Semi Final — prototype

Hackpions GDS ES Hackathon (edition 3)

EY
Building a better working world

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Theme:

NLP based tagging solution

Problem Statement

- To assist the Intelligent Automation team process large amounts of exception data
- Achieve the above by classifying exceptions relevant to specific teams, i.e. Business Exception & System Exception
- Create a self-learning model to recognize patterns from input features, tag exceptions as they come and generate an output text file, with the respective exception tags

Solution(Initial Approach)

Case 1: Keywords for Exceptions are provided. (Rule-Based approach)

- This case is relatively easy to implement. We preprocess the given input string, i.e removing special characters and common stopwords in English language using nltk library and regex.
- In this approach, we simply iterate through the keywords for Business and System Exception and when particular keywords are found we return the corresponding Exception.
- However, due to certain overlap between words in keywords for exceptions, certain inputs were misclassified.
- Not highly scalable as manual extraction for keywords is time consuming on a large scale

Solution(Initial Approach)

Case 2: Keywords for Exceptions are not provided. (ML-based approach)

- First step is same as before. We preprocess the input data.
- We used CountVectorizer from sklearn library, which converts a text string into an array of token counts.
- We trained models using Support Vector Machine, Naive Bayes & Logistic Regression on the transformed array for prediction.
- We achieved an accuracy score of 85%. This is a reasonable score given that the training & test data sizes were only 40 & 7 respectively.
- This approach can be easier to scale for a larger training dataset.

Solution(Improved Approach)

Case : Keywords for Exceptions are not provided. (DL-based approach)

- First step is same as before. We preprocess the input data.
- We used Word2Vec from gensim library, which converts a text string into a vector representation.
- We use tensorflow to build a sequence model with two bidirectional and one dense layer, containing more than 1,00,000 parameters.
- We achieved an accuracy score of 70%. This is a reasonable score given that the training & test data sizes were only 37 & 10 respectively.
- This approach can be easier to scale for a larger training dataset. And it converges better with larger dataset.

Methodology

Vectorization:

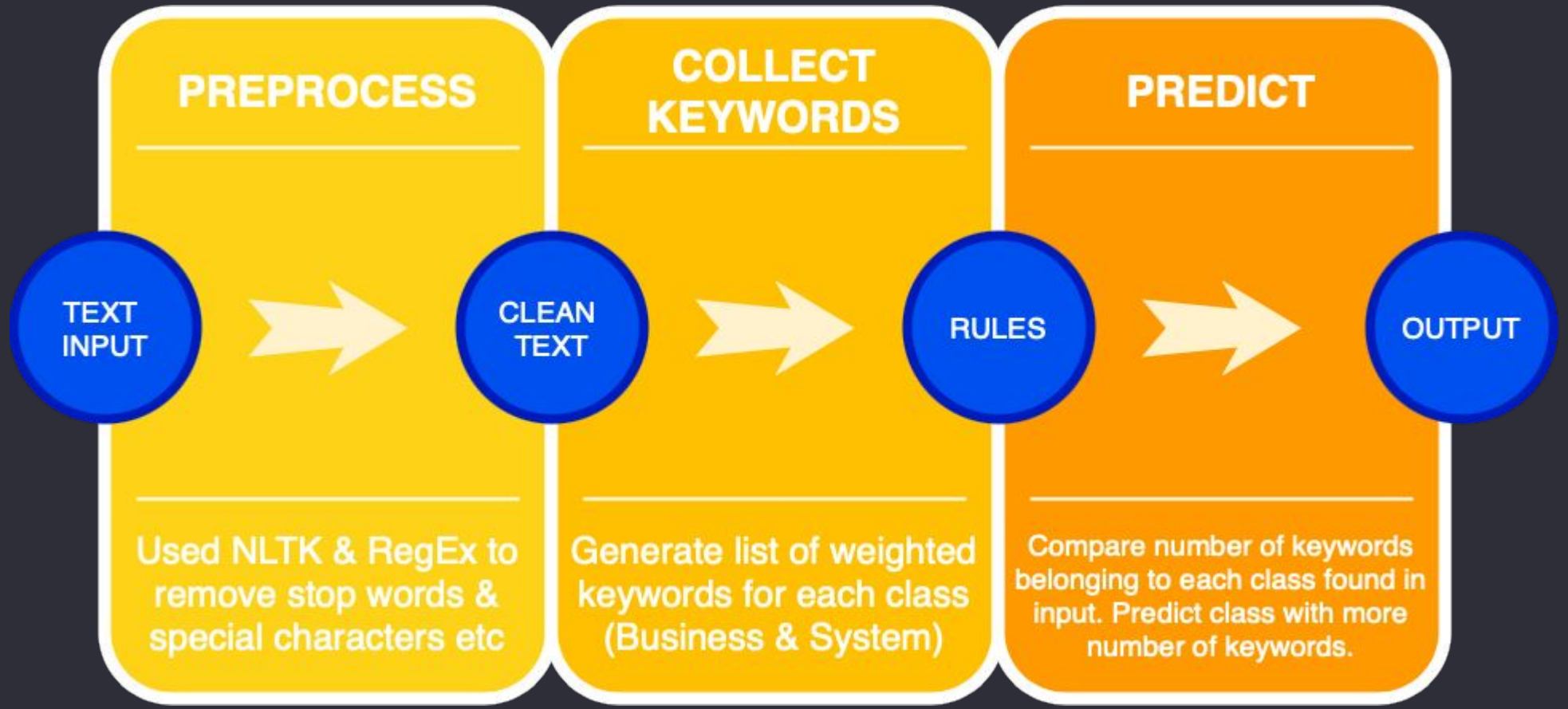
- Word2Vec maps an input word to a n-Dimensional space,allowing the data to retain semantic meaning and providing better context than TF-IDF and Bag of Words.
- Word2Vec also converts the input into vector of smaller size compared to TF-IDF/BOW decreasing the number of computations.

Model Training:

- With our input in the form of an n-dimensional, we can train our data using neural network.
- In training, our model learns which tokens correspond to which exception by going through the training set several times.
- The model can assess tokens present in test input & make predictions accordingly.

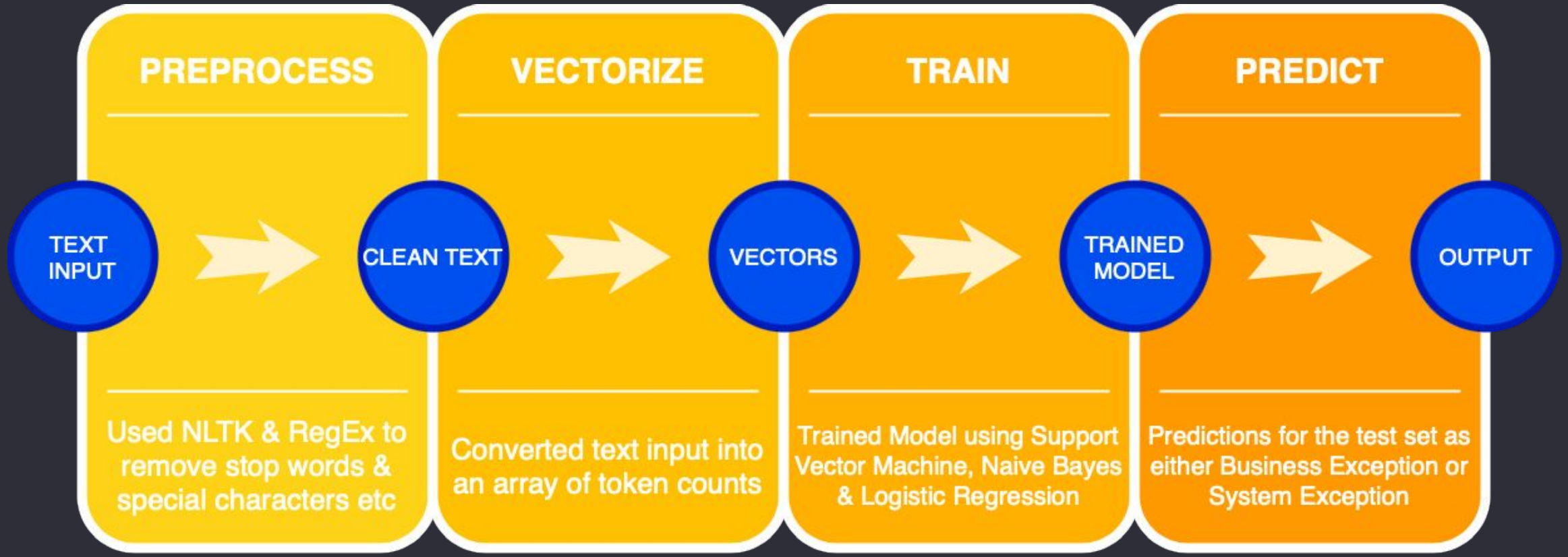
System Architecture Proposal(Initial Approach)

Case 1: Rule-based Method



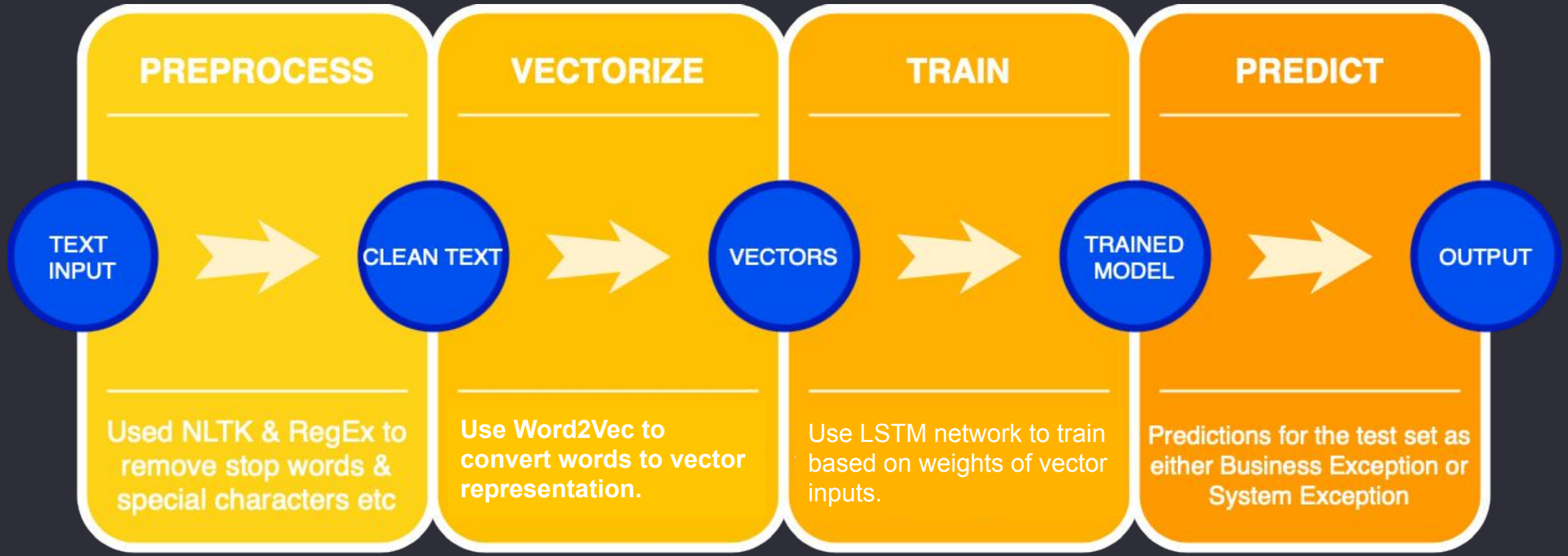
System Architecture Proposal(Initial Approach)

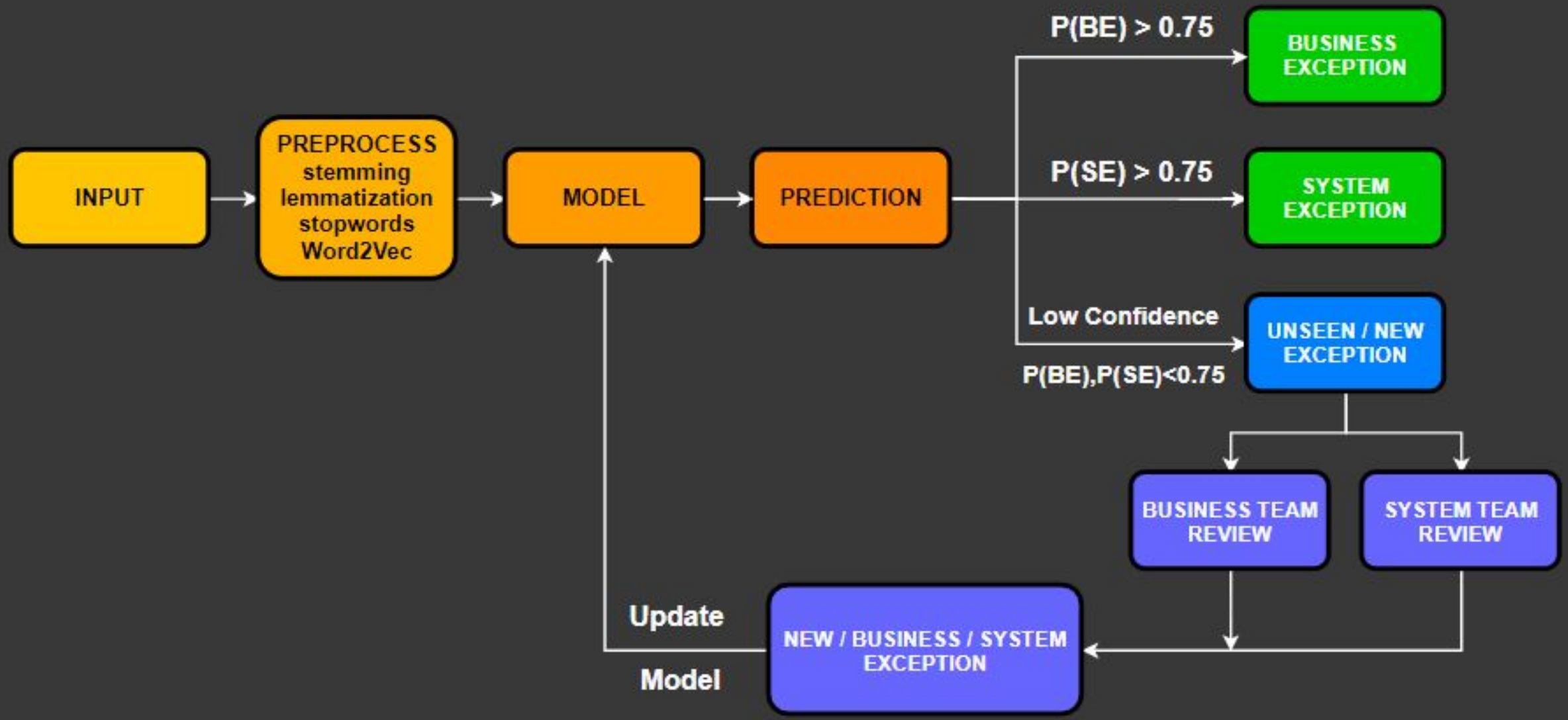
Case 2: ML Based Method



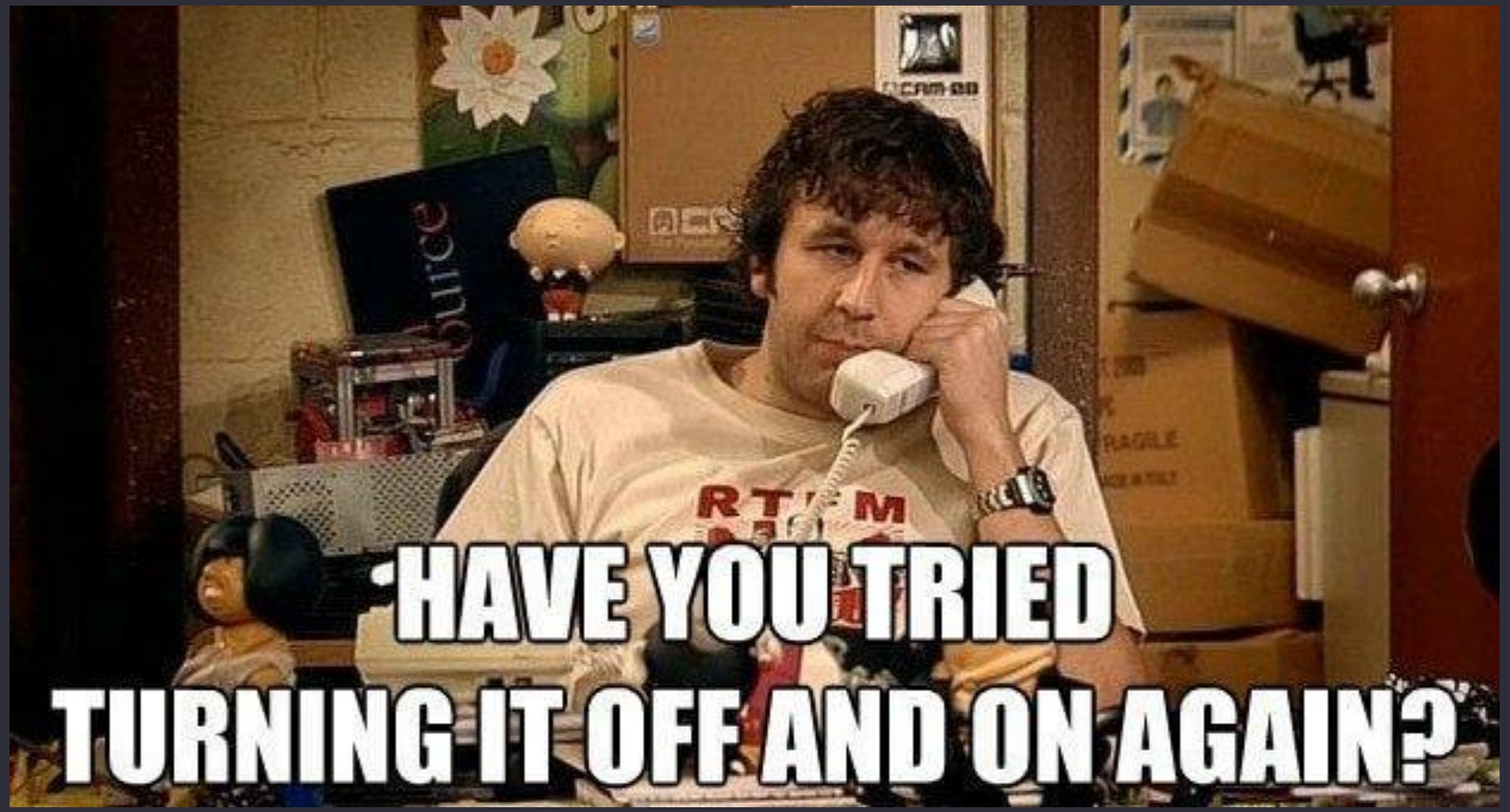
System Architecture Proposal(New Approach)

Case 3: DL Based Method




INPUT
PREPROCESS
stemming
lemmatization
stopwords
Word2Vec
MODEL
PREDICTION
P(BE) > 0.75
BUSINESS EXCEPTION
P(SE) > 0.75
SYSTEM EXCEPTION
Low Confidence
P(BE),P(SE)<0.75
UNSEEN / NEW EXCEPTION
BUSINESS TEAM REVIEW
SYSTEM TEAM REVIEW
NEW / BUSINESS / SYSTEM EXCEPTION
Update
Model

Solution Prediction Proposal -



Solution Prediction Proposal -

- Assuming we have historical data of input exception and their corresponding solutions, we can build a model to predict solutions for future incoming exceptions. Our hypothesis is that, the exceptions will occur in clusters.

- The DL model predicts the type of Exception, we also plan to predict a plausible solution for the problem based on past recommendations by the Business and System Teams.

- We can perform Agglomerative Clustering on the training data based on the prominent keywords in the exceptions.

- When we get an exception as an input, we can find the cluster this exception belongs to and recommend the 3 most frequent solutions in this cluster.

Results

	Case 1 (Rule-based)	Case 2 (ML based)	Case 3 (DL based)
Test Set Size	47	7	10
Categories	Business/System	Business/System	Business/System
Classification Accuracy	93.61%	85.71%	70%

Conclusion:

- Rule based method works well for smaller dataset & if keywords are known apriori
- ML based methods works better for larger dataset & accuracy too increases with dataset size. This solution also has the advantage of scalability.
- DL based approach has the prerequisite of large dataset and in theory would provide better result than Rule based and TF-IDF.

Attachments

Github repository : https://github.com/varadvjoshi99/ey_hackathon

- Contains dataset for training
- Contains code for Rule-based Exception classification
- Contains code for ML based Exception classification
- Contains code for DL based Exception classification.
- Contains sample output file of test set

varadvjoshi99 / ey_hackathon

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varadvjoshi99 Update README.md dc154fa now 6 commits

Datasets _ NLP based tagging solutio...	Add files via upload	25 days ago
ML_based.ipynb	Add files via upload	25 days ago
README.md	Update README.md	now
Rule_based.ipynb	Add files via upload	25 days ago
Word2Vec.ipynb	Add files via upload	4 days ago
output (2).xlsx	Add files via upload	25 days ago

README.md

EY_Hackathon

Contains file pertaining to EY-GDS Hackpions 2.0

Problem - NLP based tagging solution.

About

No description, website, or topics provided.

Readme

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Languages

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Thank You

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