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REDUCING FAILURE RATE FOR INSURANCE CLAIMS DENIAL

This is case study for the insurance claims denial improvement in Health Insurance Sector.

A. Problem

In claims processing in healthcare insurance, the denial rate for claims are high and also low efficiency. This ends in losing $M on monthly basis and also increases operation time & costs. The aim of this problem is to solve the reduction in denials so that revenue can be directly increased with per $ value on operation expenses & process.

B. Solution

1. Contract Modelling
    - It is an Information extraction module that extract and parse data present in contracts like DRG codes, REVENUE codes etc based on the linguistic orientation of the required data.
    - Data is extracted from Scanned pdf (images) and e-pdf to raw data and then parsed accordingly using NLP approaches.
    - The scanned pdf conversion to raw text is done using OCR (Optical character recognition)
    - It is generalized for some contracts (four contracts of similar format) to some accuracy level.

2. Denial Prediction

a. **Authorization based Denial Prediction:** The module checks for authorization requirement, categorize it in blue or red (as per healthcare terminology) and give the consolidated output for the same.
    i. Notes categorization into blue/red using Machine Learning: The text in different notes (EarliestAuthNote, latestNote and LatestAuthNotes) is predicted/classified into red or blue for the new claim row entry using Machine learning algorithm.
    ii. Authorization number extraction: Auth number is extracted from the notes if present.
    iii. Rule Based approach: As per rules shared, the system checks if authorization is required or not. It uses CPT-Payor combinations and exclusion list to determine the same. A GUI is also provided so that the admin can add new rules as per their requirement.

b. **General Denial Prediction:** The module predicts if the new claim entry is denied or not using 33 attributes. The module also gives the possible reason for the denial.
    i. Predict the category of claim as yes (Denial) and No (Non-denial). The accuracy achieved with the provided data (80% for training and 20% for testing) is 95% approximately.
    ii. Predict the category of possible reason of denial. The accuracy achieved in prediction the reason is 75% approximately (75% data for training and 25% for testing)
    iii. A UI page that shows the most informative features is also provided. It tells us the weightage of each attributes in the training of algorithm.
    iv. A GUI dashboard component is added to provide high level insight about the distribution of denials like percentage of denial in each category.

C. Technology Used

a. Backend
    i. Scala, java and Python for Backend API's.
    ii. Cassandra for Database.
b. Frontend
    i. AngularJS
c. Machine learning/NLP/Computer Vision

D. Technology Process Flow

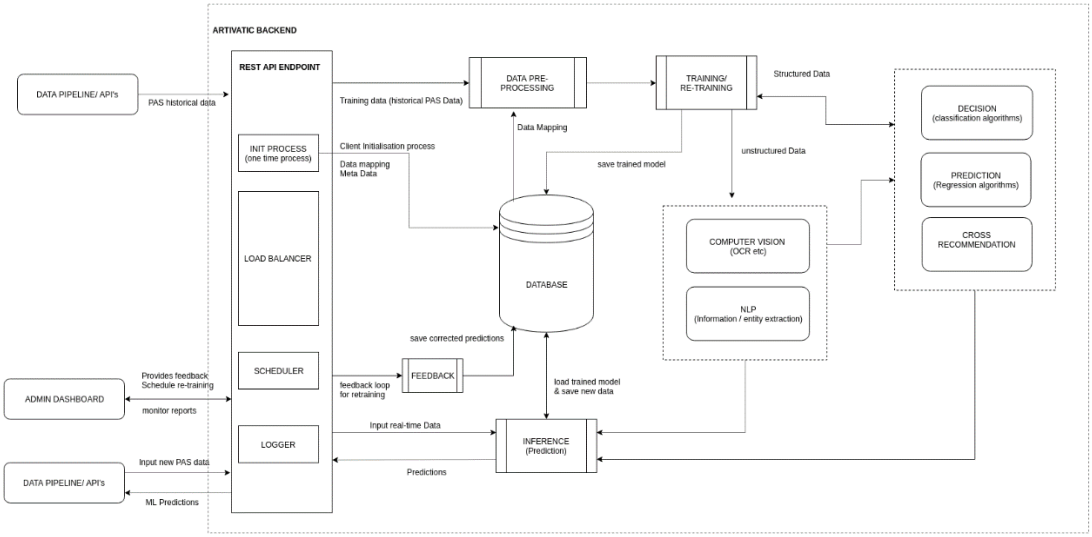

Fig: Technology System Flow

E. Results

a. Contract reading and interpretation without human intervention to some accuracy level, improves time by 5X.

b. Machine based intelligence for Decision making in case of Denials: Prediction if claim will be denied or not and prediction possible reason of the same. The accuracy achieved is 95% (approximately) for denial classification and 70% for predicting the reason. This will reduce human intervention and will help in prioritizing processing of claims. Such priority based processing will reduce the loss incurred due to delay in claims processing.

c. Prediction on Authorization based denial and Authorization number extraction. This will again reduce manual intervention to check if authorization is required or not and if required, authorization number will be extracted. Using ML algorithm on the notes taken, it will highlight the claims that needs quick attention. (Red as per terminology). Time saving by 75% for identification and processing.

d. Reduction in loss in $000 M due to delayed claims processing.

e. Less Man hours required hence increase in productivity. Approximately reduction by 60% of man hours.

f. Increase in Machine Decision making ability with time. Around, 92% increase in increase in decision making.