

AI Boot Camp

Introduction to Time Series Forecasting

Module 8 Day 2



Class Objectives

By the end of class, you will be able to:

- 1 Identify relationships among time series patterns.
- 2 Use data correlation to evaluate the predictive relationship among time series patterns.
- 3 Compute data correlation of time series data by using the pandas **corr** function.
- 4 Describe the business value of time series forecasting.
- 5 Recognize the value of automating time series forecasting.



Welcome



Activity:

Time Series Warm-Up

In this activity, you will strengthen your time series analysis skills and review the pandas functions that you learned in the previous class.

Suggested time:

20 minutes



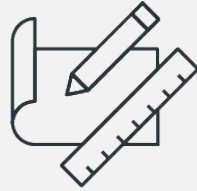


Time's up!
Let's review



Questions?





Identifying Relationships **and Correlation**



Identifying Relationships and Correlation

In this section, you will learn to use:



The pandas library to identify relationships between time series.



Correlation as a measure to assess the predictive power of time series.



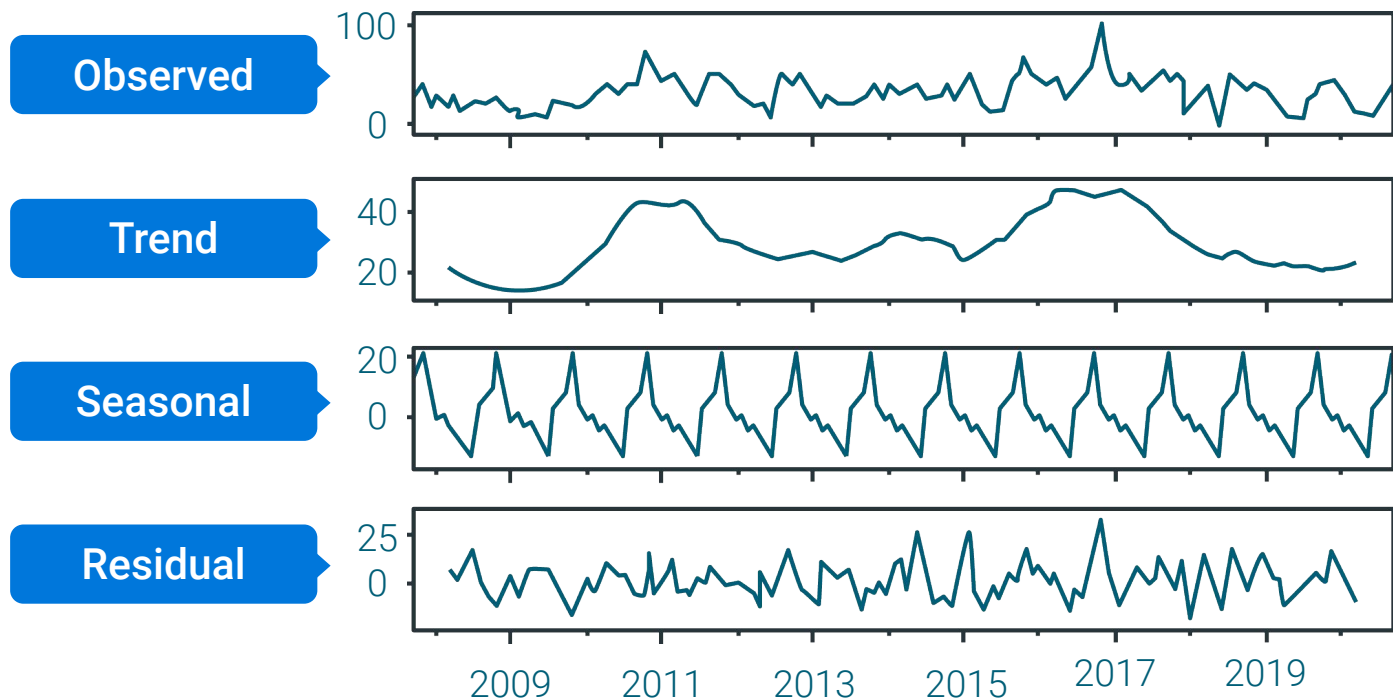


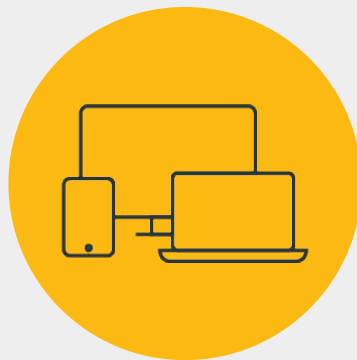
When analyzing
time series,
finding seasonal
patterns is just one
part of the job.



Identifying Relationships and Correlation

Another important task is identifying relationships between time series patterns and determining if these relationships are predictable.





Instructor **Demonstration**

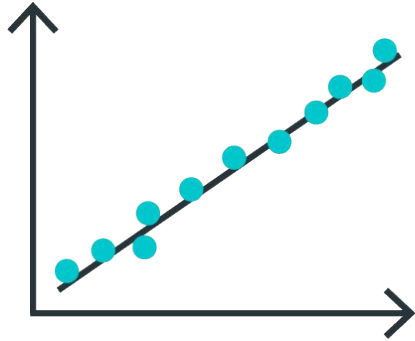
Identifying Relationships and Correlation



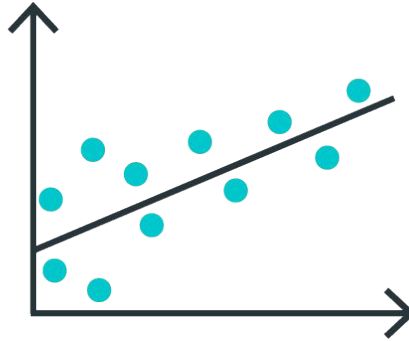
In statistics, a **correlation** defines the relationship between two or more variables.



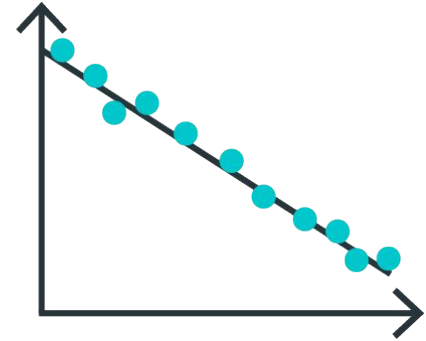
Comparison of Correlations



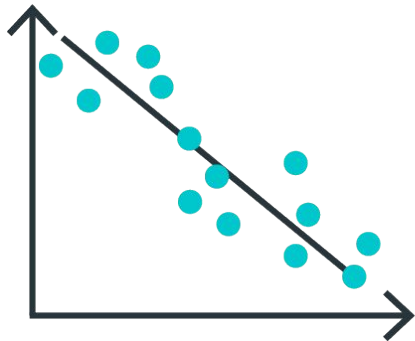
Strong positive



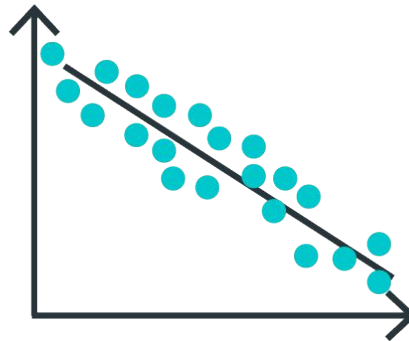
Weak positive



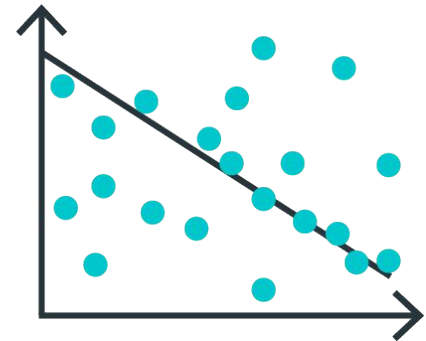
Strong negative



Weak negative



Moderate negative



No correlation



Correlations can be helpful, but they don't provide enough information to infer the relationship between two variables.



Statisticians Say...



Correlation
does not...

...imply
causation.

In other words, you can't assume causation from a correlation value only.

You will need a lot of information to determine causation between factors, including expertise in the field and extensive testing, which will likely include the ability to control for other related factors.

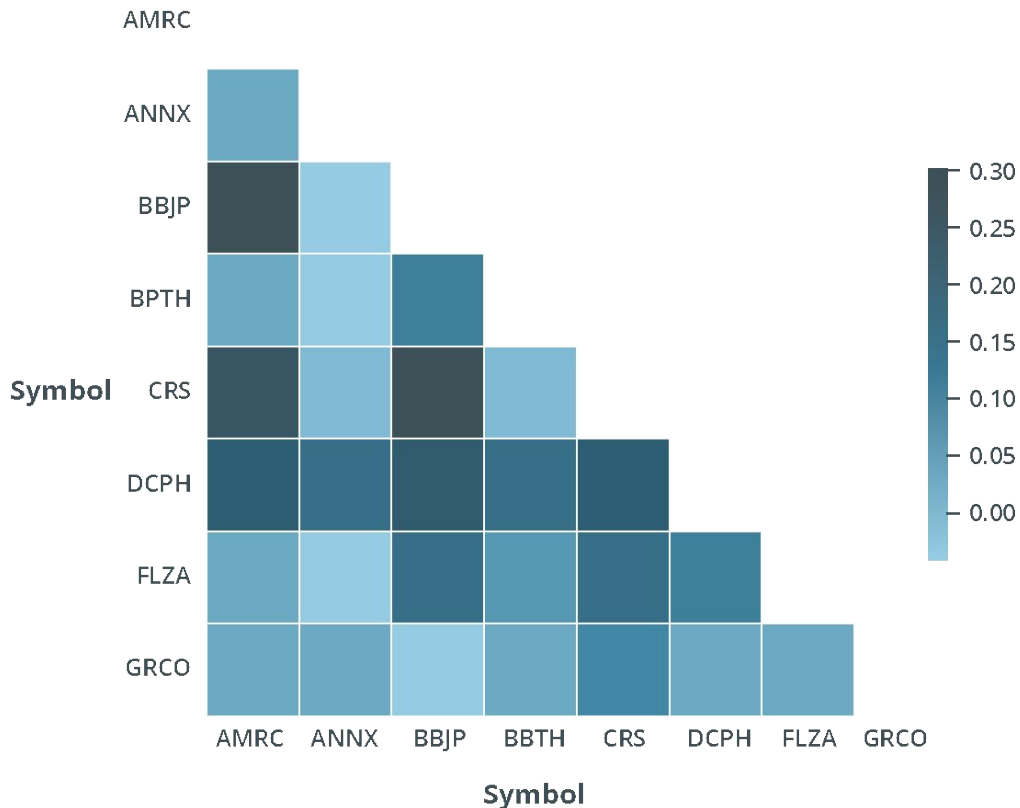
Since a correlation evaluates how much two variables move together, we can apply correlations to the analysis of stocks.

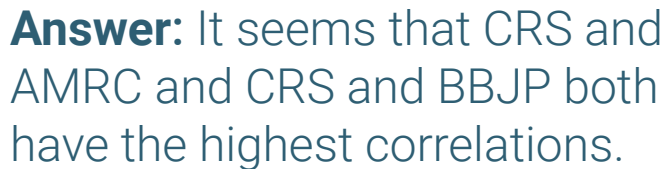




Consider the following correlation table in the form of a heatmap, which contains the correlations of various intraday stock returns (the returns are measured by using minute-level price data).

Can you identify which stocks tend to move together most strongly?





Heatmap showing the correlation matrix for the symbols AMRC, ANNEX, BBJP, BPTH, CRS, DCPH, FLZA, and GRCO. The color scale ranges from 0.00 (light blue) to 0.30 (dark blue). The diagonal elements are all 1.00. The off-diagonal elements show varying degrees of correlation, with CRS and DCPH showing the highest correlations (around 0.25-0.30).

Symbol	AMRC	ANNEX	BBJP	BPTH	CRS	DCPH	FLZA	GRCO
AMRC	1.00	0.05	0.05	0.05	0.05	0.05	0.05	0.05
ANNEX	0.05	1.00	0.05	0.05	0.05	0.05	0.05	0.05
BBJP	0.05	0.05	1.00	0.05	0.05	0.05	0.05	0.05
BPTH	0.05	0.05	0.05	1.00	0.05	0.05	0.05	0.05
CRS	0.05	0.05	0.05	0.05	1.00	0.25	0.25	0.25
DCPH	0.05	0.05	0.05	0.05	0.25	1.00	0.25	0.25
FLZA	0.05	0.05	0.05	0.05	0.25	0.25	1.00	0.25
GRCO	0.05	0.05	0.05	0.05	0.25	0.25	0.25	1.00

Going Forward

You will use correlations to identify the relationships between current observations and future values.

This differs from identifying the relationships for variables that are measured at the same time.



Activity:

Stock Volatility and Google Trends

In this activity, you will analyze time series data about companies to identify correlations among Google Trends, stock price returns, and stock volatility.

Suggested time:

20 minutes





Time's up!
Let's review



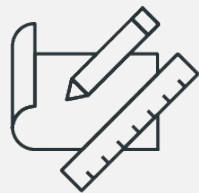
Questions?





Break

15 mins



Introducing **Time Series Forecasting**



Introduction to Time Series Forecasting



Many industries reliant on forecasting make great use of time series forecasting because of its origin in mathematics and statistics.



People sometimes refer to time series forecasting as a statistical tool, but there's a lot of overlap between statistical tools and machine learning models. Both can solve similar problems.



As you learned previously, time series analysis involves analyzing time series data to identify meaningful patterns in the data.



Time series forecasting involves using a model that is based on historical data to predict future values in the time series.



In this lesson, you'll perform time series forecasting by creating models to predict the future.



Time series forecasting can prove difficult.

External factors (such as holidays, breaking news, and special events) can impact the usual behavior of the patterns.

Additionally, it can be challenging to select the best statistical technique for analysis.

Automating Time Series Forecasting

Let's look at a scenario where
we are collaborating with the
[International Cooperative Alliance](#).



Automating Time Series Forecasting

We've been asked to find the best season to sell scarves in Japan and to forecast the demand for scarves for one year.

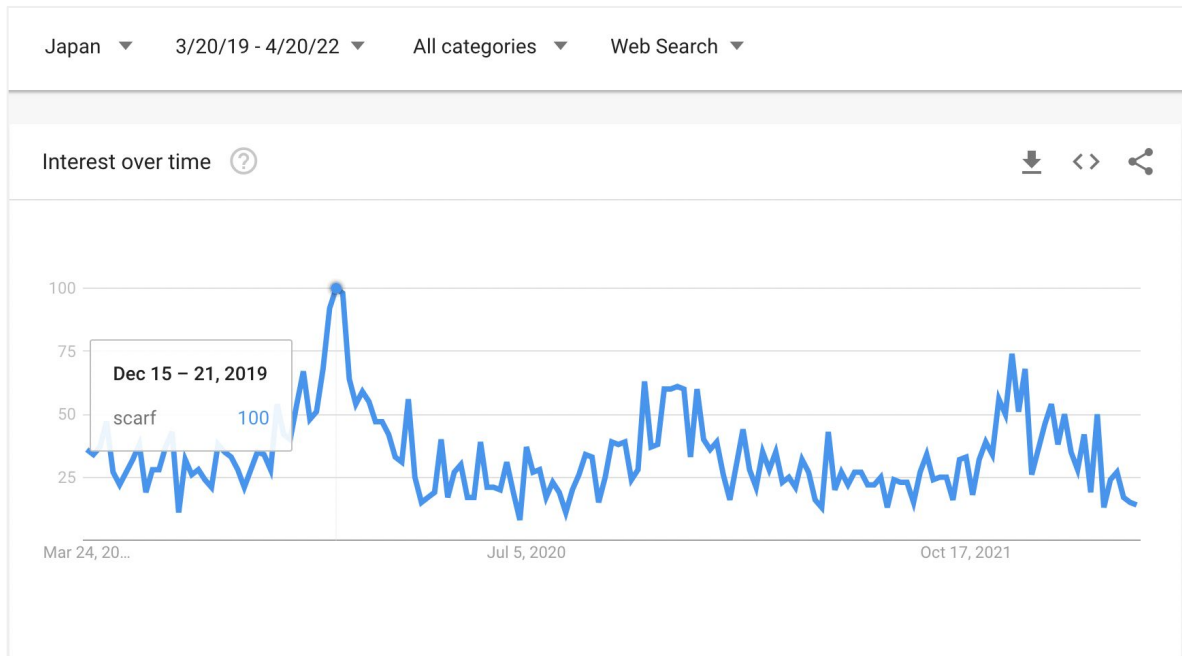
We don't know anything about the scarf market in Japan, so we've obtained some data from Google Trends to figure out the optimal selling season.

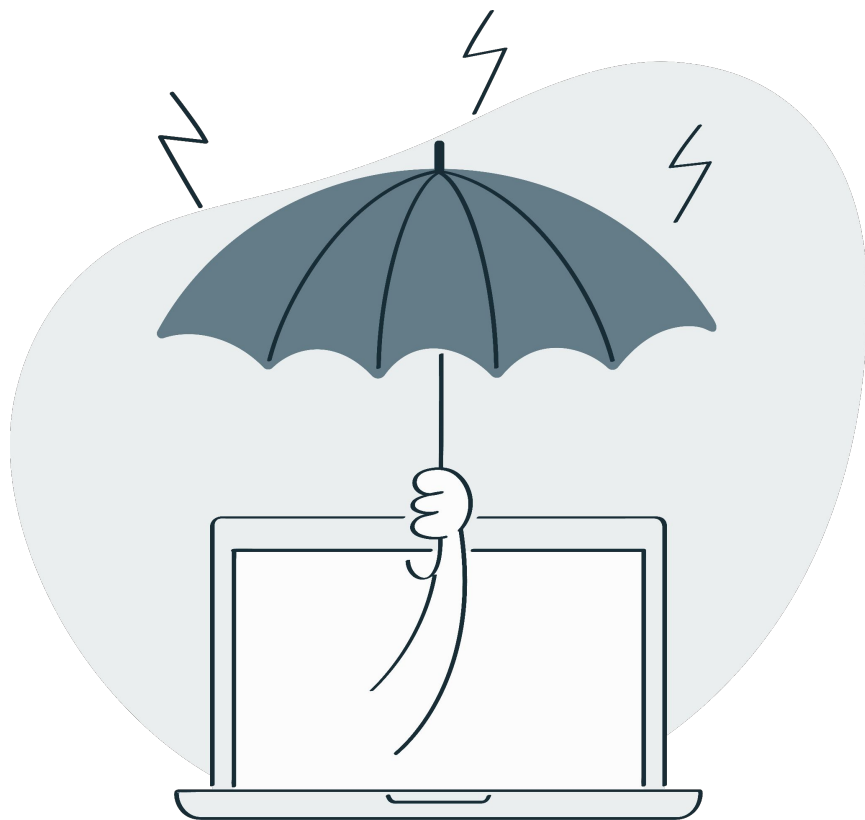


Automating Time Series Forecasting

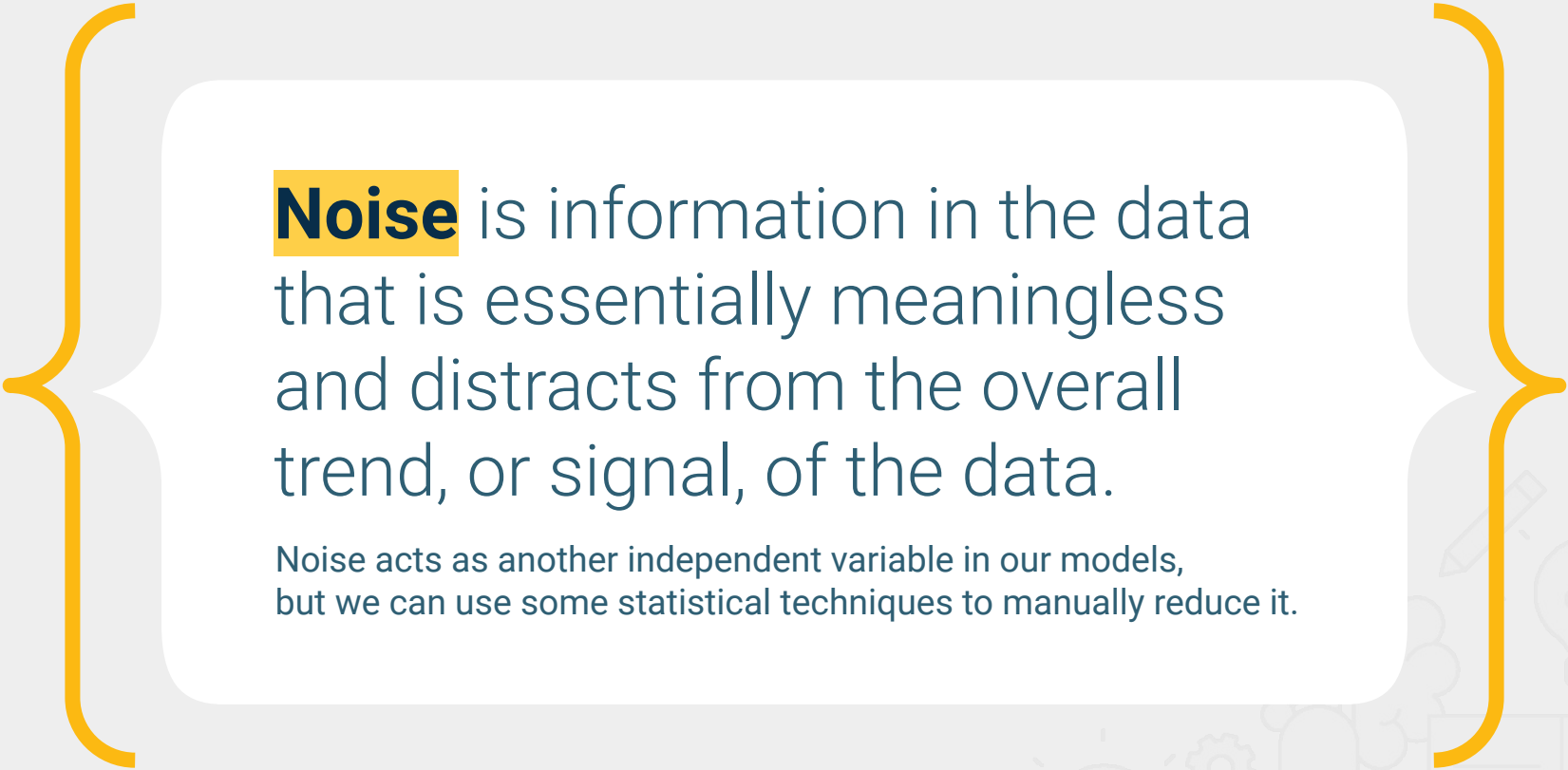
Using our time series analysis skills, we identified that people in Japan have more interest in scarves in the winter months because of the weather.

So, it might be optimal to start marketing campaigns in August and start selling scarves by October.



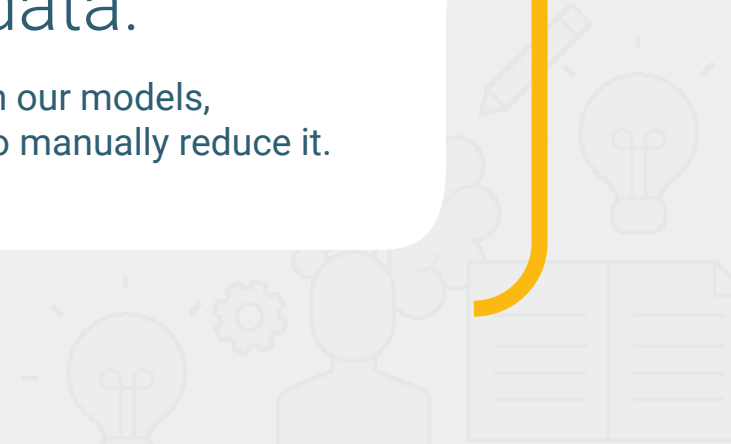


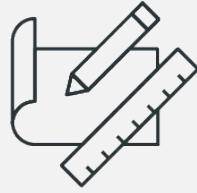
External factors,
like weather or holidays,
impact a time series
and sometimes
introduce noise.



Noise is information in the data that is essentially meaningless and distracts from the overall trend, or signal, of the data.

Noise acts as another independent variable in our models, but we can use some statistical techniques to manually reduce it.



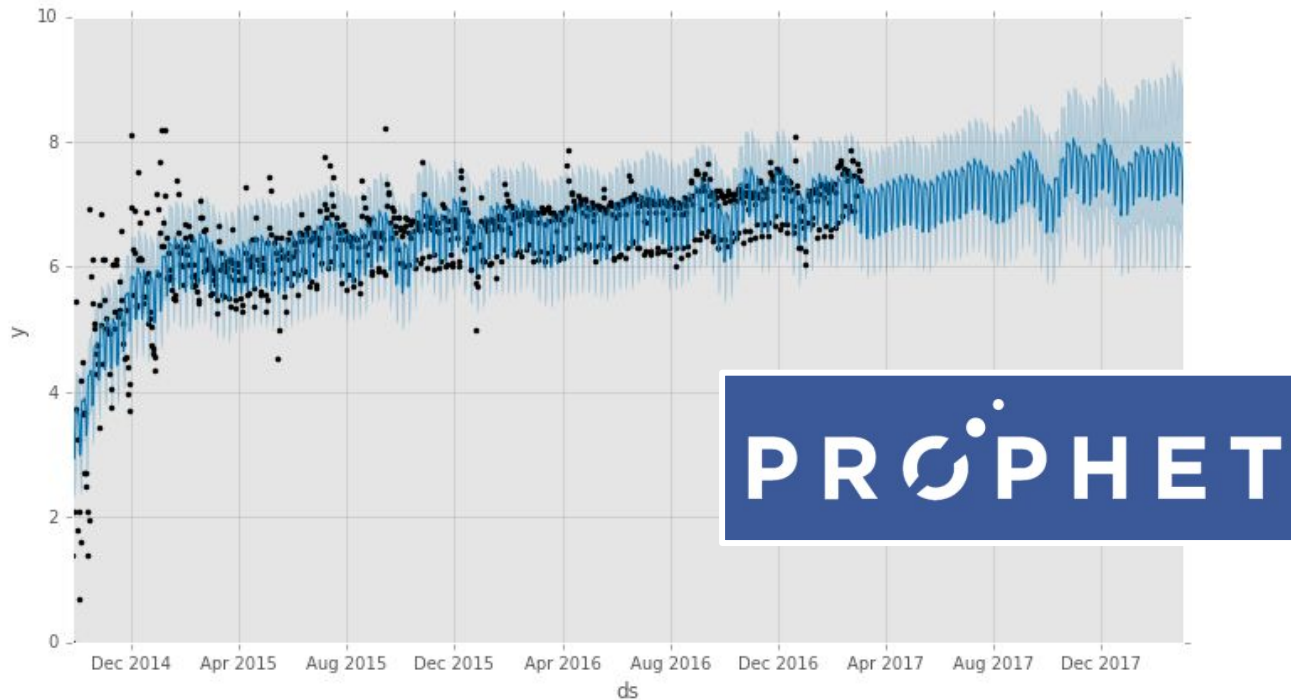


Focusing on Results Analysis **and Decision-Making with**



Introducing Prophet

Prophet is an open-source library for time series forecasting that Facebook developed to analyze data.



Results Analysis and Decision-Making with Prophet

Facebook uses Prophet to forecast growth, technological infrastructure demand, service revenue, and user activity.



Prophet automates the process of time series forecasting, allowing you to focus on a business problem.



It also tests and forecasts as many scenarios as you identify.



Prophet's forecasting automation can help to simplify your time series analysis.

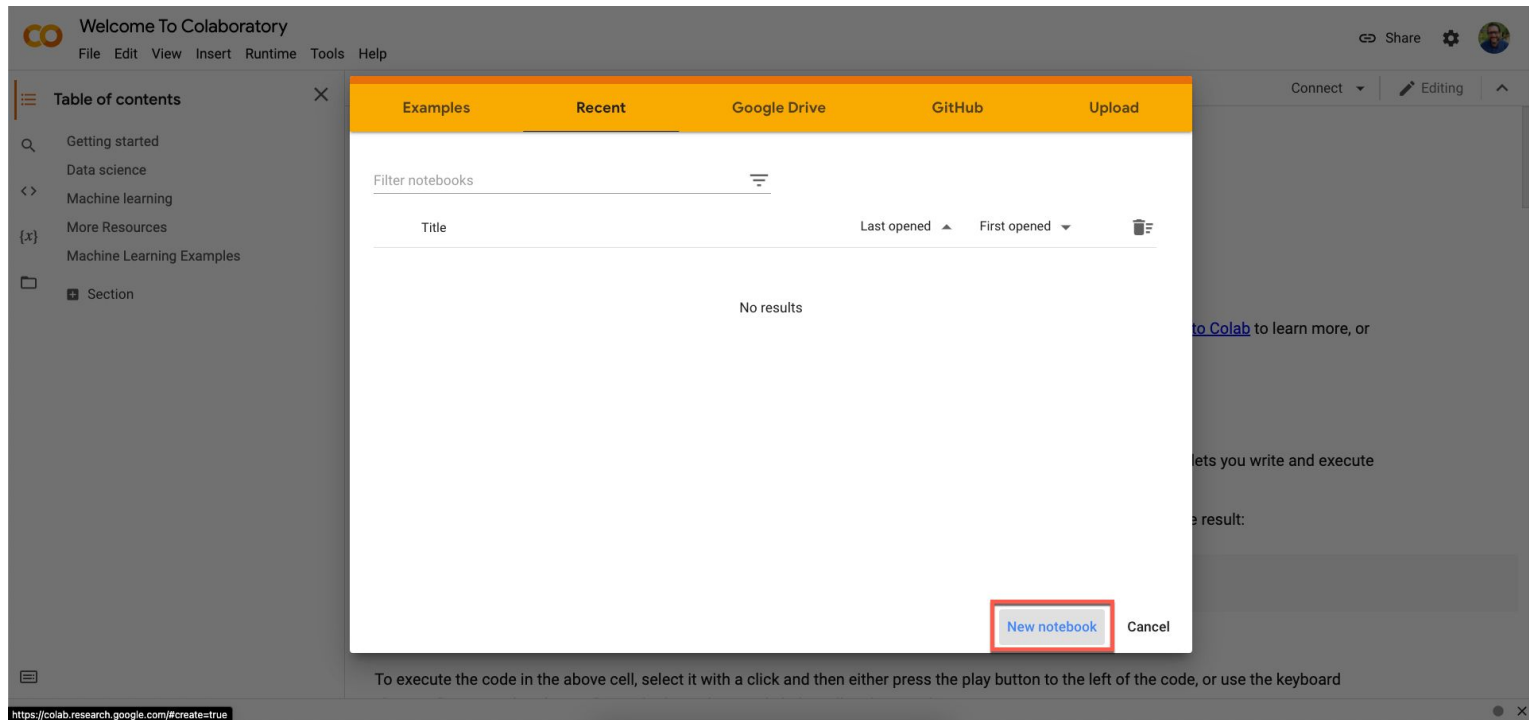


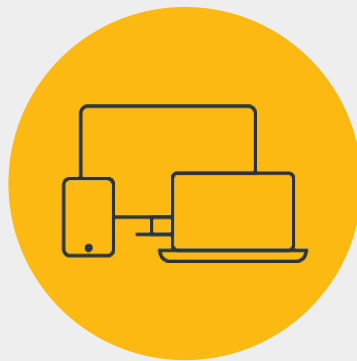
It deals with noise, holidays or special events, and time series decomposition.

Results Analysis and Decision-Making with Prophet

Installing Prophet can be tricky on some machines.

For simplicity, we'll be using Google Colab—an IDE that allows us to run Jupyter notebooks in the cloud, which allows everyone to have the same computational environment.





Instructor **Demonstration**

Configuring Google Colab



Questions?





Activity:

Setting Up Google Colab

During this activity, you will familiarize yourself with Google Colab's interface and configurations.

Suggested time:

10 minutes



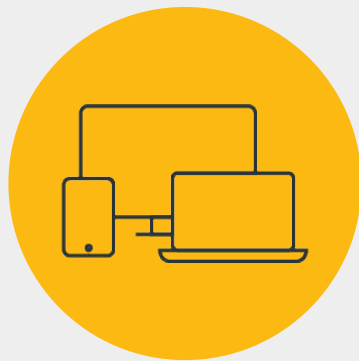


Time's up!
Let's review



Questions?





Instructor **Demonstration**

Data Preparation for Time Series Forecasting with Prophet



Questions?





Activity:

Data Preparation to Forecast Market Opportunities

In this activity, you will use Google Colab to prepare a dataset and then use that dataset and Prophet to forecast market opportunities.

Suggested time:

20 minutes



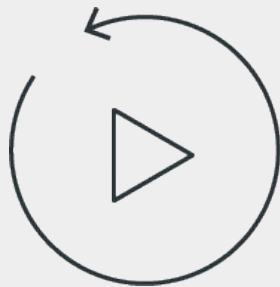


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Questions?





Let's **recap**



Recap

After today's lesson, you are able to:

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- 3 Compute data correlation of time series data by using the pandas **corr** function.
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Next

In the next lesson, you'll learn to manage time series data and create models to predict the future by using Prophet.



Questions?





The End