

# Descriptive analytics

INTRODUCTION TO DATA LITERACY



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# Analytics overview

			
Descriptive Analytics	Diagnostic Analytics	Predictive Analytics	Prescriptive Analytics
What is happening?	Why is it happening?	What will happen?	What should we do?
Summarize & visualize the data	Find root causes of events	Identify possible outcomes and the probability that they will happen	Determine the best course of action given the outcome we want to achieve

# Why use descriptive analytics?

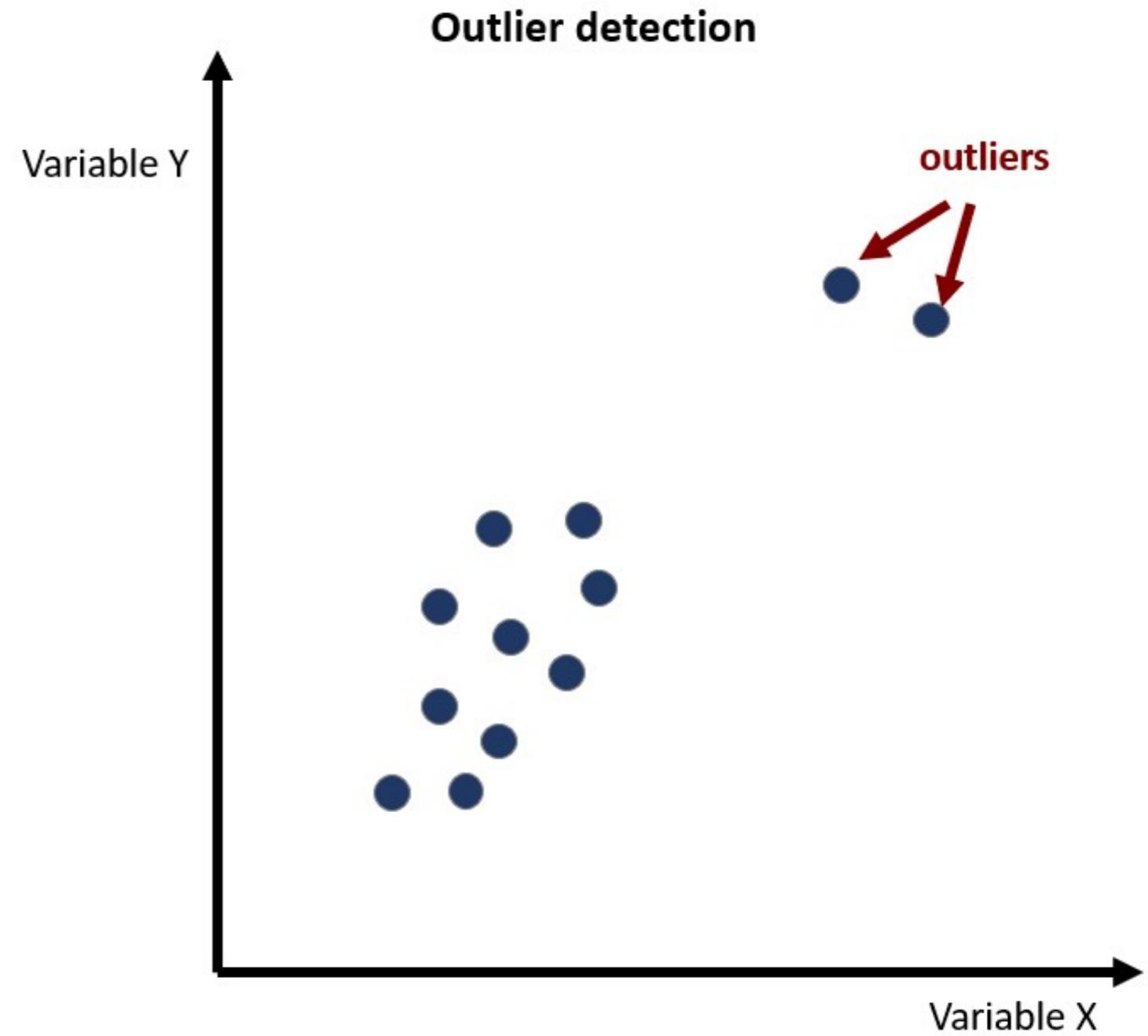
- Get to know the data
- Investigate relationships in the data
- Preparation for more advanced techniques



# Common techniques

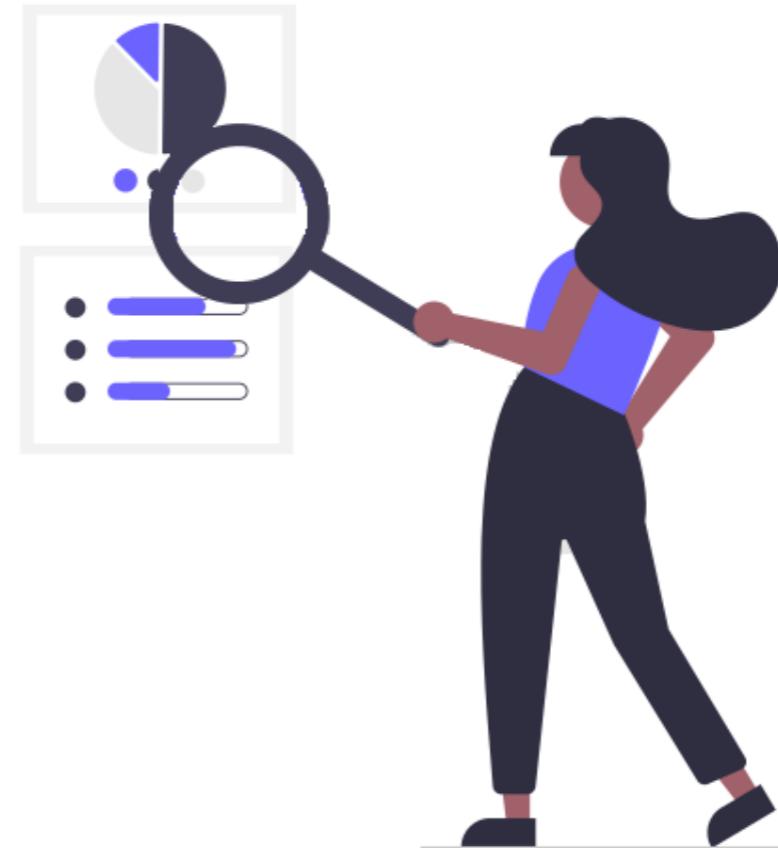
- Descriptive statistics
- Visualizations
- Outlier detection

Often combined in exploratory data analysis  
(EDA)



# Exploratory data analysis

- Focus on exploring the data:
  - Assessing its main characteristics
  - Finding relationships, patterns or groups
  - Suggesting hypotheses for future analysis
- Combines different techniques, with a strong emphasis on visualization
- Groundwork for further analysis but also valuable on its own



# Case study: ice cream sales

Which ice cream flavor sells the most?

- Count sales per flavor
- Calculate most commonly sold flavor per store
- Calculate commonly sold flavor per month

Apply insights to drop unpopular flavors or offer new flavors with similar characteristics as existing popular ones



# **Let's practice!**

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# Diagnostic analytics

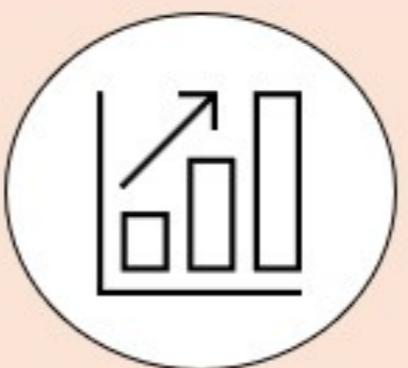
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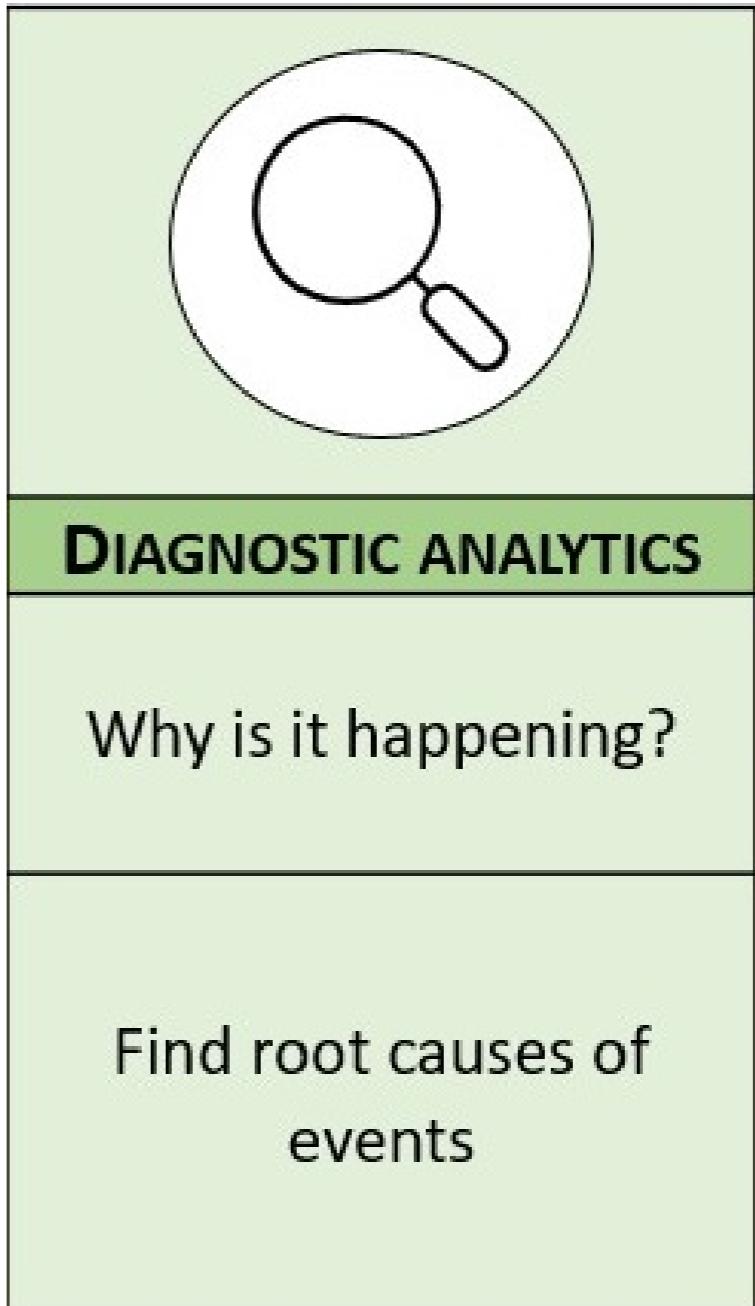
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# Why use diagnostic analytics?

- Find potential causes of events or reasons for behaviors
- Investigate causal relationships
- Suggest solutions based on the identified causes

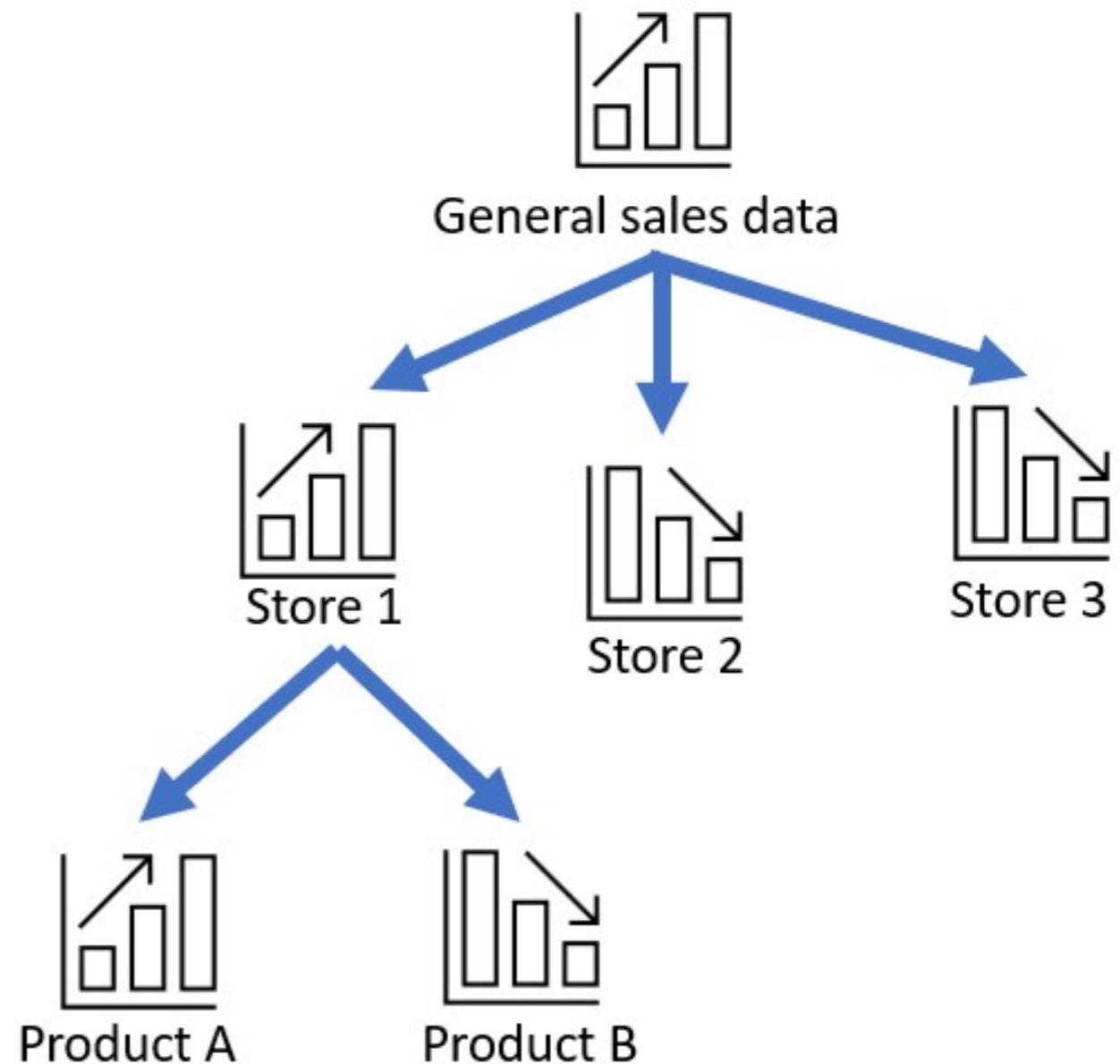
Be careful: diagnostic analytics can suggest causes, but not prove causality on its own



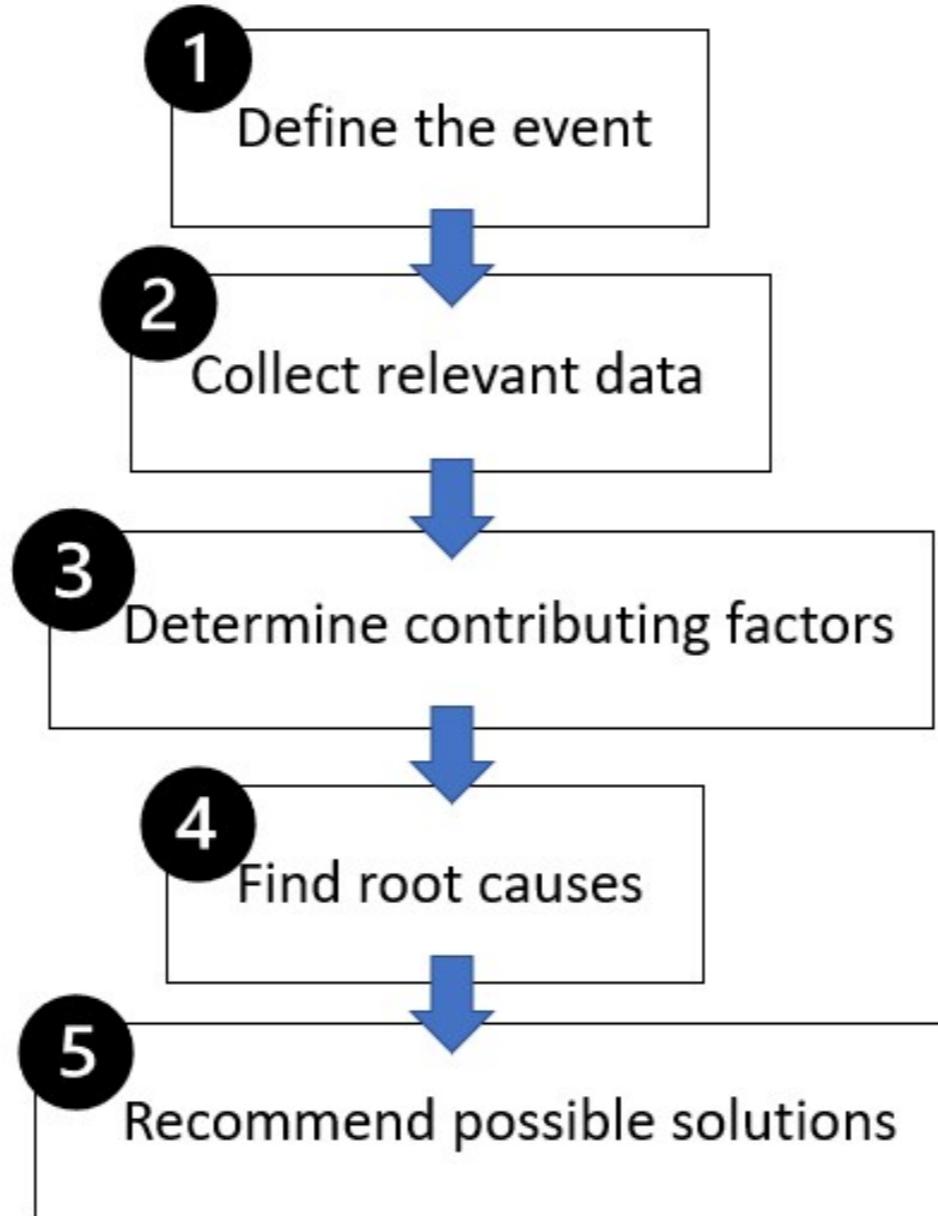
# Common techniques

- Drill-down analysis
- Correlation and regression analysis
- Hypothesis testing
- Root cause analysis

## Drill-down analysis



# Root cause analysis (RCA)

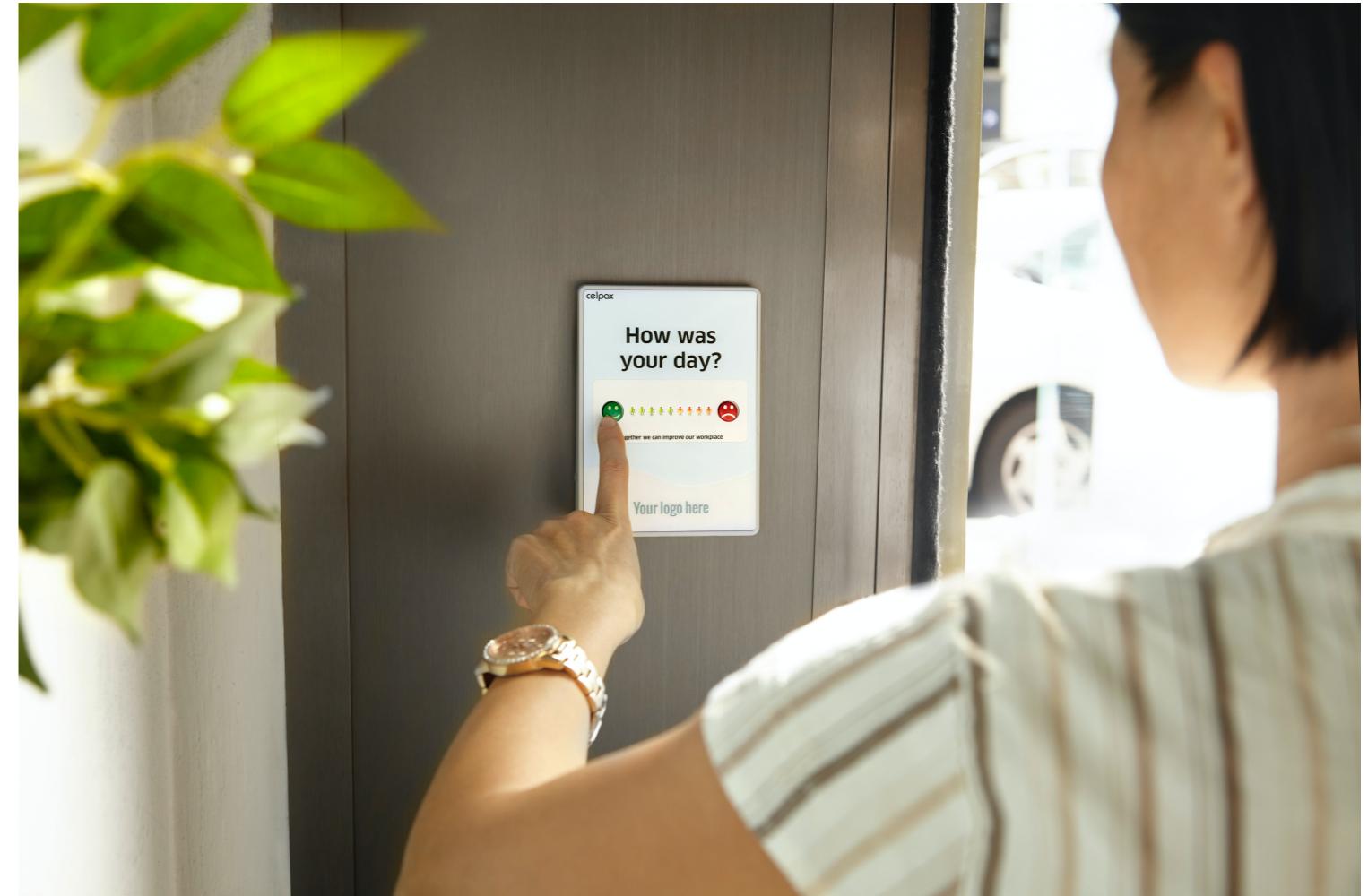


# Case study: airline customer satisfaction

Why is customer satisfaction rate for the airline declining?

- Identify keywords in complaints
- Group complaints into categories
- Investigate connections with other data

Use insights to suggest solutions for most common categories



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# Predictive analytics

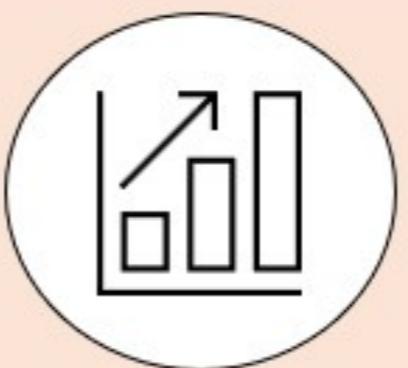
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# Why use predictive analytics?

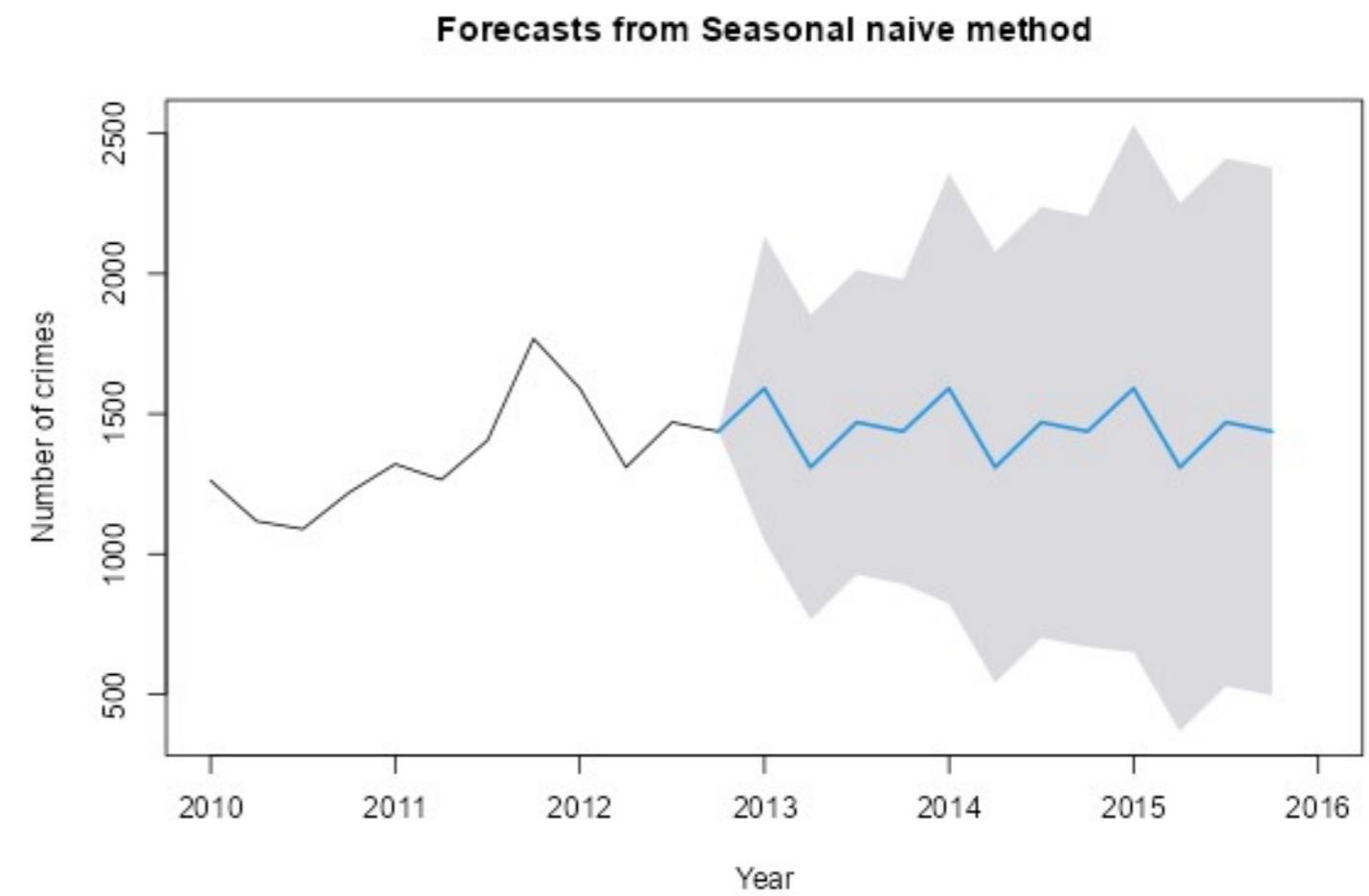
- Anticipate most likely outcomes
- Forecast a process or sequence
- Estimate an unknown based on the information that is available

Be careful: there is always a degree of uncertainty associated with predictions

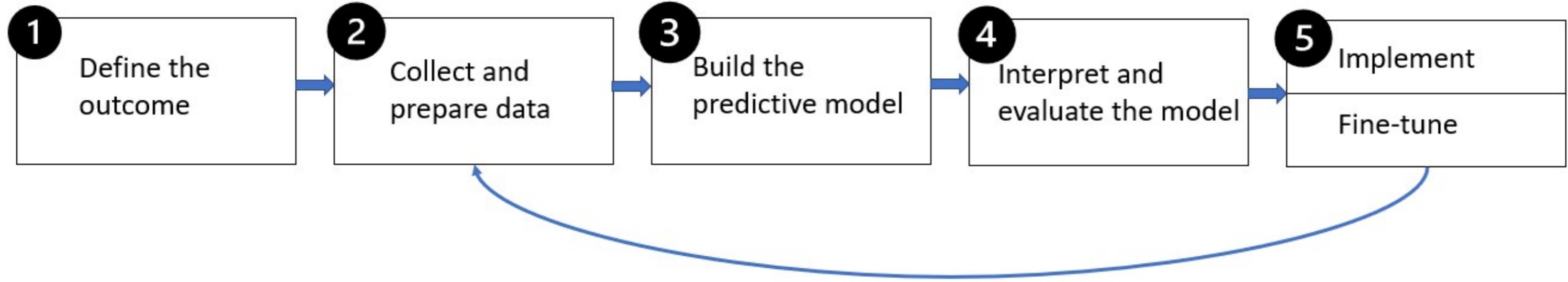


# Common techniques

- Machine learning models
  - Classification-based
    - Predicting cancellations of subscriptions
  - Regression-based
    - Predicting housing prices based on neighborhood characteristics
- Time series forecasting
  - Predicting sales revenue over time
- Predictive text analysis
  - Predicting whether an email is spam or not



# Predictive modeling



- Data is split into training and test set for building the predictive model
- Predictions are interpreted and evaluated on the test data, using pre-determined metrics like accuracy (percentage of correct predictions)

# Case study: World Cup winner

Which team is most likely to win the next FIFA World Cup?

- Select relevant variables like team ratings, player ratings, rankings, and match difficulty
- Build a predictive model to predict probability of winning or reaching specific phases

Use insights to predict winning probability for each country



# **Let's practice!**

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# Prescriptive analytics

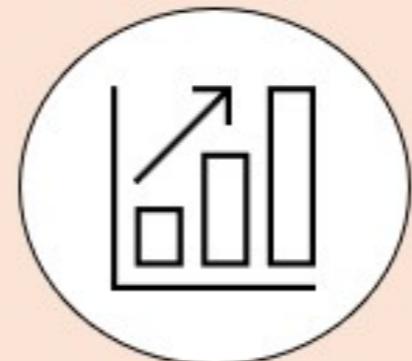
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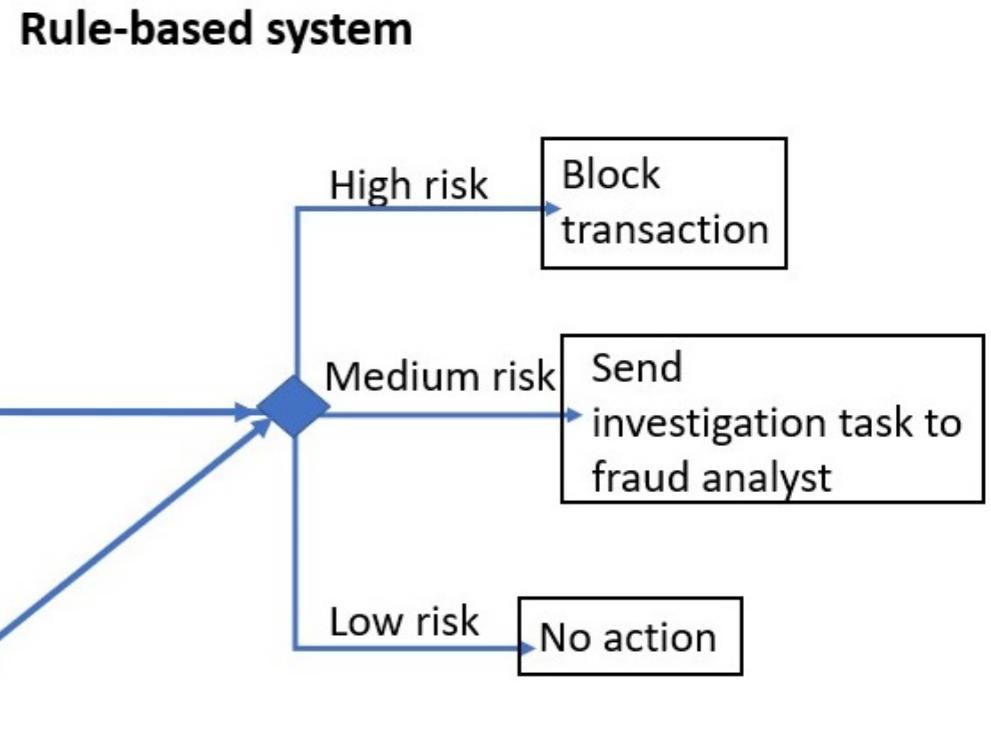
# Why use prescriptive analytics?

- Make informed, data-driven decisions
- Optimize processes
- Mitigate risks



# Common techniques

- Rule-based systems
- Reinforcement learning
- Scenario and simulation analysis
- Recommendation engine



# Recommendation engine

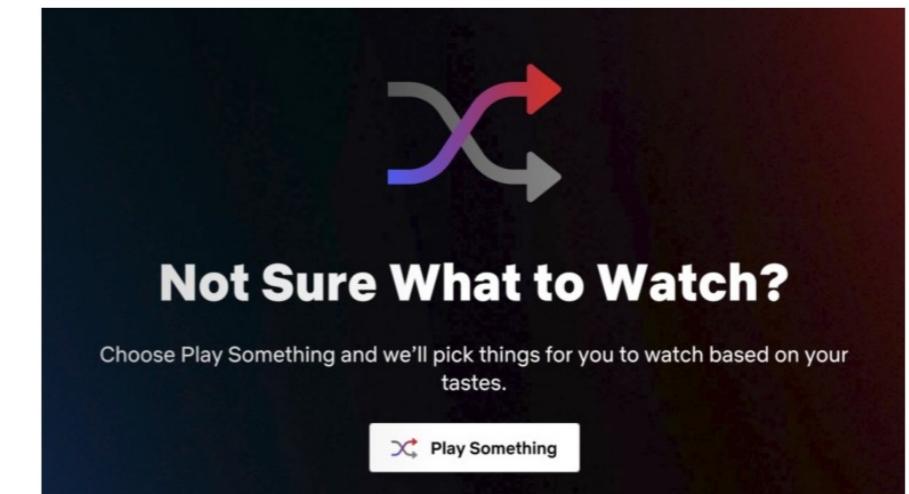
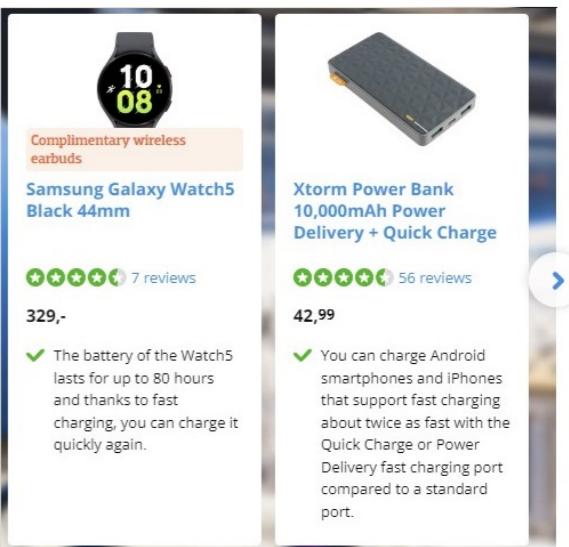
- Predicts interests based on past behavior
- Provides recommendations based on predicted interests

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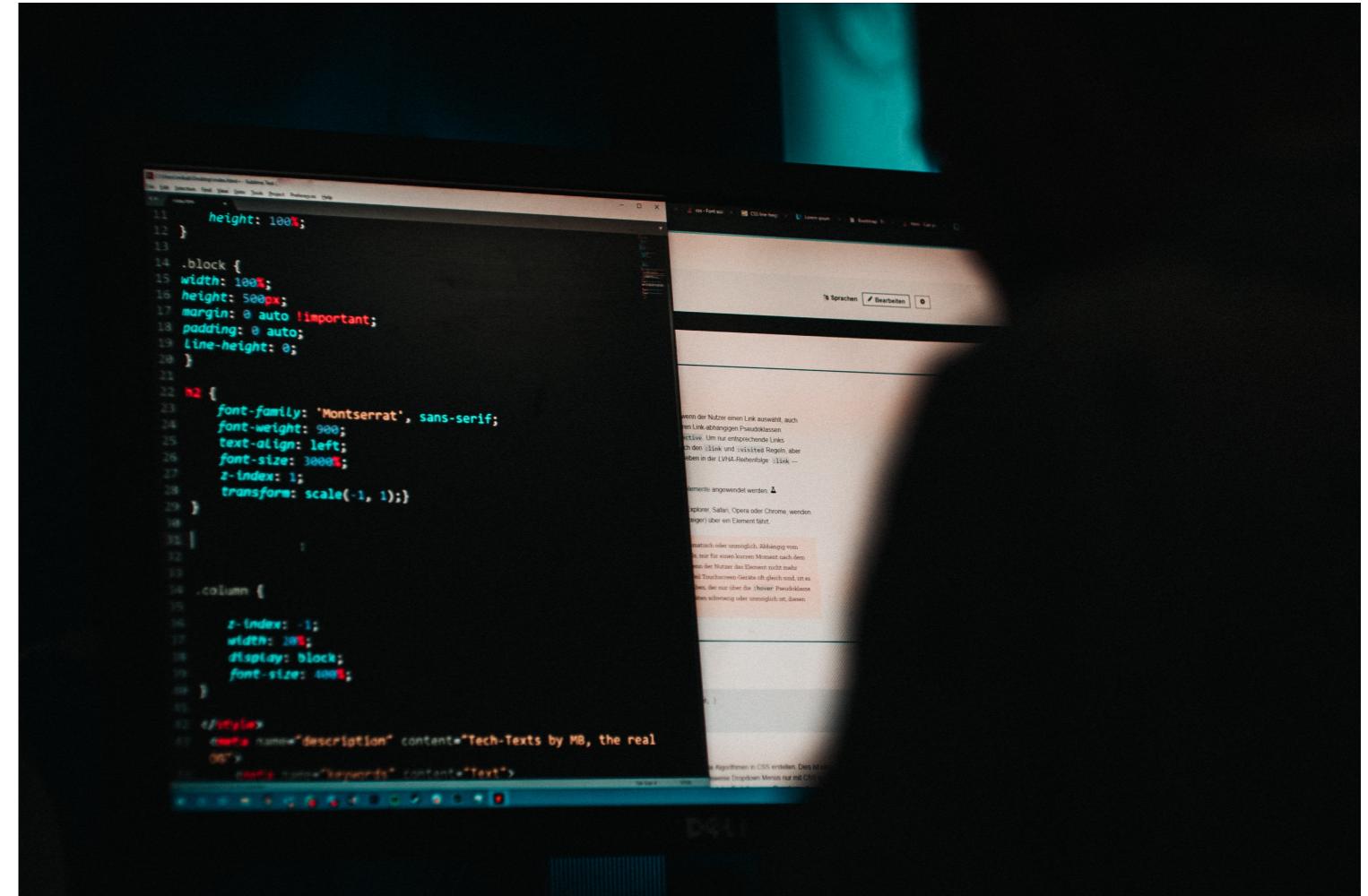
# Case study: fraud detection

A set of transactions on an account has been flagged as possibly fraudulent.

How should we proceed?

- Generate rules to select best action
- Simulate estimated losses with each scenario

Use insights to help make informed decision



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