"Who said that?" Building classifiers that predict which TV show character said a given line!

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INTRODUCTION

Motivation: Understand which techniques are useful for authorship attribution on shorter utterances

Goal: Building classifiers that predict which character said a given line of dialogue

Methods:
- Using features
- Word embeddings

Idea: Try 3 powerful classifiers!
- Random Forests
- Logistic Regression
- Neural Networks

Hypothesis: Genre will affect accuracy

DATA

The Big Bang Theory [sitcom]
- scrape scripts from WordPress website
- split lines and label the speaker for each line
- 45,825 lines, 7 characters

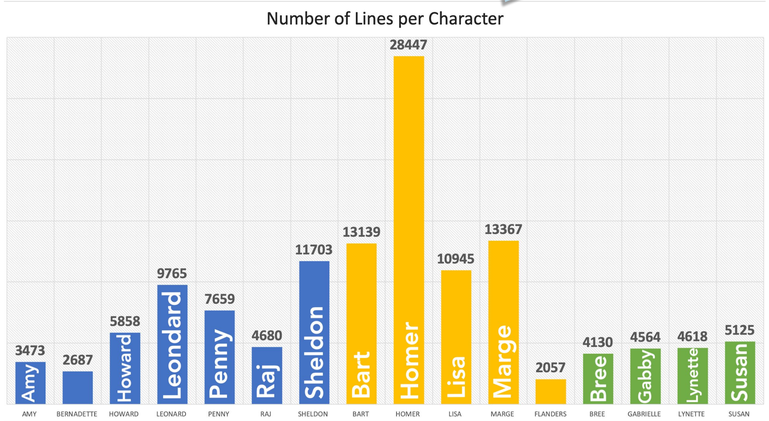
The Simpsons [cartoon]
- found existing labeled scripts in .csv format
- 67,955 lines, 5 characters

Desperate Housewives [drama]
- convert .doc scripts to .csv
- standardize speaker names and formatting
- 18,437 lines, 4 characters

Speaker	Line
Howard	[no, ,, it, ', s, okay, ., what, ?]
Raj	[oh, ., very, clever, ., but, still, racist, .]
Sheldon	[i, ', ll, pay, you, 40, dollar, .]

Normalization & Preprocessing:
- Convert all letters to **lowercase**
- **Tokenize** and **lemmatize** words
- Convert number words into **digits**
- Test/Train → **20/80 split**

The Simpsons had the largest disparity in lines per character
Desperate Housewives had the most even dataset



METHODOLOGY

FEATURES: 2 APPROACHES

Manual Feature Selection
- **type-token** ratio, **punctuation** use
- utterance length, average **word length**
- **polarity** & **subjectivity** (textblob)
- # of stop words, **neologisms**, number words, **profanity** words
- # of words in utterance that are also in each character's 20 **most frequent words**

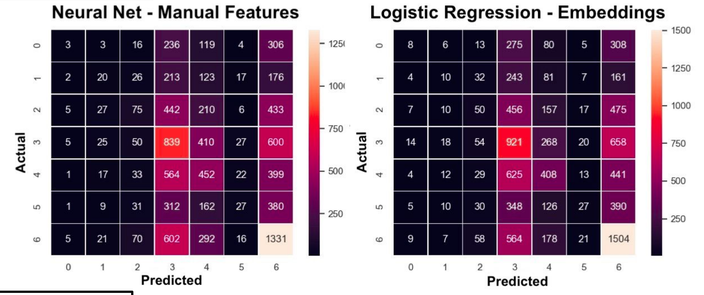
Word Embeddings
- get word vector embeddings from **word2vec**
- word vectors → **sentence vector**
- constructed embeddings using 2 corpora:
  - **Google News** corpus
  - show script (training data)

Capturing the 20 most frequent words for **Homer** (left) and **Flanders** (right)

RESULTS

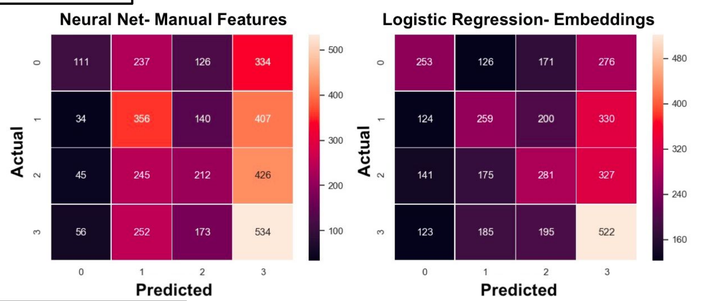
Big Bang Theory

		Accuracy	Precision	Recall
	Random Baseline	0.14		
	Majority Baseline	0.26		
Manual Features	Random Forest	0.27	0.24	0.27
Manual Features	Logistic Regression	0.29	0.28	0.29
Manual Features	Neural Net	0.30	0.27	0.30
Embeddings	Random Forest	0.31	0.26	0.20
Embeddings	Logistic Regression	0.32	0.25	0.21
Embeddings	Neural Net	0.27	0.20	0.20



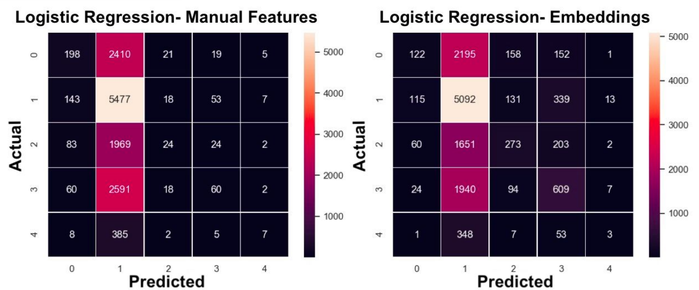
The Simpsons

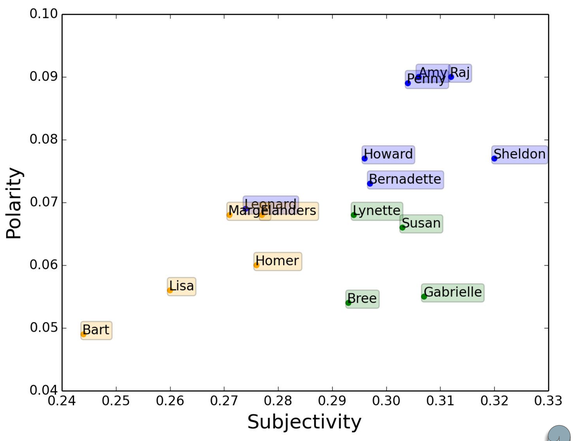
		Accuracy	Precision	Recall
	Random Baseline	0.20		
	Majority Baseline	0.42		
Manual Features	Random Forest	0.40	0.35	0.40
Manual Features	Logistic Regression	0.42	0.39	0.42
Manual Features	Neural Net	0.43	0.39	0.43
Embeddings	Random Forest	0.44	0.42	0.24
Embeddings	Logistic Regression	0.45	0.39	0.26
Embeddings	Neural Net	0.42	0.31	0.29



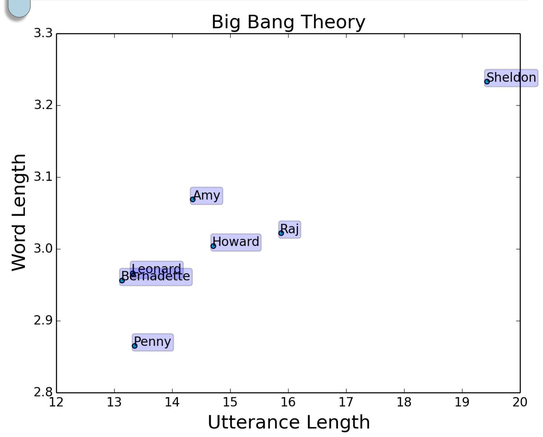
Desperate Housewives

		Accuracy	Precision	Recall
	Random Baseline	0.25		
	Majority Baseline	0.28		
Manual Features	Random Forest	0.34	0.34	0.34
Manual Features	Logistic Regression	0.34	0.35	0.34
Manual Features	Neural Net	0.34	0.36	0.34
Embeddings	Random Forest	0.34	0.34	0.33
Embeddings	Logistic Regression	0.36	0.36	0.35
Embeddings	Neural Net	0.33	0.33	0.33





Polarity & **Subjectivity** differ greatly **across shows** (above). **Word Length** & **Utterance Length** make **Sheldon** easily identifiable (below).



CONCLUSION

Best model: Logistic Regression
Best features: Word Embeddings
- Higher accuracy for almost all cases!
- On average, 6.6 percentage points above majority baseline

Hypothesis: Genre will affect accuracy
- **Easiest show** to predict: Desperate House
- **Dramas** have subplots for each character, topic might help distinguish characters

Future steps!
- Explore **additional features**: Arousal, Dominance, POS and topic
- try using **BERT**, Google's universal sentence encoder
- **Tune parameters** to optimize classification
- Try **more TV shows** to understand if indeed genre plays a role in classification