

## Chapter 7

# Heart Disease Prediction Framework Using Soft Voting–Based Ensemble Learning Techniques

**Omprakash Nayak**

*National Institute of Technology, Raipur, India*

**Tejaswini Pallapothala**

*National Institute of Technology, Raipur, India*

**Govind P. Gupta**

 <https://orcid.org/0000-0002-0456-1572>

*National Institute of Technology, Raipur, India*

### ABSTRACT

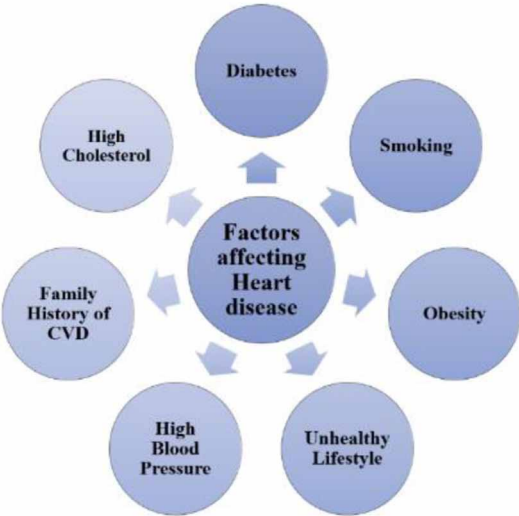
*Cardiovascular disease is among the leading sources of the growing rate of morbidity and mortality worldwide, affecting roughly 50% of the adult age group in the healthcare sector. Heart disease claims the lives of about one person per minute in this modern era. Accurate detection methods for the timely identification of cardiovascular disorders are essential because there is rapid growth in the number of patients with this disease. The goal is to understand risk factors by analyzing the heart monitoring dataset using exploratory data analysis. This chapter proposes a heart disease prediction framework using soft voting-based ensemble learning techniques. Performance evaluation of the proposed framework and its comparison with the state-of-the-art models are done using a benchmark dataset in terms of accuracy, precision, sensitivity, specificity, and F1-score. Heart disease is a long-term problem with a greater risk of becoming worse over time. The proposed model has achieved an accuracy of 90.21%.*

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INTRODUCTION

The heart is the most important complex organ. In a nutshell, it controls blood circulation inside our bodies. Any cardiac abnormality might induce agony in plenty of other parts of the body (Sivabalakrishnan, 2019). Cardio Vascular Disease (CVD) is defined as any impairment in the regular beating of the heart. Coronary artery disorder is one of the leading causes of mortality in modern society. The myocardial disease can be caused by a sedentary lifestyle, smoking, drinking, and saturated calorie consumption, all of which can lead to hypertension (Dutta et al., 2020). As per the WHO survey, greater than 15 million people worldwide die each year because of heart problems. The latest WHO report published in 2020, 59.8 million fatalities worldwide transpired in 2018 because of myocardial infarction. Cardiovascular disease claimed the lives of 20.6 million individuals in 2015 (Anitha & Sridevi, 2019). Data gathering has been indicated by the WHO as having the opportunity to assist and diagnose the beginning stages of cardiac disease and deliver proper illness solutions. The key to avoiding cardio ailments is to maintain good lifestyle habits. CVDs include heart diseases, vascular diseases of the brain, and blood vessel diseases. One of the predominant sources of life-threatening impediments and fatality is cardiac disease. Heart disease treatment and therapy are highly challenging, especially in developing nations, due to a lack of effective diagnostic instruments, medical specialists, and other resources, all of which impede patient prognosis and treatment. The main contributing factors are insufficient preventive

Figure 1. Different factors affecting heart disease



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