Flight takeoff delay prediction

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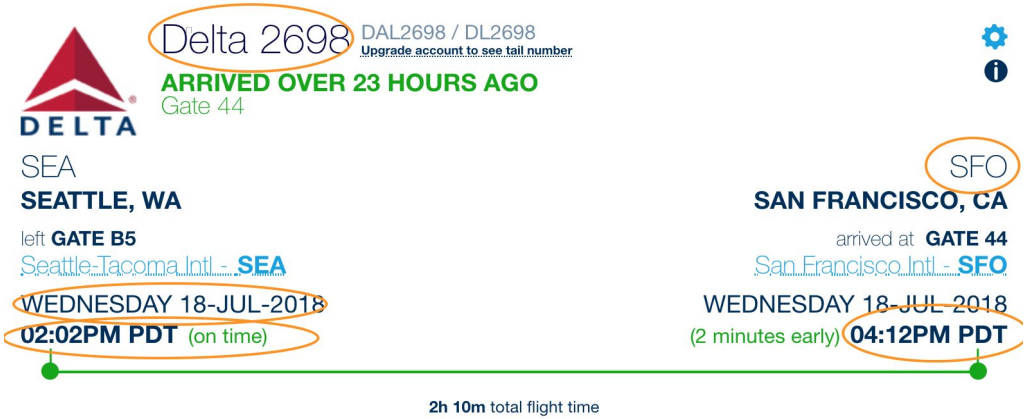


Flight Details

View track log

Track inbound plane

All flights between SEA and SFO

DEPARTURE TIMES

Gate Departure	Takeoff
02:02PM PDT	**02:23PM PDT**
Scheduled 01:50PM PDT	Scheduled 02:00PM PDT

AIRCRAFT INFORMATION

Aircraft Type	Boeing 717-200 (twin-jet) (B712)	Photos
Registration	Upgrade account to see tail number	

AIRLINE INFORMATION

Airline	Delta "Delta"	all flights
Cabin	First / Economy: Refreshments	

FLIGHT DATA

Speed	Filed: 520 mph	graph
Altitude	Filed: 33,000 ft	graph
Distance	Actual: 776 mi (Planned: 770 mi/Direct: 680 mi)	
Route	HAROB6 FEPOT RBG EBINY Q1 ETCHY MLBEC BDEGA2	decode

FlightAware

Methods

Data source

- FlightAware
  - From Sea-Tac to its top 10 destinations
  - Between 04/14/2018 - 07/14/2018
  - ~ 7000 flight records

- National Centers for Environmental Information (NCEI)
- United States Department of Transportation

Analysis

- OLS, Ridge regression
- Training:testing = 7:3
- 10-fold cross-validation
- Metrics: P-value, MSE, R^2

Python tools

Beautifulsoup, Selenium, pandas, Numpy, seaborn, scikit-learn, statsmodels

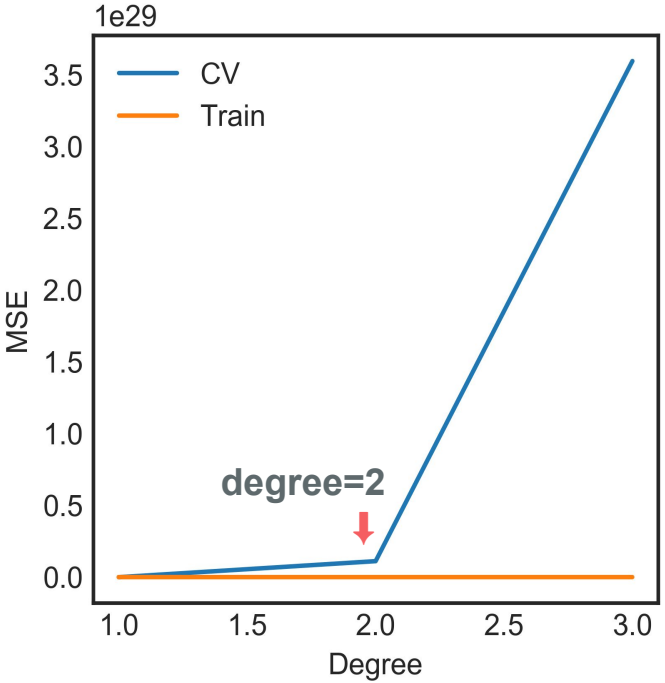
Model

Dependent variable: Flight takeoff delay

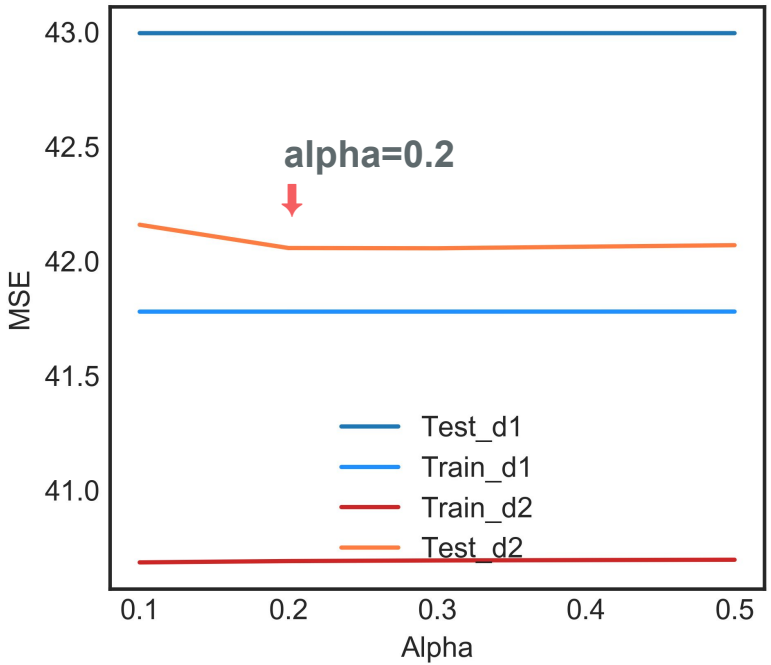
Independent variables:

3-month avg gate departure delay, airlines, time period, aircraft capacity, weekend (yes/no), distance, airport avg departure delay, avg arrival delay, avg aircraft delay, avg security line delay

Model fitting

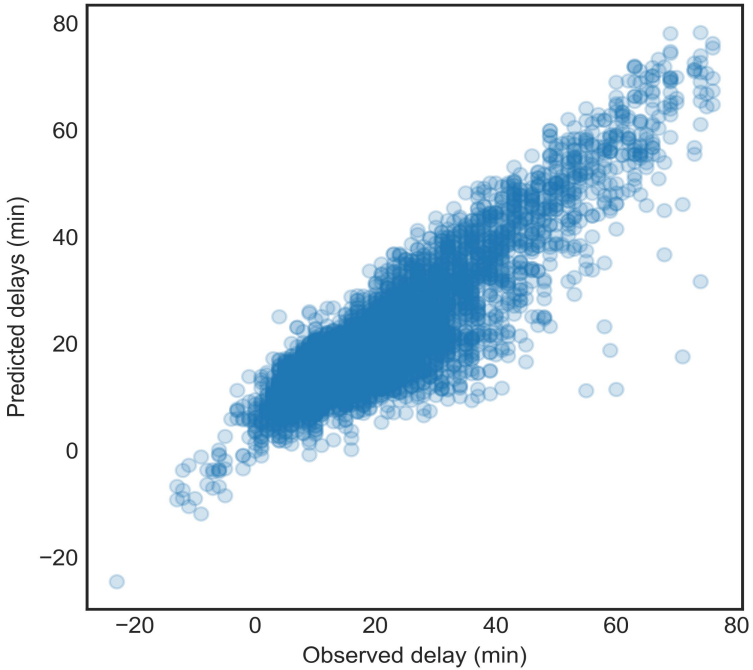


Cross validation with different degrees of polynomial



Ridge regularization with different alphas

Result



Performance metrics

$R^2 = 0.78$

MSE = 40.50

Mean prediction error = 6.4 minutes

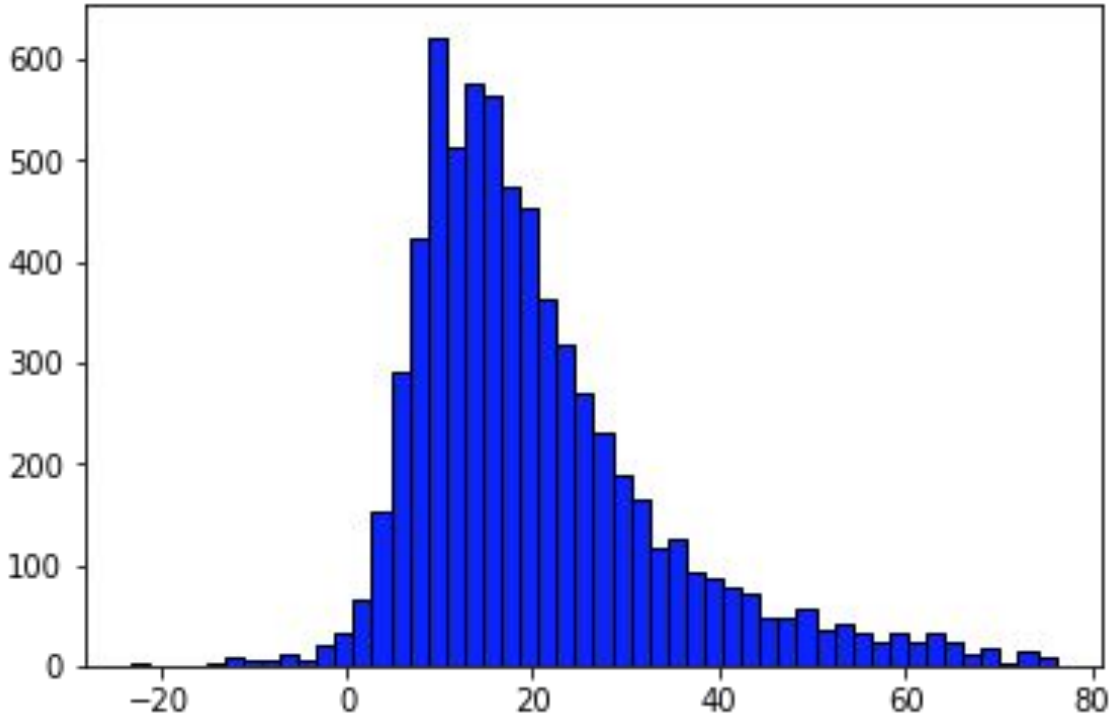
Future

- Expand to more airports
- Examine longer time frame with greater weather variation
- Incorporate more features
  - External events, i.e. shows and games
  - Aircraft conditions
- Develop app to predict takeoff delay

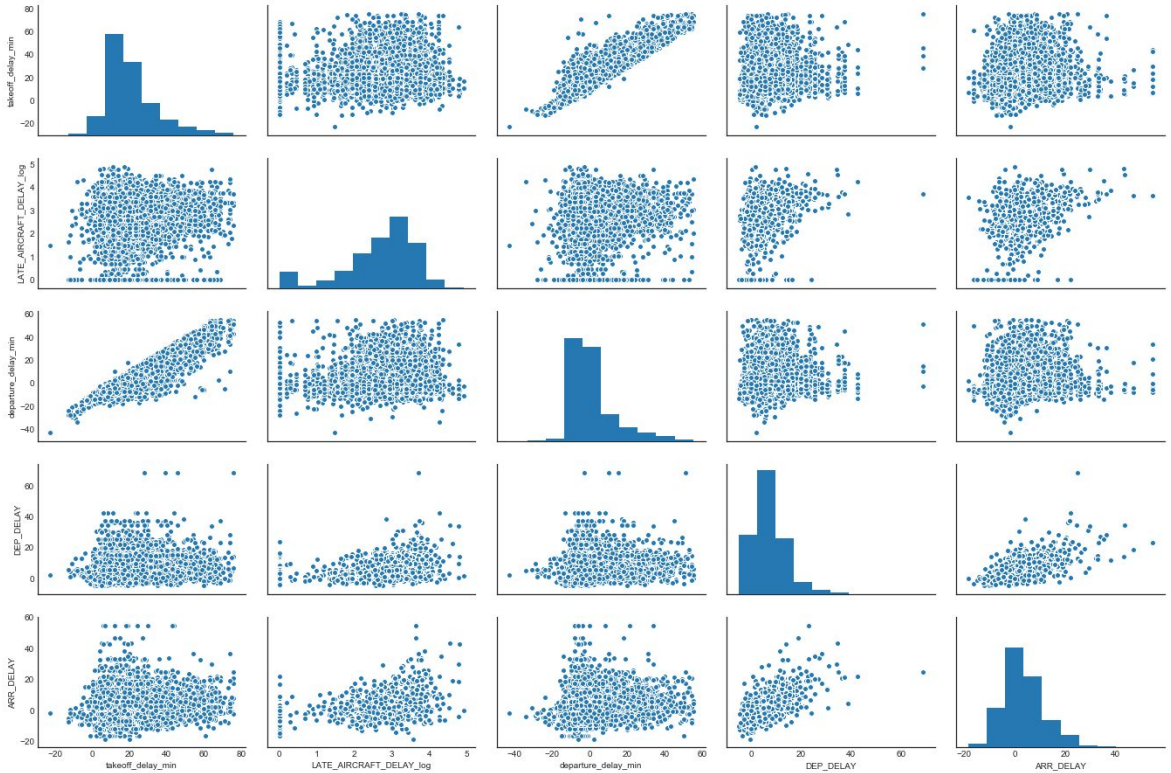
Questions?

Appendix

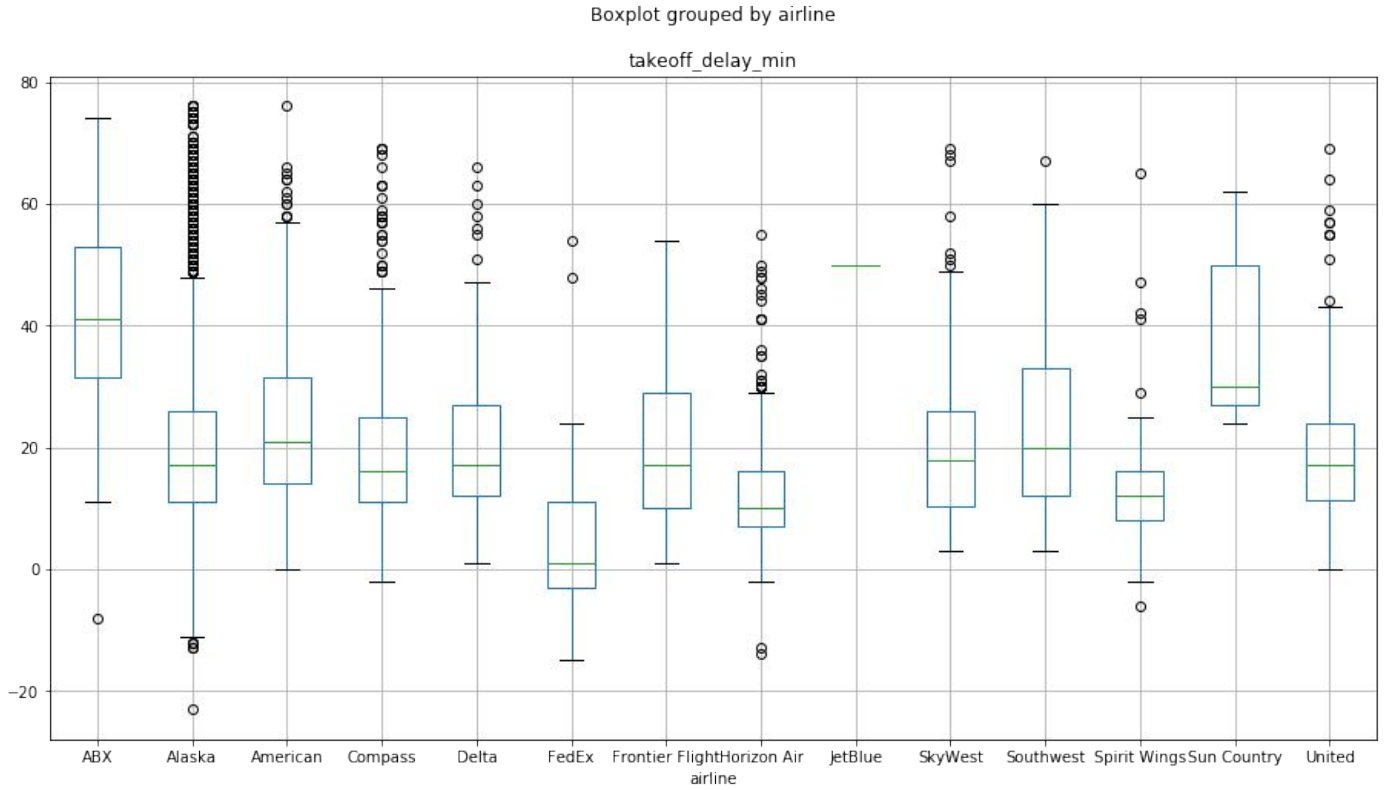
Flight takeoff delay distribution



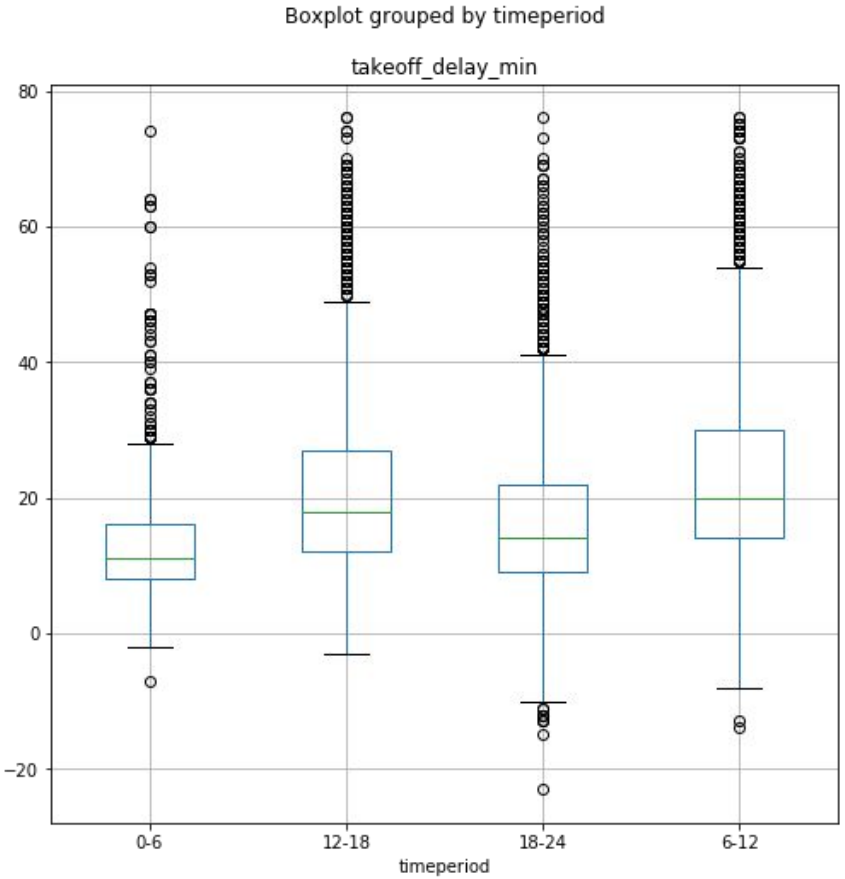
Correlations



Take off delays by Airlines



Delays by hours



Conclusions

- Large spillover effect of gate departure delays
- Arrival delays matter
- Shorter delays for big airlines
- More delays during business hours
- Holiday & weekend are irrelevant