

# 최악의 미세먼지 원인, 중국일까 한국일까…

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포스코가 미세먼지 발생 주범 웬 말?

If the cause of fine dust is the Korean steel industry,  
Fine dust observations might predict steel companies'  
performance

Given the disagreement about the cause of fine dust in Korea, attempts have been made continuously to find the cause in Korea. The most prominent cause was the steel industry. If the steel industry is the main source of fine dust in Korea, it will come from the steel production process. If the fine dust is abnormally high, it is a sign that steel companies have increased their output in line with demand, and that future earnings growth is expected. In other words, fine dust information acts as insider information that can tell the situation of steel companies in advance.

# 1. Algorithm

Predict the closing price after n days of steel industry companies and buy when it's higher than current close

## 【Input Data】

Attributes expected to affect on steel industry



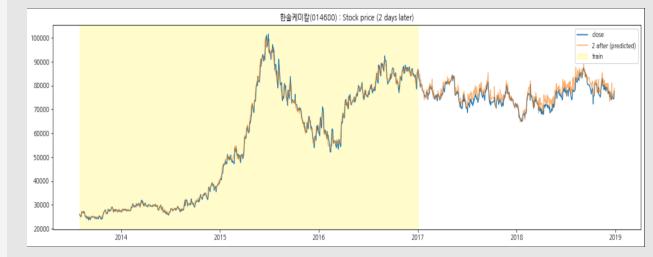
## 【Model】

Predict the closing price (in 2 days)

*dmlc*  
**XGBoost**

## 【Predicted Price】

Predicted closing price (in 2 days)



Closing price in 2 days > Today's closing price ➡ Buy

2 days after buy ➡ Sell



Bayesian Optimization showed best performance when n = 2

# 2. Data

1

## Atmospheric Data (Seoul)



Climate	Air
Avg. temperature	
Highest temperature	
Daily precipitation	
Avg. wind speed	
Most wind direction	Fine Dust
Humidity	
Sunshine hours	
Autumn time	
Mean cloud	

2

## Food Delivery Call Data



18년 9월 서울시 치킨 판매업종 이용 통화량

서울지역 치킨집에 대한 2018년 9월 한달 통화량을 기반으로 지역별 이용 현황 데이터를 제공합니다.

다운로드 수: 77

- ▶ 서울지역 치킨집에 대한 한달 통화량을 기반으로 지역별 이용 데이터를 제공합니다.
- ▶ SK 텔레콤의 통화량 데이터와 일종 데이터를 기반으로 추출한 데이터로 전체 치킨 서비스 이용 현황이 활용하시기 바랍니다.
- ▶ 본데이터는 월 1회 정기적으로 업데이트 됩니다.

## SK Big Data Hub Call Data

Daily fried chicken, pizza, Jokbal,  
chinese food phone order volume

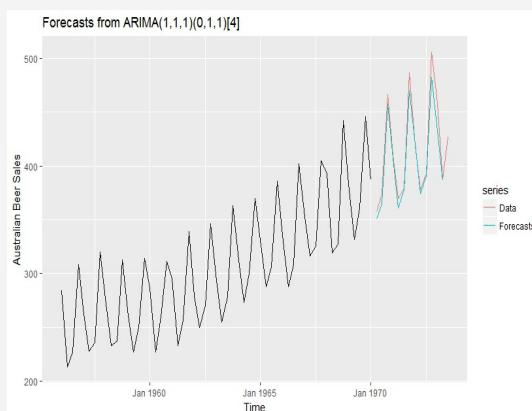
## MAFRA

Domestic Food Trend Survey Report

Monthly delivery service application share

3

## Time Series Variable



### Variables for Time Series

#### Seasonality

- Month

#### Trend

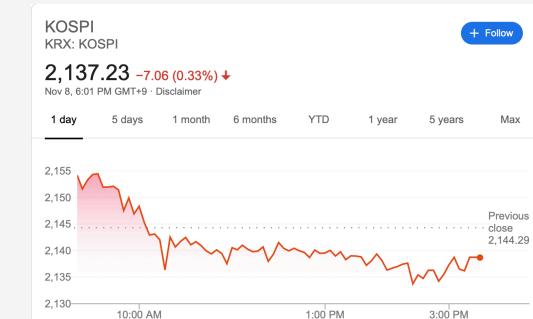
- Dayofyear, Date

#### Cycle

- Day, Date

4

## KOSPI Closing Price



KOSPI 종가 데이터

#### Training Period

IPO ~ 2016.12.31

#### Validation Period

2017.01.01 ~ 2018.12.31

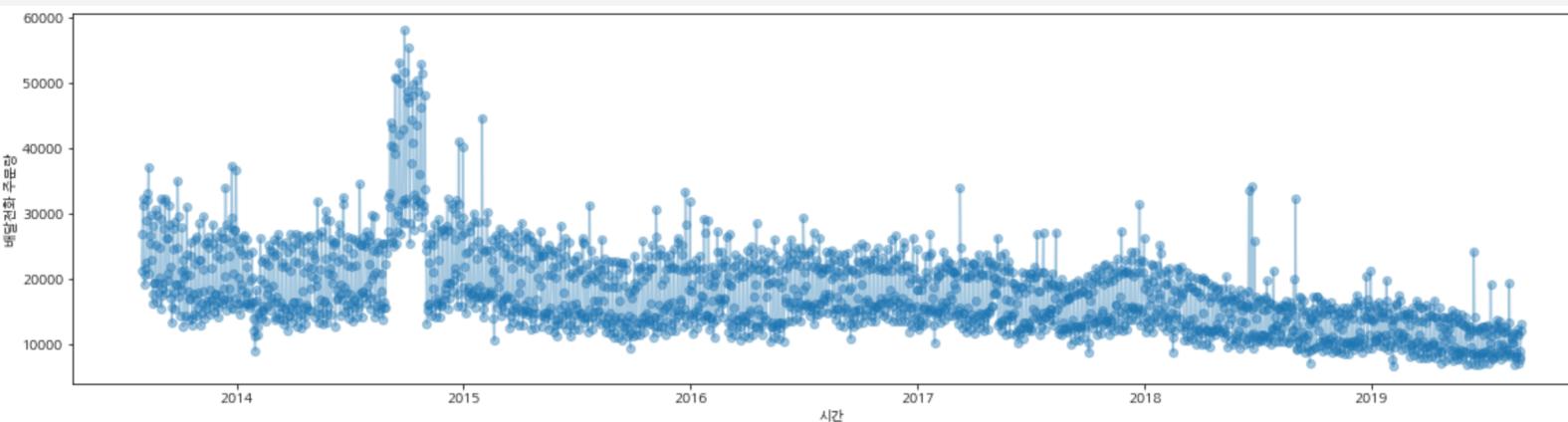
Select and analyze companies  
that are expected to be affected  
by fine dust, not the entire  
KOSPI

# 3. Data

## Relationship between steel industry and phone call volume data

### Considering Investment Sentiment

- Objective indicators, such as the company's earning, are also important to forecast the stock price, but the overall market investment sentiment must be taken into account
- Even if the company's performance is good, if the market is frozen, the share price may not increase significantly
- Factors that reflect overall consumer and market sentiment use delivery food orders
- Reflects a trend of approximately 100% increase in transaction volume for each quarter
- Determining delivery order data as reasonable data reflecting overall consumer sentiment



- With the exception of the 2014 Asian Games, the volume of **phone orders** for food delivery continues to fall
- As the market share of **delivery application grows**, the overall food delivery market is growing, but the volume of telephone order is falling
- Needed additional work to **calibrate this to use as an indicator to reflect sentiment**

배달앱, 액게임 특수 있다…'배달통' 모바일 주문량 28% 증가 머니S | 2014.09.24. | 네이버뉴스 |

모바일결제 메뉴별 주문량을 살펴보면 대표적인 응원메뉴인 '치킨'이 전체 주문량의 38%로 1위를 차지했고, 2위에는 '한식/분식'이 21%로 뒤를 이었으며, 3위는 17%로 '중식'이 차지했다. 주문 증가와 함께...

연일 들려오는 금메달 소식과 한국 선수단의 선전 속을 지켜보면서 치킨, 피자 등을 배달시키는 사례가 급증하면서 '배달통', '배달의 민족', '요기요' 등 배달앱 업체들은 주문량이 급증하는 아시안게임 '특수'를 톡톡히 누리고 있다.

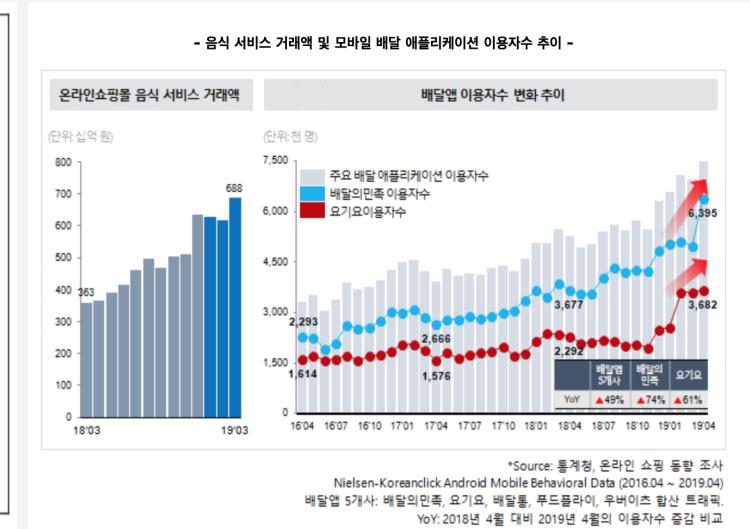
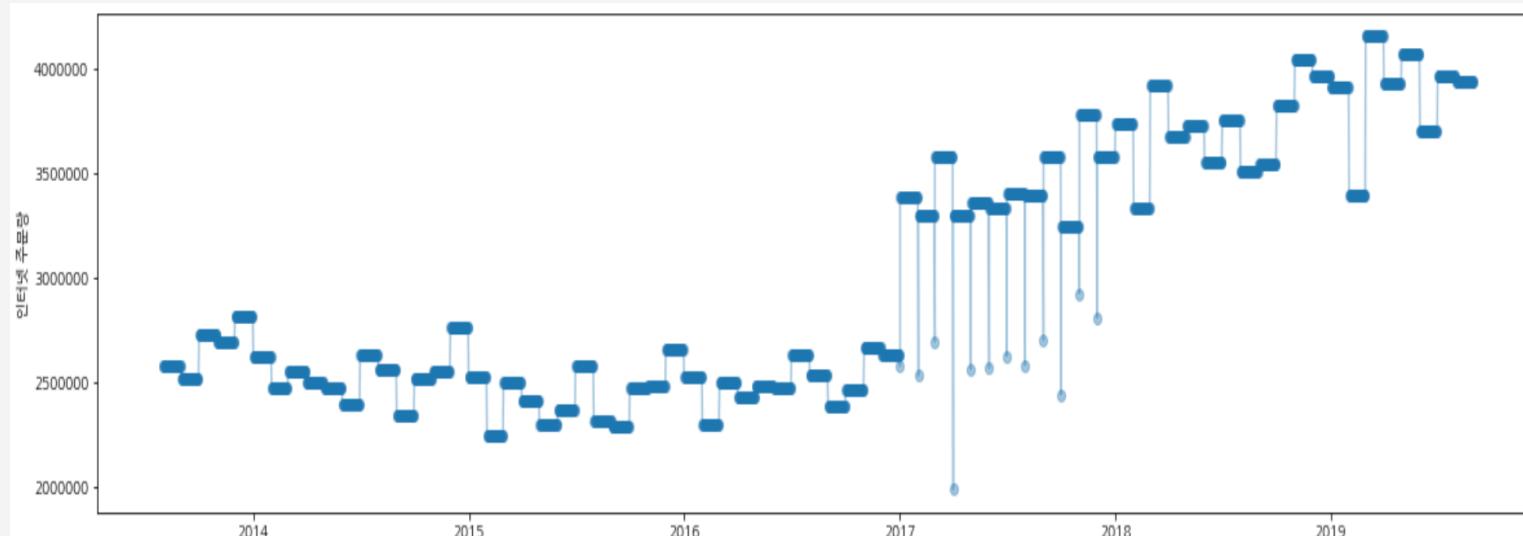
특히 '배달통'의 경우 지난 19일부터 28일까지 10일간 모바일결제 주문이 전주 대비 37% 증가하는 등 가파른 상승세를 보였다. 배달통은 이같은 상승세를 이룰 수 있었던 배경으로 타 업체보다 많은 '등록 배달업체 수'를 꼽았다.

# 4. Preprocess delivery call data

Adjust total food order volume by using delivery app share data as a variable

Correct the indicator to reflect the growth rate of the food service delivery business

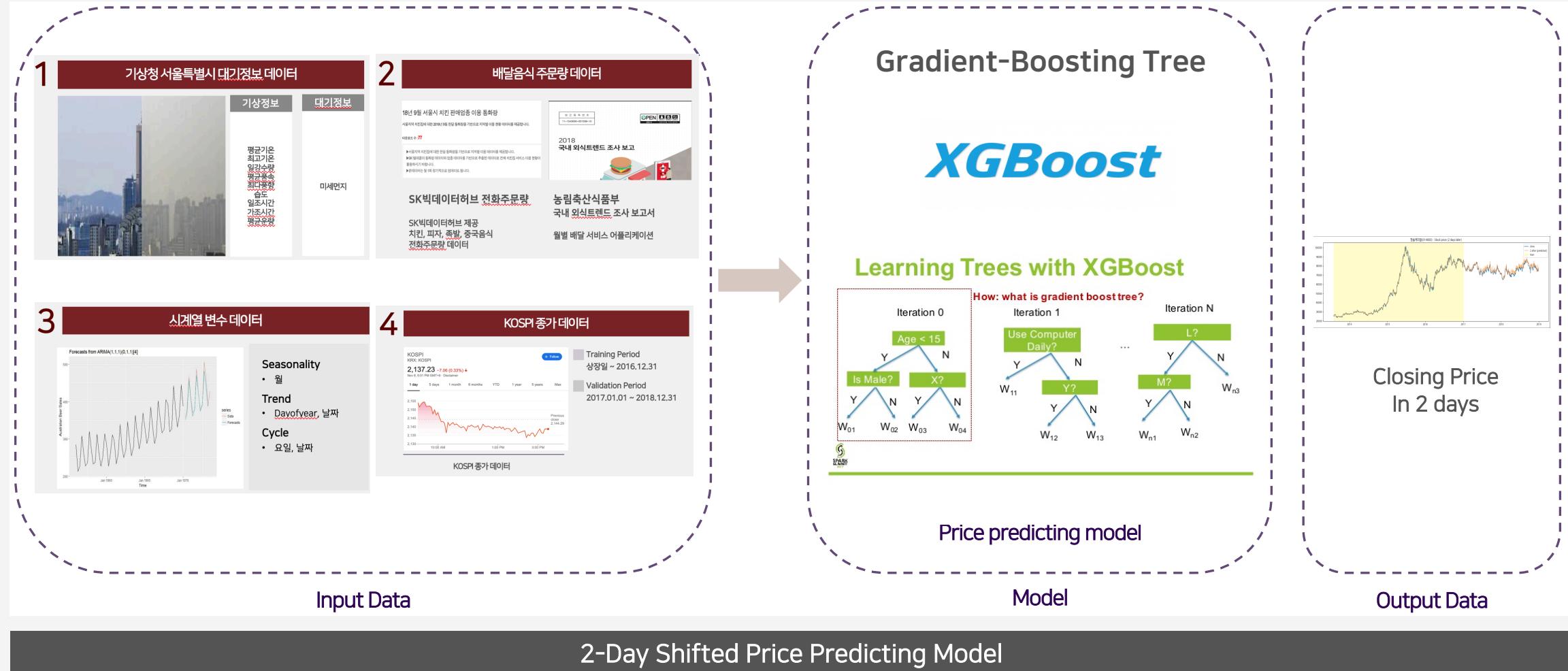
- Use the data below as an additional variable to train the model to scale to daily orders
  - '2018 Domestic Food Trend Survey Report', MAFRA
  - '2013-2019 Online Shopping Malls by Operation Type / Product Group Transactions', KOSTAT
  - 'Android Mobile App '배달의민족', '요기요' Use Behavior Analysis, April', Nielsen Koreanclick



'2013-2019 Online Shopping Malls by Operation Type / Product Group Transactions', KOSTAT

'Android Mobile App '배달의민족', '요기요' Use Behavior Analysis, April', Nielsen Koreanclick

# 5. Model



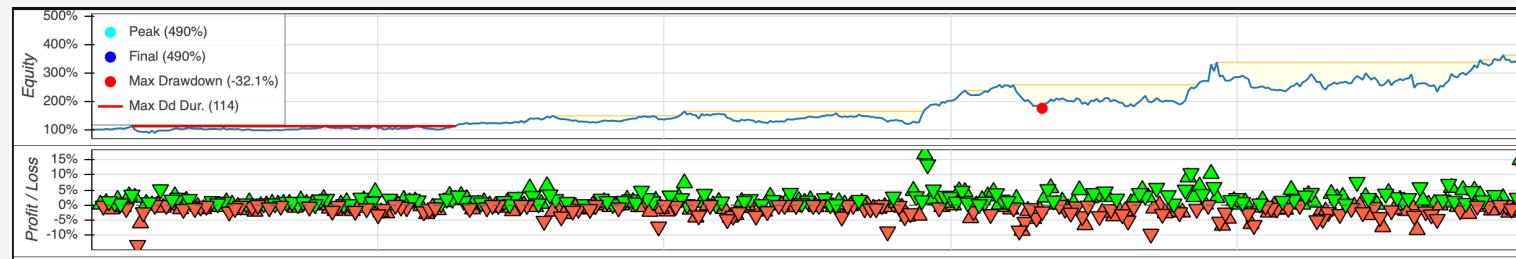
"Use fine dust and other data and same day closing prices to predict the closing price of steel companies in two days"

# 6-1. Backtesting Result (이화산업 000760)



## Price Prediction

- Training Period : 2013.08.01 ~ 2016.12.31
- Validation Period : 2017.01.01 ~ 2018.12.31
- Training R2 Score : 0.9987
- Validation R2 Score : 0.7461



## Backtesting Result

- End Equity : 490%
- Maximal Drawdown : -32.1%
- Sortino Ratio : 0.15
- Sharpe Ratio : 0.10
- Exposure : 99.67%
- Win Rate : 49.01%



## 6-2. Backtesting Result (한국주철관공업 000970)



### Price Prediction

- Training Period : 2013.08.01 ~ 2016.12.31
- Validation Period : 2017.01.01 ~ 2018.12.31
- Training R2 Score : 0.9994
- Validation R2 Score : 0.7682

### Backtesting Result

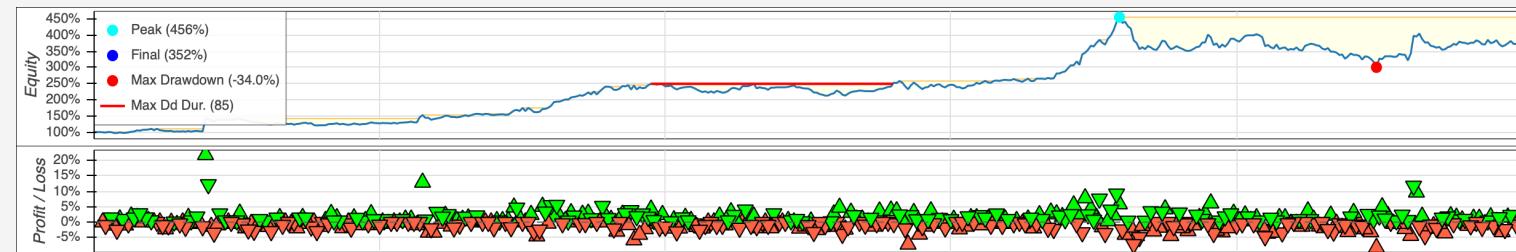
- End Equity : 454%
- Maximal Drawdown : -32.9%
- Sortino Ratio : 0.09
- Sharpe Ratio : 0.06
- Exposure : 99.60%
- Win Rate : 46.41%

# 6-3. Backtesting Result (대장 012800)



## Price Prediction

- Training Period : 2013.08.01 ~ 2016.12.31
- Validation Period : 2017.01.01 ~ 2018.12.31
- Training R2 Score : 0.9966
- Validation R2 Score : 0.7792



## Backtesting Result

- End Equity : 456%
- Maximal Drawdown : -34.0%
- Sortino Ratio : 0.18
- Sharpe Ratio : 0.09
- Exposure : 99.60%
- Win Rate : 44.62%

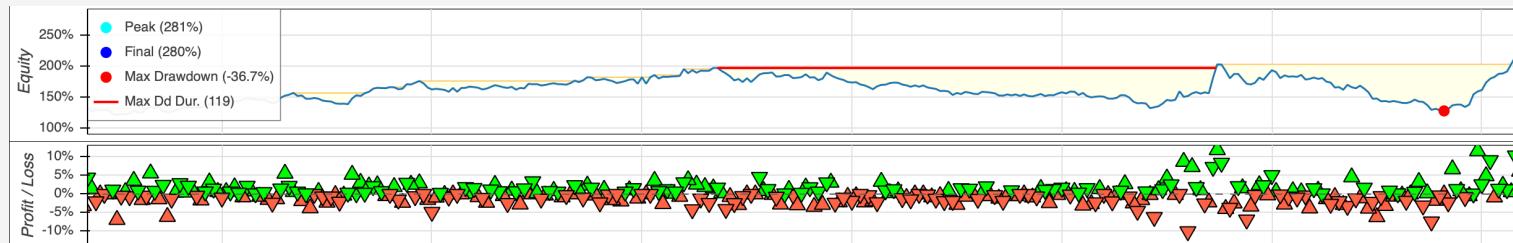


# 6-4. Backtesting Result (GS글로벌 001250)



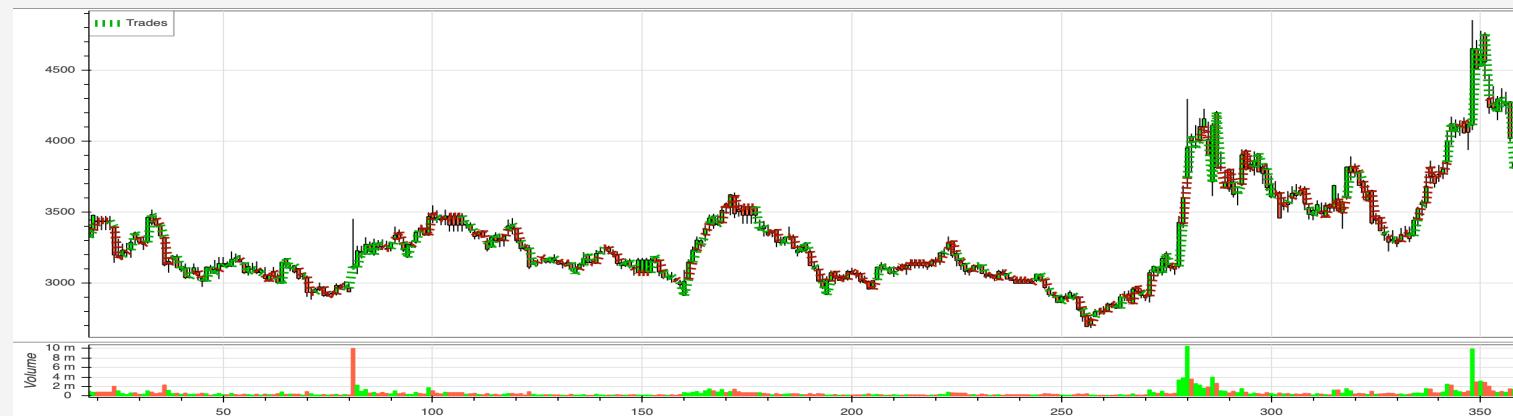
## Price Prediction

- Training Period : 2013.08.01 ~ 2016.12.31
- Validation Period : 2017.01.01 ~ 2018.12.31
- Training R2 Score : 0.9998
- Validation R2 Score : 0.7914



## Backtesting Result

- End Equity : 280%
- Maximal Drawdown : -36.7%
- Sortino Ratio : 0.1
- Sharpe Ratio : 0.06
- Exposure : 99.60%
- Win Rate : 47.21%



# 7. Backtesting Result

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## Validation Metric

- Use Sharpe Ratio and Sortino Ratio considering Variance of Profit
- Several indicators with high profits increase variance resulting in poor indicators
- In addition, End Equity, Max.Drawdown, Win Rate was observed

## Algorithm earns money at downhill

- Algorithms that generate revenue even though selected sectors do not show any particular upward trend within the validation period
- Most of the profits are coming from the dead cat bounce at the downhill

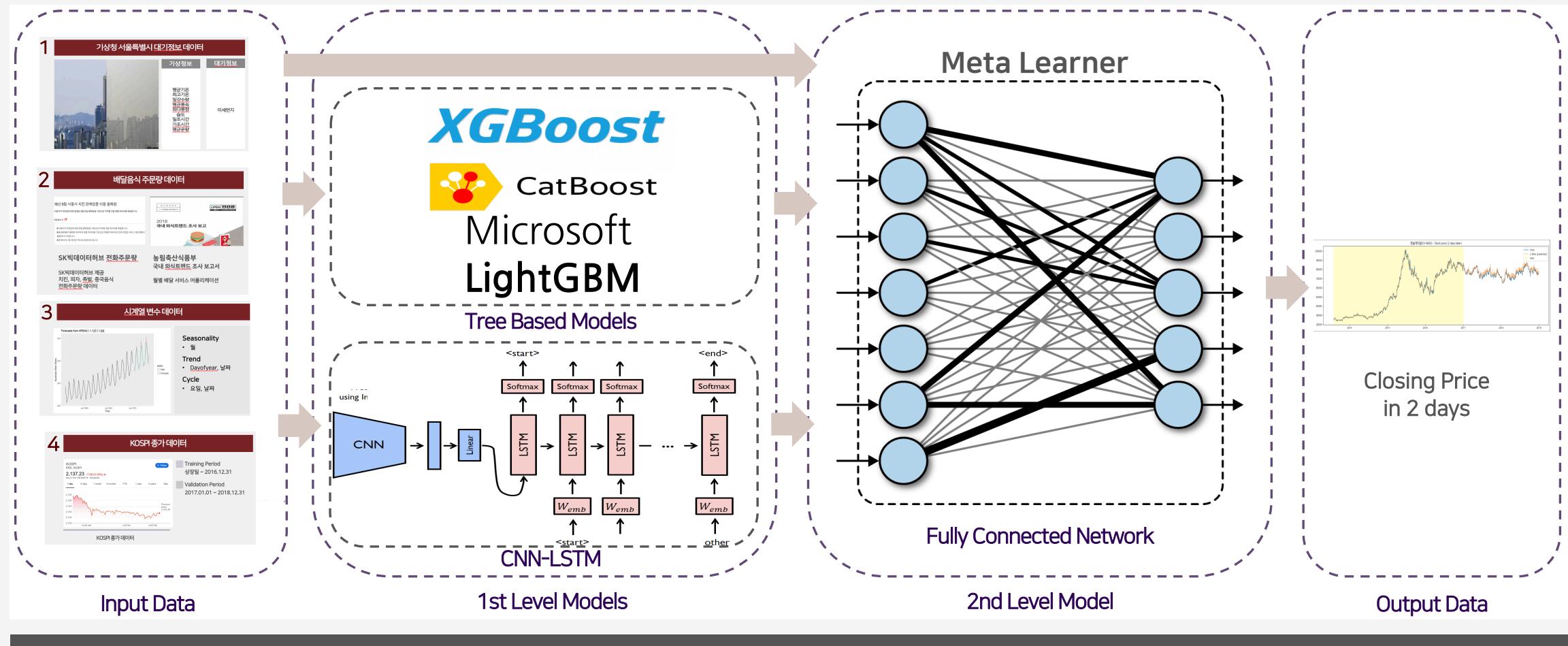
## Low Max. Drawndown

- High profit is expected while having low expected Max. Drawdown
- Max. Drawdown is approximately 10% of Max. Profit

## Algorithm catches big revenue

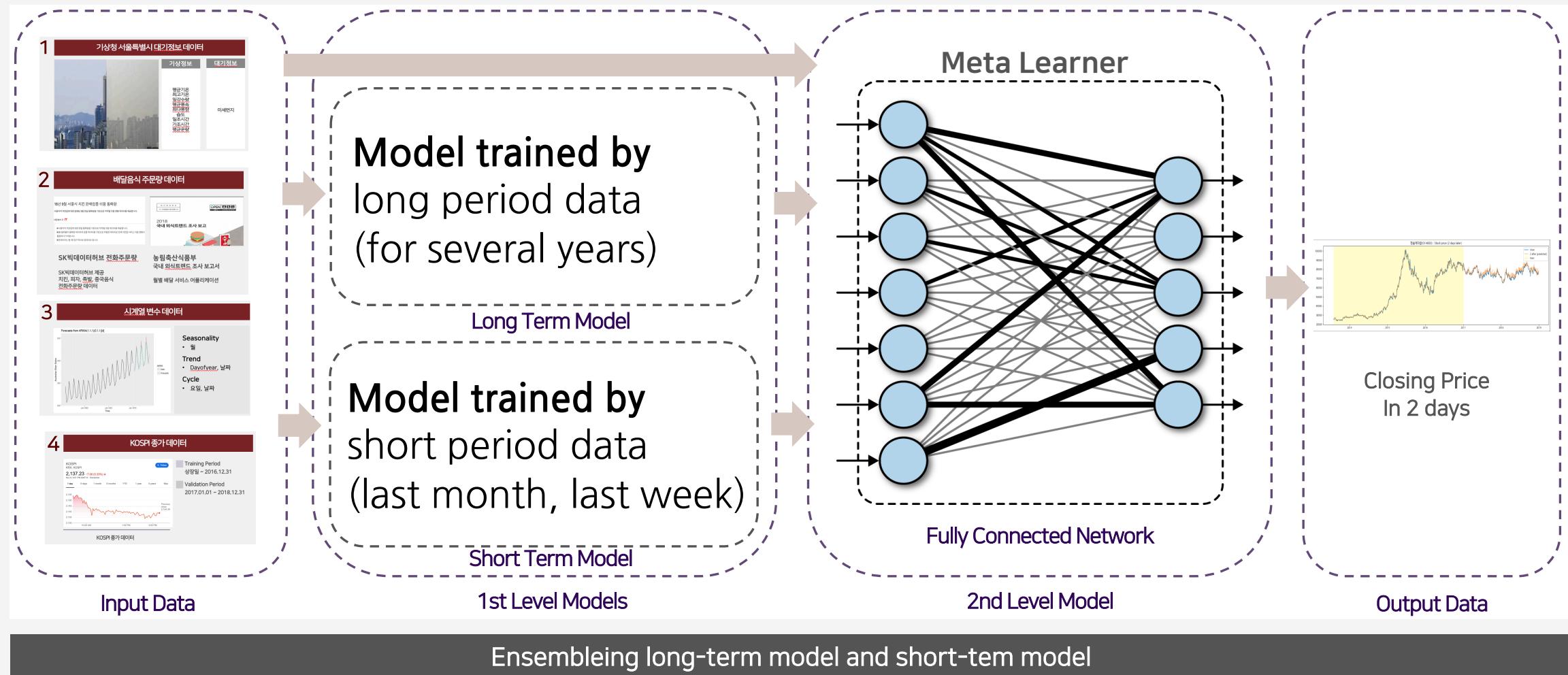
- Algorithms that catch 15-15% profitable transactions
- On the other hand, if you're losing money, you're up to 10%, which is much less than your 15-20% profit and less frequent

# 8-1. Future work



Improving price-predicting model performance with Stacked Regressor

## 8-2. Future work



Improving price-predicting model performance with considering long term and short term trend

## 8-3. Future work

Improve accuracy by using Air Korea air pollution information data that provides more detail than fine dust data from the KMA

KMA

Provides only a single item called fine dust with weather information

날짜	시군구	성별	연령대	총건수	월	요일	평균기온	최고기온	최저기온	일강수량	평균풍속	최다풍향	평균상대습도	기조시간	일조시간	강설량	평균운량	미세먼지	
0	2013-08-01	강남구	남	10대	71	8	목요일	28.0	24.5	32.1	0.0	1.7	50.0	67.3	14.1	6.0	0.0	7.1	34
1	2013-08-01	강남구	남	20대	241	8	목요일	28.0	24.5	32.1	0.0	1.7	50.0	67.3	14.1	6.0	0.0	7.1	34
2	2013-08-01	강남구	남	30대	276	8	목요일	28.0	24.5	32.1	0.0	1.7	50.0	67.3	14.1	6.0	0.0	7.1	34
3	2013-08-01	강남구	남	40대	142	8	목요일	28.0	24.5	32.1	0.0	1.7	50.0	67.3	14.1	6.0	0.0	7.1	34
4	2013-08-01	강남구	남	50대	44	8	목요일	28.0	24.5	32.1	0.0	1.7	50.0	67.3	14.1	6.0	0.0	7.1	34
5	2013-08-01	강남구	남	60대	28	8	목요일	28.0	24.5	32.1	0.0	1.7	50.0	67.3	14.1	6.0	0.0	7.1	34
6	2013-08-01	강동구	남	10대	45	8	목요일	28.0	24.5	32.1	0.0	1.7	50.0	67.3	14.1	6.0	0.0	7.1	34
7	2013-08-01	강동구	남	20대	91	8	목요일	28.0	24.5	32.1	0.0	1.7	50.0	67.3	14.1	6.0	0.0	7.1	34
8	2013-08-01	강동구	남	30대	136	8	목요일	28.0	24.5	32.1	0.0	1.7	50.0	67.3	14.1	6.0	0.0	7.1	34
9	2013-08-01	강동구	남	40대	71	8	목요일	28.0	24.5	32.1	0.0	1.7	50.0	67.3	14.1	6.0	0.0	7.1	34

Airkorea

PM10, PM2.5, ozone, nitrogen dioxide, carbon monoxide, sulfur dioxide

날짜(년-월-일)	PM <sub>10</sub> ( $\mu\text{g}/\text{m}^3$ )	PM <sub>2.5</sub> ( $\mu\text{g}/\text{m}^3$ )	오존(ppm)	이산화질소(ppm)	일산화탄소(ppm)	아황산가스(ppm)
2019-01-01	36	25	0.02	0.03	0.6	0.003
2019-01-02	33	22	0.015	0.036	0.6	0.004
2019-01-03	35	22	0.007	0.048	0.7	0.004
2019-01-04	55	38	0.003	0.068	1	0.006
2019-01-05	60	38	0.021	0.03	0.6	0.005
2019-01-06	42	20	0.011	0.041	0.6	0.004
2019-01-07	51	32	0.01	0.053	0.9	0.005
2019-01-08	38	18	0.025	0.023	0.5	0.005
2019-01-09	47	22	0.009	0.041	0.7	0.004
2019-01-10	51	30	0.005	0.052	0.7	0.005
2019-01-11	71	48	0.004	0.061	1	0.005
2019-01-12	89	63	0.01	0.058	1	0.005
2019-01-13	107	73	0.018	0.05	1.1	0.005
2019-01-14	155	113	0.005	0.073	1.4	0.006
2019-01-15	122	72	0.024	0.029	0.8	0.005
2019-01-16	43	17	0.017	0.026	0.5	0.003
2019-01-17	39	20	0.014	0.038	0.6	0.004
2019-01-18	53	32	0.01	0.054	0.8	0.005
2019-01-19	87	58	0.01	0.059	1	0.007
2019-01-20	59	30	0.029	0.019	0.5	0.004

More detailed fine dust data

Learn more by understanding the impact of each air pollution on forecast prices

# 10. References

## News

- '최악의 미세먼지 원인, 중국일까 한국일까.. 확인 가능하다', 송채경화, 한겨레
- '미세먼지 오염 주 원인은 지나친 과장', 윤철주, 철강금속신문
- '철강업계 "고로 대기오염 물질 배출 현재로선 해결 어려워" 호소', 김지은, NEWSIS

## Books

- '알고리즘 트레이딩', 장순용
- '알고리즘 트레이딩. 2.' 금융 투자 리스트, 장순용
- '파이썬으로 배우는 알고리즘 트레이딩', 조대표
- '머신러닝을 이용한 알고리즘 트레이딩 시스템 개발', 안명호 외 1인

## Python Package Documentation

- Backtesting.py Documentation
- XGBoost Documentation

## Papers

- 'A Study on the Number of Domestic Food Delivery Services (2015)', Jaeyoung Kwion et al.

## Reports

- '2018 국내 외식 트렌드 조사 보고서', 농림축산식품부
- '2013 – 2019 온라인 쇼핑몰별 운영형태/상품군별거래액', 통계청
- 'Android Mobile App '배달의민족', '요기요' 4월 이용 행태 분석', Nielsen Koreanclick