the final application: DONE
- Ensure functionality with incorporation of necessary components: DONE

Section II – Project Artifacts

Deployed Application URL: *https://launch.smarthealthit.org/*
App's Launch URL (type in @SMART Sandbox Launcher):
https://eboy77.github.io/smart-on-fhir-tutorial/example-smart-app/launch-smart-sandbox.html
GitHub Repository Link: https://github.com/eboy77/smart-on-fhir-tutorial
Dataset Link: https://synthea.mitre.org/downloads

- "1K Sample Synthetic Patients Records, FHIR R4" (81 MB)

Section III – Project Presentation

Please see the Canvas Assignment page for the current semester for general guidelines on the presentation.

Presentation Link: *https://youtu.be/RRQF6MKqD-0*

Section IV – Project Documentation

Create a directory in your GitHub repository called "Documentation". Within this directory provide the following:

- Technical and/or User Manual: saved as *UserManual.md*
- Research: within *Research* folder
- Architecture Diagram: saved as *ArchitectureDiagram.png*
- Documents: other documents such as this document, previous sprint reports, the academic paper, and the presentation file.

For each item included, provide a labeled direct links. Use full URLs, do not embed the link in a word or phrase.

All of the documentation that you submit with your final project should be treated as an official deliverable – this includes the technical/user manual(s). Documentation that is not well structured or clearly written may result in point loss, as it can impact use and thus grading of the application.