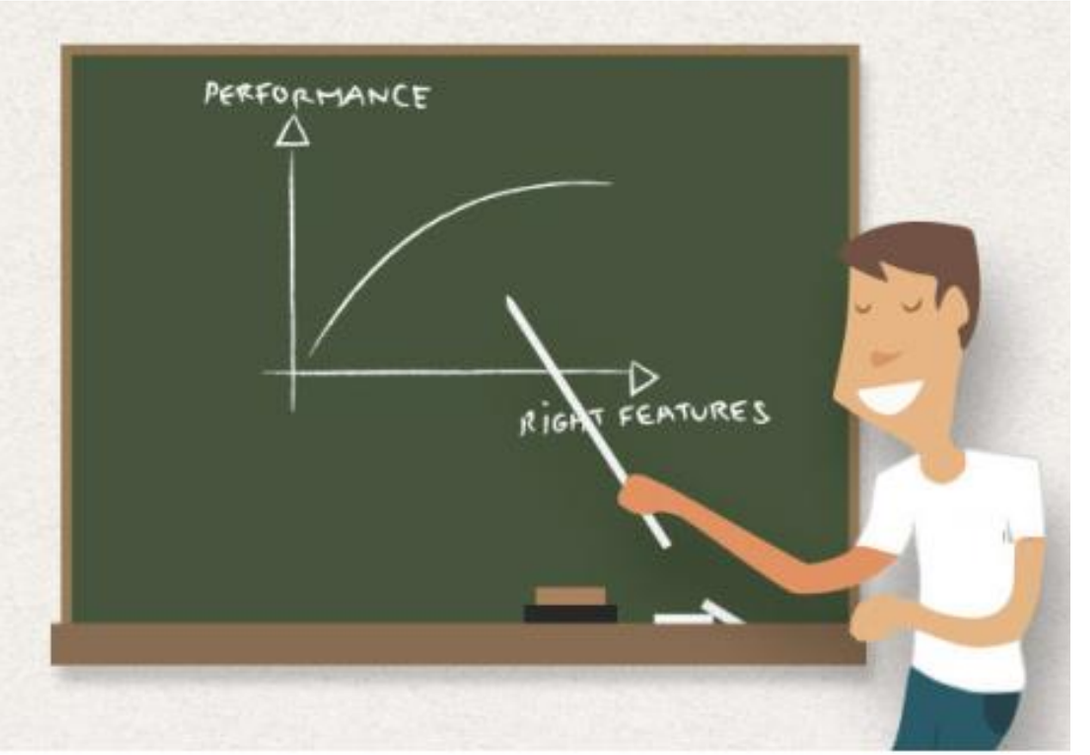
Microsoft

Business Analytics with Power BI

Microsoft Services

Module 3: Predictive Analytics with Power BI and R

Lesson 2: Machine Learning Introduction



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What **is** Machine Learning?

Methods and Systems that …

Adapt based on the recorded data

Predict new data based on recorded data

Optimize an action given an utility function

Extract hidden structure from the data

Summarize data into concise descriptions

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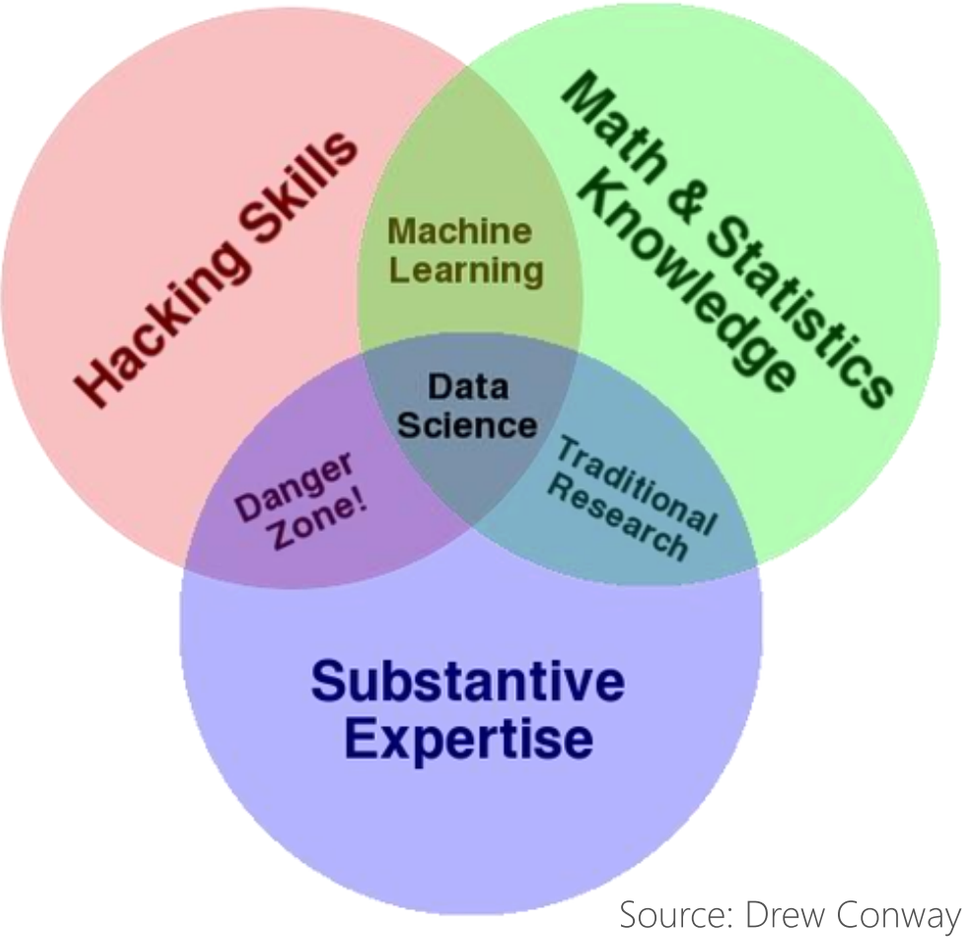
Machine Learning

Common definitions

"The goal of machine learning is to build computer systems that can adapt and learn from their experience." (Tom Dietterich)

"Field of study that gives computers the ability to learn without being explicitly programmed" (Arthur Samuel)

"A computer program is said to learn from experience E with respect to some class of tasks T and performance measure P if its performance at tasks in T, as measured by P, improves with experience E." (Tom Mitchel)



Source: Drew Conway

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Machine Learning **is not**

Methods and Systems that …

Can yield **Garbage-In-Knowledge-Out**

Can perform good **predictions without data modeling** & feature engineering

Silver-bullet for all data-driven tasks – it's a powerful data tool!

Is a **replacement for business rules** – they augment them!

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Why Learn?

1. Learn it when you can't code it
   (e.g. Recognizing Speech/image/gestures)

2. Learn it when you can't scale it
   (e.g. Recommendations, Spam & Fraud detection)

3. Learn it when you have to adapt/personalize
   (e.g. Predictive typing)

4. Learn it when you can't track it
   (e.g. AI gaming, robot control)

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Can Machine Learning Help Me?

- Automated prediction is core
- Lots of past data already available
- Magic numbers in the current prediction system

Yes

- Prediction is small part of the experience
- No past data available
- Many business-rules govern the experience
- Predictions do not have a predictable pattern

No

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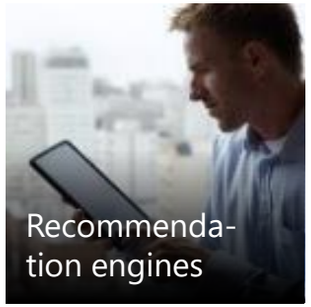
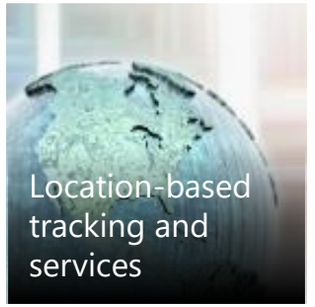
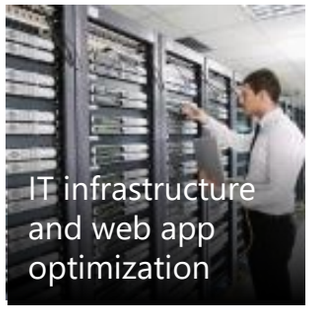
Real world problems

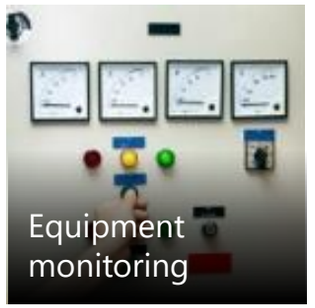
Predictive Analytics

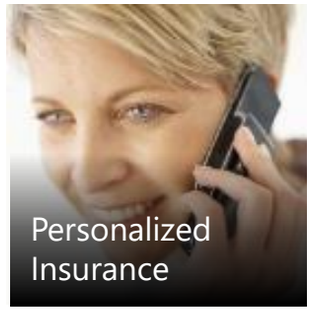
Predictive analytics should address the likelihood of something happening in the future, even if it is just an instant later…











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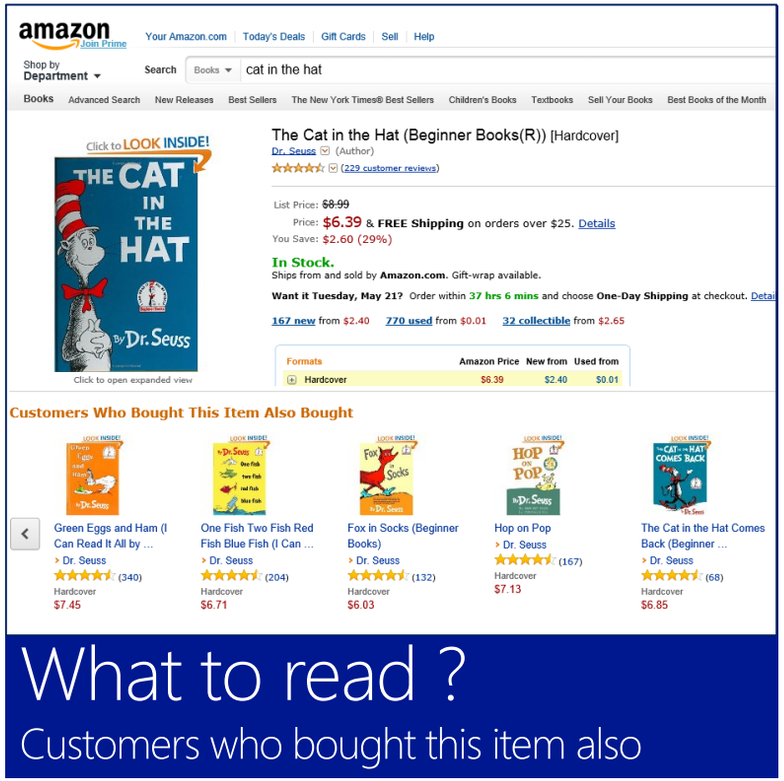
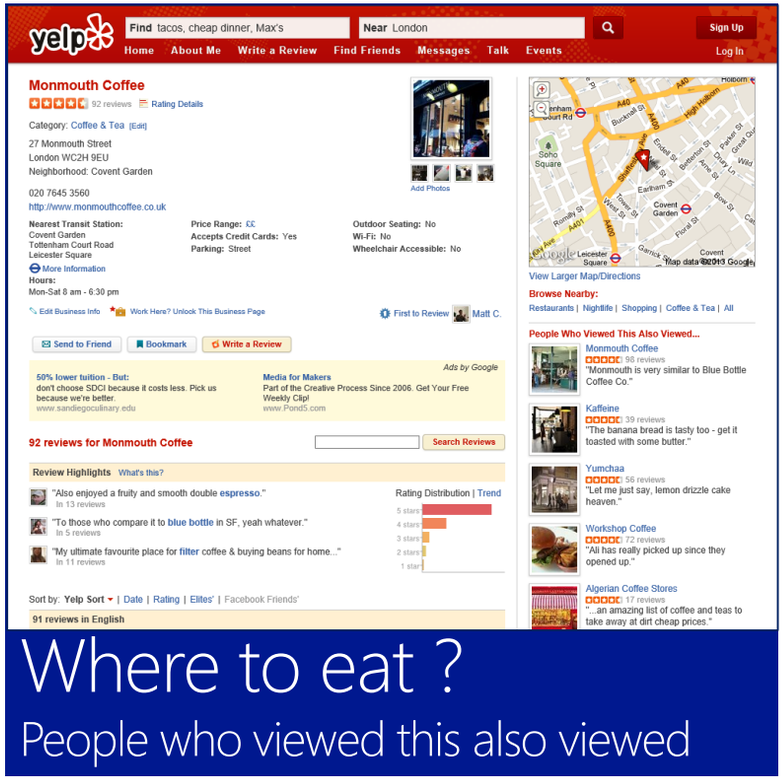
Real world problems



What to read ?

Customers who bought this item also



Where to eat ?

People who viewed this also viewed

What to buy ?

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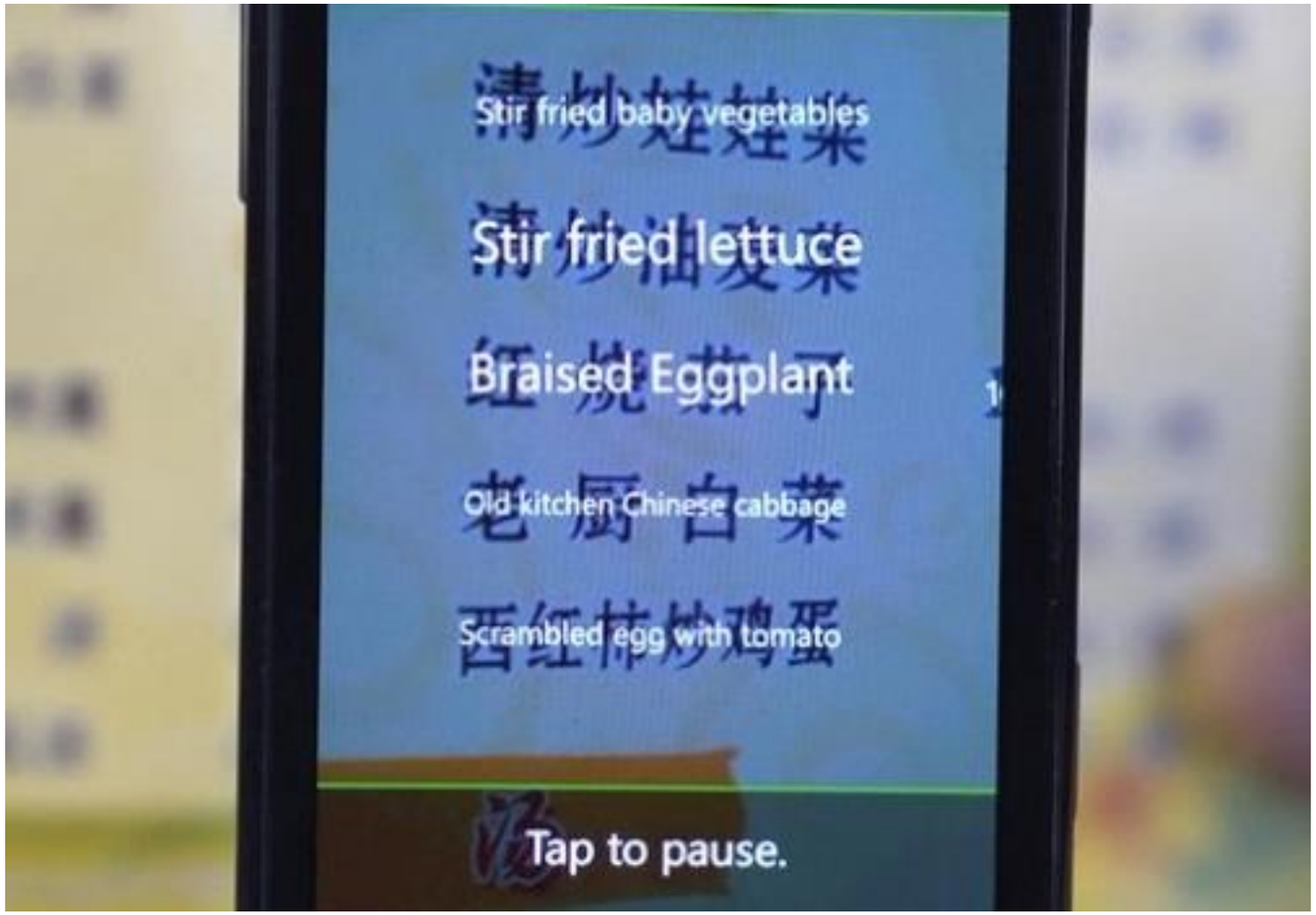
Real world problems

Example from Microsoft



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Real world problems

Example from Microsoft

Store

Search for apps

Picks for you ›

Popular with people who have Star Chart
Not interested

SkyMap Free
The popular Windows Phone SkyMap application, downloaded by more than one million users, now comes to Windows 8! SkyMap Free
Free ★★★★☆ 206 Education

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Get an incredible reading experience with NOOK® from Barnes & Noble, one of the world's largest booksellers. With a rich history of
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One of the top 5 downloaded Music & Video apps last week
Not interested

VLC for Windows 8
VLC for Windows 8 is an experimental port of VLC media player for the WinRT platform. VLC media player is an open source application
Free ★★★½☆ 2,550 Music & Video

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Not interested

OneNote
Microsoft OneNote is your digital notebook for keeping track of what's important in your life. Jot down your ideas, keep track of
Free ★★★★☆ 5,758 Productivity

Popular with people who have Star Chart
Not interested

Tour The Universe
Take a tour of the Universe as we learn about the planets, stars and galaxies.
Free ★★★★☆ 50 Education

Popular with people who have Remote Desktop
Not interested

Lync
You can use the Lync Windows Store app to join a Lync Meeting, but you must have a Lync account already to enjoy all the advanced
Free ★★★☆☆ 1,726 Productivity

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Real world problems

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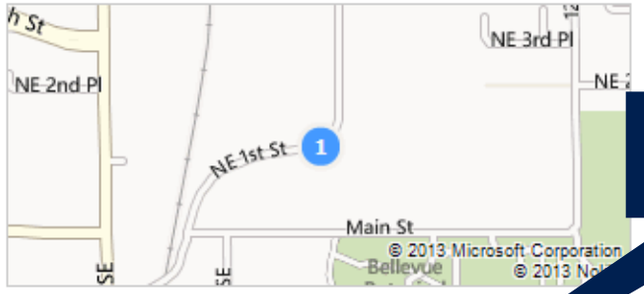
Seattle's Best Mortgage Inc



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Website: seattlesbm.com

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Mortgage Calculator

Ads related to **getting a morgage in seattle**

What language?

Which ads to show, and in what order?

Misspelled?

Which links are most likely to get clicked?

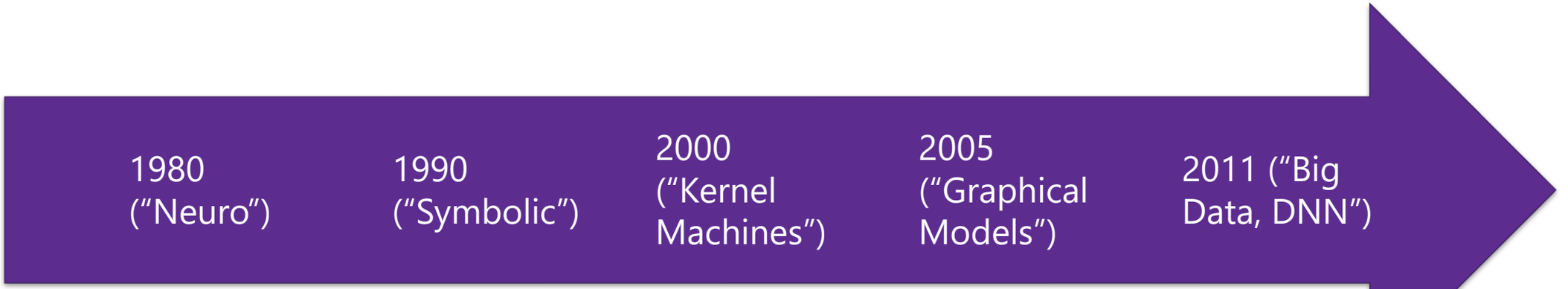
What is the probability of a click on each ad?

What is the intent?

Are any of these pages malicious?

What pages should we index?

History of Machine Learning



1980 ("Neuro")

- Neural Networks
- Artificial Intelligence
- *Learning = Adaptation of Neurons based on External Stimuli*

1990 ("Symbolic")

- Expert Systems
- Decision-Tree Learning (C4.5)
- *Learning = Methods to automatically build Expert Systems*

2000 ("Kernel Machines")

- Statistical Learning Theory
- Scoring Systems
- *Learning = Optimization of Convex Functions*

2005 ("Graphical Models")

- Wide application in products
- Statistical Modeling of Data
- *Learning = Parameter Estimation or Inference*

2011 ("Big Data, DNN")

- Distributed computing and storage
- Deep Neural Networks
- *Learning = Scalable, Adaptive Computation for Various Big Data*

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Machine Learning

Common/Basic concepts

Feature and Labels

Predictive Model

Feature Engineering

Supervised Learning

Binary x Multiclass Problems

Unsupervised Learning

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Machine Learning

Problem categories x Samples

Classification	"Is it going to rain tomorrow? Yes or no?" "What is the facial expression in this picture? Neutral/Happy/Sad"
Regression	"What is the consumption in miles per galon of this car?" "What will be the max temperature tomorrow?"
Anomaly Detection	"Is this credit card operation valid or a fraudulent one?"
Clustering	"I have several .mp3 files here and I want to group them. I don't know what is the type for each file."

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Machine Learning

Problem categories x Algorithms

Classification	Decision Tree | Naïve Bayes Support Vector Machines | Logistical Regression Neural Networks
Regression	Linear Regression Bayesian Linear Regression Poisson Regression
Anomaly Detection	One-Class Support Vector Machine
Clustering	K-Means

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Knowledge Check

Basic Concepts of Machine Learning

1. When you should use machine learning techniques?

2. What is a binary problem?

3. What is the major difference between a classification problem and a regression problem?

4. What kind of problems anomaly detection algorithms may be useful?

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