



Complaint Assistant

Helping companies predict
complaint escalation

Hao Lin

Dalton Chiscolm Lawsuit: Man Sues Bank Of America For “1,784 BILLION, TRILLION Dollars”



Problem

Complaint Escalation

- Huge money loss
- Lose customers
- Ruin reputation



After a positive customer experience:

- 69% would recommend the company to others
- 50% would use the business more frequently



After a negative experience:

- 58% will never use the company again
- 49% will tell friends not to use the business
- 34% would take revenge by posting a review online or sharing a poor experience on social media

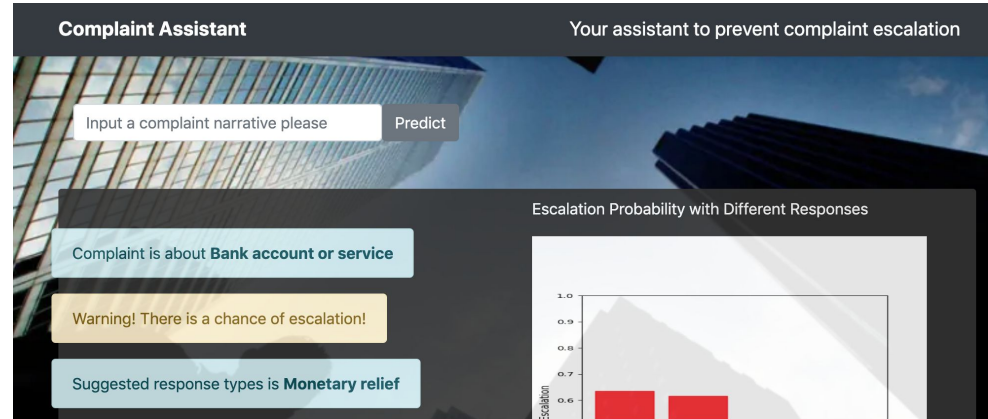
Product

Developed a Web app

- Categorize the product type of the complaint
- Predict the chance of complaint escalation
- Suggest best response type to prevent escalation

 **Complaint Assistant**

www.complaintassistant.best





Data : 16k Historical Consumer Complaints



Consumer Tools

Practitioner Resources

Data & Research

Policy & Cor

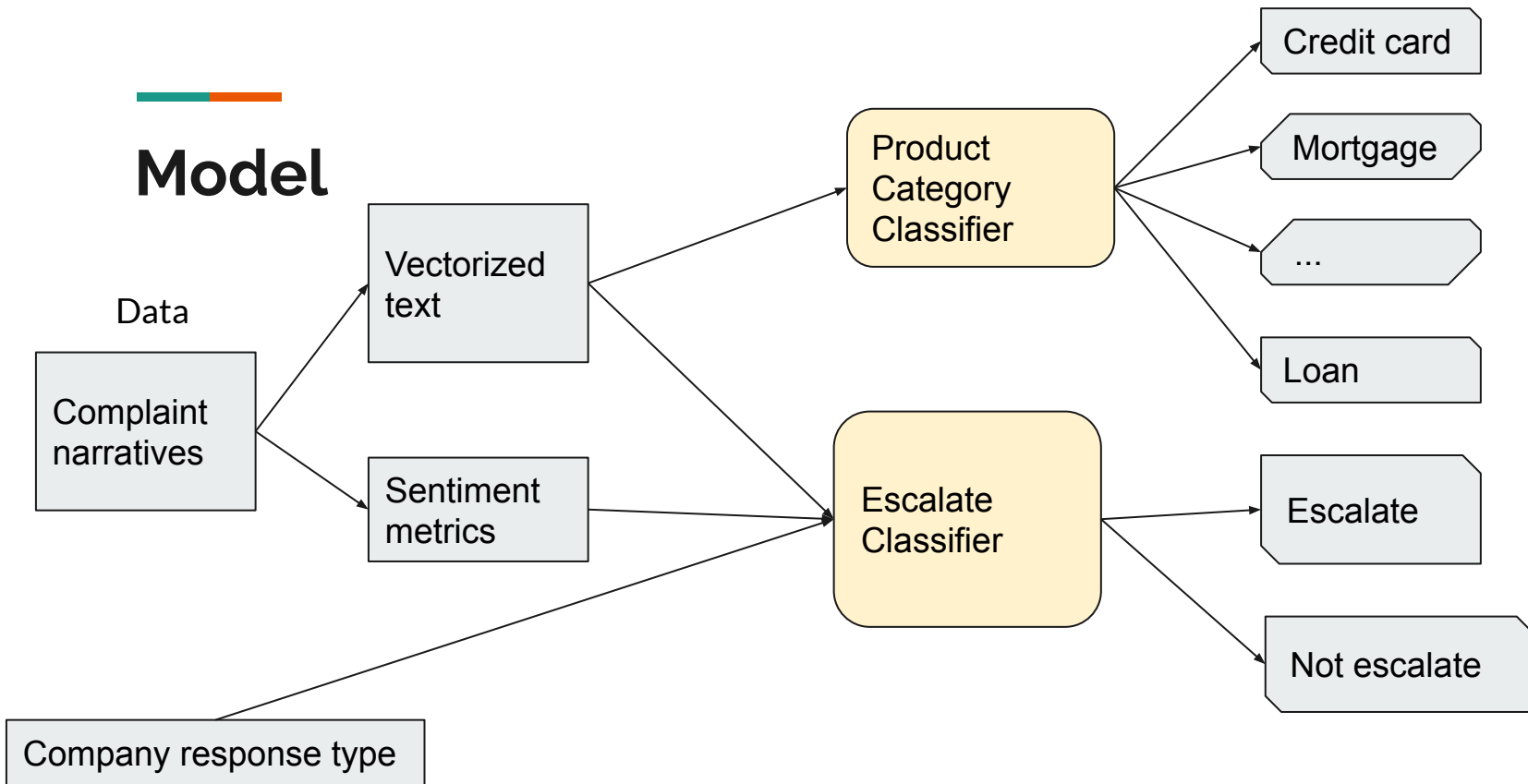
Consumer Complaint Database ^{BETA}

Consumer complaints are added to this public database after the company has responded to the complaint, confirming a commercial relationship with the consumer, or after they've had the complaint for 15 calendar days, whichever comes first. We don't verify all the facts alleged in complaints, but we do give companies the opportunity to publicly respond to complaints by selecting responses from a pre-populated list. Company-level information should be considered in the context of company size and/or market share.

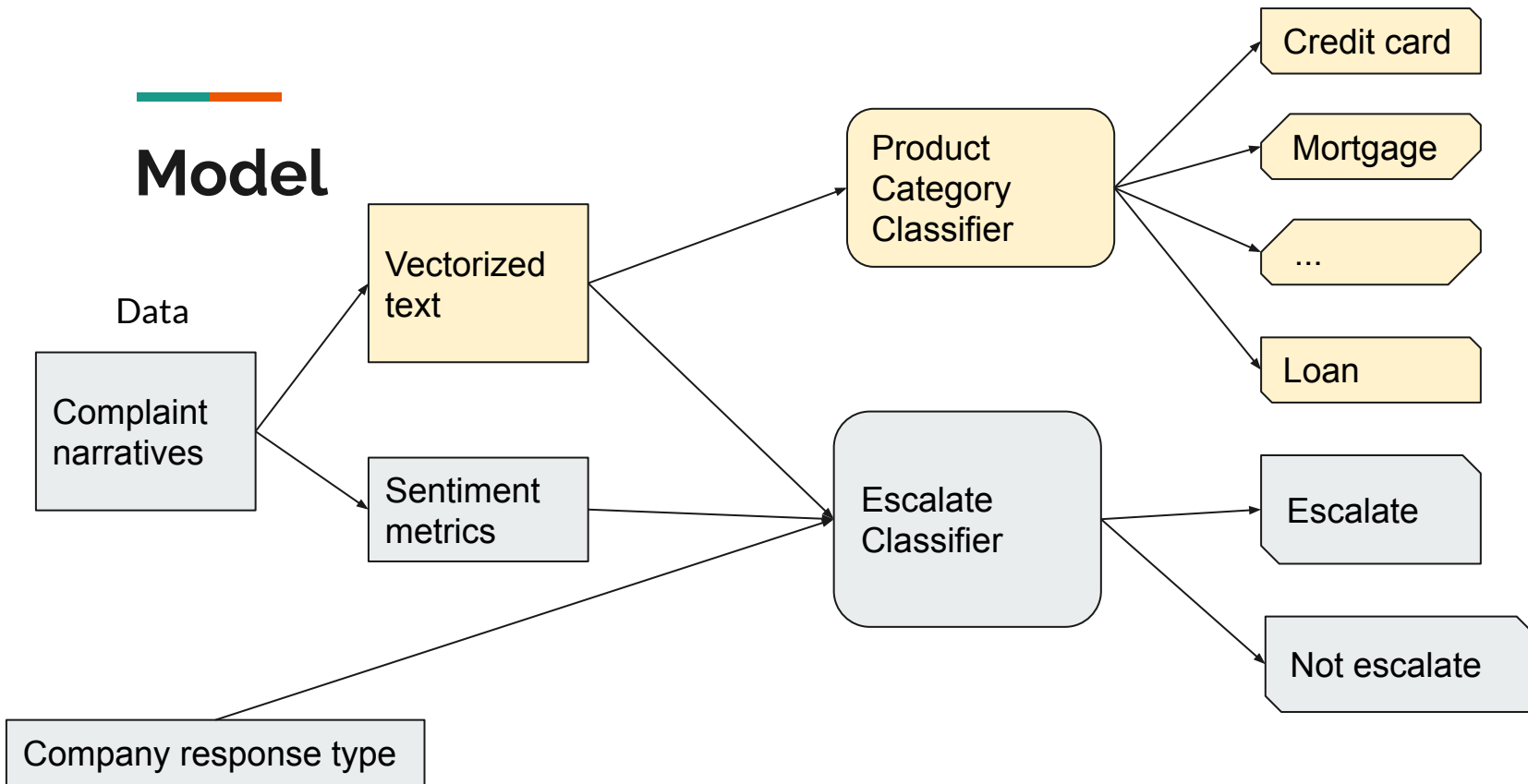
complaints about financial products

- Labeled (Dispute Yes / No)
- Narratives
- 13 product categories
- Company responses

Model



Model



Model

Tokenization
Lemmatization
Stopword
Tf-idf
vectorization

Data

Complaint
narratives

Vectorized
text

Sentiment
metrics

Product
Category
Classifier

Escalate
Classifier

Credit card

Mortgage

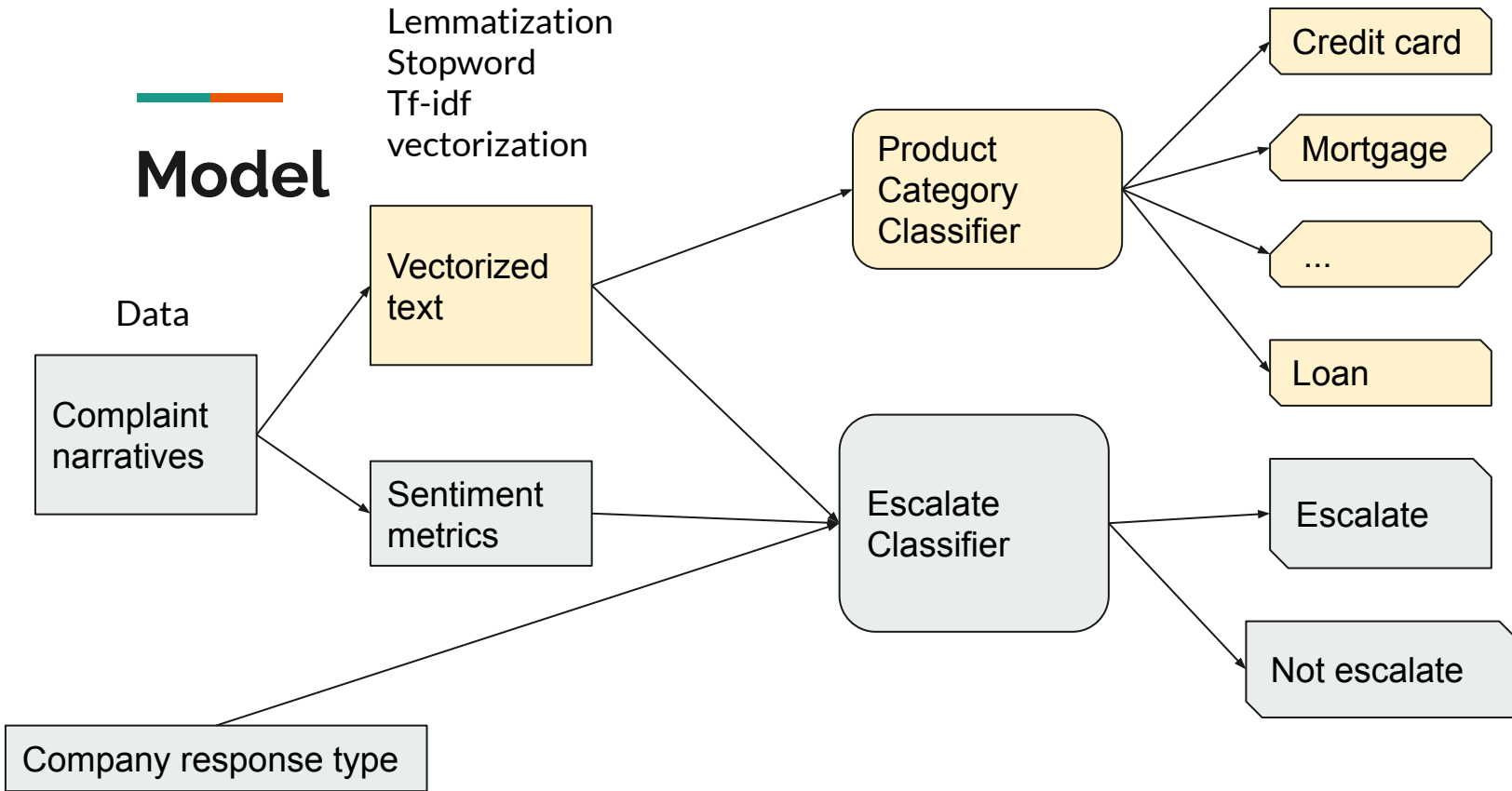
...

Loan

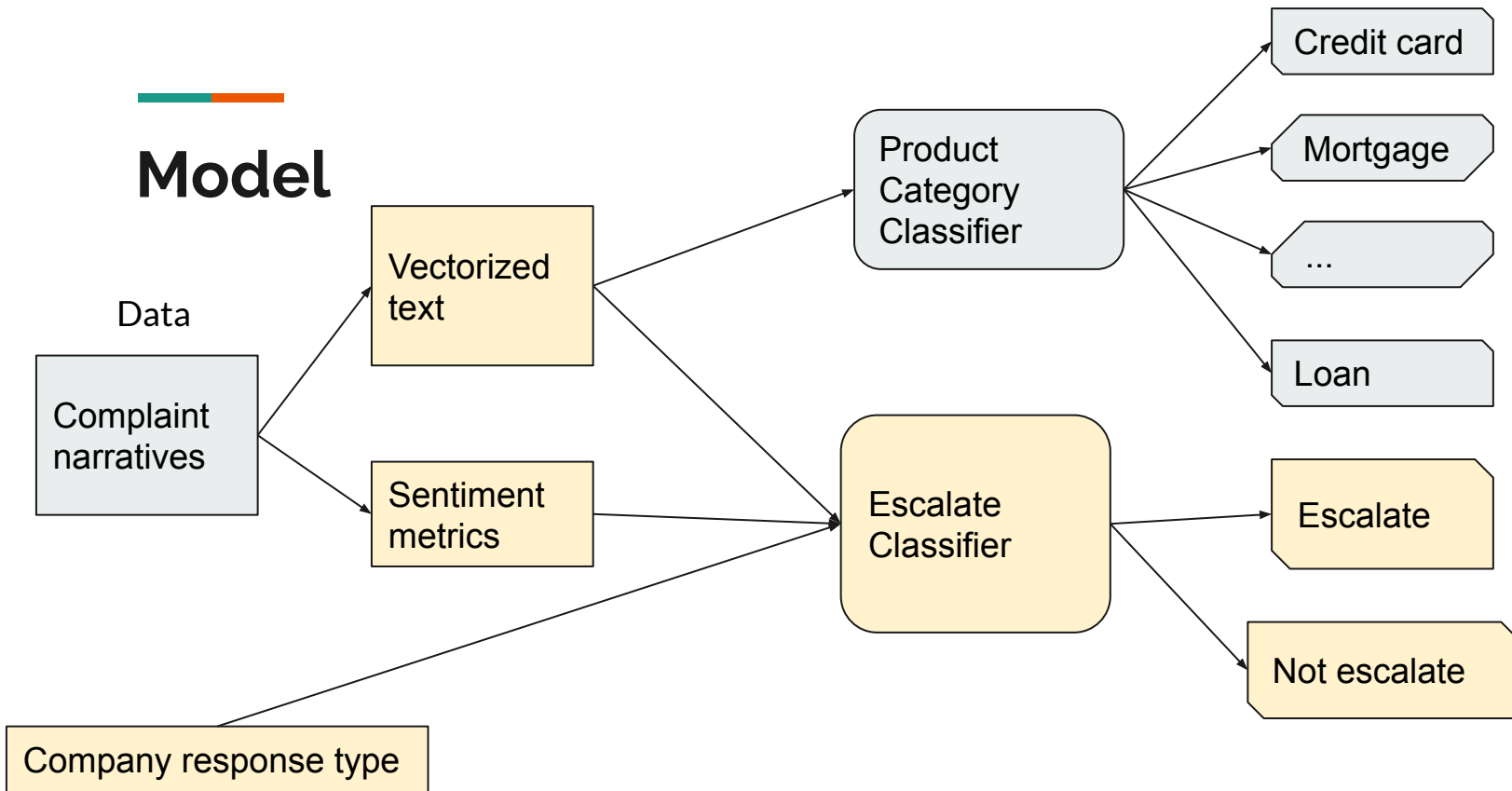
Escalate

Not escalate

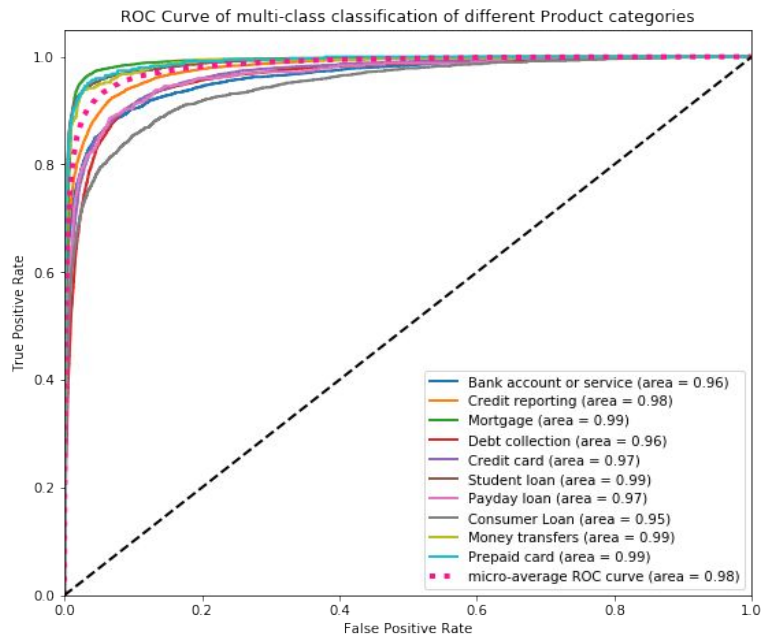
Company response type



Model



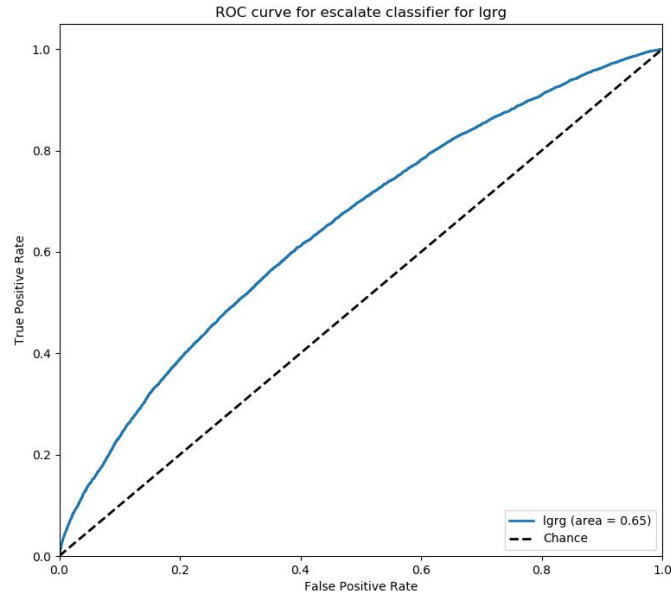
ROC Curve of Product Category Classifier



OneVsRest, Logistic Regression

AUC score 0.98

ROC Curve of Escalate Classifier



Logistic Regression($C=1$)

AUC for model is: 0.648



Validation

Validate using 1000 recently submitted complaints

- 240 are labeled as escalation in the data
- 118 escalation are detected
- 117 out of 118 are suggested to adopt a response different from current response

Half of the escalation could be eliminated !!



Conclusion

Complaint Assistant

- Leveraged by NLP and machine learning
- Could be customized to specific company

Other Application

- Product category classifier -> Customer segmentation
- Imbalanced data -> Fraud detection



Hao Lin

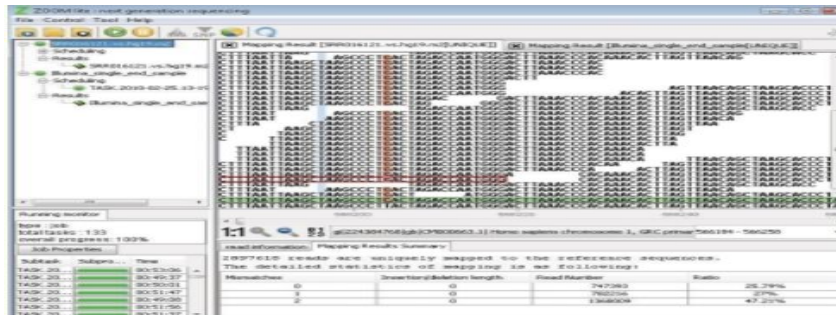
PhD in Computer Science



中国科学院计算机技术研究所
INSTITUTE OF COMPUTING TECHNOLOGY, CHINESE ACADEMY OF SCIENCES



UNIVERSITY OF
WATERLOO





NLP processing of narrative

Tokenization

Stop word

- Combine two nltk stop word library and sklearn.feature_extraction
- Remove stop words with strong sentiment. Eg. shouldn't, never

Lemmatization

TF-IDF vectorization (ngram=(1,3) max_feature_num = 50000



Sentiment Metrics for each narrative

Based on sentiment score generated by Vader for each sentence

- # of sentences
- # of words
- the most negative score
- Negative ratio
- sum of sentiment score
- average sentiment score
- # of ?
- # of !



Future Plans

More accurate sentiment analysis

- Train sentiment analysis model other than using Vader as base

Incorporate more semantic information

- Fine tune doc2vec
- Bi-LTSM

Generate dangerous word library

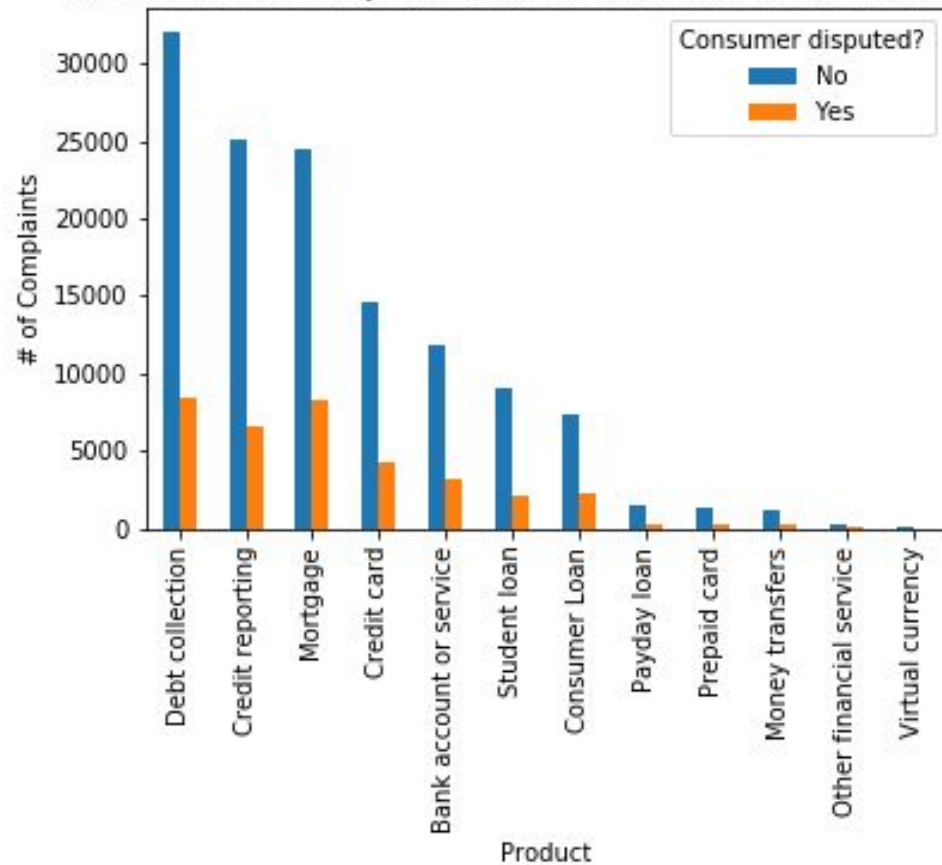


Customer complaint content and sentiment

'credit card number : XXXX set up automatic payment to " Pay amount due on due date \'\' for this Bank of America Visa Card (under XXXX XXXX XXXX). However, on XXXX, only minimum payment of {\$25.00} was deducted. This resulted in I being charged interest on XXXX (and potentially future date), and potentially affect my credit score. I contacted BOA but it is a mess there. I was being directed here and there with no resolution. \n**The mistake is unexcusable.** My family have all kind of credit cards and **have never seen a mistake like this.** I like BOA to:1. **correct his promptly** and refund any penalty interest charged. \n2. **explain to CFPB** why this happen and how many customers have been affected by this mistake, **how much fee they have collected out of this mistake.** \n3. explain to me whether this affect my credit score and correct promptly if it does.'

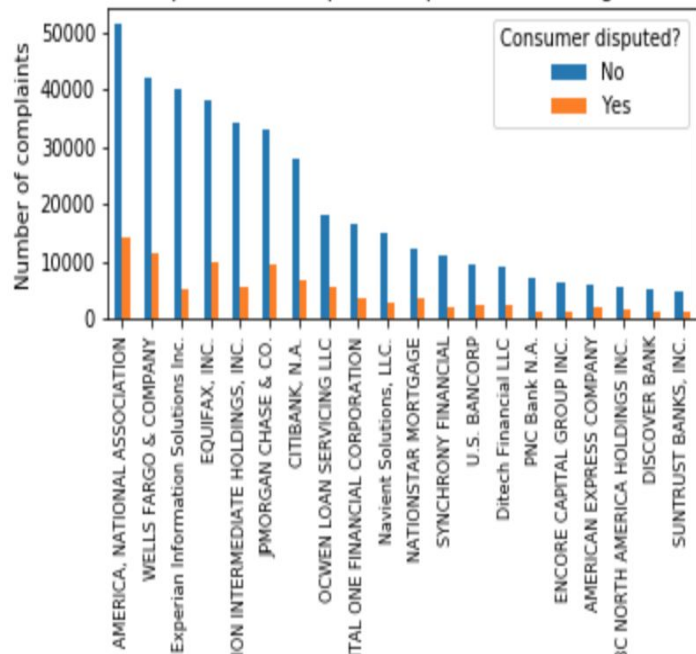
In []:

The bar chart of complaints number in different Product categories



How the company response matters

Number of complaints from top 20 companies containing most complaints



Dispute Ratio of complaints of 20 companies with most number of Complaints

