



Supporting Automated Health Insurance Claims Adjudication with Machine Learning Algorithms

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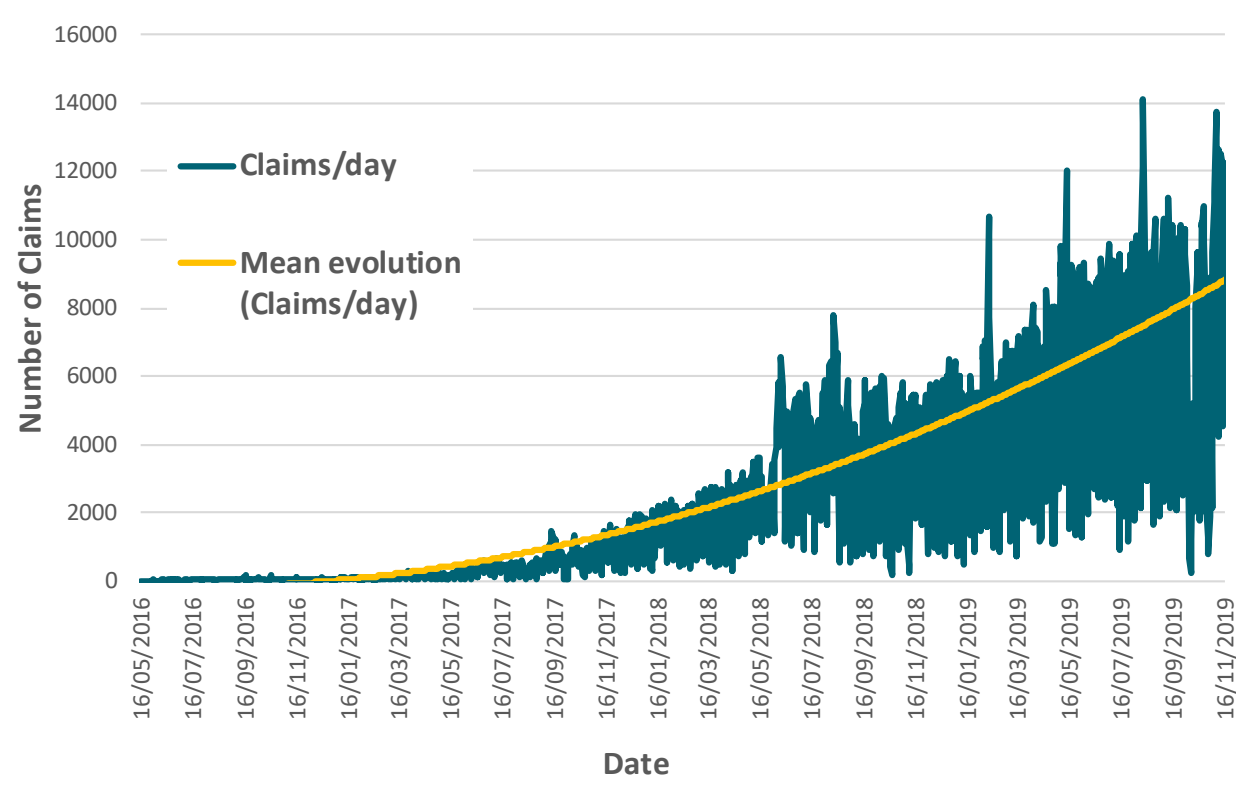
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1. Background

The openIMIS Initiative is set up as a joint initiative by the Swiss and the German Development Cooperations to establish a community of users and developers, around an open source software for the management of health financing schemes. Its objective: to provide for a seamless integration into the activities of related communities from the global digital health ecosystem such as the Open Health Information Exchange (OpenHIE) community.

Substantial manpower, time and resources must be deployed in the process of claim management for cost refunds or claim audits.



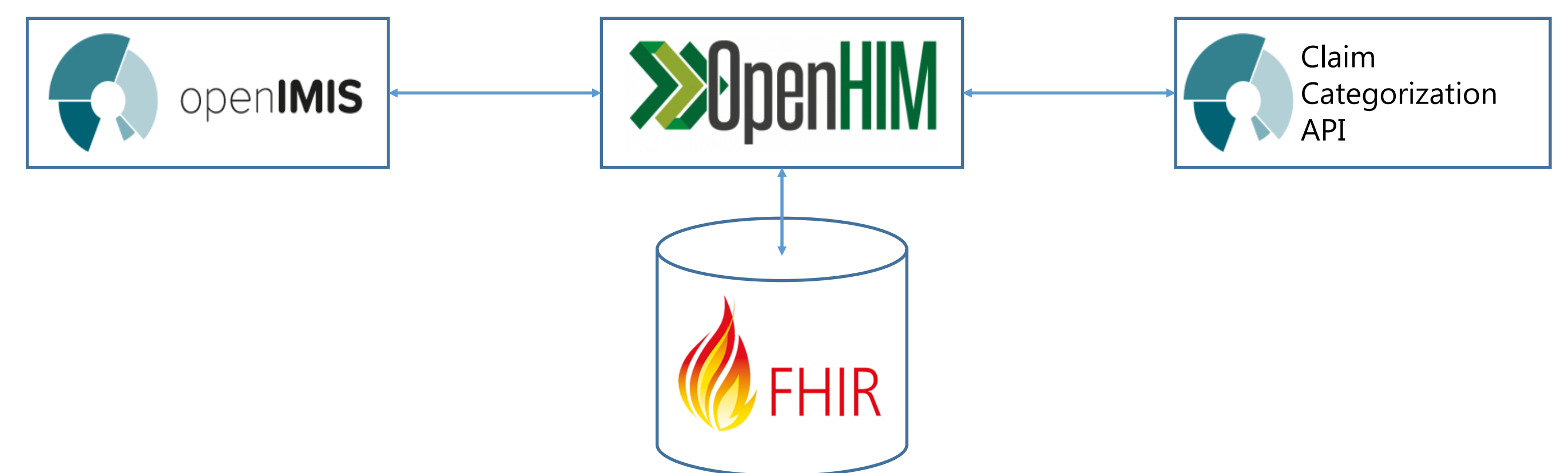
Claim submission evolution in Nepal

openIMIS Nepal in numbers:

- 686.687 enrolled Families
- 2.366.271 Insurees
- Up to 14.000 Claims/day
- 5 Medical Officers
- Up to 1.000 reviewed Claims/day

2. Objective

- The goal of this project is to develop an automatic Claims Categorization API based on state-of-the-art Machine Learning (ML) algorithms
 - claim's status: *accepted, rejected or to be further analyzed by a medical expert*
- In order to make the solution available for different contexts and insurance entities, HL7 FHIR will be used for the input and output data format of the ML model.



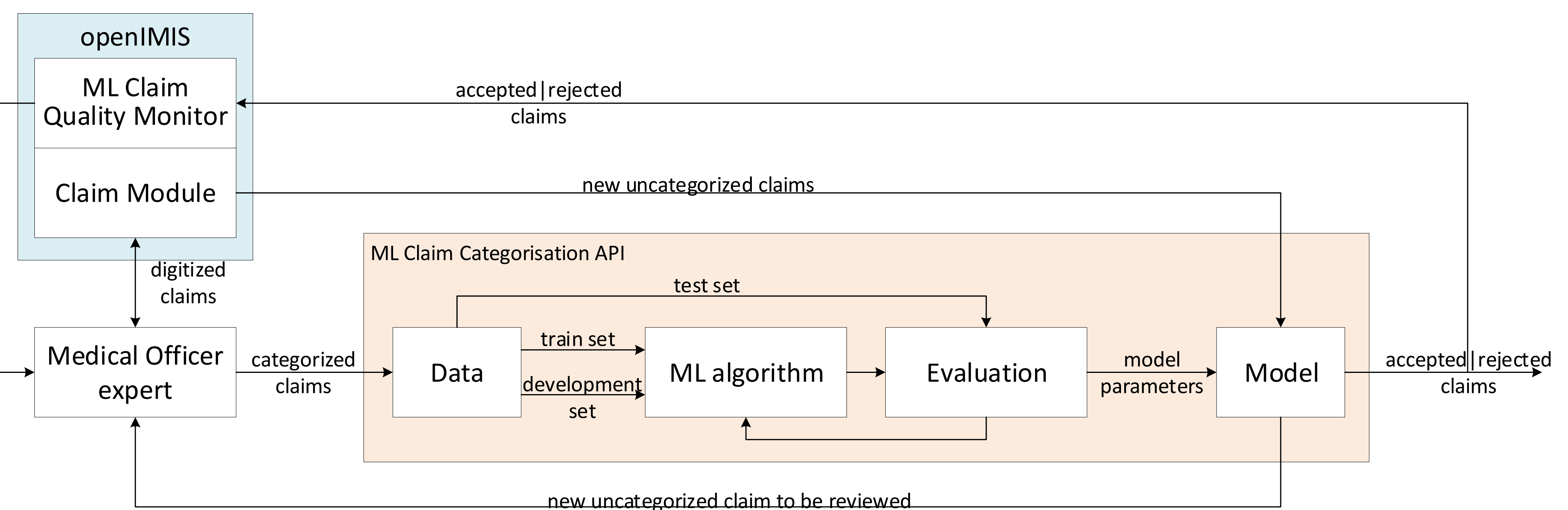
3. Technical requirements for the AI component

- ✓ The AI component shall ideally be part of the official openIMIS distribution, but should be designed in way that it can operate independently though data exchange via the FHIR APIs of openIMIS
- ✓ It shall ideally be build using technologies form the openIMIS Target Technology Stack
- ✓ The component shall be designed in a way that allows the implementing organization to select suitable decision support models (e.g. decision trees, regression models etc.), define suitable factors (e.g. attributes) in the chosen models and train the models with historical claims data from manual review processes
- ✓ The component shall allow an export/import of trained models as blue-prints for other organizations
- ✓ The decision mechanisms of a trained model for or against flagging claims must be human readable and explainable on a per claims basis
- ✓ A QA loop for a continuous evaluation of the validity of the model must allow monitoring of sensitivity and specificity in terms of false-positive and false-negative decisions

4. Methodology

The project will be divided into three phases:

- **Research phase:** research and development of the ML algorithm and model for claims categorization based on anonymized openIMIS claim data. Access to a database with already categorized digitized claims (by a Medical Officer) is mandatory. The overall objective of the ML component is to achieve claims categorization performance similar to the human expert results. Several classification methods (supervised and unsupervised) will be considered to fit the specific ML model to be elaborated. The result of this phase will be the **Claims categorization API** based on ML.
- **Development phase:** development of an openIMIS module integrating the Claims categorization API, that will create the requisite links and transitions to push new claims and to register the results of the automatic categorization process. Moreover, an extension of the Claim review module will be developed allowing Medical Officers to check the quality of the API's categorization results and adjust, if necessary, thus improving more the AI categorization model.
- **Testing phase:** the Claims categorization API will be implemented and tested in Nepal.



5. Implementation of the ML Claim Categorization API

Automated claims adjudication shall provide optional process steps for the automated processing of larger claim volumes once the claim has been submitted to the payer organization. Three levels of verification should be available at the payers side:

- **Manual level:** Manual review of claims by reviewers at the payers side.
- **Rule based level:** Automated verification of claims through the rule sets that were configured in a Configurable Claims Review Engine.
- **Artificial Intelligence level:** Automated verification of claims through a decision support model that was generated with machine learning algorithms.

