Question classification for Code-Mixed text

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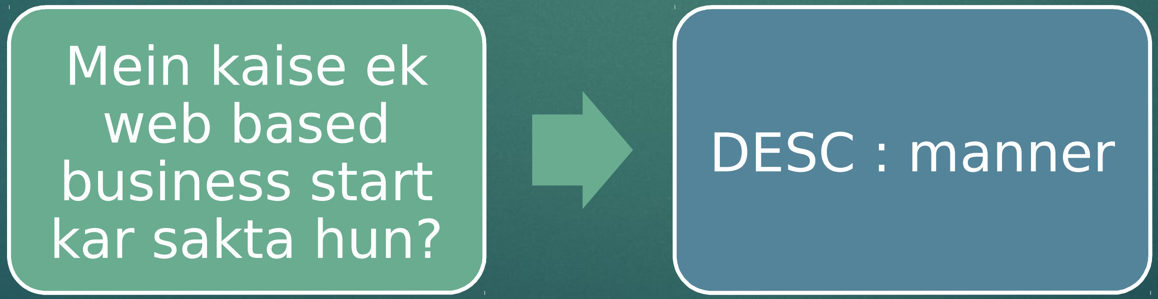
Problem Statement

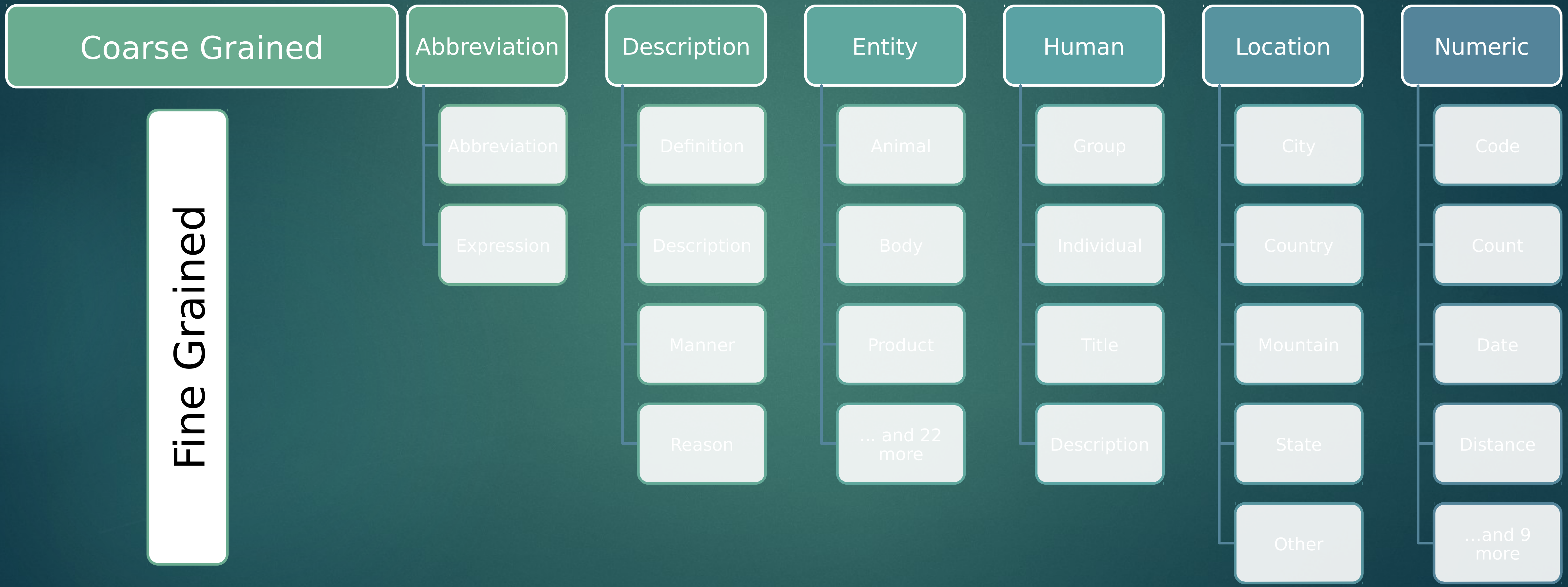
- Given:
  - A code-mixed question
- To predict:
  - Expected type of the answer



Mein kaise ek web based business start kar sakta hun?

DESC : manner

Answer-type hierarchy [1]



Coarse Grained

Fine Grained

- Abbreviation
  - Abbreviation
  - Expression
- Description
  - Definition
  - Description
  - Manner
  - Reason
- Entity
  - Animal
  - Body
  - Product
  - … and 22 more
- Human
  - Group
  - Individual
  - Title
  - Description
- Location
  - City
  - Country
  - Mountain
  - State
  - Other
- Numeric
  - Code
  - Count
  - Date
  - Distance
  - …and 9 more

Challenges

- No dataset available on the public domain
- Dearth of tools that handles code-mixed text – no POS-taggers, chunkers, dependency parsers, language identification tools etc

Proposed Solution

- Create a new dataset of code-mixed questions
- Make dataset in a format compatible with the existing tools

Dataset Format

- QueNo#1 CoarseLabel:FineLabel <QueString in English>
- QueNo#2 CoarseLabel:FineLabel <QueString in Hindi>
- QueNo#3 CoarseLabel:FineLabel <QueString in Codemixed_scriptPreserved>
- QueNo#4 CoarseLabel:FineLabel <QueString in Codemixed_romanized>

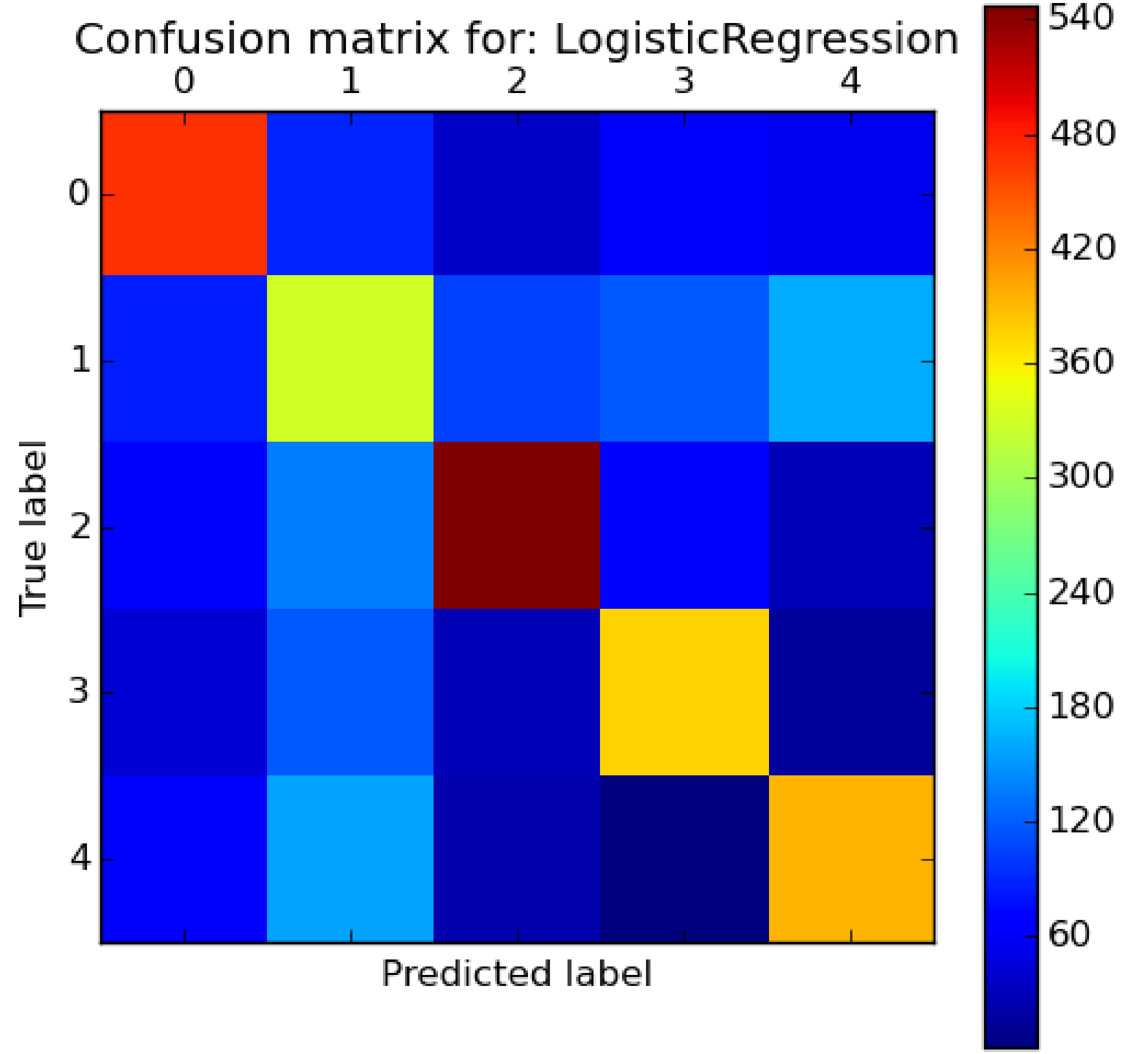
- 185#1 DESC:reason Why do horseshoes bring luck ?
- 185#2 DESC:reason घोड़े की नाल भाग्य क्यों लाती है?
- 185#3 DESC:reason घोड़े की नाल luck क्यों लाती है?
- 185#4 DESC:reason Ghode ki naal luck kyon laati hai?

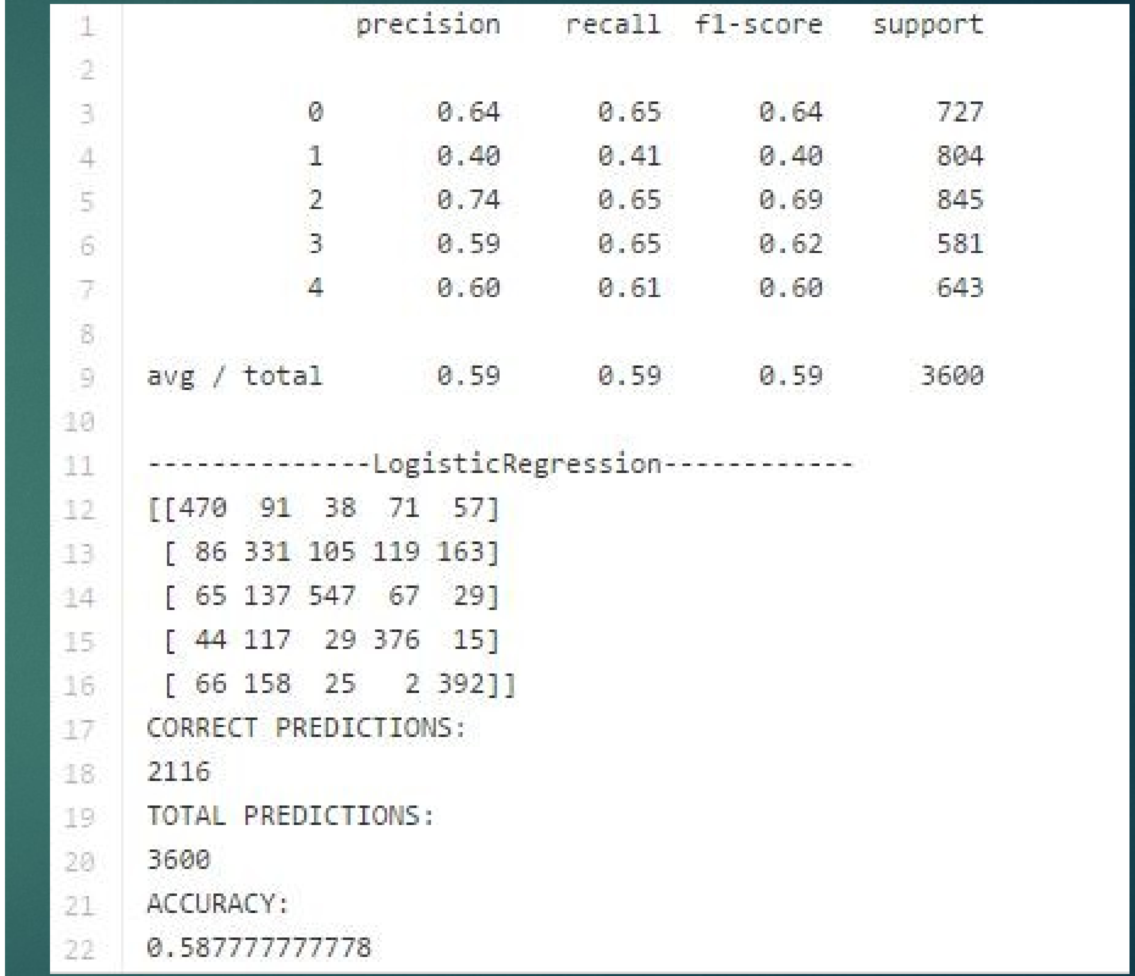
Dataset Creation

- Get English annotated questions from dataset created by Li and Roth [5]
- Use python’s Goslate API to convert these questions to Hindi
- Manually do the following:
  - Fix translation errors in Goslate output
  - Repose the questions in a code mixed sense
- Transliterate the script-preserved code-mixed questions to roman script
  - Done using “Sanscript” API : has problems with schwa deletion [8]
  - Manually corrected as of now

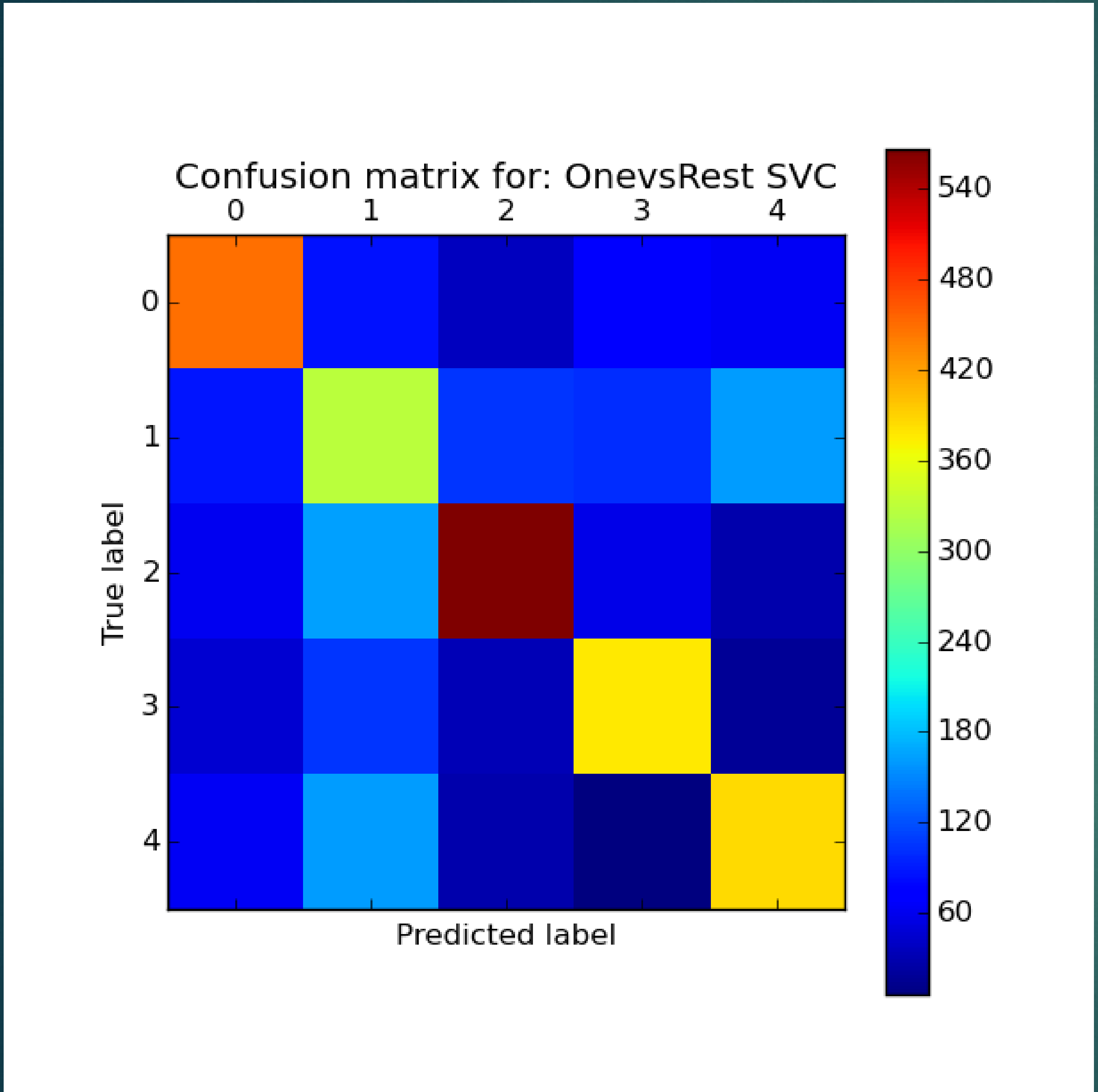
Preliminary Results

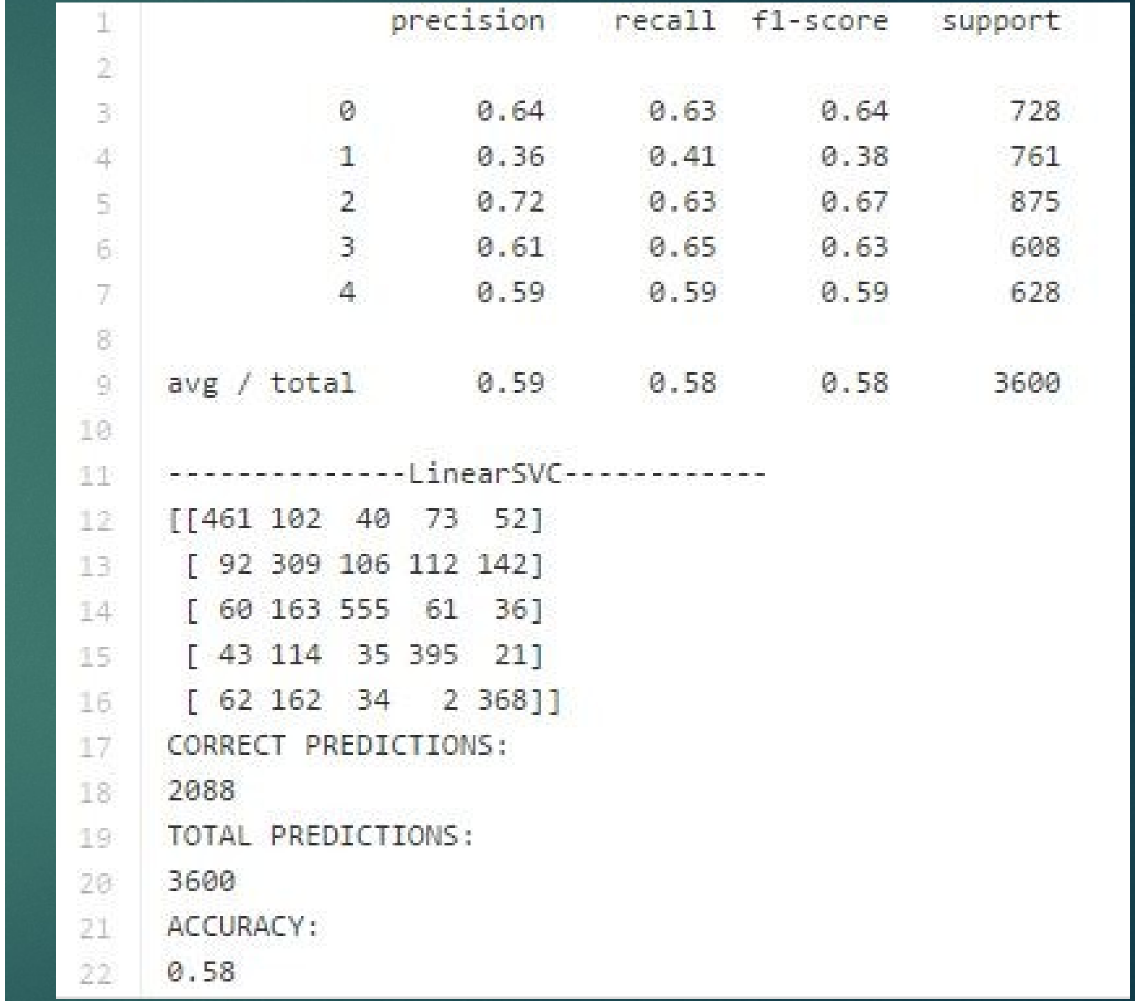
- Data of 200 code-mixed sentences
- Used :
    - Linear kernel SVM   (one-vs-rest approach)
    - Logistic regression classifier
- Performed 100 iterations of training and testing with both classifiers
- Split data randomly with 0.8 : 0.2 ratio





```
             precision    recall  f1-score   support

          0       0.64      0.65      0.64       727
          1       0.40      0.41      0.40       804
          2       0.74      0.65      0.69       845
          3       0.59      0.65      0.62       581
          4       0.60      0.61      0.60       643

avg / total       0.59      0.59      0.59      3600

--------------LogisticRegression-----------
[[470  91  38  71  57]
 [ 86 331 105 119 163]
 [ 65 137 547  67  29]
 [ 44 117  29 376  15]
 [ 66 158  25   2 392]]
CORRECT PREDICTIONS:
2116
TOTAL PREDICTIONS:
3600
ACCURACY:
0.587777777778
```

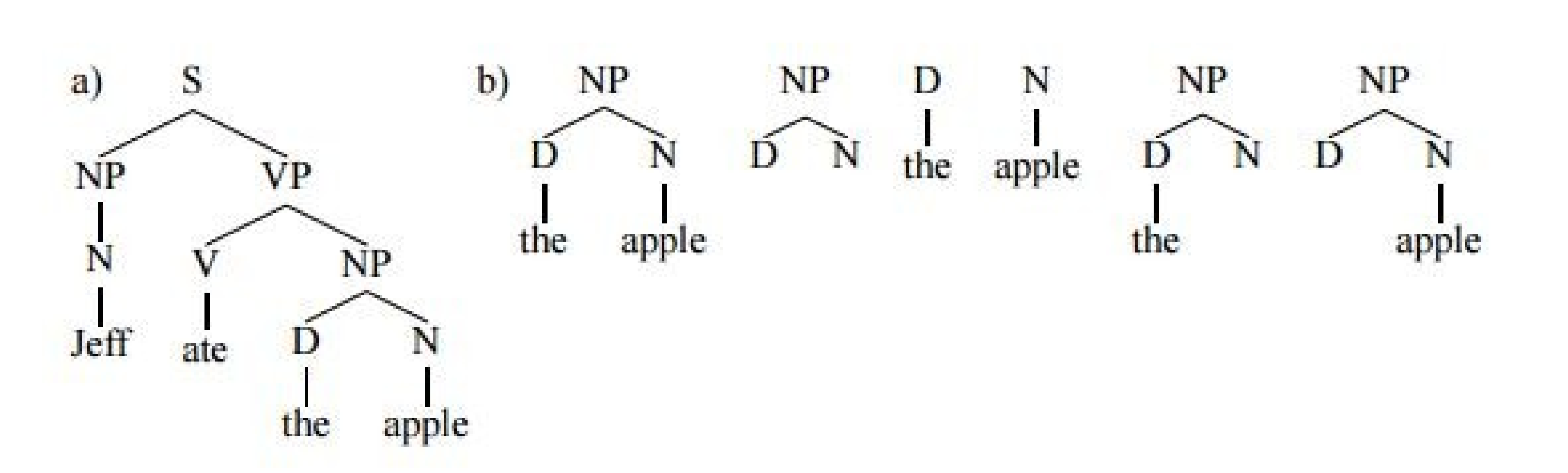




```
             precision    recall  f1-score   support

          0       0.64      0.63      0.64       728
          1       0.36      0.41      0.38       761
          2       0.72      0.63      0.67       875
          3       0.61      0.65      0.63       608
          4       0.59      0.59      0.59       628

avg / total       0.59      0.58      0.58      3600

--------------LinearSVC-----------
[[461 102  40  73  52]
 [ 92 309 106 112 142]
 [ 60 163 555  61  36]
 [ 43 114  35 395  21]
 [ 62 162  34   2 368]]
CORRECT PREDICTIONS:
2088
TOTAL PREDICTIONS:
3600
ACCURACY:
0.58
```

Further Work

- Use a tree kernel for SVM as proposed by Collin and Duffy [3]



- Introduce adjacency features as proposed by Raghavi et al [2]
- Use DCNN for sentence modelling – Kalbrechhner et al [6]

Fig – Collin and Duffy

References

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2. Khyathi Chandu Raghavi, Manoj Kumar Chinnakotla, and Manish Shrivastava. “Answer ka type kya he?” Learning to classify questions in code-mixed language. Proceedings of the 24th International Conference on World Wide Web, pages 853–858, 2015
3. Collins, Michael, and Nigel Duffy. "Convolution kernels for natural language.“ *Advances in neural information processing systems*. 2001.
4. Siva Reddy. Hindi dependency parser. https://bitbucket.org/sivareddyg/ hindi-dependency-parser, 2014
5. Xin Li and Dan Roth. Experimental data for question classification. http://cogcomp.cs.illinois.edu/Data/QA/QC/.
6. Kalchbrenner, Nal, Edward Grefenstette, and Phil Blunsom. "A convolutional neural network for modelling sentences." *arXiv preprint arXiv:1404.2188* (2014).
7. Source - https://github.com/sanskrit/sanscript