

CHAPTER III

RESEARCH METHODOLOGY

3.1 Research Design

The research process for this study involves several stages. The first stage is the literature review, where various concepts, theories, and materials related to the research topic are observed and comprehended. Specifically, this study focuses on exploring the utilization of Artificial Intelligence, Face Recognition, Machine Learning, Convolutional Neural Networks, and the Dart language for face detection.

Once the relevant literature has been reviewed, the next stage is data collection. In this stage, the necessary data and other requirements are obtained based on the findings from the literature review. For this particular research, a facial dataset collected from several students of UPI is utilized as the primary data source.

After data collection, the development of the facial recognition system takes place. This stage involves the creation of software utilizing the iterative waterfall model methodology. The iterative waterfall model includes a series of steps such as analysis, design, coding, and testing, which are iteratively performed to ensure the effectiveness and functionality of the developed application.

The subsequent stage is experimentation. Here, different Machine Learning methods for facial recognition are tested and evaluated to identify the most suitable approach. The experimentation phase helps in determining the effectiveness and accuracy of the selected Machine Learning method.

Following the experimentation phase, the analysis of the experiment and documentation takes place. The experimental results are analyzed to create the facial recognition system based on the findings and outcomes. Additionally, thorough documentation is carried out to record the experiments conducted, providing a comprehensive account of the research process and its outcomes.

Overall, this research involves studying literature, collecting data, developing an application, conducting experiments, and analyzing the results, followed by documentation. Each stage contributes to the overall process of exploring and

implementing a facial recognition system using Artificial Intelligence, Machine Learning, and specific programming languages like Dart. The process of research design involves a series of steps conducted by the researcher to formulate their research plan. Figure 3.1 illustrates the specific stages undertaken by the author during their research process.

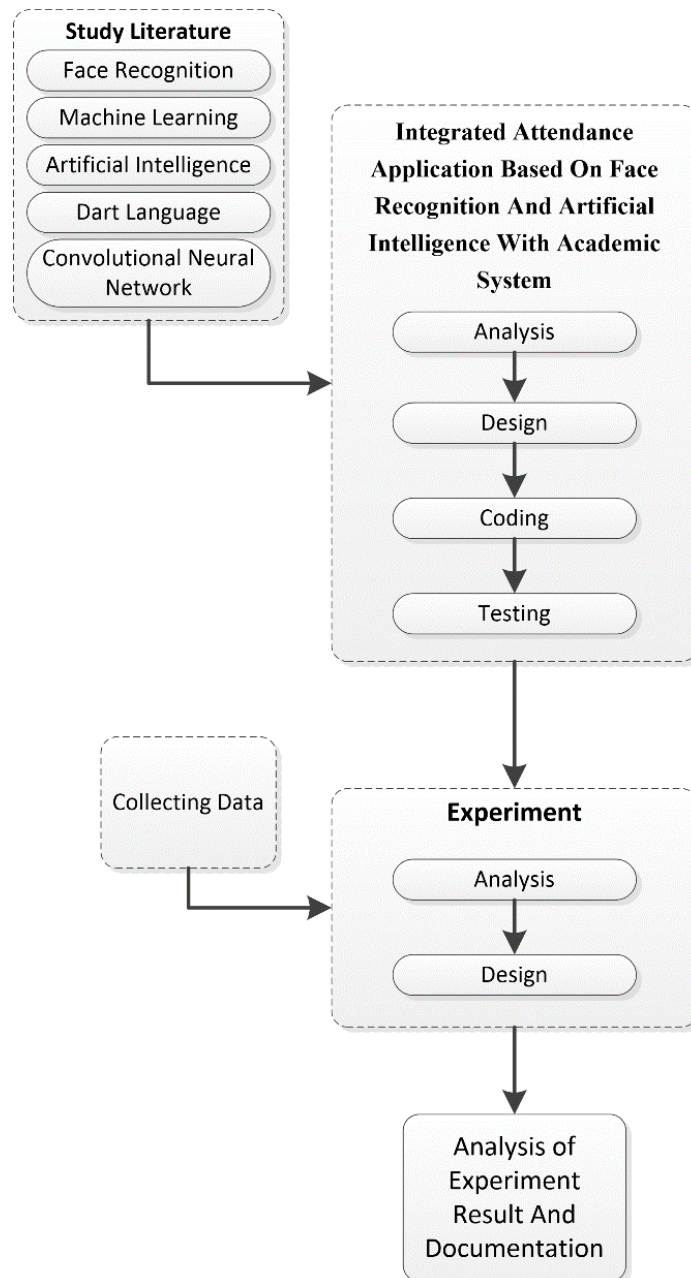


Figure 3.1 Research Design

3.2 Research Tools and Materials

In this section, we will outline the research tools and materials that will be employed in this study. The research will utilize a combination of hardware and software resources. The primary research material to be utilized in this study will be a facial dataset.

3.2.1 Research Tools

The following hardware and software were utilized in the research:

1. Hardware
 - a) Processor AMD A8-7410 APU with AMD Radeon R5 Graphics 2.20 GHz
 - b) Installed RAM 12.0 GB
 - c) System type 64-bit operating system, x64-based processor
2. Software
 - a) Windows 10
 - b) Visual Studio Code
 - c) Flutter 3.10.4
 - d) Android Studio
 - e) Chrome

3.2.2 Research Materials

The research material utilized in this study consisted of gathering facial data from students of UPI.

3.3 Research Methodology

In this section, we will present the research methodology employed in this study. The methodology consists of two main parts: data collection and software development methods.

3.3.1 Data Collection Methodology

In this study, the researcher conducted data collection to obtain accurate and relevant information to support the research. The data collection process involved

exploration and literature review through journals, articles, websites, textbooks, and e-books from both national and international sources.

3.3.2 Software Development Methodology

The software development methodology utilized in this study is the iterative waterfall model (Fagarasan et al., 2021) as seen in Figure 3.2. This methodology involves a sequential process where each phase, such as analysis, design, coding, and testing, is performed iteratively. It allows for continuous feedback and refinement throughout the development process, leading to an efficient and good software product.

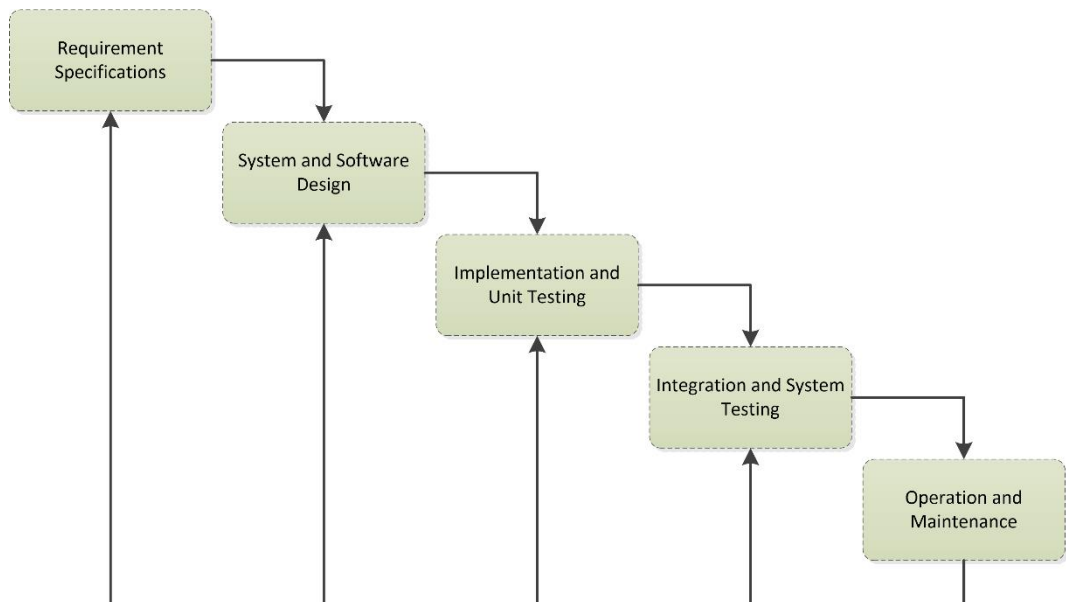


Figure 3.2 Iterative Waterfall Model

In Figure 3.2, a detailed illustration is provided as follows:

1. Requirement Specifications

In this stage, the focus is on understanding the system's requirements for development. This process includes defining the concept, functionalities, and feature specifications. The main objective of the system being developed is to perform facial recognition using Machine Learning algorithms.

2. System and Software Design

This stage involves designing the system to be developed. During the design process, a representation of the requirements specifications, which have been identified in the requirements specification step, is created.

3. Implementation and Unit Testing

In this phase, the programming modules created undergo testing. Once these modules are deemed satisfactory, they are then integrated into a cohesive program that aligns with the specified requirements.

4. Integration and System Testing

In this phase, the designed and developed system is subjected to testing. The objective of this testing is to verify whether the constructed system aligns with the design and meets the necessary requirements.

5. Operation and Maintenance

In this final stage, the system has been successfully created and deployed. In this phase, a thorough examination is conducted to detect any potential errors that may have arisen during the development of the facial recognition system. Furthermore, in this last step, additional features and new functionalities can be added to enhance the built facial recognition system.