

MoCab: A Model Management System Based on FHIR for Clinical Decision Support

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Abstract. MoCab is a framework that deploys high-accuracy medical models across various health information systems (HISs) using fast healthcare interoperability resources (FHIR). MoCab simplifies the process by importing and configuring stored models and retrieving data for prediction. Two case studies illustrate how MoCab can be used to support decision-making. The proposed framework increases model reusability across EHRs and improves the clinical decision-making process.

Keywords. Fast healthcare interoperability resources, clinical decision support, system design, information management system

1. Introduction

Integrating high-accuracy predictive models into health information systems (HIS) is challenging due to the disparate formats of electronic health records (EHRs). Fast healthcare interoperability resources (FHIR) can be used to be retrieved clinical data in a standardized form [1]. To address these challenges, MoCab was developed to store and retrieve predictive models. MoCab deploys models by configuring and importing stored models and can be executed in multiple EHR systems with FHIR specification. Two example models were implemented to show how models can be imported and deployed.

2. Methods

MoCab uses FHIR server as the standard for data retrieval, making it possible to implement the system across different EHRs. Figure 1 illustrates the proposed architecture. MoCab performs two main actions: retrieving data by the Data Service Center (DSC) and passing it to the Knowledge Model Center (KMC) to process using a "Feature Table" and "Transformation Table" respectively. The prediction result can be obtained by providing patient's ID or patient's data. With patient's ID, MoCab gathers patient's data through DSC and passes it to the KMC (Figure 1, red line). And with patient's data, it can be directly passed to the KMC after verification (Figure 1, green line).

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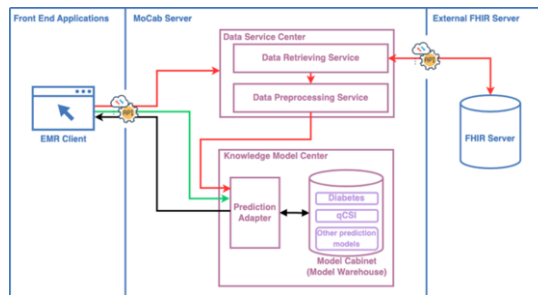


Figure 1. MoCab Architecture.

3. Results

MoCab was demonstrated through two examples. Simulated data was generated based on the Chang Gung Research Database and FHIR document examples. The first example was a Pima Indians diabetes model using a logistic regression model with seven numerical features and one formulate-type feature (BMI) [2]. The second example was the qCSI model, which predicts the 24-hour risk of critical respiratory illness in COVID-19 patients using respiratory rate [3], SpO₂, and flow rate. MoCab calculated both model scores by defining configurations for data retrieval and transformation. The source code, data-retrieval and data-transformation configurations are available on GitHub [4].

4. Conclusions

We discussed the challenges associated with deploying models in HIS. We also proposed MoCab to deploy multiple models using FHIR as the standard for data storage and exchange. In conclusion, MoCab can enhance the reusability of models in multiple EHRs and assist in the clinical decision-making process.

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