

# **System Requirements Specification**

## **1. Introduction**

This document describes the functionality and basic idea behind the project “Cardiovascular diagnosis using Federated Learning”.

## **2. Purpose**

Cardiovascular diseases (CVDs) continue to be the leading cause of morbidity and mortality worldwide according to WHO. Automated classification of cardiovascular sounds has the potential to detect abnormalities in the early stages of a cardiovascular dysfunction and thus enhance the effectiveness of decision making. One of the first steps in evaluating the cardiovascular system in clinical practice is physical examination, which is dependant on the level of expertise of the physician. Also, because of data-privacy restrictions, conventional Machine Learning based technologies are not able to achieve the level of accuracy, comparable to a human counterpart. Our system, which uses Federated Learning methodology proves to be a solution to most of the currently prevailing restrictions.

## **3. Description**

An Electronic stethoscope is used to auscultate a patients heartbeat sound and obtain the recorded sample of the same. This recorded sample is passed to our system to obtain a diagnosis of the patient’s heart condition. Federated Learning training methodology is utilized to obtain inferences from many such implementations of the system to improve the overall efficiency of the system over time without sharing private patient data.

## **4. Functional requirements**

- Diagnose the patient’s heart condition effectively
- Improve the overall efficiency of the system over time

## **5. Technical requirements**

### **1. TensorFlow**

TensorFlow is a free and open-source software library for machine learning. It can be used across a range of tasks but has a particular focus on training and inference of deep neural networks.

### **2. TensorFlow Federated (TFF)**

TensorFlow Federated (TFF) is an open-source framework for machine learning and other computations on decentralized data. TFF has been developed to facilitate open research and experimentation with Federated Learning, an approach to machine learning where a shared global model is trained across many participating clients that keep their training data locally

### **3. Python3**

Python is an interpreted, high-level and general-purpose programming language used worldwide. Python's design philosophy emphasizes code readability with its notable use of significant whitespace.

### **4. Google Colab**

Colaboratory, or “Colab” for short, is a product from Google Research. Colab allows anybody to write and execute arbitrary python code through the browser, and is especially well suited to machine learning, data analysis and education.

## **6. Design Constraints**

- Limited number of data samples in publicly available datasets