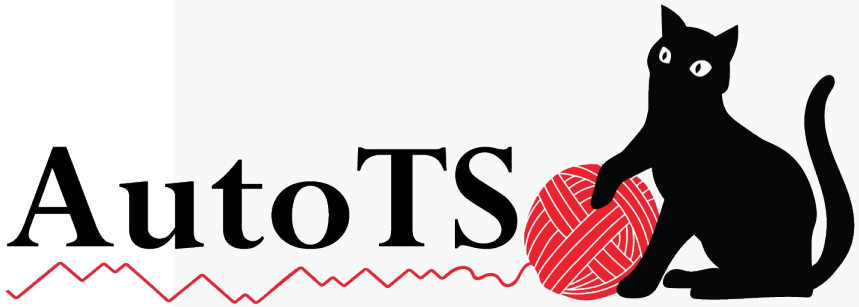


Automate Time Series Forecasting using AutoTS

Presented by: Shu-Yun Liu, Devansh Bhasin, Chu-Yun Hsiao, Vivian Ho, Chien-Chu Hsu

What is Time Series Forecasting?

Predicting future values based on historical time stamp data

Weather Forecast

Will it snow on Thursday? What would be the average temperature next month?

Sales Forecast

What would be the sales of a given product in December?

Predicting Stock Prices

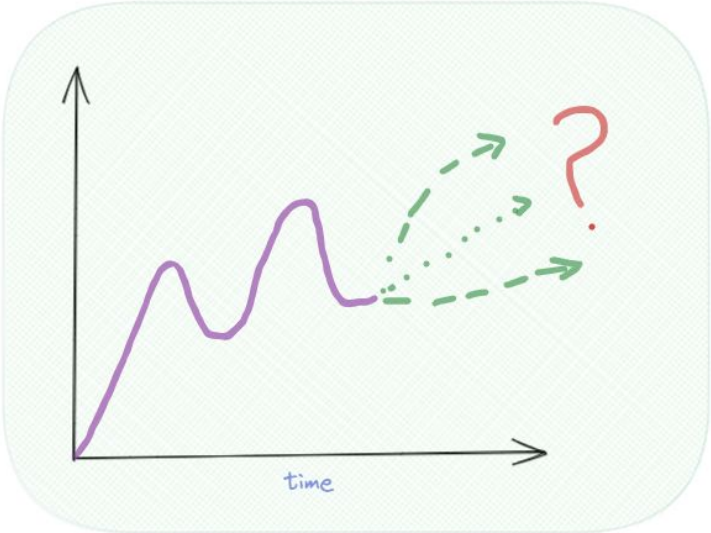
What would be the closing prices of AAPL and AMZN in the next 10 days?

Time Series Forecasting Problems Can be Complex and Time Consuming

1. Don’t know which model to choose from - Statistical, ML, ARIMA, Naïve, Exponential Smoothing, FB Prophet etc.

2. Several Parameters to tune.

3. Require extensive data prep - Data cleaning, Seasonal Adjustment, Feature engineering etc.



What if... There was an easy way?
AutoTS can automate the process and find the best time series forecasting model

Open Source:
Open Source Python Library to automate Time Series Forecasting Implementation

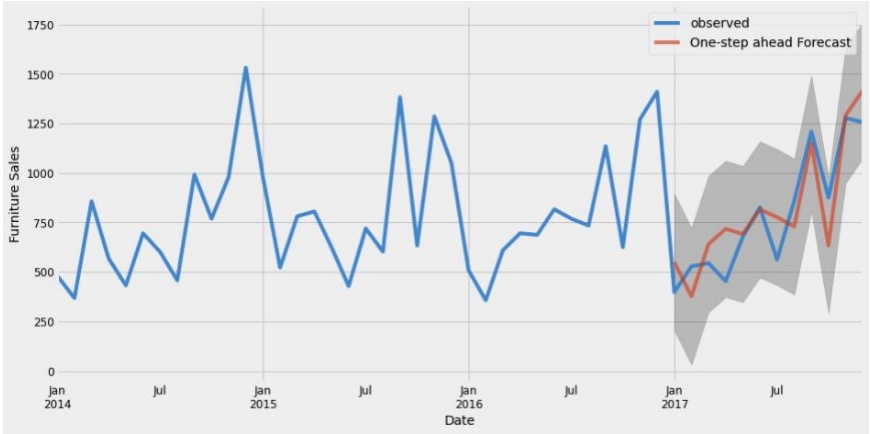
Noob Friendly:
Automatically train multiple time series models with just one line of code

AutoTS Can Find the Optimal Time Series Model

1. Has around 20 built-in models which make it powerful enough to work on any type of time-series data.

2. It can tune the parameters and automatically select the best model.

3. Ability to handle messy data by learning optimal NaN imputation and outlier removal.



Working of AutoTS

Step 1

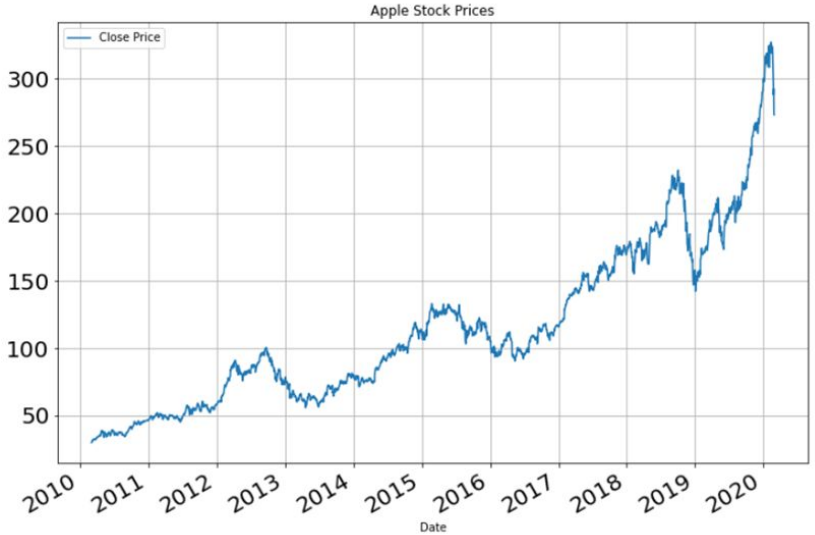
Loading the required packages in Python and preparing the data

```
# Loading the package
from autots import AutoTS
import matplotlib.pyplot as plt
import pandas as pd

# Reading the data
df = pd.read_csv('../input/apple-aapl-historical-stock-data/HistoricalQuotes.csv')

# Doing some preprocessing
def remove_dollar(x):
    return x[2:]
df[' Close/Last'] = df[' Close/Last'].apply(remove_dollar)
df[' Close/Last']  = df[' Close/Last'].astype(float)
df['Date'] = pd.to_datetime(df['Date'])
```

Working of AutoTS

Step 1

Loading the required packages in Python and preparing the data



This is how the Time Series looks like
(Apple Stock Price)

Working of AutoTS

Step 1

Loading the required packages in Python and preparing the data

Step 2

Defining the AutoTS function and fitting the model

```
model = AutoTS(forecast_length=40, frequency='infer',
               ensemble='simple',
drop_data_older_than_periods=100)
model = model.fit(df, date_col='Date', value_col='
Close/Last', id_col=None)
```

Working of AutoTS

Step 1

Loading the required packages in Python and preparing the data

Step 2

Defining the AutoTS function and fitting the model

```
Model Number: 373 with model FBProphet in generation 4 of 10
Model Number: 374 with model GLS in generation 4 of 10
Model Number: 375 with model GLS in generation 4 of 10
Model Number: 376 with model GLS in generation 4 of 10
Model Number: 377 with model ETS in generation 4 of 10
Model Number: 378 with model ETS in generation 4 of 10
Model Number: 379 with model ETS in generation 4 of 10
Model Number: 380 with model ETS in generation 4 of 10
Model Number: 381 with model UnobservedComponents in generation 4 of 10
Model Number: 382 with model UnobservedComponents in generation 4 of 10
Model Number: 383 with model UnobservedComponents in generation 4 of 10
Model Number: 384 with model ZeroesNaive in generation 4 of 10
Model Number: 385 with model ZeroesNaive in generation 4 of 10
Model Number: 386 with model ZeroesNaive in generation 4 of 10
Model Number: 387 with model Theta in generation 4 of 10
Model Number: 388 with model Theta in generation 4 of 10
Model Number: 389 with model Theta in generation 4 of 10
Model Number: 390 with model Theta in generation 4 of 10
Model Number: 391 with model NVAR in generation 4 of 10
Model Number: 392 with model NVAR in generation 4 of 10
Model Number: 393 with model NVAR in generation 4 of 10
Model Number: 394 with model LastValueNaive in generation 4 of 10
Model Number: 395 with model LastValueNaive in generation 4 of 10
Model Number: 396 with model LastValueNaive in generation 4 of 10
```

100s of models with different parameters are run with just 1 line of code

Working of AutoTS

Step 1

Loading the required packages in Python and preparing the data

Step 2

Defining the AutoTS function and fitting the model

Step 3

Making predictions with the best model (automatically)

```
prediction = model.predict()
forecast = prediction.forecast
print("Stock Price Prediction of Apple")
print(forecast)
```

Best model is chosen automatically! We can select any individual model for prediction too

Working of AutoTS

Step 1

Loading the required packages in Python and preparing the data

Step 2

Defining the AutoTS function and fitting the model

Step 3

Making predictions with the best model (automatically)

After plotting the predicted data

Stock Price Prediction of Apple

	Close/Last
2020-03-02	258.796000
2020-03-03	256.887843
2020-03-04	255.718292
2020-03-05	254.331729
2020-03-06	254.171729
2020-03-09	251.770756
2020-03-10	252.930442
2020-03-11	251.745526
2020-03-12	253.620329
2020-03-13	252.026865
2020-03-16	253.442820
2020-03-17	254.372863
2020-03-18	255.658565
2020-03-19	256.944267
2020-03-20	255.976983
2020-03-23	259.317484
2020-03-24	259.715370
2020-03-25	261.700232
2020-03-26	261.894274
2020-03-27	262.809190
2020-03-30	265.230873
2020-03-31	266.481334
2020-04-01	267.775662
2020-04-02	268.705705
2020-04-03	270.000033
2020-04-06	272.421716
2020-04-07	273.336632
2020-04-08	274.251548
2020-04-09	275.181591
2020-04-10	276.111634
2020-04-13	278.372463
2020-04-14	279.287379

Advantages of AutoTS

For Newbies

Accurate and Effective Time Series forecasting even for newbies

Save Time

Do hours worth of experimentation in minutes

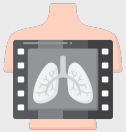
Complex made Easy

Easy model selection and parameter tuning for Advanced Analysts

Applications in Various Industries

Financial and Business Domain

Stock Price Prediction, Options/Pricing Trading, Portfolio Construction



Public Health Domain

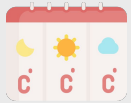
Covid cases, weekly admissions to an emergency department

Astronomy Domain

Observing Novel Phenomenon, Classifying Astronomical Objects

Business Development

Sales Growth, Trend Estimation and Seasonal Patterns



Weather/Climate Forecasting

Predicting long term temperature change,, global warming effects, daily/hour weather forecast

Business Cases

Uber

Predict number of trips during special events, driver incentive allocation, as well as real-time anomaly detection across millions of metrics

Walmart

Do the weekly revenue forecasts at a branch/ store level, ensuring that the annual sales target can be achieved smoothly

NETFLIX

Analyze the viewing data and provides real time accurate bookmarks and personalized recommendations

TOYOTA

Build demand forecasts through vehicle sales and maintenance data, reducing inventory and logistics costs caused by surplus

THANK YOU