I. Introduction

A 2019 World Health Organization (WHO) report shows that heart disease is currently a major factor in deaths worldwide, causing 17.9 million deaths annually. Heart disease is a general term for conditions that affect the heart or blood vessels. Various factors can cause an increased risk of heart disease such as cholesterol, obesity, hypertension, smoking, and others. At present there are various methods to detect heart disease such as electrocardiogram, CT angiography, and others.

In recent years, various organizations have studied models for disease detection based on machine learning methods. There are various methods such as SVM, DL, Decision Tree, K Neighbors, Random Forest, and Logistic Regression to predict heart disease [1]. In [2], the authors propose GAPSO-RF which is a combination of the Hybrid GA and PSO models where this model applies multivariate statistical analysis in the first step to select the best features for use in the initial population and a discriminatory mutation strategy is carried out. However, the previous method only focused on differences between clinical features and neglected modeling of interactions between individual features and global features. Therefore, high-dimensional, nonlinear relationships between captured features are very limited.

A graph neural network (GNN) is a type of neural network that operates directly on structured graph data. It is designed to study and process relationships between objects represented in graphs where objects are represented as nodes and relationships as edges. There are several types of methods from GNN, one of which is in the research of Kipf et al. [3] introduced a scalable approach to semi-supervision learning on graph data structures based on efficient variants of convolutional neural networks that operate directly on graphs, allowing GCN to directly determine convolutions on graphs.

Recently, GCN has helped solve problems in the medical world, especially in the scenario of applying medical images and non-image information. In some studies, many methodological advances have been achieved such as prediction of Autism and Alzheimer's [4], [5] and mammogram analysis [6]. There is recent research that uses the GCN method that combines with the attention mechanism to predict heart disease and get good results for the accuracy of the method [7]. In addition to these studies, there are studies that propose the GCN method for predict heart disease with a new approach, namely domain-adaptive multichannel graph convolutional network that can perform graph transfer learning on cross-domain tasks to achieve cross-domain medical knowledge transfer on different CHD datasets [8]. Graphs provide a powerful overview and have an intuitive way to model nodes and edges. In such scenarios, a node can represent the data obtained from a subject in a particular modality and the edge weights used to capture the equation between each pair of nodes [7]. However, there are several drawbacks, first focusing too much on pairwise similarity between nodes and relying on one way to create graphs or edges. Second, GNN may not be able to learn some of the deep correlation information between topology and node features [7]. This makes those tasks more challenging as well as limited performance because they are harder to generalize. There are several limitations in this study. First, it uses datasets from patients who have been diagnosed with heart disease. Second, the GCN method is used as one of the methods of GNN. Third, for the accuracy value achieved at least 75% . The purpose of this study is to create a system with a GNN model that can perform early detection of heart disease using the UCI Machine Learning heart disease dataset. The GNN approach we use is GCN introduced by Kipf et al. [3].