

Swiss TPH



openIMIS

AI-based Claim Categorization

Workshop 2 – Finance & Insurance Services PartnerHack

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Main Activities

1. Data gathering and preparation
2. Implementation of the AI algorithm
3. openIMIS AI module development
4. openIMIS AI Claim Quality Monitor module development
5. openIMIS AI module User Acceptance Testing

1. Data gathering and preparation

- Input data model: [FHIR ClaimResponse](#)
- [Mapping of openIMIS database to FHIR R4 data structure](#)
- Data source: openIMIS Nepal implementation
- Skewed database, 0.197% of Claims are labeled as manually rejected

FHIR R4 Resource (AI algorithm input data model)	openIMIS Database Tables (mapped entities)	Entity
ClaimResponse	tblClaim tblClaim → tblClaimServices tblClaim → tblClaimItems	Claim
ClaimResponse → Condition	tblClaim → tblICDCodes	Diagnosis
ClaimResponse → HealthcareService	tblClaim → tblHF	Health Facility
ClaimResponse → Patient	tblClaim → tblInsurees tblClaim → tblInsurees → tblFamilies	Insuree
ClaimResponse → ActivityDefinition	tblClaim → tblClaimServices → tblServices	Medical Service
ClaimResponse → Medication	tblClaim → tblClaimItems → tblItems	Medical Item
ClaimResponse → Practitioner	tblClaim → tblClaimAdmin	Claim Administrator

1. Data gathering and preparation

- Data preparation
 - Data visualization
 - Sanity check of the database
 - Selection of the data fields
 - Definition of the model output and evaluation metrics
- Model output:
 - Claim response: Claim accepted / rejected
 - or Item/Service accepted / rejected
 - -> rejected Item or Service : model output is $y=1$.

1. Data gathering and preparation

- Four scenarios may occur:
 - True Positive (TP): model predicts 1 & actual class is 1
 - True Negative (TN): model predicts 0 & actual class is 0
 - False Positive (FP): model predicts 1, but actual class is 0
 - False Negative (FN): model predicts 0, but actual is 1
- Evaluation metrics:
 - Precision: $P = TP / (TP + FP)$
 - Recall: $R = TP / (TP + FN)$
 - F score: $F = 2 * (P * R) / (P + R)$
 - Specificity: $SPC = TN / (TN + FP)$

2. Implementation of the AI algorithm

- Algorithm selection
- Building the AI model
- Analyzing the obtained results

K-nearest neighbor

Multivariate Gaussian

Local Outlier Factor

K-means

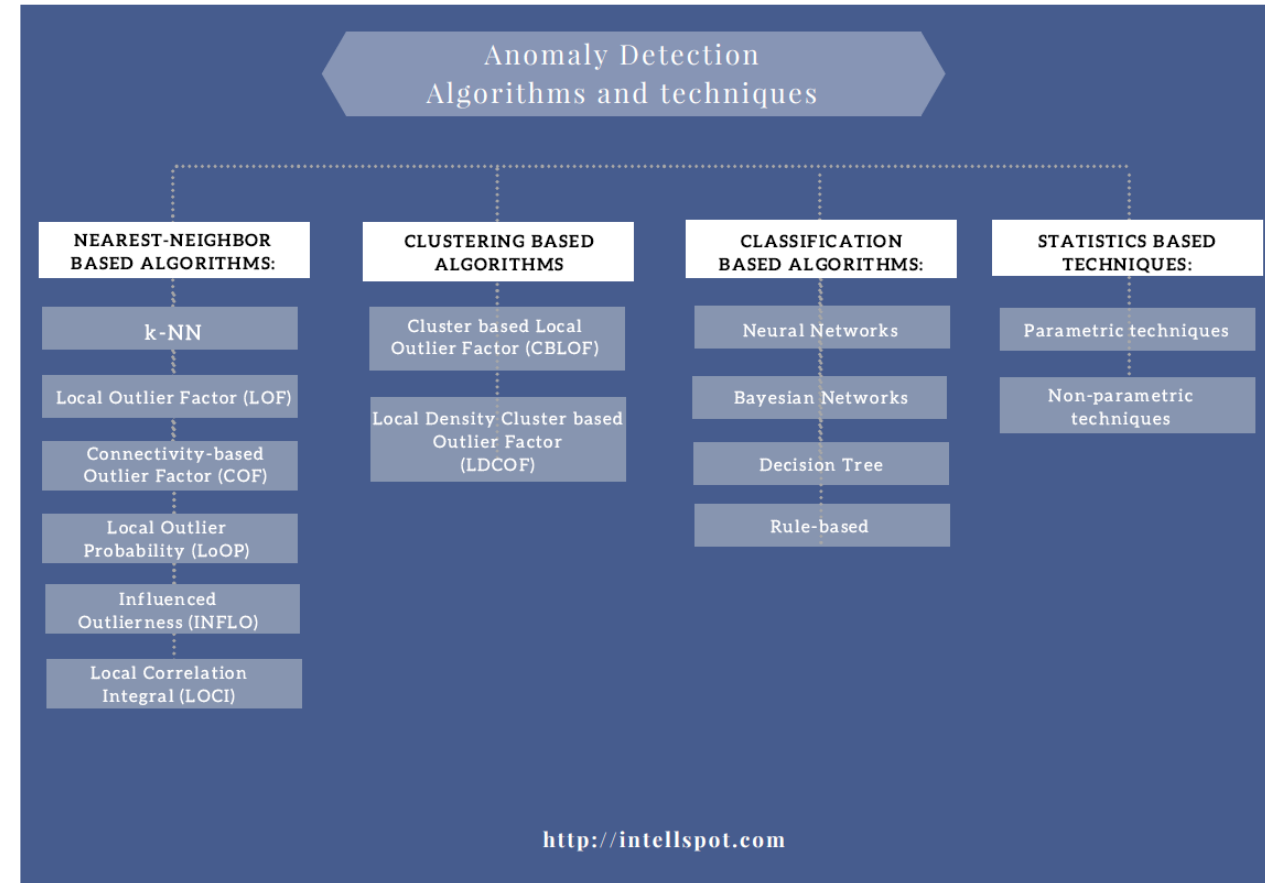
Isolation Forest

Robust covariance

Autoencoders

2. Implementation of the AI algorithm

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3. openIMIS AI module development

- Claim adjudication process update
- openIMIS AI module development
 - Activation: Event-based, Scheduled task, Manual
 - Self containing module
 - AI model parameters from DB
 - Integrated with openIMIS FHIR module

4. openIMIS AI Claim Quality Monitor module

- Additional Claim filtering mechanism
- Allows to check manually the results of AI-based categorization
- Detect False Positive and False Negative results
- Manually fix the categorization output
- AI model retraining based on updated Claims

5. openIMIS AI module User Acceptance Testing

- Installation of AI module in Nepal implementation
- Participation of Medical Officers
- Feed the instance with Claims and check the results

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