A Framework and Its User Interface to Learn Machine Learning Models

Atsushi Takamiya
Dept. of Computer and Info. Systems
The University of Aizu
Aizuwakamatsu, Japan
s1260013@u-aizu.ac.jp

Md. Mostafizer Rahman
Dept. of Computer and Info. Systems
The University of Aizu
Aizuwakamatsu, Japan
mostafi26@gmail.com

Yutaka Watanobe
Dept. of Computer and Info. Systems
The University of Aizu
Aizuwakamatsu, Japan
yutaka@u-aizu.ac.jp
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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
References


