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Use Case Modelling

Software Engineering

Index

1. Actor Identification

Actor candidates were identified by analyzing the Project Dictionary, with particular focus on terms describing persons interacting with the system.

1.1 Identified Actors

The following actor was identified:

- **User** – an anonymous person submitting email text to the system in order to verify whether the message is spam or not.

The Administrator role was identified during analysis but remains outside the scope of the system and is not included in the use case model.

2. Use Case Identification

Use case candidates were identified by analyzing the Project Dictionary for terms related to system activities, functions, and scenarios that represent externally visible behavior.

Based on this analysis, the following use cases were identified:

- **Submit Email for Spam Analysis**
- **View Spam Classification Result**
- **View Spam Explanation with Keywords**

Internal system operations such as model loading, logging, or training were not included, as they are not directly initiated by the actor.

3. Use Case Descriptions

3.1 Submit Email for Spam Analysis

This use case represents the primary interaction between the User and the system. The User provides the content of an email through a web form and submits it for analysis.

The system validates the input and forwards the email text to the spam detection service for

processing.

3.2 View Spam Classification Result

This use case represents the presentation of the spam detection outcome to the User. The system displays whether the submitted email is classified as spam or not.

This use case is always executed after a successful email submission.

3.3 View Spam Explanation with Keywords

This use case represents an automatic extension of the spam classification result when spam is detected. When the submitted email is classified as spam, the system automatically presents keywords that had the most influence on the classification decision.

This use case is executed automatically whenever an email is classified as spam, providing transparency in the detection process.

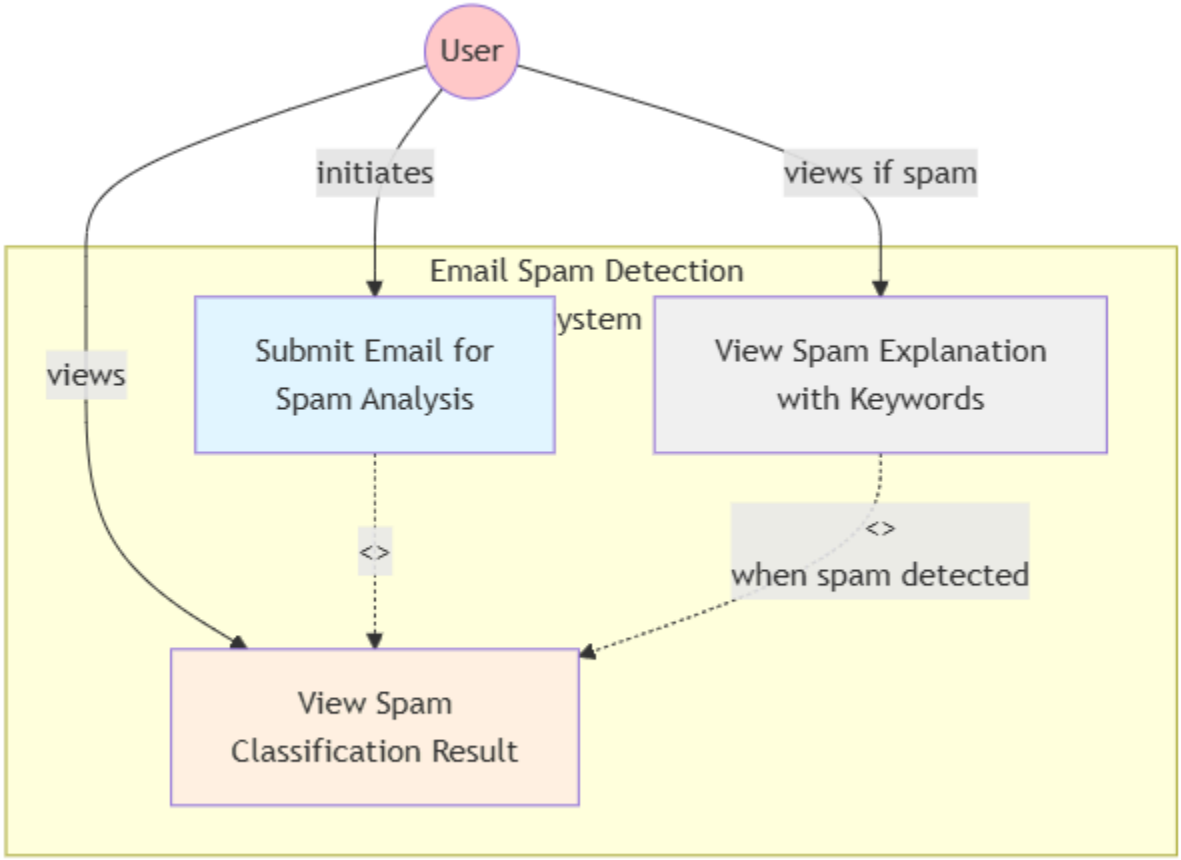
4. Use Case Diagrams

The use case diagram consists of:

- One actor: **User**
- Three use cases:
  - Submit Email for Spam Analysis
  - View Spam Classification Result
  - View Spam Explanation with Keywords
- Association relationships between the User and all use cases
- An <<*include*>> relationship between submitting an email and viewing the classification result
- An <<*extend*>> relationship between viewing the explanation and viewing the classification result

The use case diagram provides a clear overview of the system's functional behavior from the User's perspective.

4.1. Use Case Diagram

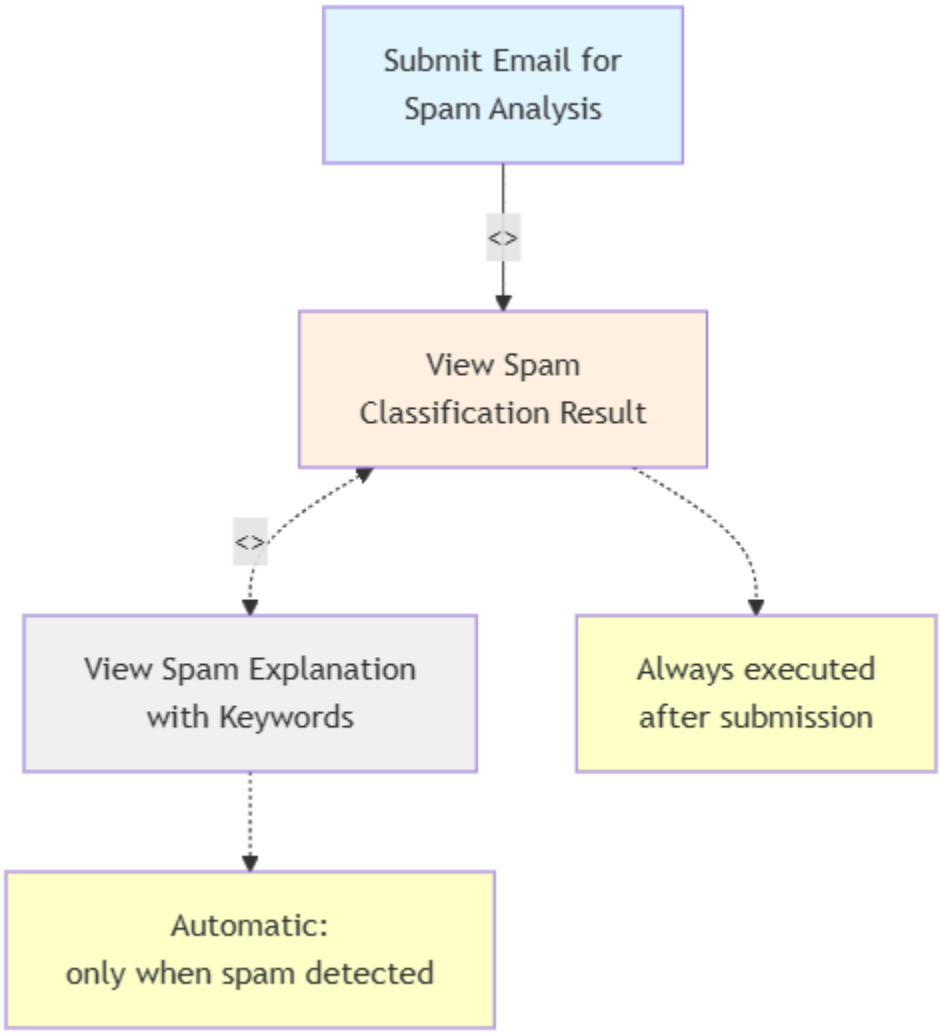


5. Visual Models

This section provides additional visual representations of the system's use cases, interactions, and processes to enhance understanding of the Email Spam Detection System.

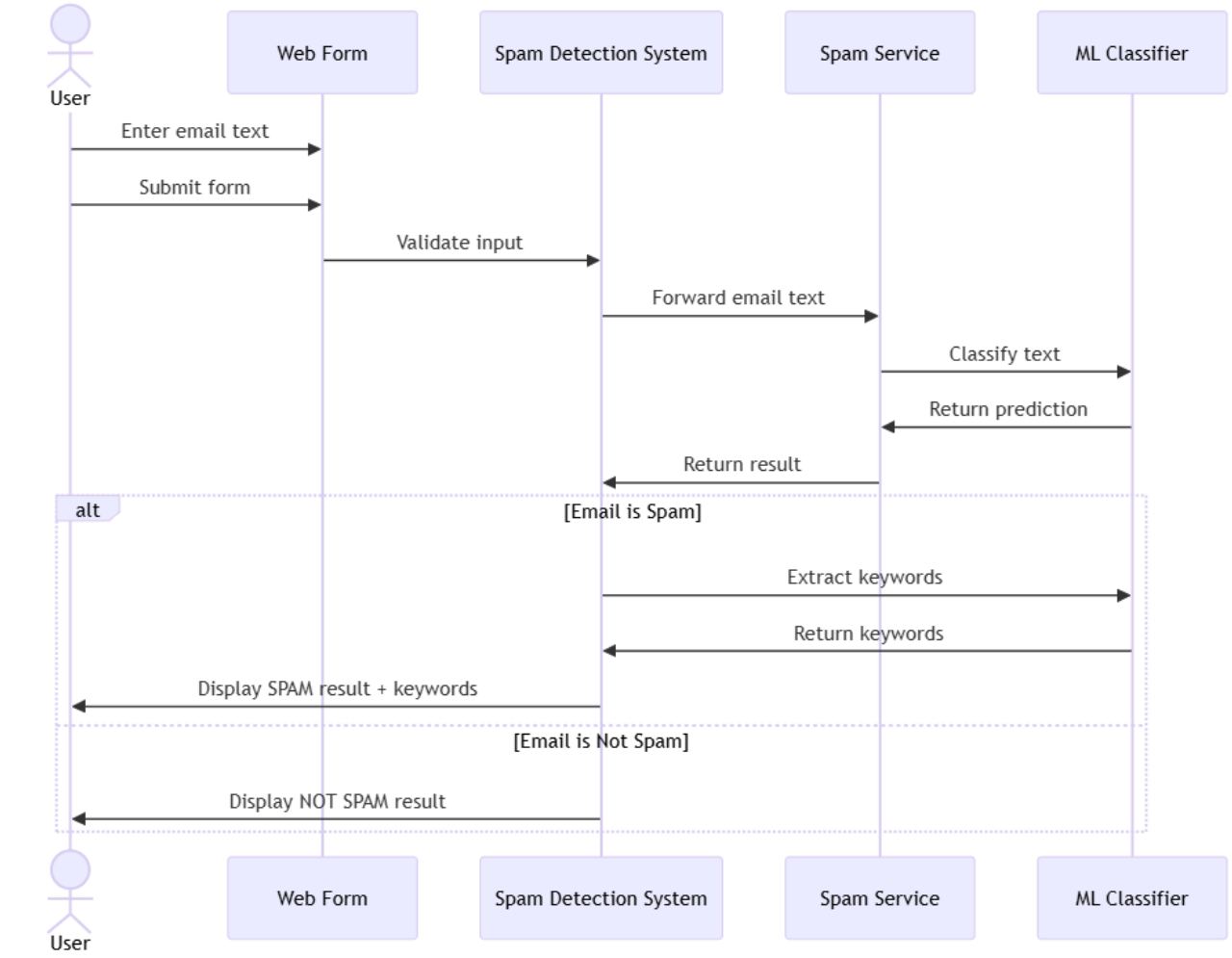
5.1 Use Case Relationship Diagram

This diagram illustrates the dependencies and relationships between use cases in detail.



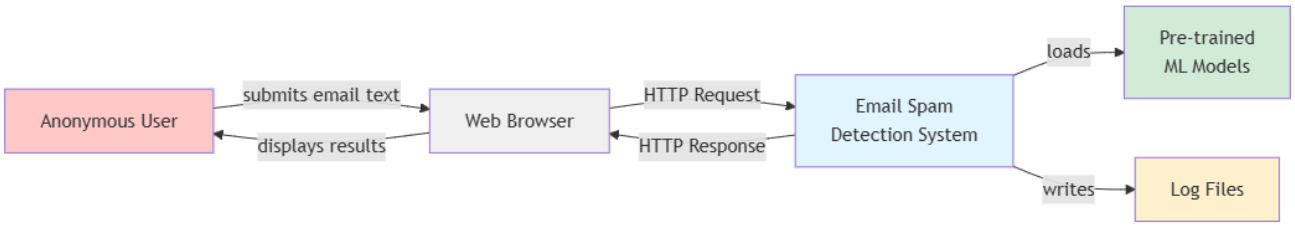
5.2 Use Case Flow Sequence

This sequence diagram shows the interaction flow between the User and the system components during spam analysis.



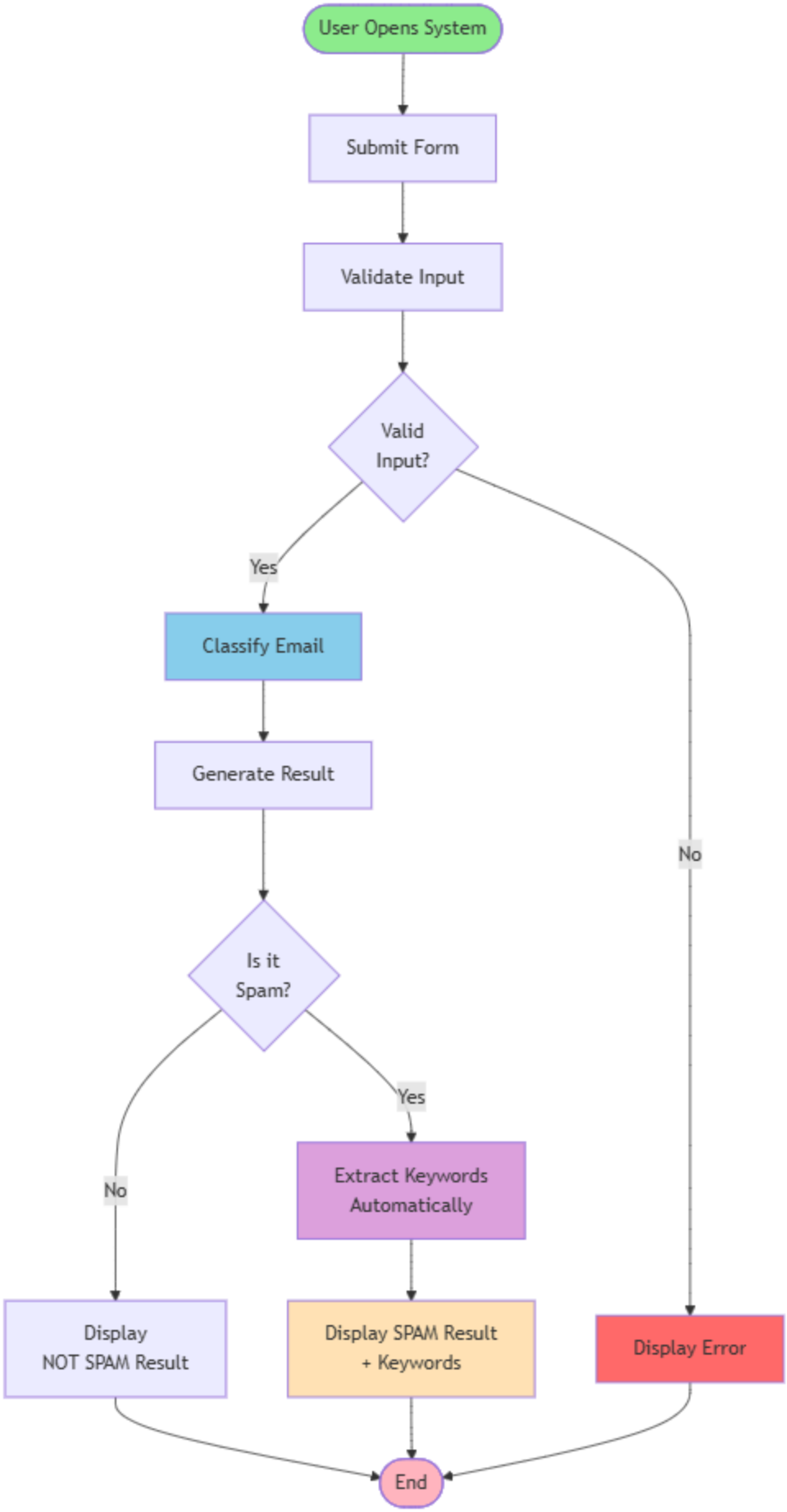
5.3 System Context Diagram

This diagram shows the Email Spam Detection System in its operational context, including external entities and data flows.



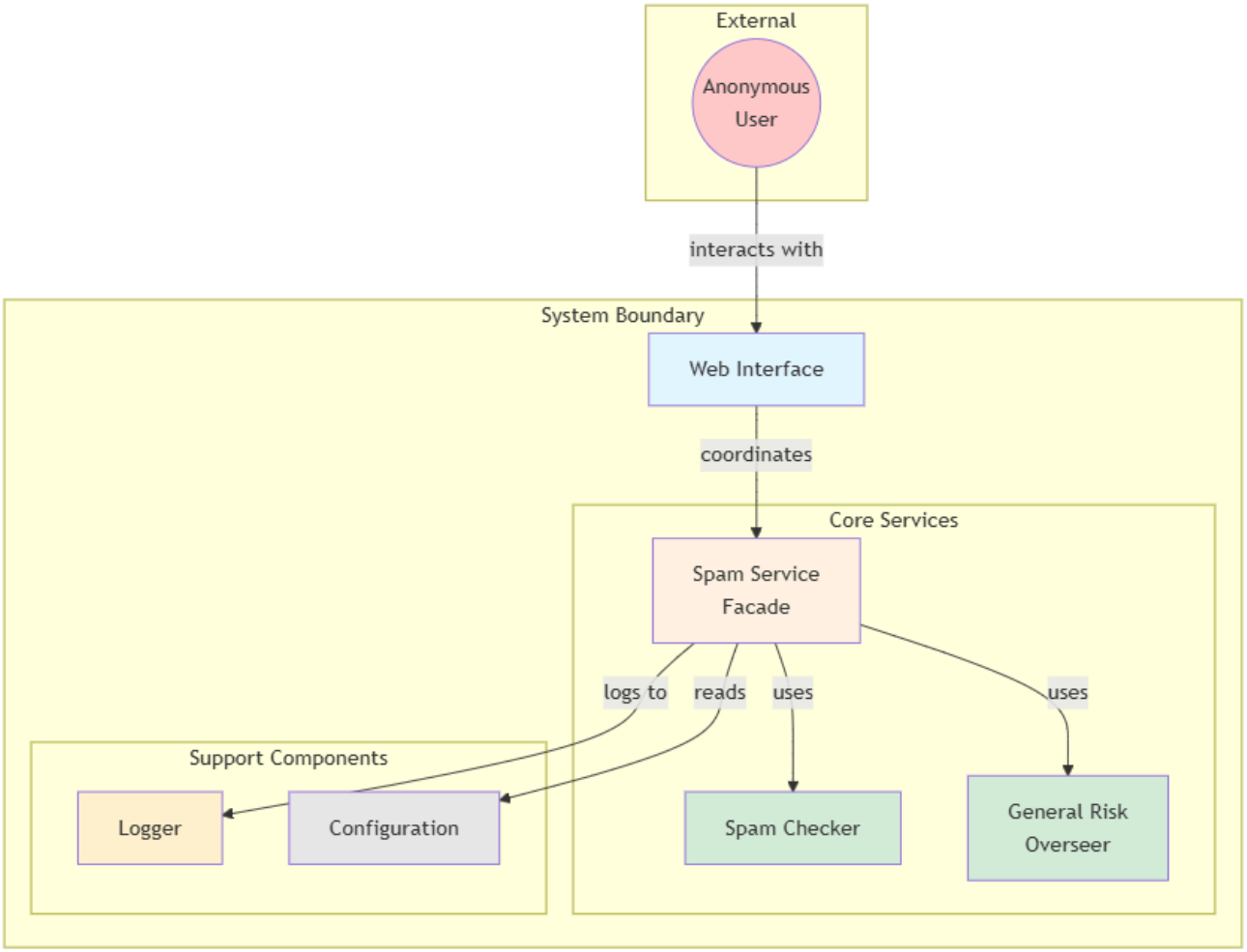
5.4 Main System Process Flow

This flowchart illustrates the complete process flow from user input to result presentation.


User Opens System
Submit Form
Validate Input
Valid Input?
Yes
No
Classify Email
Generate Result
Is it Spam?
Yes
No
Extract Keywords Automatically
Display NOT SPAM Result
Display SPAM Result + Keywords
Display Error
End

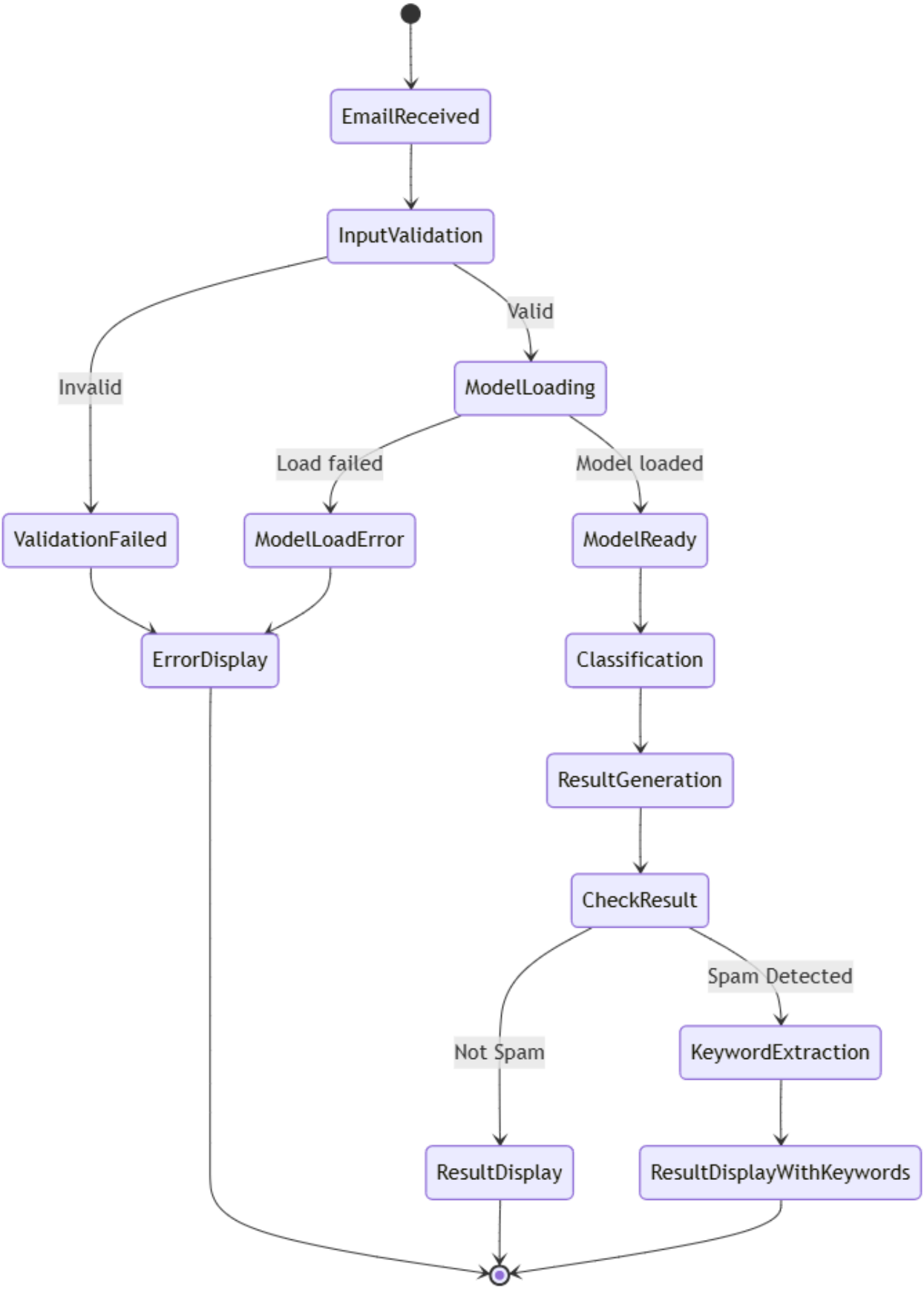
5.5 Actor-System Interaction Overview

This diagram provides a comprehensive view of how the User interacts with different system components.



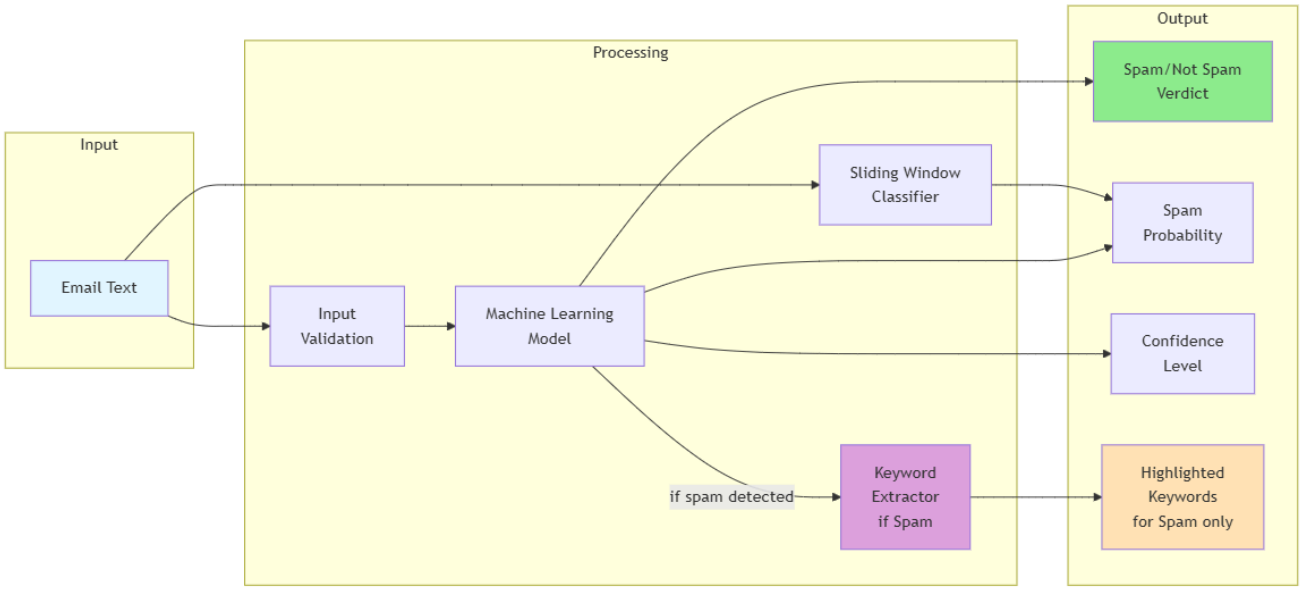
5.6 Classification Process State Diagram

This state diagram shows the various states the system goes through during the spam classification process.


EmailReceived
InputValidation
Valid
Invalid
ModelLoading
Load failed
Model loaded
ValidationFailed
ModelLoadError
ModelReady
ErrorDisplay
Classification
ResultGeneration
CheckResult
Spam Detected
Not Spam
KeywordExtraction
ResultDisplay
ResultDisplayWithKeywords

5.7 Data Flow Overview

This diagram illustrates how data flows through the system from input to output.



6. Conclusion

This Use Case Modelling document provides a overview of the Email Spam Detection System from the user's perspective. The identified use cases:

- Submit Email for Spam Analysis
- View Spam Classification Result
- View Spam Explanation with Keywords

The visual models presented in this document complement the textual descriptions and provide multiple perspectives on system functionality:

- **Use Case diagrams** show the functional requirements and their relationships
- **Sequence diagrams** illustrate the temporal ordering of interactions
- **State diagrams** show the system's behavioral states
- **Flow diagrams** demonstrate process logic and decision points
- **Context diagrams** position the system within its operational environment

A key feature of the system is the automatic provision of keyword explanations whenever spam is detected. This design decision enhances transparency by showing users which

keywords influenced the spam classification.

The system maintains its core principles of privacy, transparency, and simplicity throughout all identified use cases.