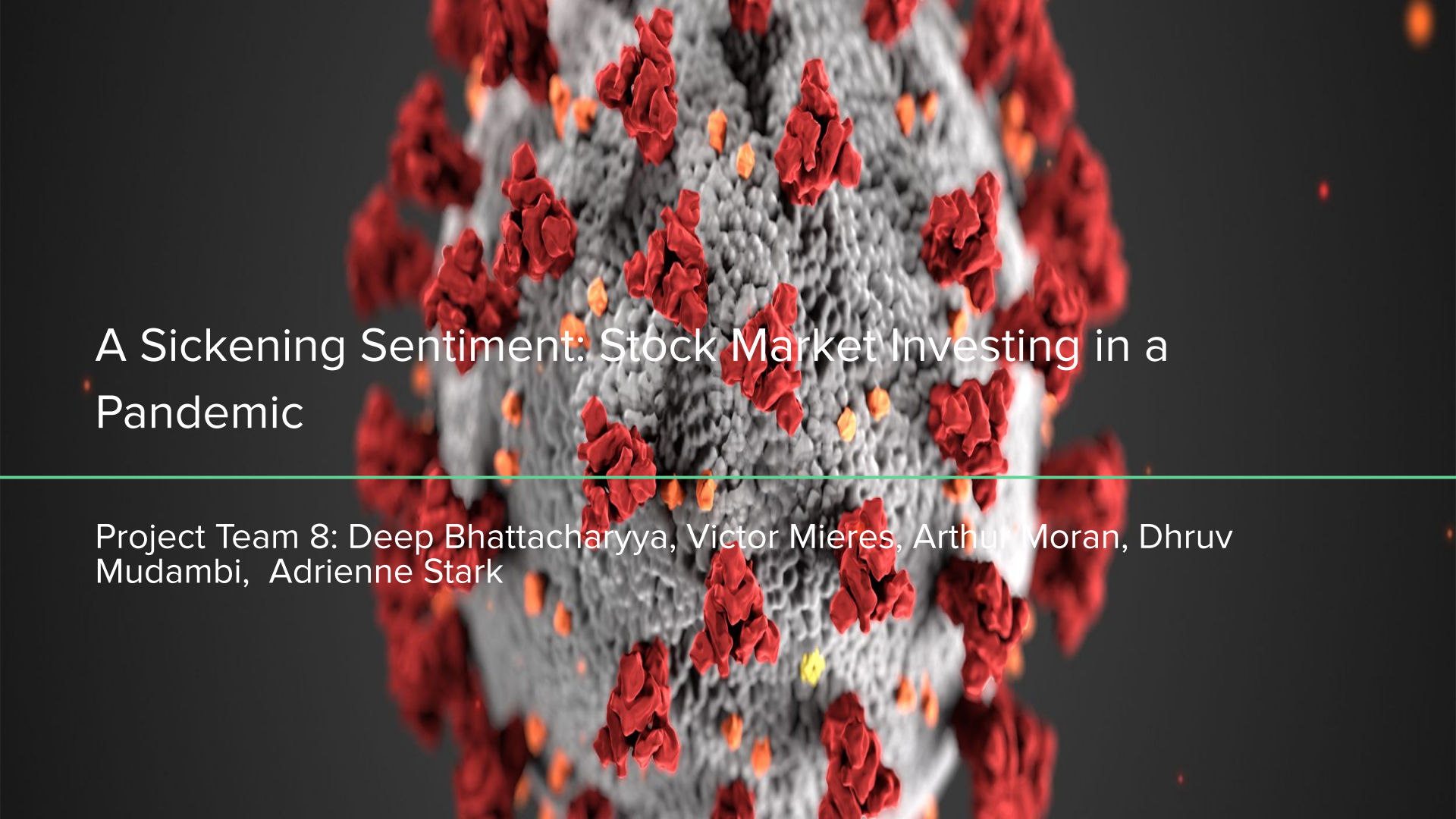


A Sickening Sentiment: Stock Market Investing in a Pandemic

Project Team 8: Deep Bhattacharyya, Victor Mieres, Arthur Moran, Dhruv Mudambi, Adrienne Stark

Research Question

Our research question was to evaluate how a machine learning model could predict stocks prices through a black swan event like the coronavirus. We wanted to see how a model would work through something that is typically not “modelable”

What are Black Swan Events?

The **black swan theory** or **theory of black swan events** is a metaphor that describes an event that comes as a surprise, has a major effect, and is often inappropriately rationalised after the fact with the benefit of hindsight. The term is based on an ancient saying that presumed black swans did not exist – a saying that became reinterpreted to teach a different lesson after the first European encounter with them. (Source: Wikipedia)

Stocks selected

- Carnival Cruise Lines (CCL)
- Delta Airlines (DAL)
- Paypal (PYPL)
- ETSY (ETSY)

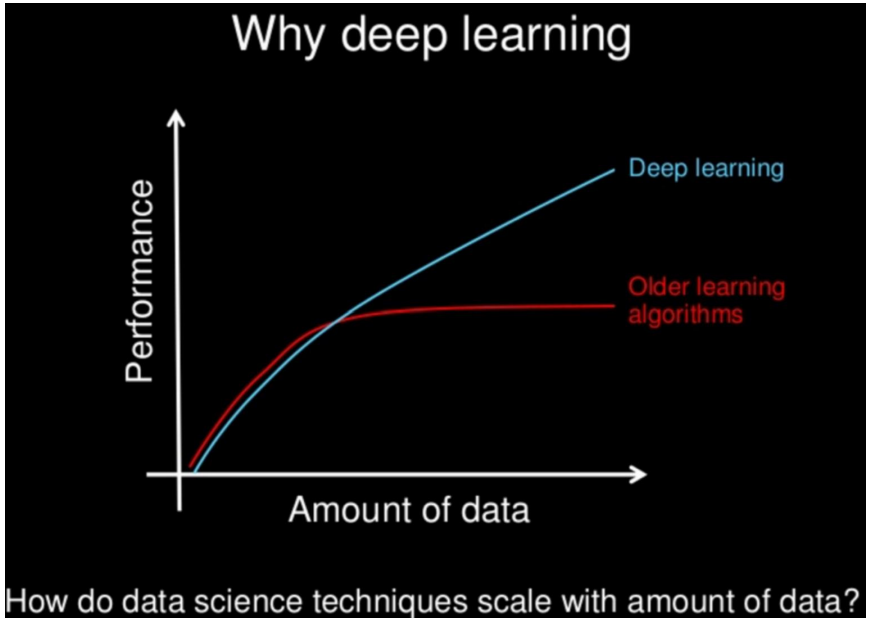
Stock name	5 year return ending 12/31/20	4 year return ending 12/31/19	2020 return	Sentiment Analysis Compound Mean
Carnival (CCL)	-14.55%	5.67%	-56.89%	0.13 = Positive
Delta(DAL)	-2.69%	5.96%	-30.77%	-0.05 = Negative
Paypal (PYPL)	45.27%	31.48%	116.51%	0.13 = Positive
Etsy (ETSY)	84.78%	52.18%	301.60%	0.32 = Positive
S&P 500 ETF (SPY)	15.11%	14.31%	18.37%	-0.01 = Neutral

Linear regression

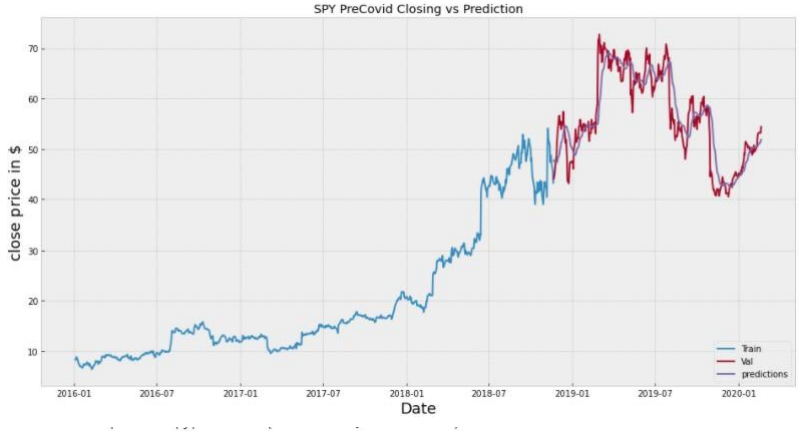
- Simple model
- Tends to overfit
- Not recommended

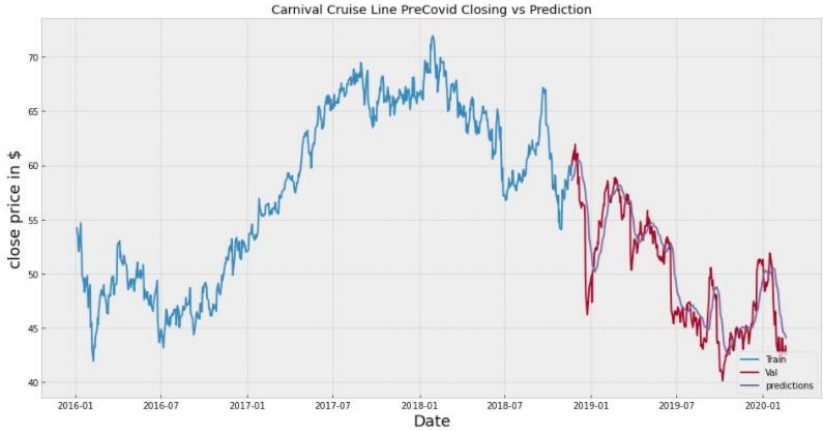
Deep Learning - LSTM

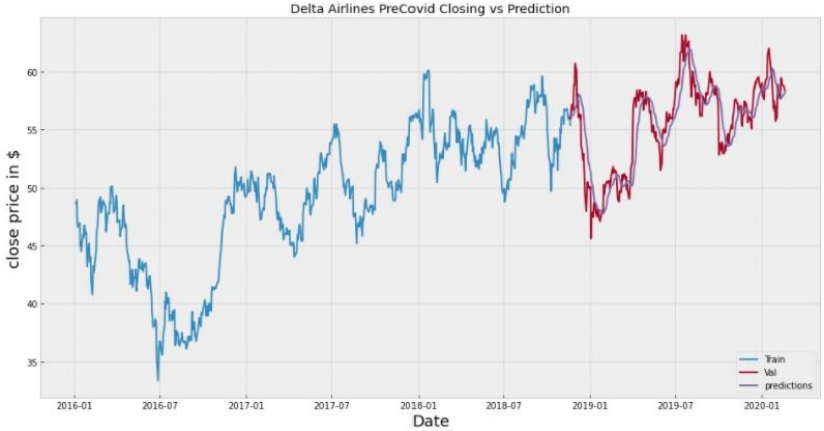
- Model learns over time with new information
- Model “forgets” less relevant information
- Provides better predictions versus linear regression

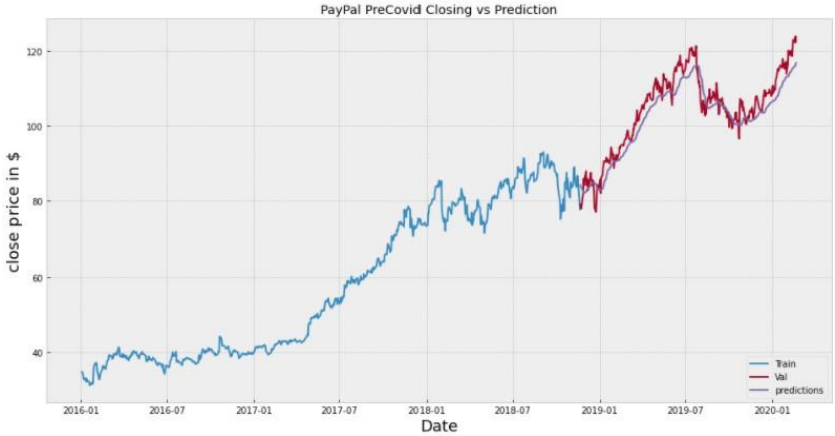


LSTM Models Precovid

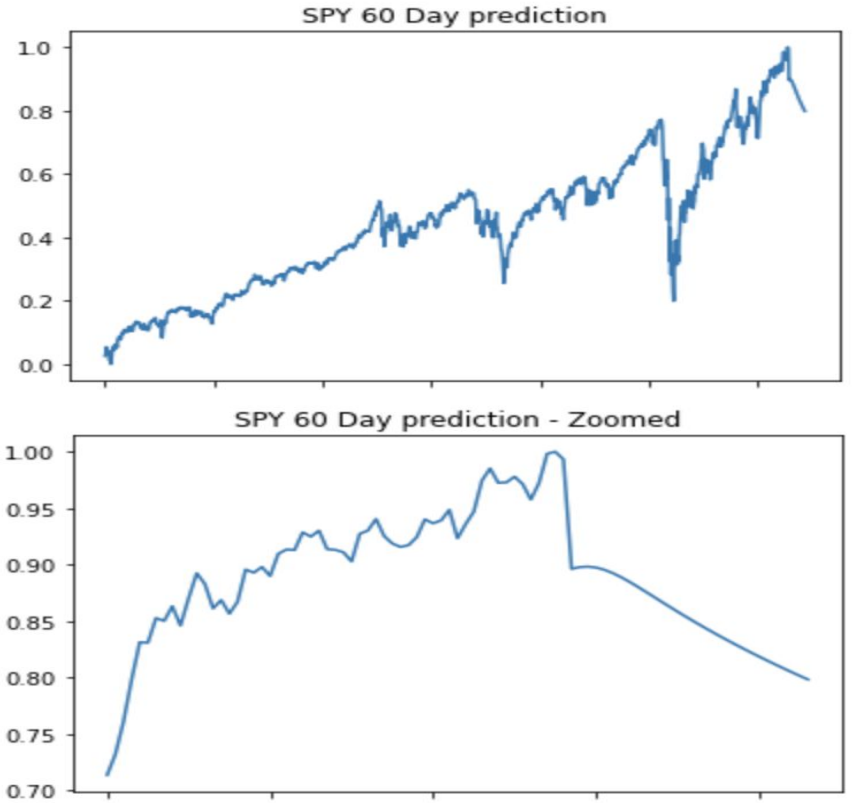


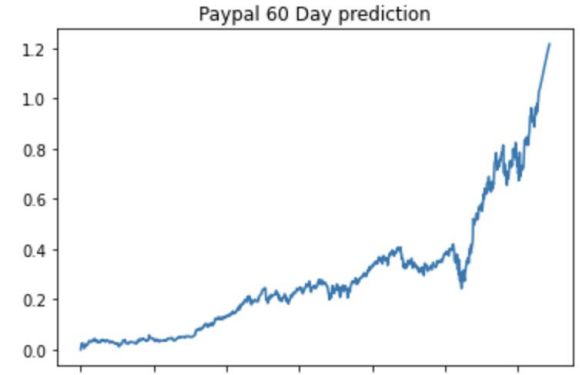


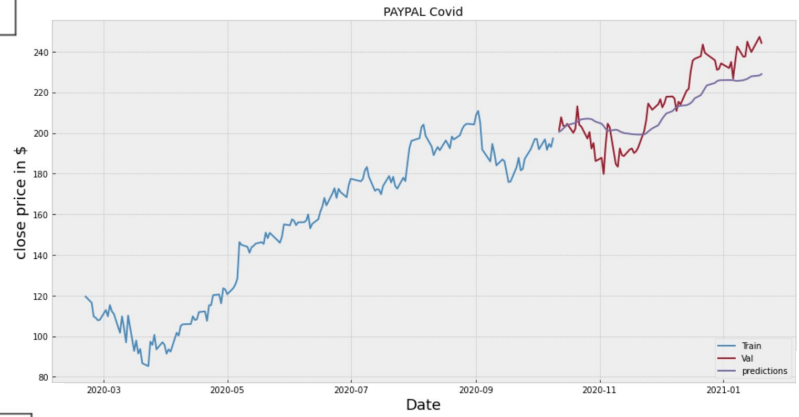


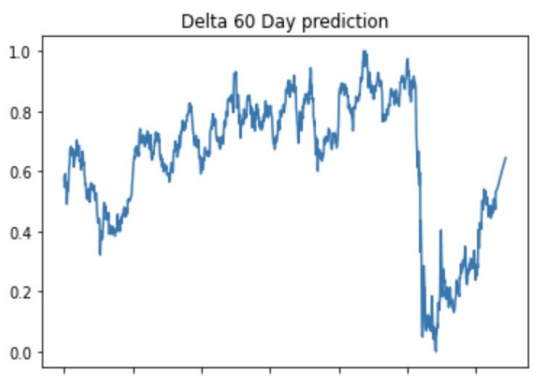


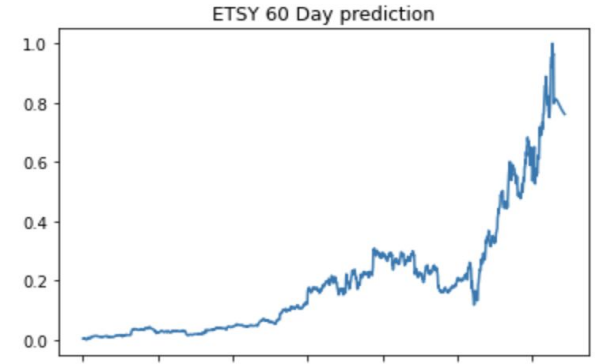
The Black Swan Event

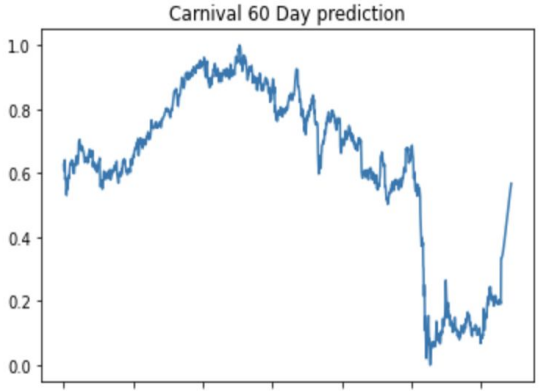



Paypal 60 Day prediction

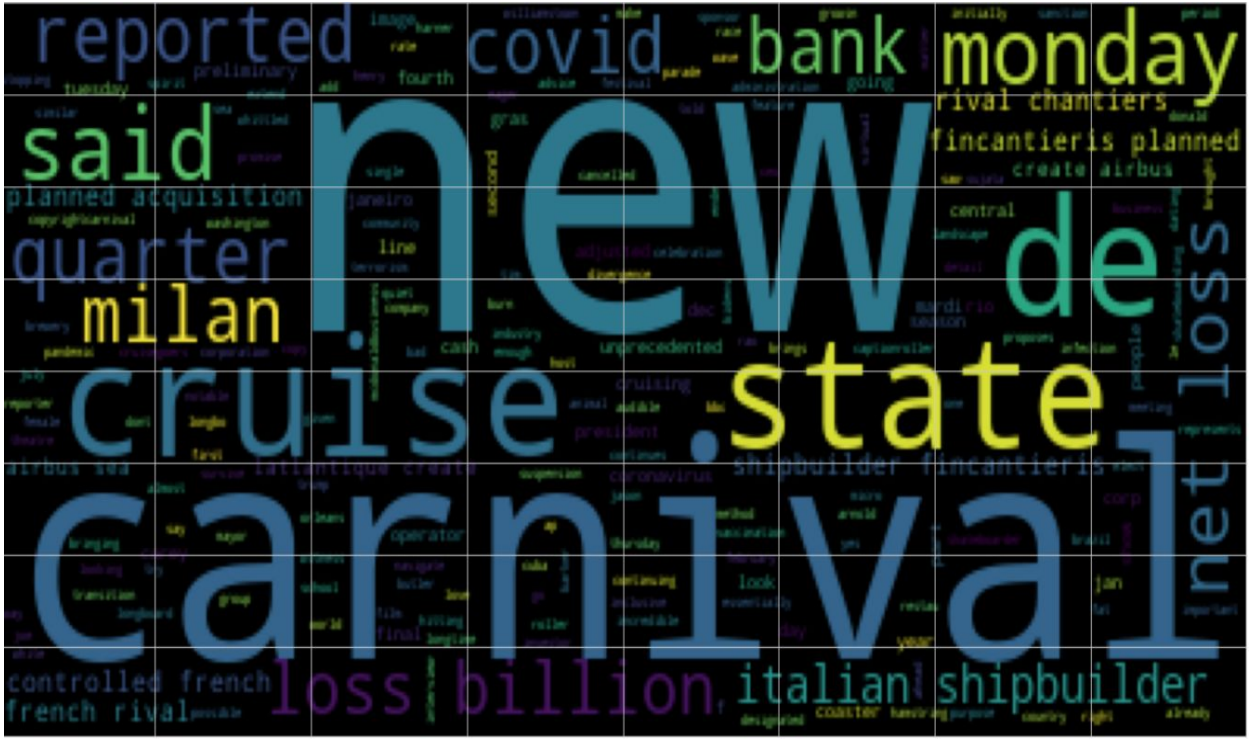

PAYPAL Covid
close price in $
Date
Train
Val
predictions


Delta 60 Day prediction


ETSY 60 Day prediction


Carnival 60 Day prediction

Carnival Cruise Lines Word Cloud



Articles = 1,238

Stop Words:

- Ship
- UK

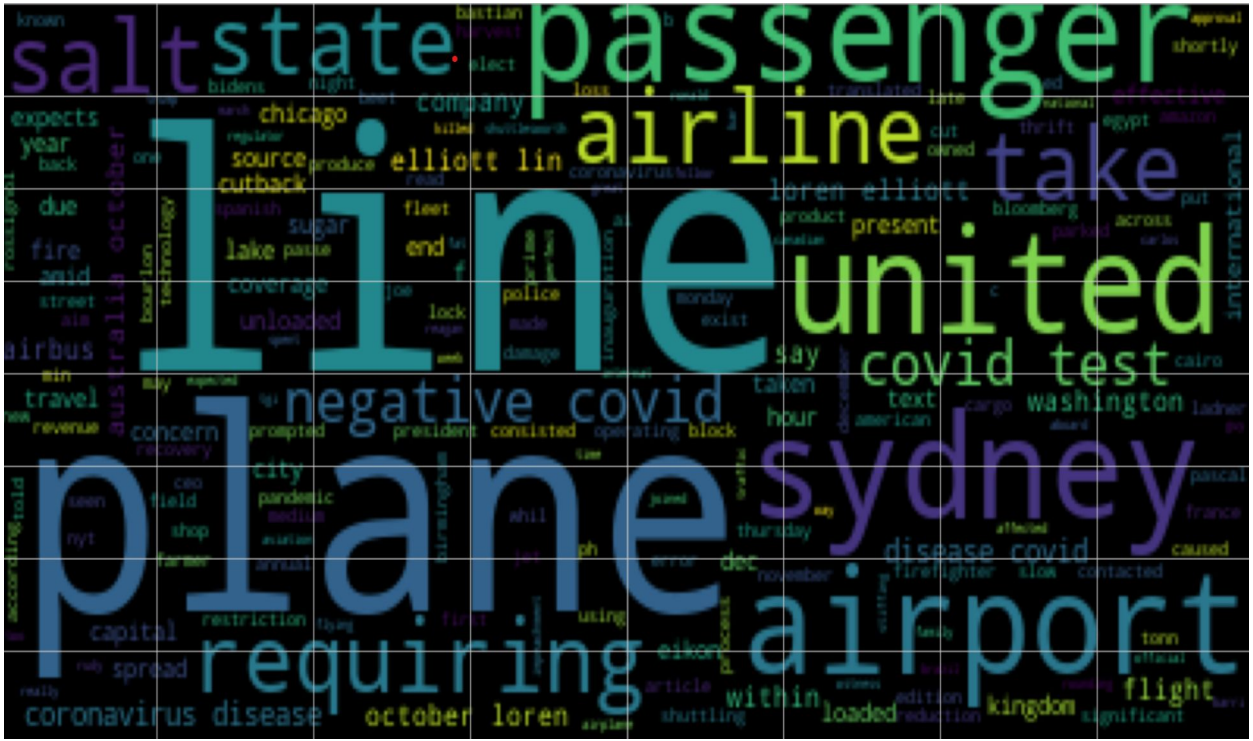
N-Grams:

- Net, loss
- Loss, billions
- Italian, shipbuilder
- State, controlled

Compound Score:

0.13 = Positive

Delta Airlines Word Cloud



Articles = 4,674

Stop Words:

- Delta
- Air
- Photo
- European

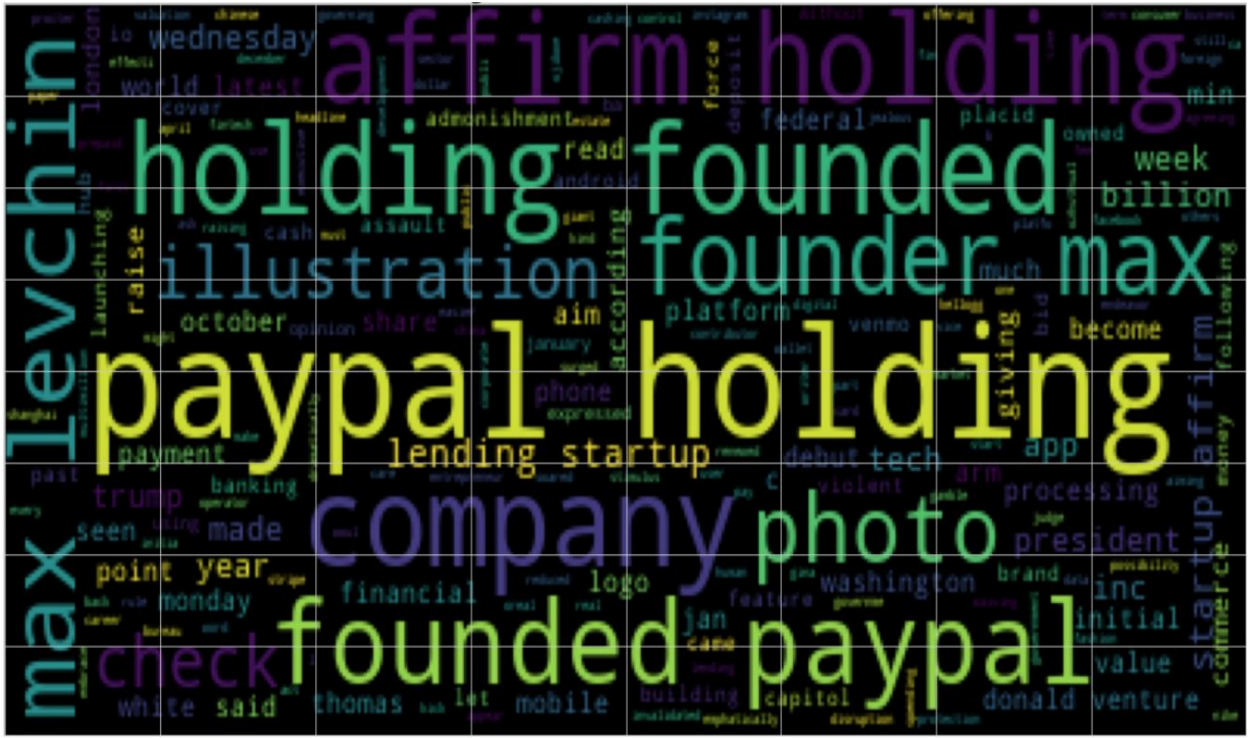
N-Grams:

- Negative, covid
- Covid, test
- Coronavirus, disease
- Line, airbus

Compound Score:

-0.05 = Negative

Paypal Word Cloud



Articles = 5,599

Stop Words:

CHAR
amp

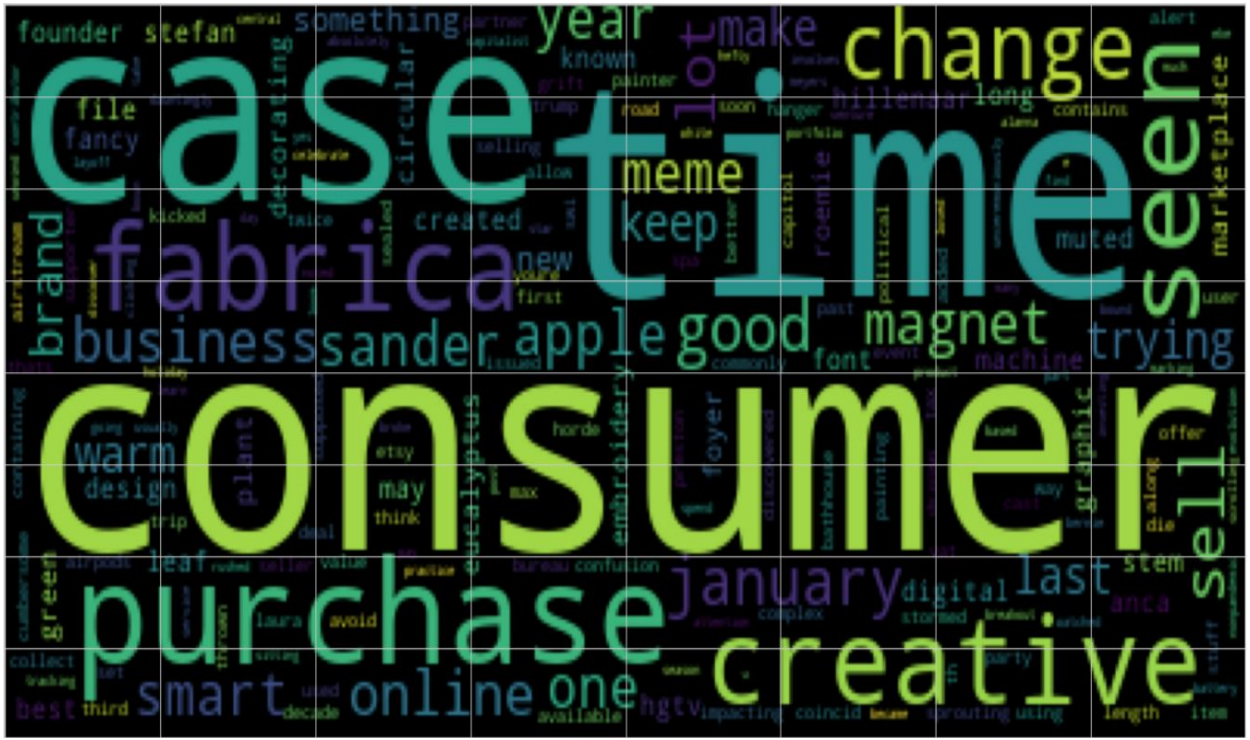
N-Grams:

Paypal, holding
Affirm, holding
Holding, founded
Founded, paypal
Founder, max

Compound Score:

0.13 = Positive

ETSY Word Cloud



Articles = 872

Stop Words:

Co
inc

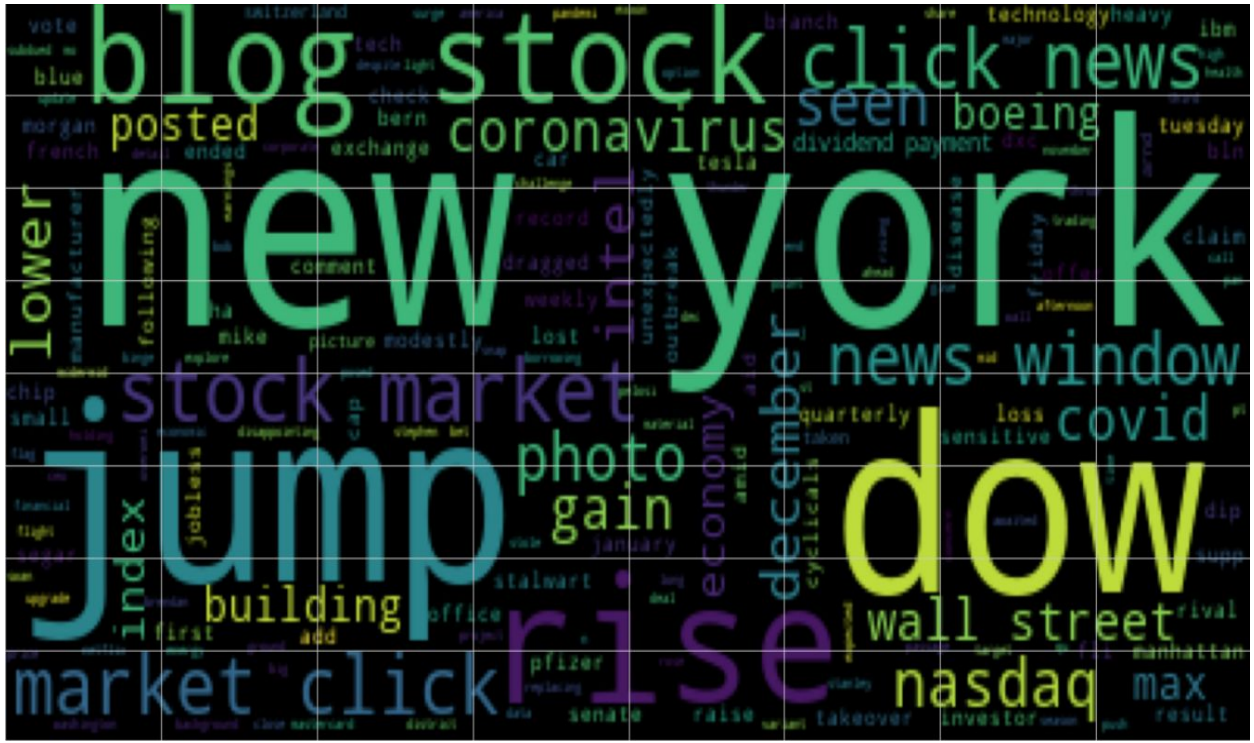
N-Grams:

Creative, fabrica
Apple, smart
Smart, case
Keep, warm
Stefan, founder

Compound Score:

0.32 = Positive

S&P 500 Word Cloud



Articles = 9,939

Stop Words:

- Reuters
- Live
- File

N-Grams:

- New, york
- Blog, stock
- Stock, market
- Market, click

Compound Score:

-0.01 = Neutral

Challenges

- Availability of data from News API
- Selecting appropriate models
- No reliable benchmark for comparison
- Overfitting Model

Conclusions

- Linear Regression v. LSTM Model Accuracy
- Continuing Volatility in Observed Stocks (Next 60 Days)
- Very difficult to foresee and account for Black Swan events
- Trade - Off between Large amount of historical data v. Small amount of historical data