

# Statement of Work

Michael Dang, Chaitanya Padamata

Data Science Capstone

University of Missouri - Kansas City

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## 1 Introduction

- According to the CDC, in 2022, the U.S. has **1 in 6 deaths** (17.5%) from cardiovascular disease due to stroke. Every **40 seconds**, someone in the U.S. has a stroke. Every **3 minutes and 11 seconds**, someone dies of a stroke in this country.
- Early action is **crucial** in stroke cases, as the chances of survival significantly increase with immediate emergency treatment. People who arrive at the emergency room within three hours of their first symptoms often experience less disability three months after the stroke.
- With today's technological advancements and the rapid growth of AI, we aim to develop a platform that can detect potential strokes and provide a fast-response system for stroke victims.

## 2 Objective

- The primary objective of this project is to develop an integrated platform that combines early stroke detection and a fast-response system to minimize the time between stroke attack and medical intervention.
- The platform will utilize a multi-modal approach to detect potential stroke incidents by analyzing facial asymmetry, behavior, and past medical history. Additionally, the platform will implement a fast-response system that locates the nearest emergency room (ER) with the shortest wait time. Nevertheless, an LLM chatbot will guide users through the critical first steps after stroke detection, providing recommendations on what to do immediately.

### 3 Existence Work

- FAST AI is a mobile application that detects strokes based on facial asymmetry, speech changes, and arm weakness. The platform utilizes machine learning, computer vision, and signal processing methodology to predict potential stroke.

### 4 Summary of Relevant Projects

- [Stroke prediction using electrocardiogram \(ECG\):](#)  
In this paper, the authors use ECG raw data to predict potential stroke in over 71 studies by stacking three convolutional neural networks (CNN). The prediction achieves 99.7% accuracy.
- [Prediction of stroke based on hypertensive patient:](#)  
In this paper, the authors use 4 machine-learning algorithms to model stroke risk. The tree-based algorithm extreme gradient boosting achieves the optimal performance with an area under the receiver operating characteristic curve of 0.92.
- [Predicting stroke based on body movement:](#)  
In this paper, the authors used deep neural networks to analyze hand, face, pupil, and body movement to estimate the possibility of a stroke attack. The object is to develop an AI system that can easily screen and manage neurological diseases through videos.
- [Early-life tobacco smoke exposure and stroke risk:](#)  
This paper give an overview of how smoke can in the probability of getting a stroke.

### 5 Contribution

Since the team has 3 members the corresponding roles are Frontend, Backend, and Data Science or Machine Learning Engineer.

1. Michael Dang:

Michael has a setup workstation at home with a GPU (Nvidia GeForce RTX 4070Ti Super) and can maintain the database. Hence, he claims a Data Science/Machine Learning Engineer role in this project. For the Data Science part, his responsibility is to collect and process relevant data, train the ML model, and interpret it. For the Machine Learning Engineer part, his responsibility is model deployment and system integration along with optimization, scaling, and maintenance.

So far, he has collected some relevant papers in section (4) and skimmed through them. Also, he prepared the Ignite Talk and Statement of Work

by himself.

His plan for accomplishing this project, divide the project into smaller parts, each part will take around 1-2 weeks to complete. Here is a breakdown:

- Research and Data Collection (1-2 weeks)
- Algorithm Development (1-2 weeks)
- Development of Fast-Response Coordinate System (1-2 weeks)
- LLM Chatbot Development and Integration (1-2 weeks)
- System Integration and User Interface (1-2 weeks)
- Testing (1-2 weeks)
- Deployment and Final Adjust (1-2 weeks)

Note: This plan is not guaranteed, some limitations may occur.

For changes and improvements, no for now.

2. Chaitanya Padamata:

- **Role:** Frontend and Full-Stack Developer
- **Responsibility:**  
Chaitanya is responsible for the design and development of the user interface and will also assist in integrating the backend services. He is also involved in integrating machine learning models into the frontend and ensuring their functionality in a real-time environment.
- **Contribution:**
  - (a) Completed: Chaitanya has begun initial work on the frontend design, focusing on the user interface's layout and usability aspects. He has also been involved in discussions about full-stack integration and the incorporation of machine-learning models
  - (b) Planted:
    - Frontend Design and Prototyping (1-2 weeks)
    - Development and Integration of User Interface (1-2 weeks)
    - Integration of Machine Learning Models with Frontend (1-2 weeks)
    - Collaboration on LLM Chatbot Interface (1-2 weeks)
    - Final Testing and User Experience Optimization (1-2 weeks)
- **Changes/Improvements:** Chaitanya is considering improvements to the user interface design to enhance user experience and accessibility, and may also explore additional frontend frameworks to optimize performance.

3. Karthik Chellamuthu:  
Backend.