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A Framework and Its User Interface to Learn Machine Learning Models

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Introduction

- Machine Learning (ML) is a fundamental skill in Artificial Intelligence (AI) that has been applied to a variety of fields in recent years
- Proficiency in ML is essential for the development of AI in a wide range of fields
- High-level ML implementation requires understanding of various complexities, including
  - ✓ mathematical theories such as ML model theory
  - ✓ implementation methods
  - ✓ verification methods
  - ✓ improvement methods
- Currently, there are some learning services on the Internet that provide code snippets, but most of the code snippets do not have contents that visualize the implementation procedures of ML models.
- Each ML model also has different implementation, validation, and improvement methods depending on its ML model, data set, and error types
- It is important to understand the procedure in order to realize the optimal ML model

Background

- In order to help high school students learn ML, a visualization technique based on the concept of gamification that does not require much knowledge of mathematics or programming is proposed

- Developing a visual interface that does not require much programming skills or knowledge of ML theory is useful for users/students to learn ML easily, and is a contribution to ICT [1]

- Many visual and adaptive programming learning applications are available for elementary, middle, and high school students to improve their programming knowledge and skills
  - scratch [2]
  - code.org [3]
  - khan academy [4]

- Advanced programming learning support systems have also been proposed in various studies [5]-[7]

Objectives

✓Proposal of a theory of a framework for learning ML models

✓Proposal of a theory for constructing UI based on the framework

Symbols

- Details of UI symbols
  i. A phase symbol
  ii. A ML model symbol
  iii. A step symbol
  iv. A conditional branch symbol
  v. A go to next phase symbol

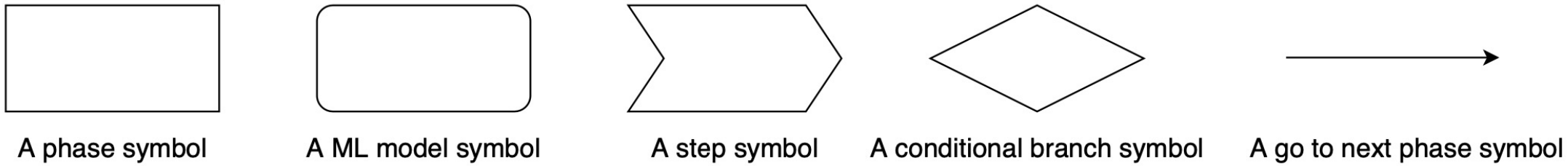

Fig. 1. Overview of the symbols of UI of the proposed ML learning interface

Proposed Framework

- Management of the various phases of ML learning
  - ✓ theory and knowledge learning
  - ✓ implementation
  - ✓ Validation
  - ✓ Improvement
  - ✓ model completion.
- Components of the framework
  - ✓ The study ML phase
  - ✓ The implementation phase
  - ✓ The testing phase
  - ✓ The improvement phase
  - ✓ The deployment phase
  - ✓ The one conditional branch

Proposed Framework (Cont.)

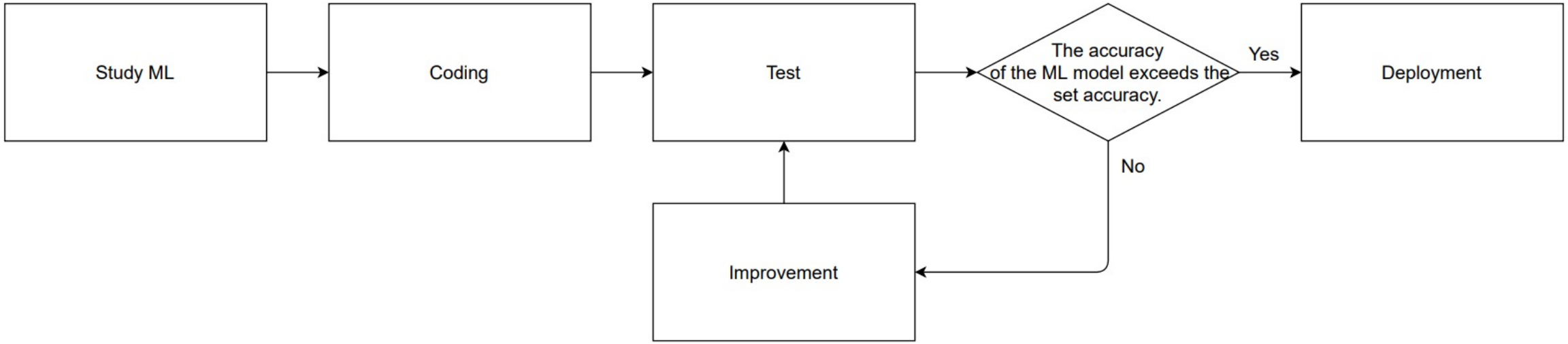

Fig. 2. Workflow of the phases in the proposed ML learning

Proposed UI construction theory

- The proposed UI automatically builds and presents the steps of implementing and improving the ML model to the user.
- By visualizing the tasks, the user can work smoothly without losing sight of the next task to be done after the current task is completed.
- Components of the UI
  - ✓ The current position of the user in the ML learning framework
  - ✓ The current task in the phase of the user
  - ✓ A workspace of the user

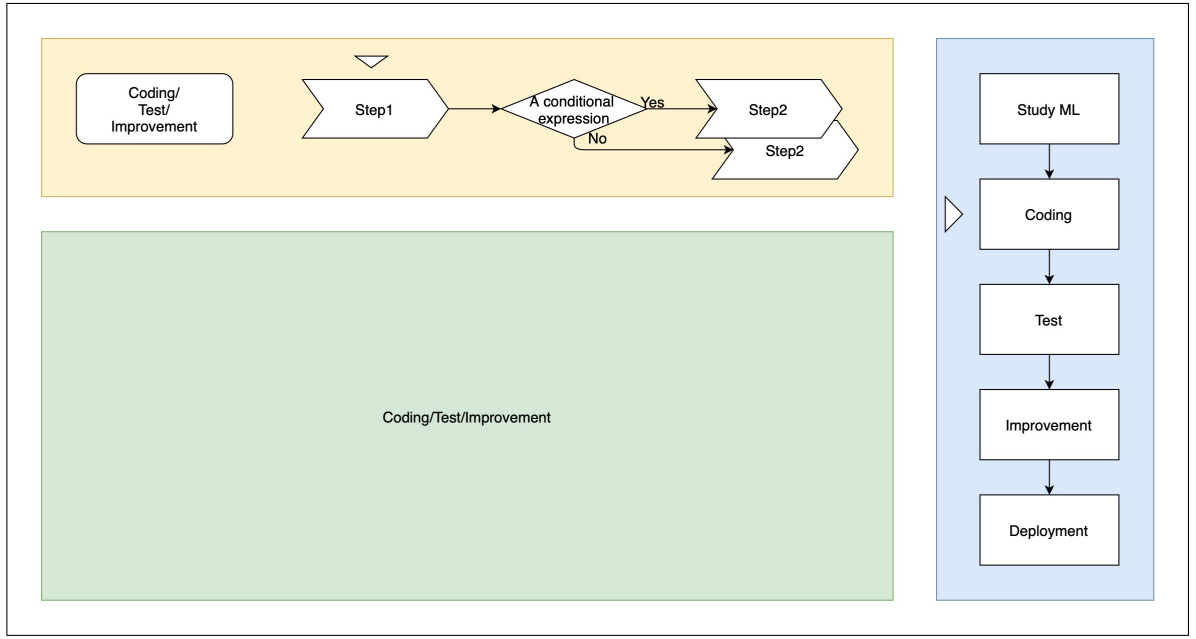

Fig. 3. A sample UI for the proposed ML learning framework

Architecture

- The server provides an interface for users to implement ML models.

- Permanent storage
  - ✓ Data sets
  - ✓ Implementation/validation/improvement steps of ML models implemented by the user
  - ✓ Indicators of the accuracy of ML models for each data set
  - ✓ Learning histories of the user

- Temporary storage
  - ✓ The location of the current task of the user
  - ✓ Program codes of the user
  - ✓ Validation results of ML models in the testing phase

Architecture (Cont.)

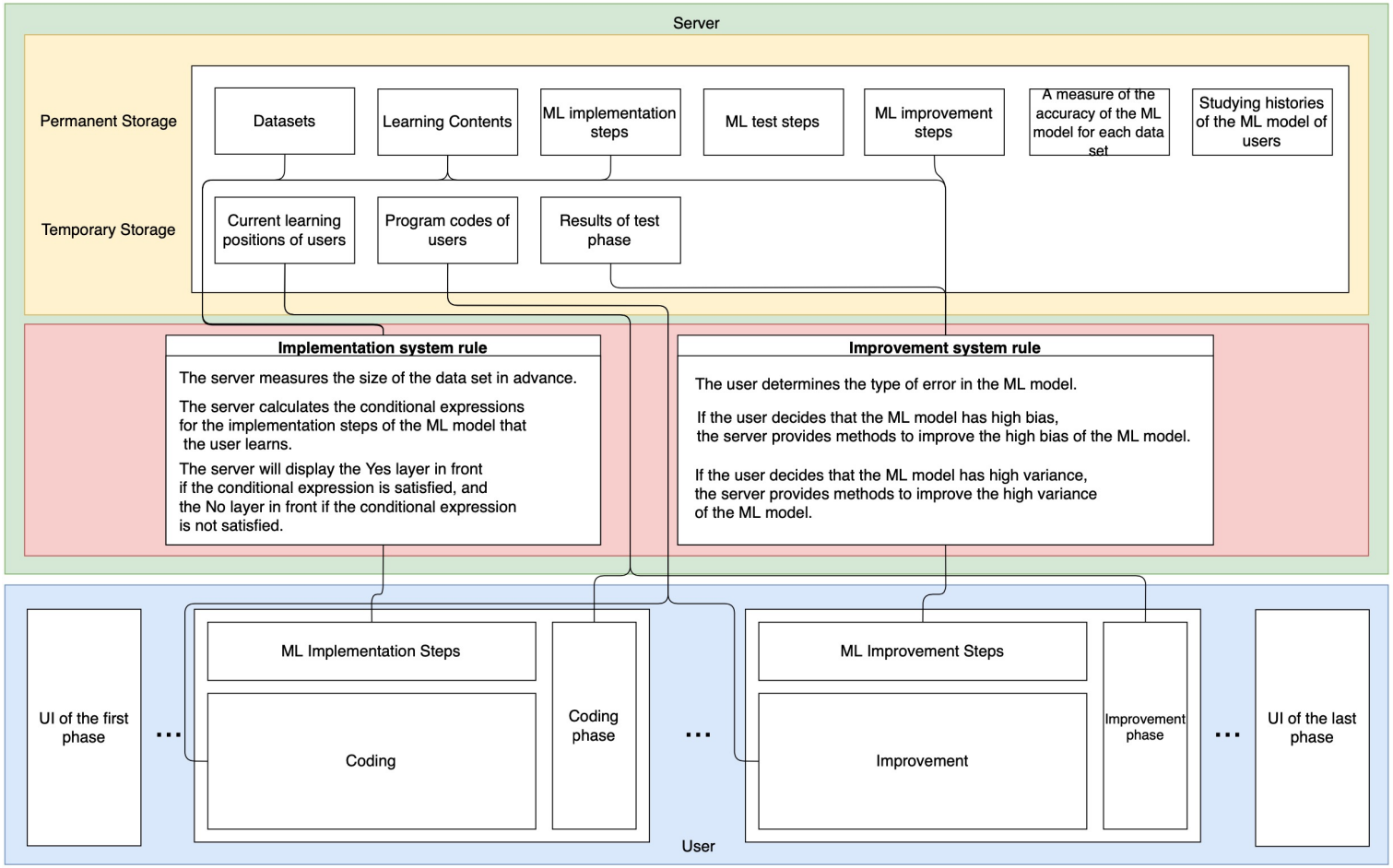

Fig. 4. An architecture of the proposed ML learning framework

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