# QuoRUM

Group 4
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# Points to cover

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# Problem Statement

Studying and Analyzing the Evolution of a User's Answering Style over a period of time on Quora and developing a model to predict it

# Overview

- To attribute and quantify the answers of a user on Quora to a set of features:
  - Humor (0-100)
  - Readability (0-100)
  - Inappropriateness (0-100)
  - Formalness (0-100)
  - Detailing (0-100)
- To collect ground truth for the above features
- To generate models to predict the future answering style of a user on Quora based on his past answers
- Validating the model

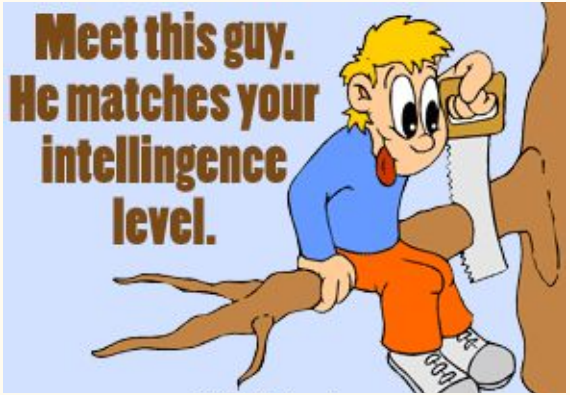
# Data Set

| Phases | Number of Users | Number of answers |
|---|---|---|
| Initial data set | 1822 | 102273 |
| Users with > 100 answers in 1 year | 87 | 24012 |
| Users who've answered for 50 weeks | 60 | 4597 |

Features tested using manually tagged data set of 525 answers from the initial data set

# Features - Humor

- Extracted the counts of each bigram and normalized them
- Trained a Linear Regression model on the normalized counts of the vocabulary
- Made a random 80-20 split of the tagged dataset to obtain the training and the test dataset




- Ran 5-fold cross validation and got an average accuracy of over 95%

# Features - Inappropriate

- Used Bag of Words features
- Used data from LIWC-swear words and noswearing.com (manually verified it)
- Normalized the words both in answers as well as BoW
- Used unigram and bigram method to find inappropriate words

Inappropriate(answer) $=$ $\frac{\#(inappropriate\ words)}{\#(words)}$

# Features - Detailed

- Used features like
  - Count of word/sentences in text
  - Count of images/URL
  - Count of nouns/verbs
  - Entropy of answer
- Score is independent of the type of question asked
- Used Linear Regression as training model
- Accuracy of the model came out to be 60%

# Features - Readability

- Flesch-Kincaid reading index used
- Reading Index = 206.835 - 1.015(total words/total sentences) -84.6(total syllables/total words)
- Accuracy: 71.3% - maximum out of other reading metrics (second best: Dale Chall: 64%)

| Score | Notes |
|---|---|
| 90.0-100.0 | Understood by an average 11 yr |
| 60.0-70.0 | Understood by 13-15 yr olds |
| <30.0 | Understood by university graduates |

# Features - Formal

- Used public classifier at uclassify.com
- The implementation uses naive bayes classifier which gives the probability of the input belonging to a particular class. In our case the classes are formal or informal, so the result is the probabilities belonging to this particular class.
- Features used in the model include
  - formal word list
  - informal word list
  - active voice
  - passive voice
  - type token ratio
  - abbreviations
  - phrasal verbs

# Model

- Filtered 60 users from the dataset of users that have answered more than 100 answers over a period of 1 year
- Computed the 5 features for each of the answers for each user
- The time scale was chosen to be a week and the feature values for that week was the average of the values for that week
  - Humor for week 1 = Average of humor for all the answers in that week

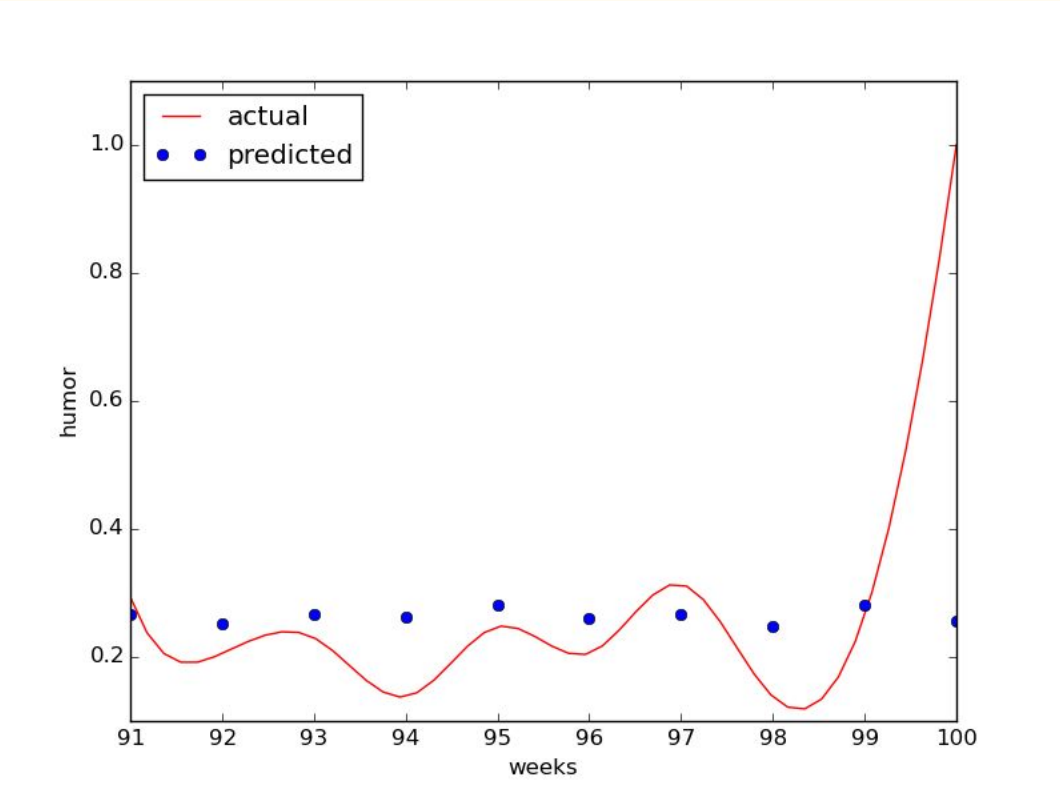
# Model

- Trained a separate model for each feature for each user, i.e. each user has 5 models to predict the 5 features
- Used a sliding window method to train Linear Regression
  - The current value depends on the previous 5 values
  - Week 1-5 - target week 6, week 2-6 - target week 7, …. week n-5 - n-1, target week n

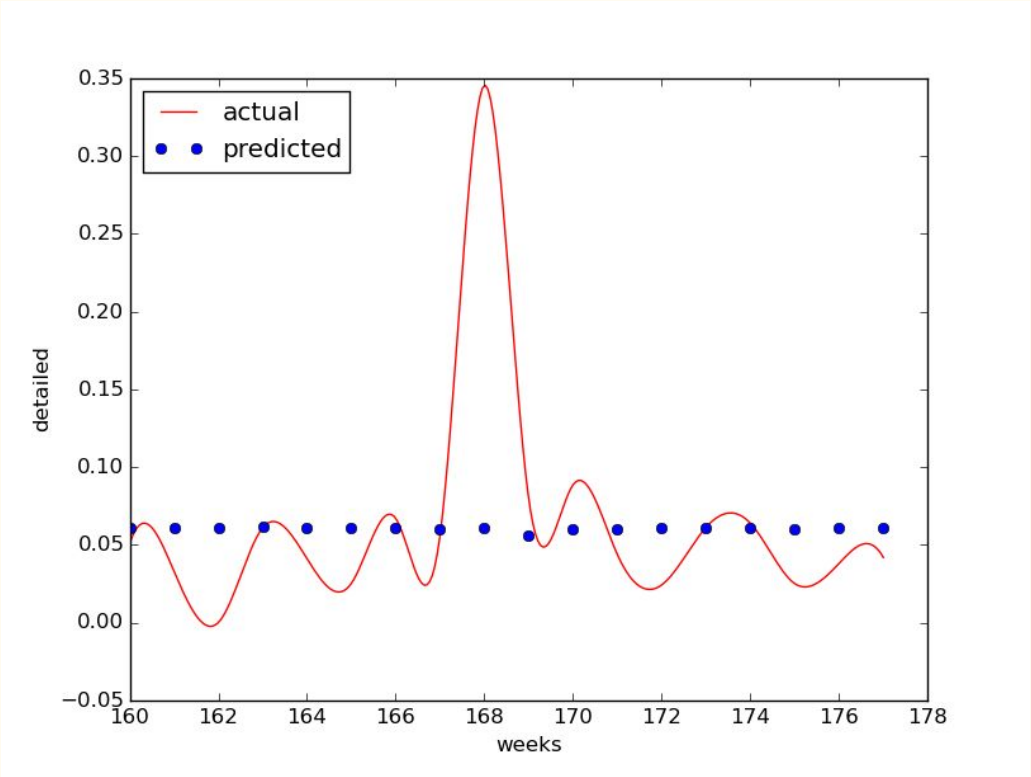
# Validating the model

- The training dataset and the test dataset were created using 90:10 random split
- The accuracies for the individual models was calculated by averaging 10 runs of 5-fold cross validation
- The error measure was taken to be the root mean square error
- Accuracies of the individual components :
  - Humor : 82%
  - Readability - 69%
  - Formalness - 73%
  - Inappropriateness - 99%
  - Detailed - 87%

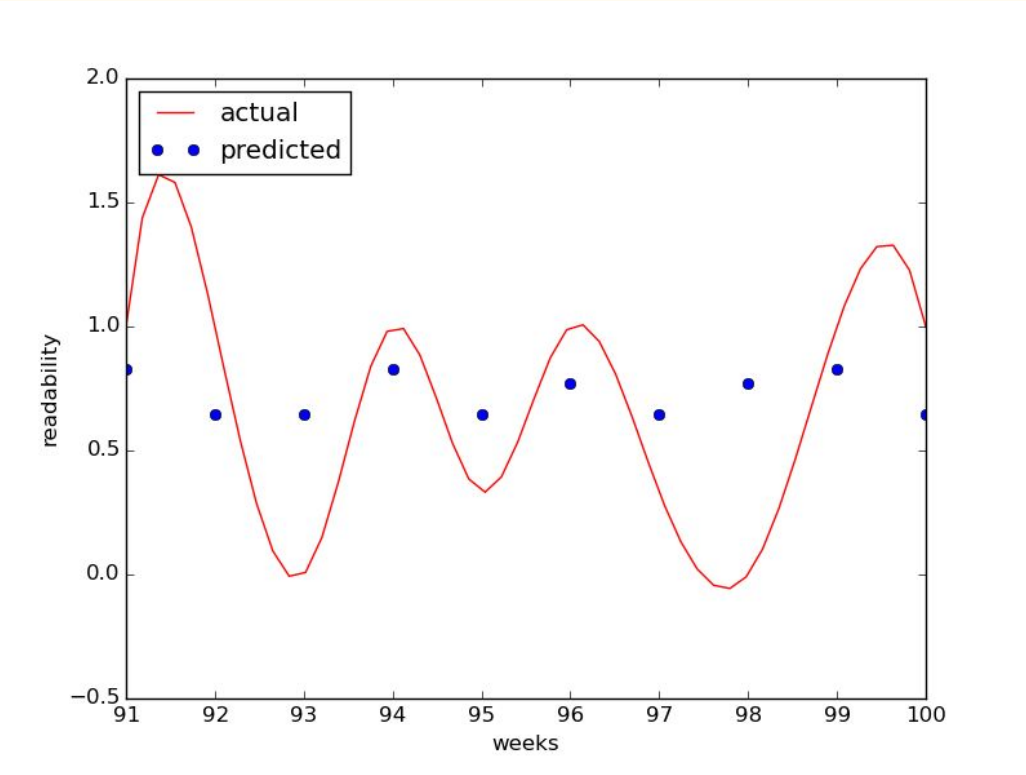
# Result - Humor



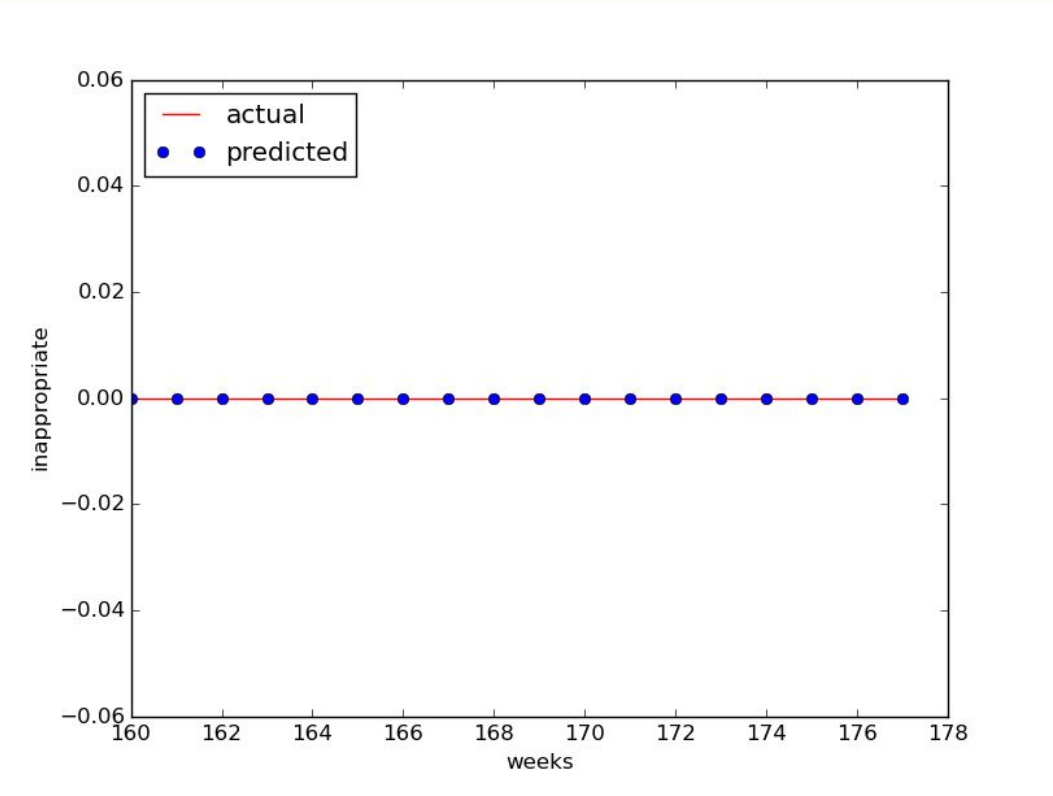
# Result - Detailed



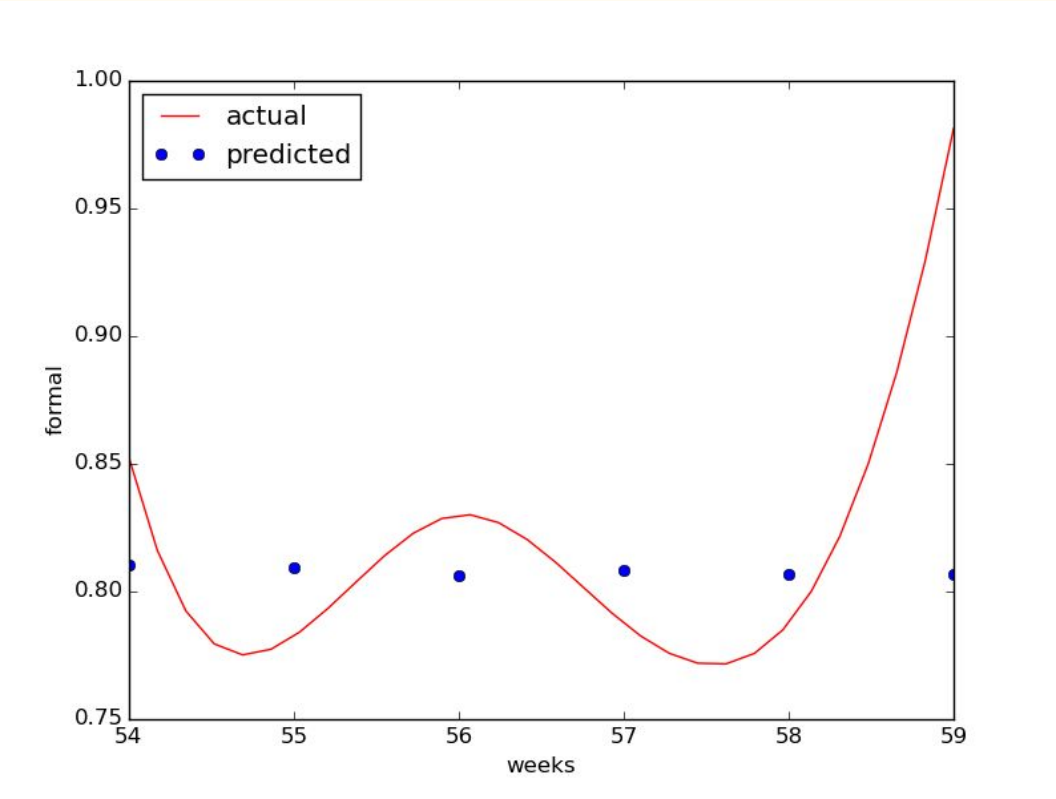
# Result - Readability



# Result - Inappropriate



# Result - Formal



# Conclusion

- Gold standard dataset of features like humor, inappropriateness, readability, formal and detailed
- Model that accurately predict the 5 features in a text answer
- Sliding Window Regression model to predict answer characteristics
- Model predicts fairly accurately how a user's writing style would change with time

# Future Work

- Better models like Autoregressive Moving Average (ARMA) Model to predict a user's writing style
- Improving the Ask to Answer feature of Quora
- Include various other features like upvotes, replies, structure of the answer

# Demo