# How do I ask a Good Question?

## A *StackOverflow* Content Quality Study

Created by Yuqin Wei (@yuqinouou)

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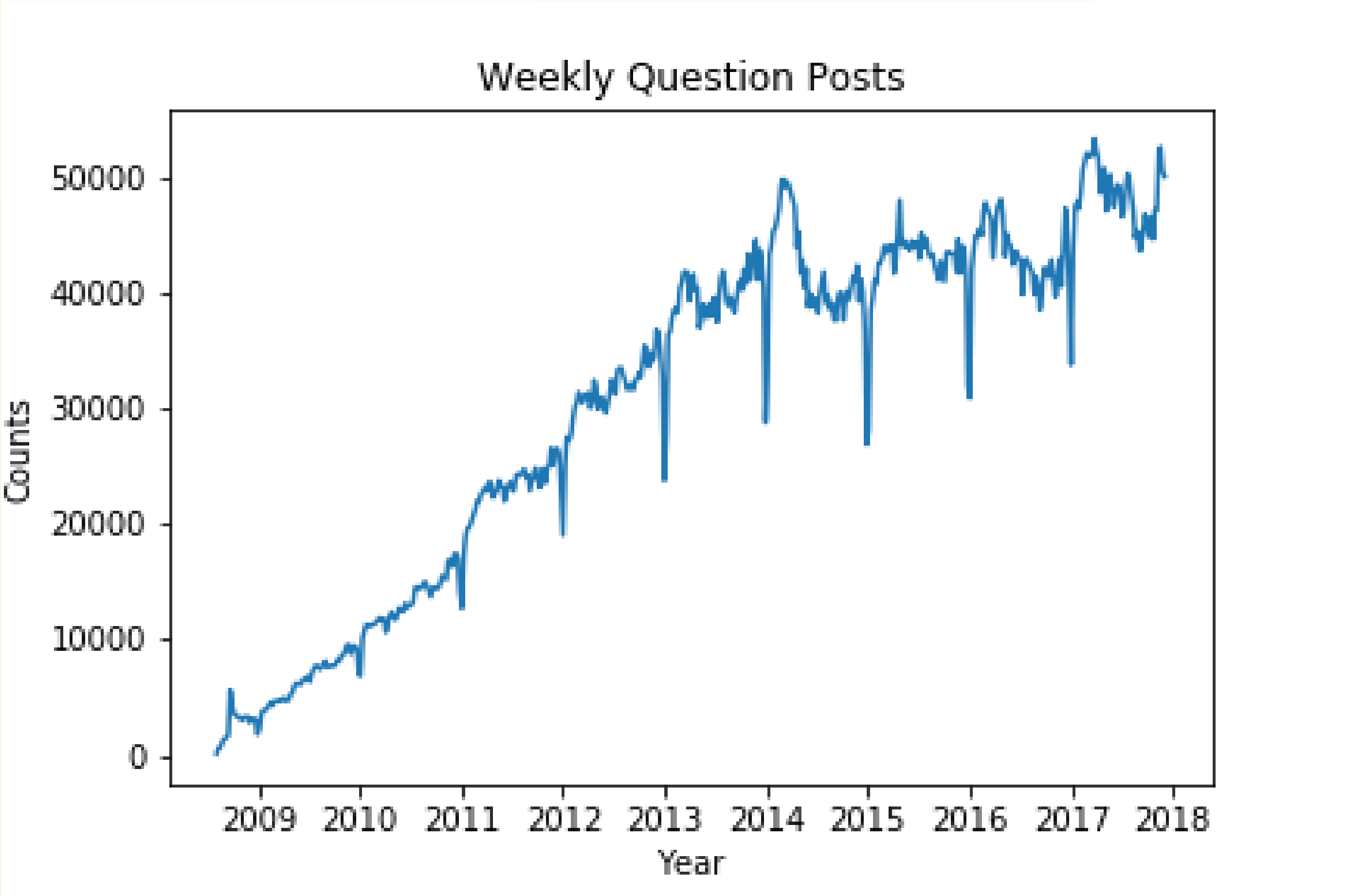
> “The art of proposing a question must be held of higher value than solving it.
>
> *-- Georg Cantor*”

# Overview

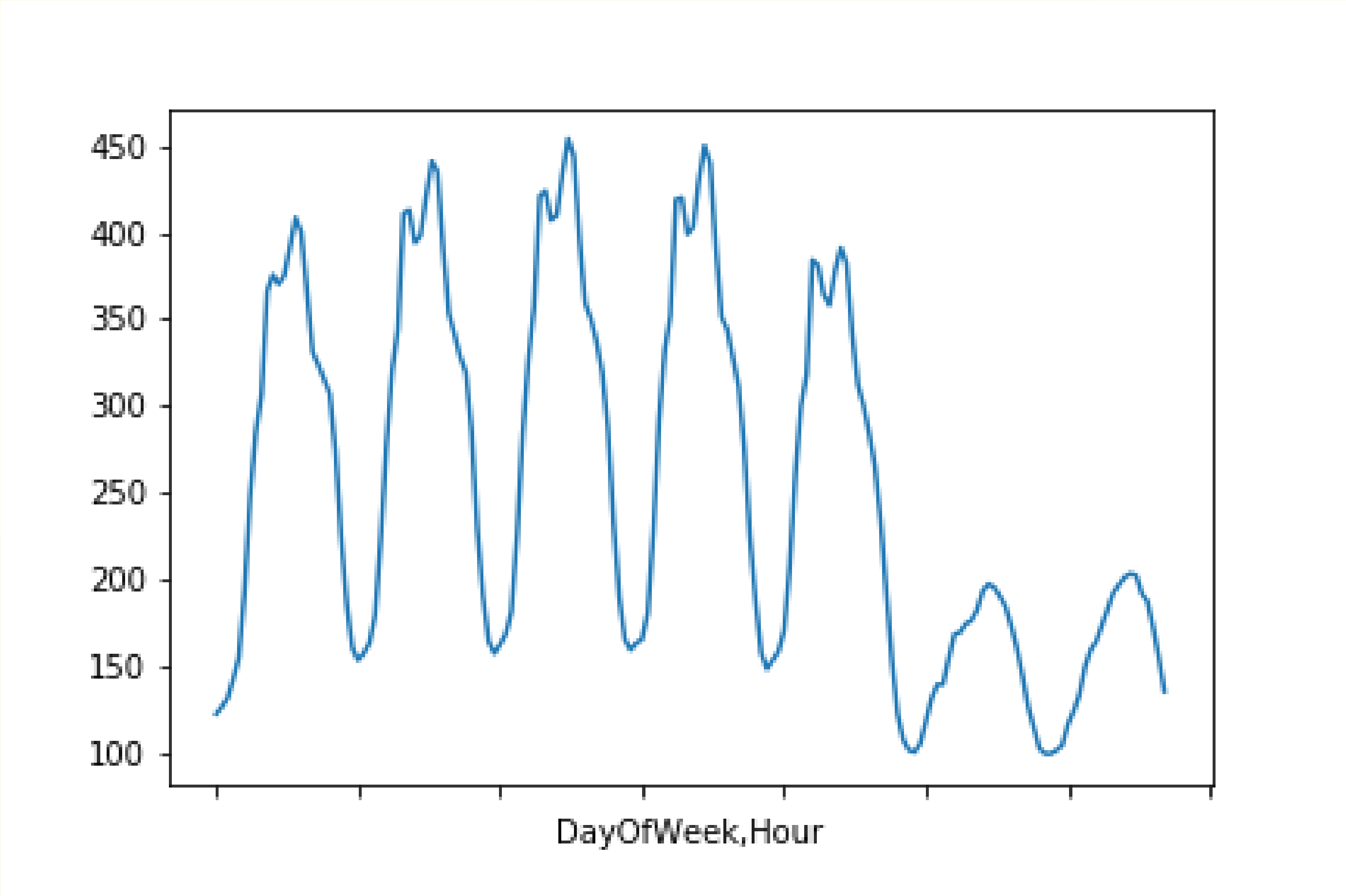
- **Proposed Analtical Work**
  1. Exploratory Analysis
  2. Statistical Inference
  3. Machine Learning Modeling
     - Feature Clustering
     - Classification

# 1. Exploratory Analysis

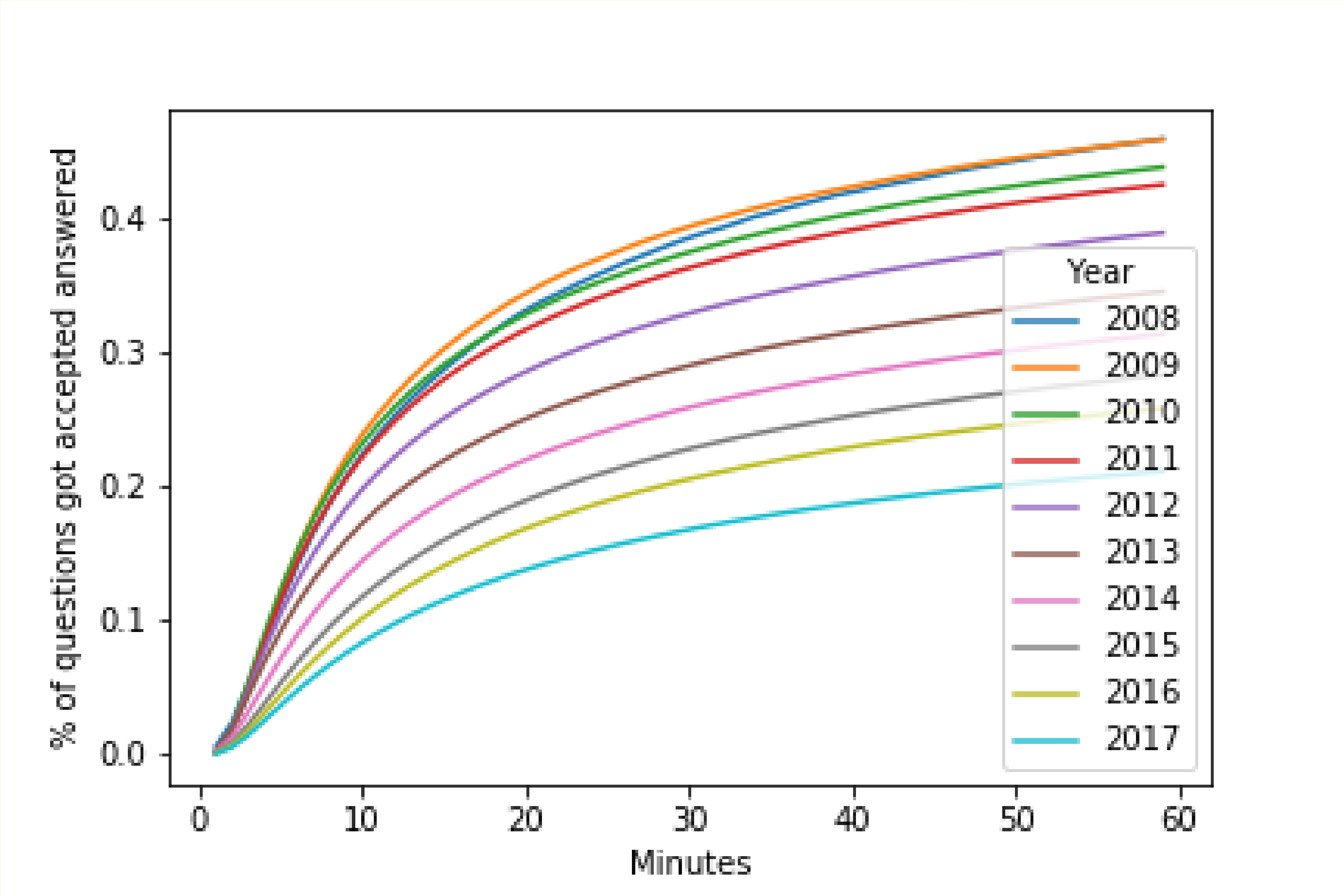
# Time Trends


Weekly Question Posts
Counts
50000
40000
30000
20000
10000
0
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
Year

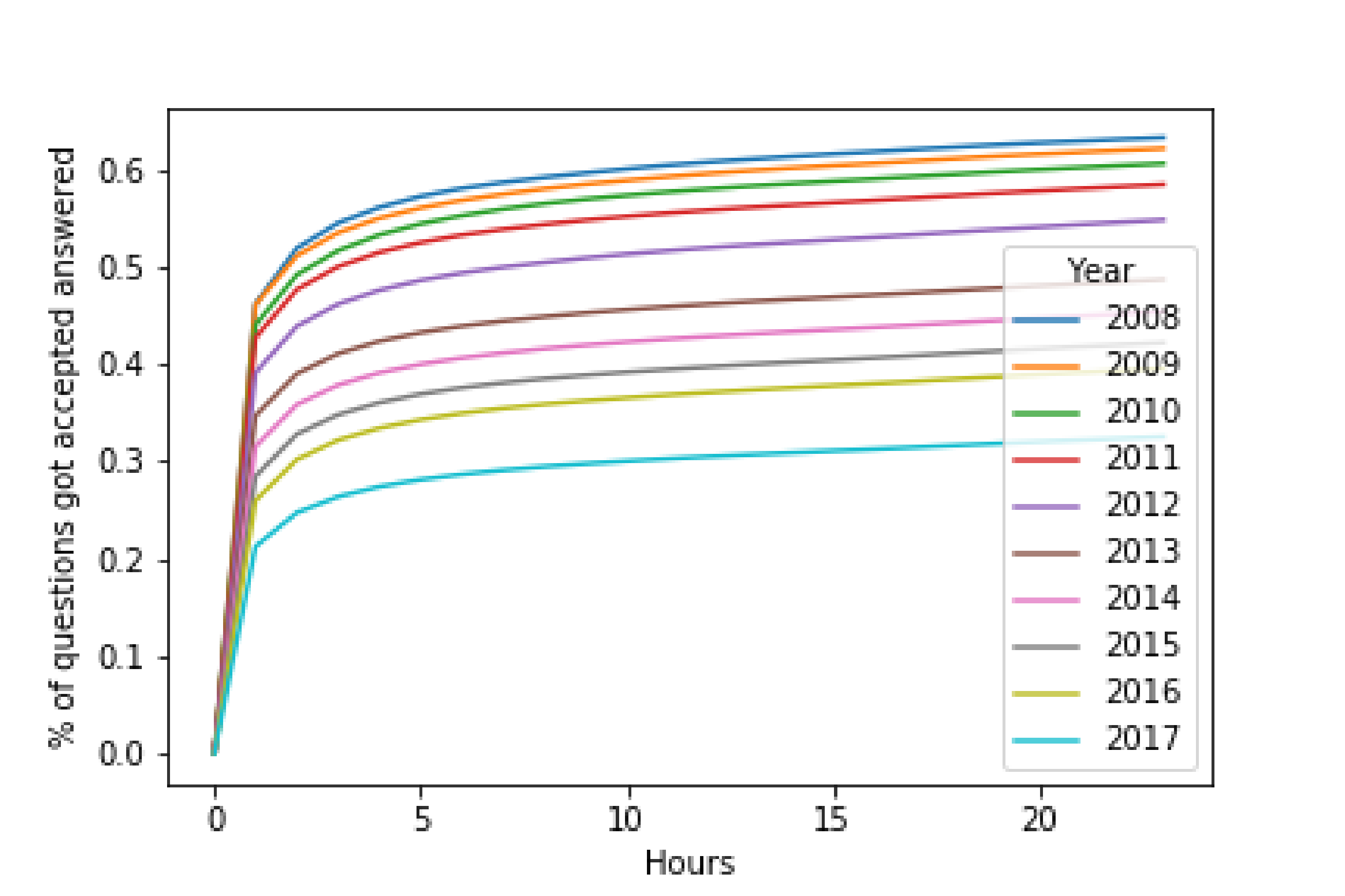
# Daily Trends in a Week



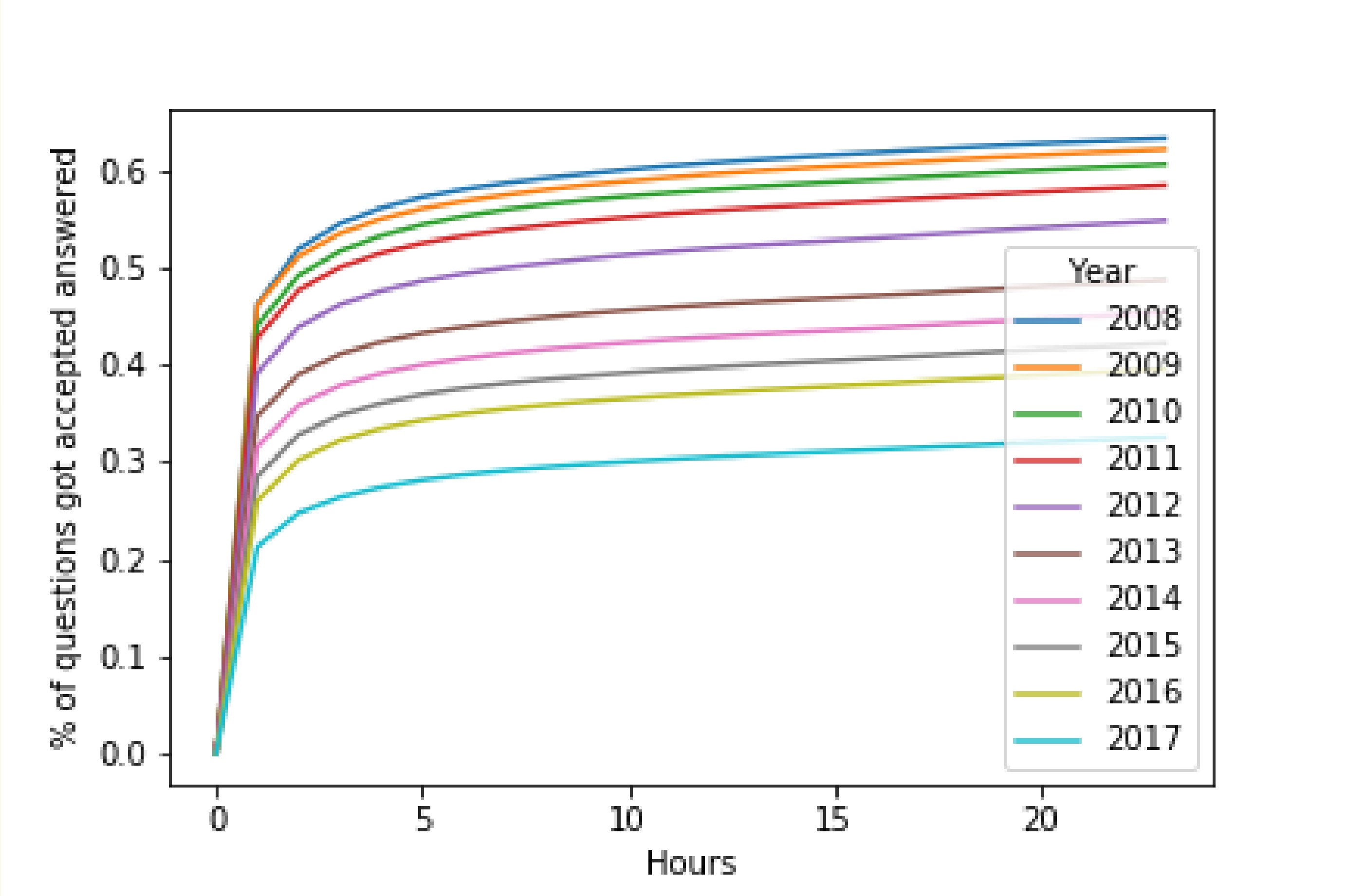
# Time to First Accepted Answer by Year (1h)



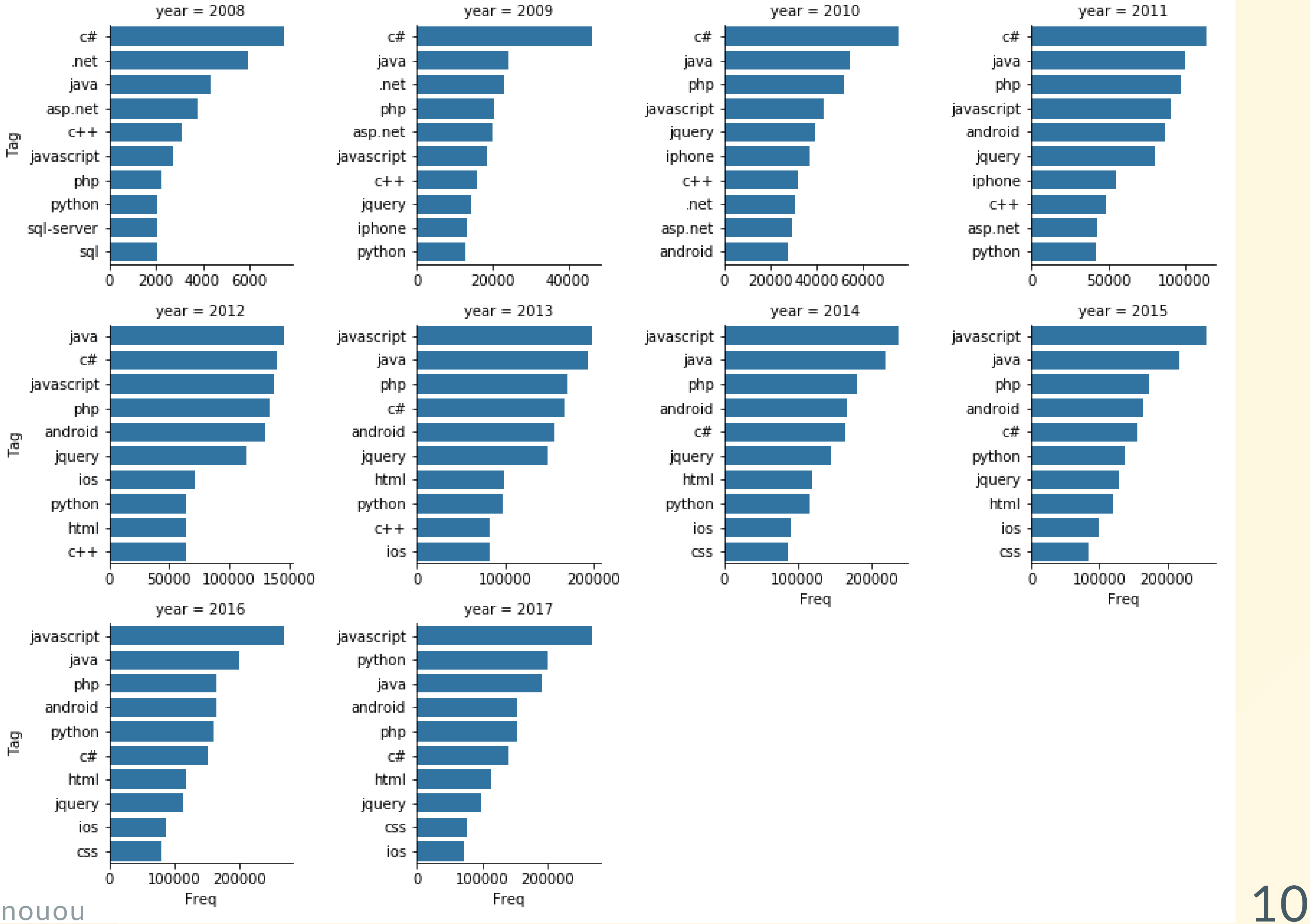
# Time to First Accepted Answer by Year (1d)



# Time to First Accepted Answer by Year (1d)



# Tags



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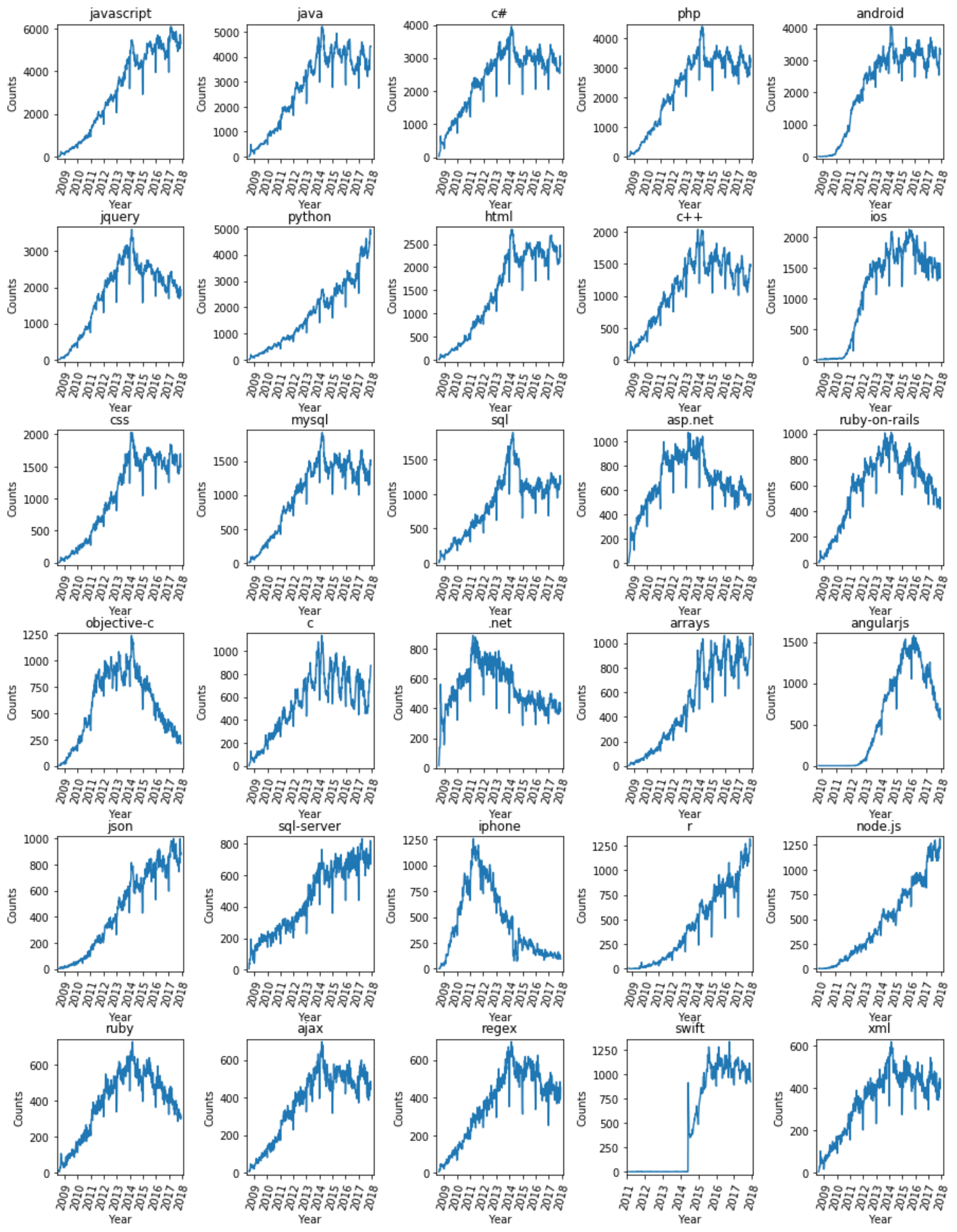
# Tags


javascript
java
c#
php
android
jquery
python
html
c++
ios
css
mysql
sql
asp.net
ruby-on-rails
objective-c
c
.net
arrays
angularjs
json
sql-server
iphone
r
node.js
ruby
ajax
regex
swift
xml
Counts
Year
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018

# Text Data

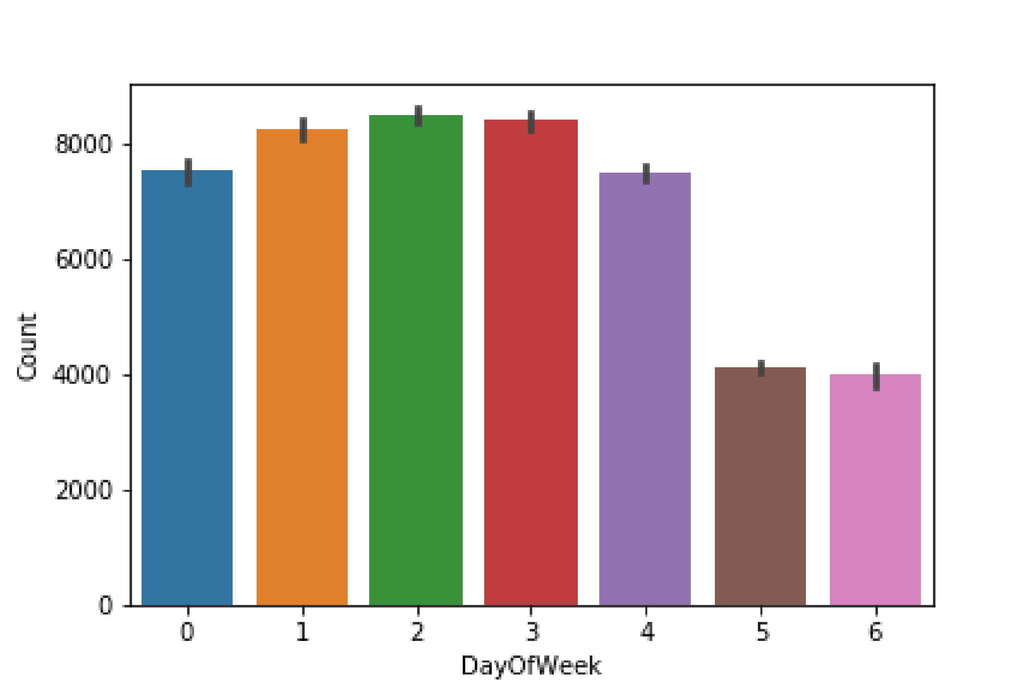
- Number of paragraphs
- Number of code chunks
- Number of pre-formatted text chunk
- Total number of HTML tags used
- Image file links
- Total number of external links
- Length of title (after cleaning for stopwords)
- Is the title a statement or a question?
- Any use of appreciation words in the main text

# 2. Inferential Statistic Modeling

# Post Frequency by Weekdays

| Weekday | Average Number of Questions |
|---|---|
| Monday | 7535 |
| Tuesday | 8259 |
| Wednesday | 8512 |
| Thursday | 8418 |
| Friday | 7502 |
| Saturday | 4124 |
| Sunday | 4011 |

# Post Frequency by Weekdays



| Comparison | T-statistics | P-value |
|---|---|---|
| Mon vs. Fri | 0.27 | 0.784 |
| Mon&Fri vs. Tue&Wed&Thu | -12.38 | <0.001 |

# Does it help to put a question in the title?

34% of question posts using a "question" title while the remaining 66% are using a "statement" title.

| Question Title or Statement Title? | Answered within 1h | No answer with 1h |
|---|---|---|
| Question | 175,148(22.2%) | 612,391(77.8%) |
| Statement | 319,188(20.8%) | 1,218,570(79.2%) |

# 2. Machine Learning Modeling

# Feature Clustering

## K-mean with `n_clusters = 5`

# Feature Clustering

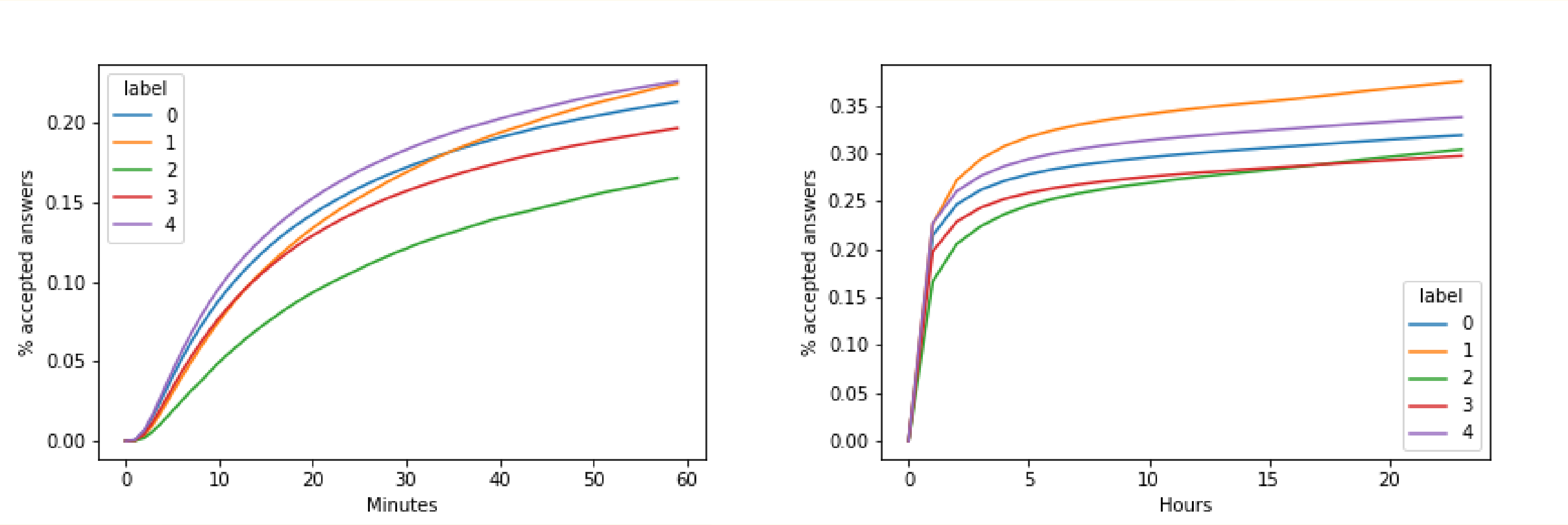
| label | size | paragraph count | code count | pre count | tag count | img count | href count | title count | is question | is thankful |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 839,588 | 3.44 | 1.8 | 1.09 | 6.91 | 0.06 | 0.2 | 5.75 | 0.0 | 0.0 |
| 1 | 330,486 | 8.48 | 7.1 | 3.47 | 21.49 | 0.06 | 0.34 | 6.47 | 0.27 | 0.31 |
| 2 | 99,203 | 7.28 | 2.25 | 1.15 | 12.33 | 1.86 | 2.64 | 6.54 | 0.32 | 0.33 |
| 3 | 565,753 | 4.17 | 1.59 | 1.08 | 7.49 | 0.07 | 0.22 | 6.31 | 0.31 | 1.0 |
| 4 | 490,267 | 3.21 | 1.75 | 0.96 | 6.48 | 0.06 | 0.21 | 7.18 | 1.0 | 0.01 |

- Cluster 0. Questions with statement title and no thankful words.

- Cluster 1. Wordy questions with a lot of paragraphs and code chunks.
- Cluster 2. Wordy questions with a lot of paragraphs, less code chunks but more images and external links.
- Cluster 3. Questions with appreciation words.

- Cluster 4. Questions with question title and no thankful words.

# Feature Clustering



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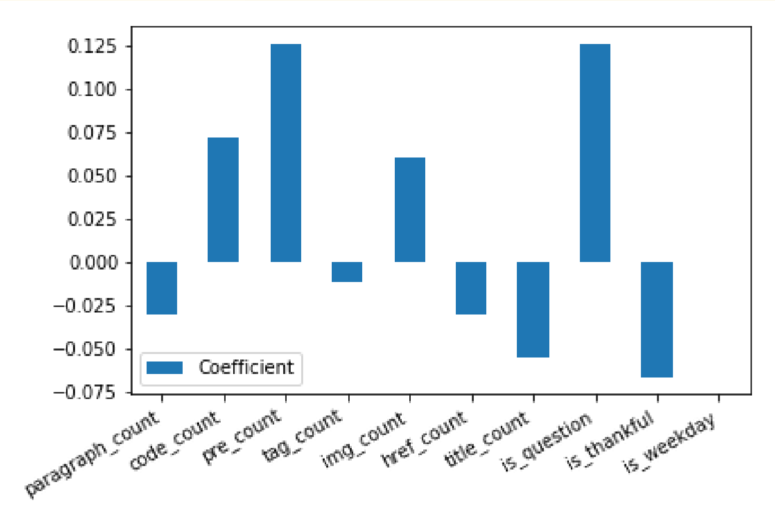
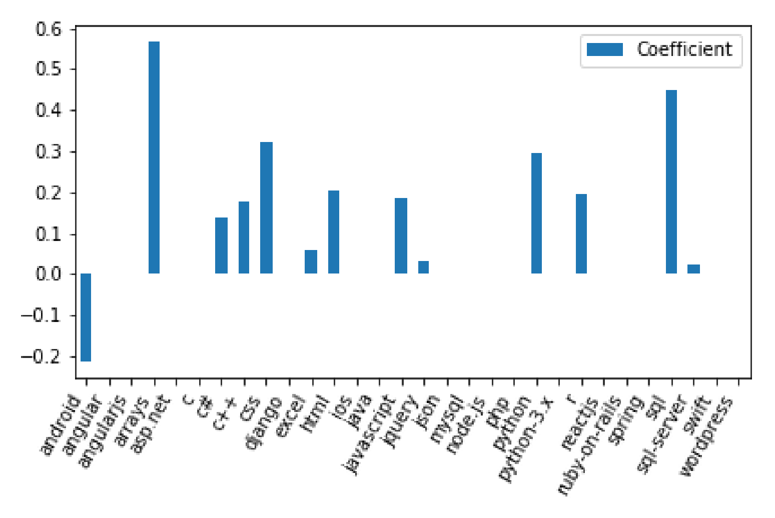
# Classification Model

Logistic regression with `sklearn.linear_model.SGDClassifier` tuning on `alpha`, `l1_ratio`. The performance score used is `weighted average f1 score`. `5-folds` cross-validation were performed on `70%` of data.

| Final Model | Average F1 | Accuracy | ROC_AUC |
|---|---|---|---|
| {'alpha': 0.001, 'l1_ratio': 1} | 0.617 | 0.61 | 0.61 |

# Classification Model





# Conclusions

- Growth slowed down after 2013, and % of accepted question within day 1 dropped to 30%.
- Users have different styles of posting questions.
  - Good Style: more code chunks, emphasizing terms and adding image files; with question titles
  - Bad Style: too many external links; with long statement titles
- The current prediction model is mediocre.

## Suggestions to *StackOverflow* Management

launching a prediction model of question quality -

- To remind the question owner and to provide instructions.
- To inform moderators.
- To help improve the community guideline.
    - The current guideline is well aligned with some of our results. See here https://stackoverflow.com/help/how-to-ask

# Acknowledgment

**Deep appreciation to Serena Peruzzo!**

## That's all!

## Thanks!