Data Analytics

Lesson 08.

Forecasting Techniques

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Scholar: https://scholar.google.com/citations?user=kHZvlTkAAAAJ&hl=en&oi=ao

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Learning materials

- Textbook
  - Evans, J. (2016) Business Analytics. 2nd edn. Pearson.
  - Runkler, T. (2016) Data Analytics: Models and Algorithms for Intelligent Data Analysis. 2nd edn. Vieweg+Teubner Verlag.

- Online reference materials
  - archive.ics.uci.edu/ml/
  - powerbi.microsoft.com
  - https://github.com/topics/data-analysis-python
  - https://media.pearsoncmg.com/ph/esm/esm_evans_eba3e_20/tools/eba3e_analytic_solver.html
  - https://data.imf.org/

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Agenda

- Lesson 1: Understanding Data Analytics Terminologies.
- Lesson 2: Foundation of Business Analytics
- Lesson 3: Visualizing and Exploring data
- Lesson 4: Applying Descriptive Analytic Techniques
- Lesson 5: Data Modeling
- Lesson 6: Predictive Analytics
- Lesson 7: Regression, Classification and Clustering
- Lesson 8: Forecasting Techniques
- Lesson 9: Investigating Predictive Analytic Techniques
- Lesson 10: Introduction to Data Mining
- Lesson 11: Demonstrating Prescriptive Analytic Methods
- Lesson 12: Recap and advanced topics

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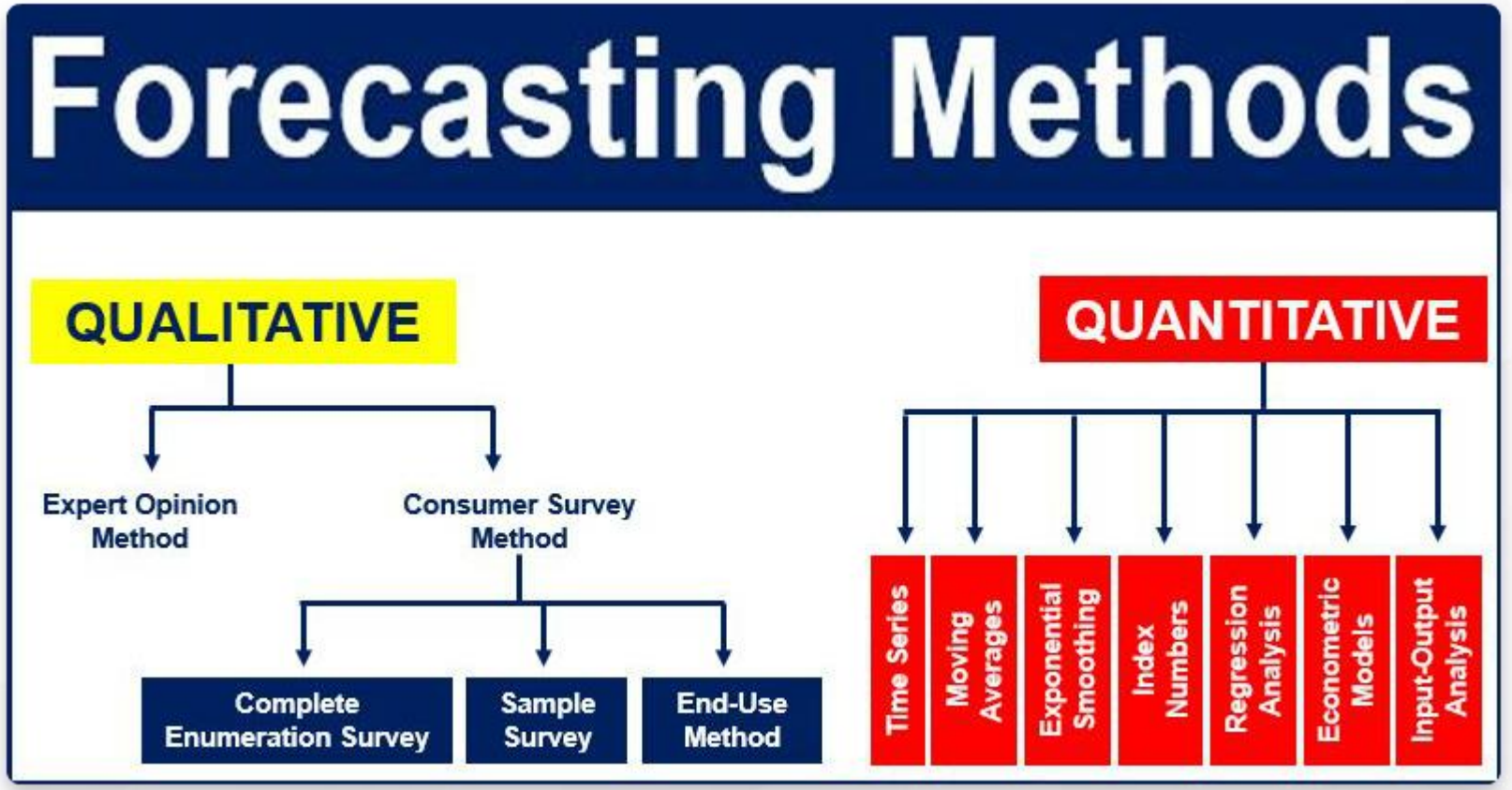
●Forecasting Techniques

Discover the importance of forecasting and learn about the different types of forecasting techniques in this engaging presentation.

Two main forecasting approaches are qualitative and quantitative.
The **qualitative** meth od is based on expert opinions and the comprehensive analytical research of consumers' behavior.
The **quantitative** met hod is built on the concept of past statistics research.



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Qualitative Techniques

1 Delphi method

A structured approach that involves obtaining anonymous opinions and feedback from a panel of experts.

2 Expert opinion

Relies on the knowledge and insights of subject matter experts to make informed predictions.

3 Market research

Uses surveys, customer feedback, and market analysis to gather insights and make qualitative forecasts.

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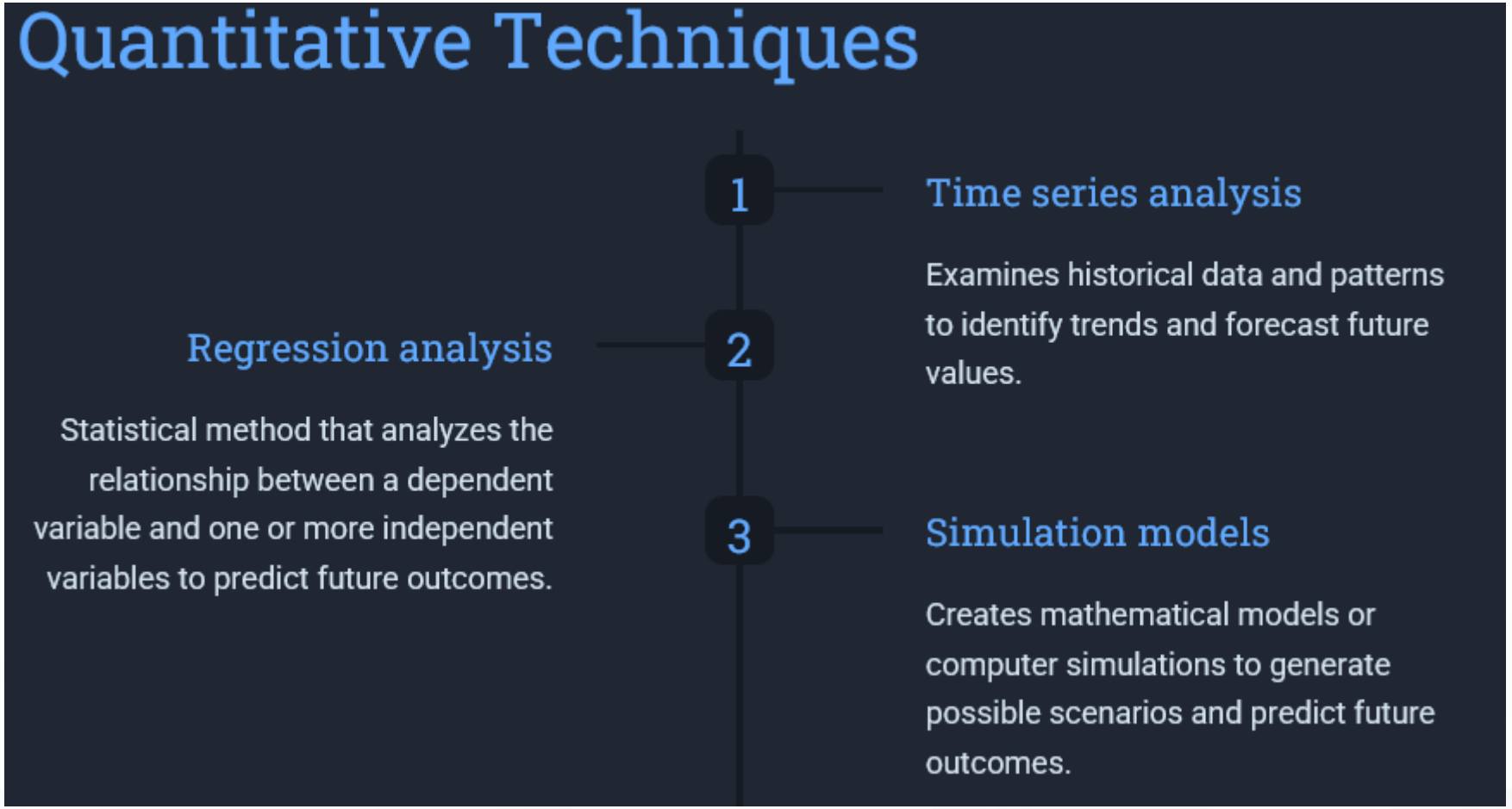

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- To demonstrate forecasting survival in the Titanic dataset using Python, you can use a machine learning approach, such as logistic regression. Below is a simple example using Python with the popular scikit-learn library:

```
# Import necessary libraries
import pandas as pd
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LogisticRegression
from sklearn.metrics import accuracy_score,
classification_report
from sklearn.preprocessing import LabelEncoder

# Load the Titanic dataset
titanic_data = pd.read_csv('titanic.csv')

# Preprocess the data
# Drop unnecessary columns or fill missing values as
needed
titanic_data = titanic_data[['Pclass', 'Sex', 'Age',
'SibSp', 'Parch', 'Fare', 'Embarked', 'Survived']]
titanic_data = titanic_data.dropna()

# Encode categorical variables
label_encoder = LabelEncoder()
titanic_data['Sex'] =
label_encoder.fit_transform(titanic_data['Sex'])
titanic_data['Embarked'] =
```

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- To predict a new record, you can use the trained model to make predictions on a set of features for a new passenger. Here's how you can modify the code to predict a new record:

```
# ... (Previous code remains unchanged)

# Suppose you have a new passenger's information
new_passenger = {'Pclass': 3, 'Sex': '0', 'Age': 25,
'SibSp': 1, 'Parch': 0, 'Fare': 7.5, 'Embarked': '0'}

# Convert the new passenger's information into a DataFrame
new_passenger_df = pd.DataFrame([new_passenger])

# Encode categorical variables

# Make predictions for the new passenger
new_passenger_prediction = model.predict(new_passenger_df)

# Print the prediction
if new_passenger_prediction[0] == 1:
    print("The new passenger is predicted to survive.")
else:
    print("The new passenger is predicted not to survive.")
```

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Google classroom task

- **What is Forecasting? | Process & Benefits of Forecasting**
- https://www.youtube.com/watch?v=M8Kiwv9gDJU
  - Watch and investigate.
  - Submit your answer:
    - YouTube Link
    - Draw a diagram to show Forecasting Process.
    - List down benefits of forecasting.

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Question	Match A	Match B
1. What is the primary purpose of data cleansing?	A. Identifying patterns in data	B. Removing errors and inconsistencies
2. Which statistical measure represents central tendency?	A. Mean	B. Standard Deviation
3. What is the main goal of exploratory data analysis (EDA)?	A. Summarizing data	B. Discovering patterns and trends
4. In machine learning, what does "overfitting" refer to?	A. Model fitting the training data	B. Model performing poorly on new data
5. Which type of chart is suitable for displaying the distribution of a continuous variable?	A. Histogram	B. Pie Chart

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Question	Match A	Match B
1. What is the purpose of time series analysis in forecasting?	A. Identifying trends and patterns over time	B. Classifying data into categories
2. Which forecasting method involves using past values to predict future values?	A. Moving Averages	B. Exponential Smoothing
3. What is the primary advantage of using quantitative forecasting methods?	A. Reliance on historical data	B. Subjectivity in decision-making
4. What does the term "seasonality" refer to in forecasting?	A. Regular patterns that repeat at known intervals	B. Random fluctuations in data
5. Which technique involves combining forecasts from multiple sources or models?	A. Ensemble Forecasting	B. Regression Analysis

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Learning Mission

30 mins

Reading Business Analytics textbook: Chapter 9, page 273 – 300.

Discussion and answer:

Give another example (text and chart) like example 9.18?

EXAMPLE 9.18 Forecasting Gasoline Sales Using Simple Linear Regression

Figure 9.27 shows gasoline sales over 10 weeks during June through August along with the average price per gallon and a chart of the gasoline sales time series with a fitted trendline (Excel file *Gasoline Sales*). During the summer months, it is not unusual to see an increase in sales as more people go on vacations. The chart shows a linear trend, although R^2 is not very high. The trendline is:

$$\text{sales} = 4{,}790.1 + 812.99\ \text{week}$$

Using this model, we would predict sales for week 11 as

$$\text{sales} = 4{,}790.1 + 812.99(11) = 13{,}733\ \text{gallons}$$

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Conclusion and Questions

- A forecasting approach similar to simple exponential smoothing used for time series with a linear trend and no significant seasonal components.
- A forecasting approach similar to a simple moving average used for time series with a linear trend and no significant seasonal components

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Thank you