TWITTER SENTIMENT CLASSIFICATION

Nick Gigliotti

Business Problem

Create an accurate explanatory model that classifies tweets as expressing positive or negative sentiment.

Find out what people are saying about Apple and Apple products at South by Southwest, 2011.

Make some PR recommendations for the period immediately following the event.

Dataset

Tweets related to South by Southwest, 2011

- Annual conference and arts festival
- Austin, TX
- Major site for iPad 2 Launch

Crowdsourced sentiment labels
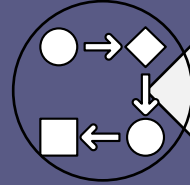
~3.5k tweets: just text and labels

- Tweets are labeled with *Positive* or *Negative*
- Tweets are labeled with brands and products related to the sentiment

Sparse 'Negative' class

Class Balance - 3,510 Samples

Methods

Iterative Process
- First developed a strong conventional model
- Used TF*IDF vectorization and VADER analysis
- Switched to fine-tuning a BERT (deep neural network)

Cleaning
- Removed duplicates, but left most retweets
- Filled some missing brand names
- Minimal text cleaning before BERT

Finetuned BERT
- Bidirectional Encoder Representations from Transformers
- Considers context in both directions (hence "bidirectional")
- Pretrained on Toronto Book Corpus and Wikipedia
- Finetuned on this dataset
- Beat Random Forest, SVM, Logistic Regression, Naïve Bayes

Bigram Analysis
- Searched for bigrams in whole corpus and for each brand
- Predicted probabilities for each bigram
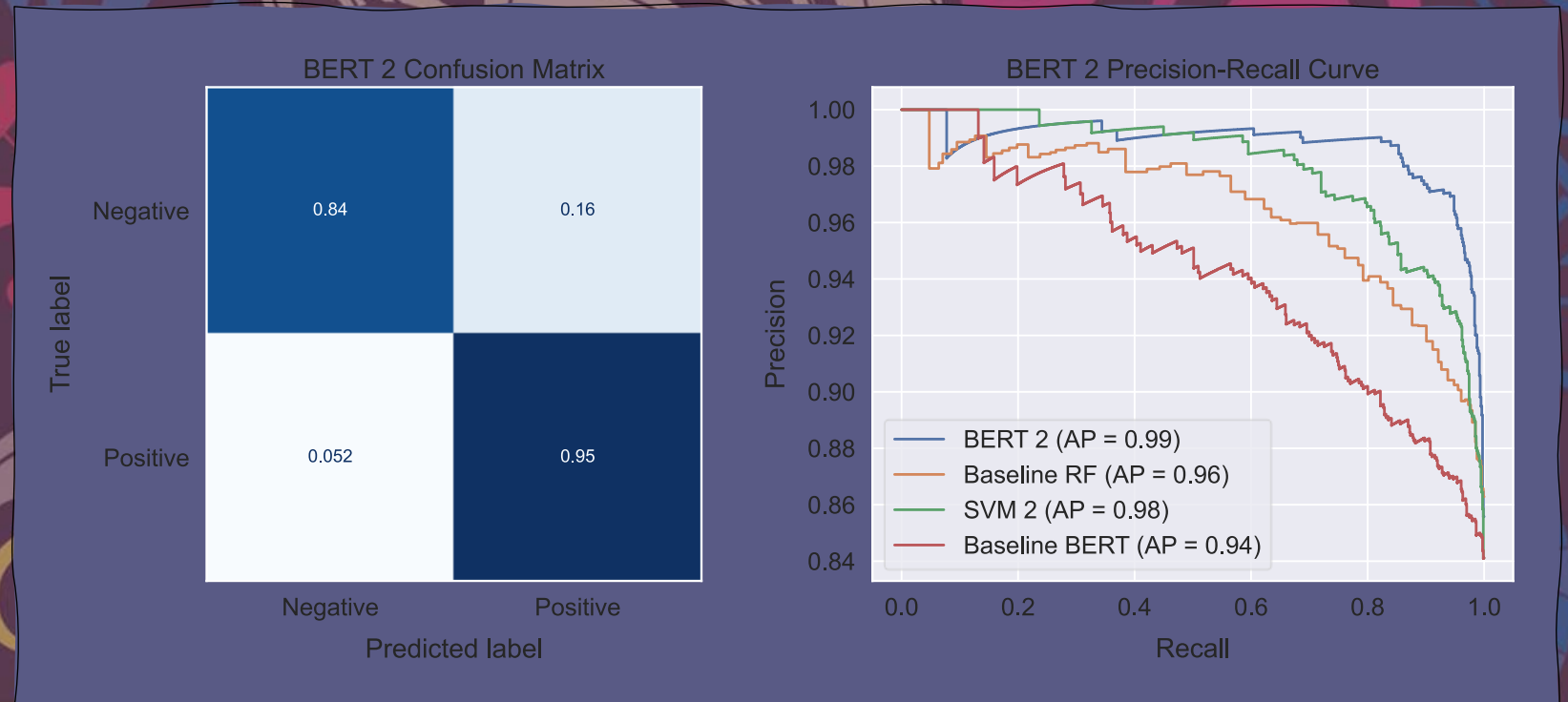- Generated word-clouds from probabilities

Model

Accuracy: 93%

Mean Recall: 89%

Widest Precision-Recall Curve

Almost never mistakes a positive for a negative

Rarely mistakes a negative for a positive

BERT 2 Confusion Matrix
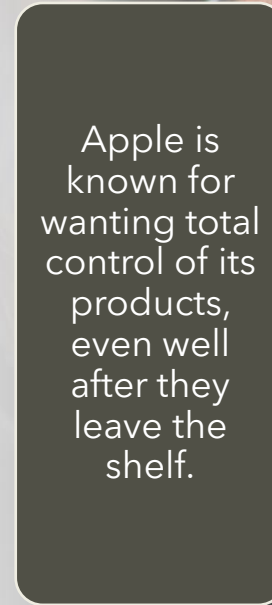

BERT 2 Precision-Recall Curve

Freeeeedom!
One of Apple's values?

Recommendation:
Relinquish some control to send the message that people are free to use Apple's products however they wish.

Apple: Negative

Apple: Positive

People were very excited about the "new iPads" and "cool technology" at the pop-up store.

Apple is known for wanting total control of its products, even well after they leave the shelf.

At SXSW, Tech Reporter Kara Swisher called Apple "the classiest fascist company in America," and it took off.

The original comment was in response to the suggestion that Apple might create its own proprietary newsstand for e-magazines.

Flipboard: game-changer or just a fad? (2011)

Complaints about iPhone Battery Life

○ Many people are complaining about the iPhone's limited battery life.

○ Others are rejoicing at having a charger or "juice pack."

○ Some people mocked the spotty AT&T service which many iPhone users have.

  ○ You already solved this problem by making a deal with Verizon.

Recommendation:

○ Improve the iPhone's battery life and turn it into a new marketing campaign. People will pay attention.

iPad: Negative

iPad: Positive

iPad 2 Popup Store was a Success

○ People couldn't stop talking about the iPad 2 popup store.

○ "64gig wifi" is a top phrase because everything but that model **sold out**.

○ "Congrats winning" and "win free" have to do with an iPad case giveaway, which people liked.

○ People said that others "look weird" using iPads to take photos.

○ "Design headaches" and "hate ipad's" have to do with a benign talk given about iPad app design.

○ "Worth unless" comes from a claim that the iPad 2 is only a minor upgrade and not worth the price.

Recommendation:

○ Do another temporary popup store for your next big product launch.

Conclusion

- I built a 93% accurate model despite a small and noisy dataset.

- There is still room to improve the model, though it's probably not necessary.

- I have four recommendations:
  - Send the message that Apple cares about individual freedom by relinquishing control in a public manner.
  - Improve the iPhone's battery life and use it as a rallying point for a marketing campaign.
  - Open another temporary popup store for your next big product launch.
  - Give away free refreshments at your events. Phrases like "free food" and "free drinks" were associated with the positive class.

BERT 2 Confusion Matrix

	Negative	Positive
Negative	0.84	0.16
Positive	0.052	0.95

True label / Predicted label

Future Work

- Stacking Classifiers
  - Combine the results of multiple classifiers to make a better conventional model.
  - Probably not necessary given the success of BERT.
- BERTweet
  - Try using BERTweet, a pretrained BERT designed specifically for English tweets.

THANKS

Nick Gigliotti

ndgigliotti@gmail.com