VIBE PROJECT

Virtual Biomedical and STEM/STEAM Education

2021-1-HU01-KA220-HED-000032251

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PATTERN RECOGNITION IN BIOMEDICAL ENGINEERING

UNSUPERVISED LEARNING

Learning

- Increased with work in artificial intelligence
- New computer capabilities

Examples:

- Database Mining
  - Data Growth Due to Process Automation
  - Web click data, medical records, biology, engineering.
- Apps can't program manually.
  - Autonomous medical robots, handwriting recognition, Natural Language Pressing (NLP) processing, computer vision.

Machine Learning

- Increased with work in artificial intelligence
- New computer capabilities

Examples:

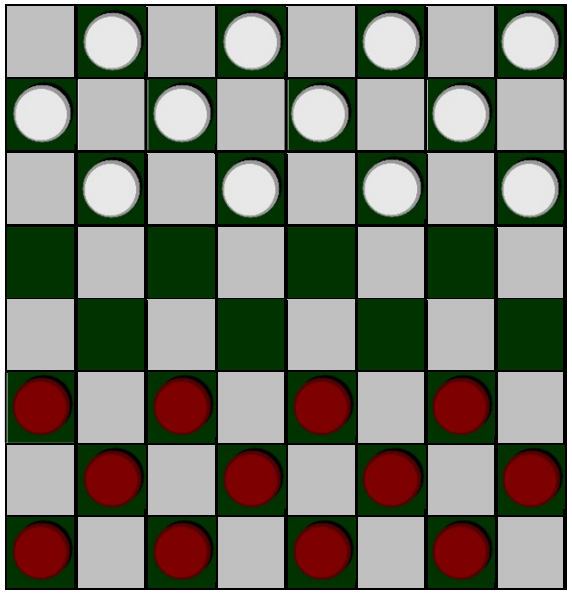
- Self-adaptive programs

  Product recommendations from Netflix, Amazon.

- Understanding human learning (brain, real AI).

Machine learning definition

- Artur Samuel (1959). Machine learning: A field of study that gives computers the ability to learn without being explicitly programmed.



Machine learning definition

- Artur Samuel (1959). Machine learning: A field of study that gives computers the ability to learn without being explicitly programmed.
    - Tom Mitchell (1998) A well-posed learning problem: A computer program is said to learn from experience D with respect to task Z and some measurements of performance W if its performance on Z, as measured by W, improves with experience D.

A computer program is able, let's say, to learn from experience D with respect to the task Z and with some measure of performance W, if the efficiency, the effectiveness of the computer program Z, measured by the measure W, increases with experience D.

Let's say your email program watches which emails you flag as "spam" and which you don't flag as "spam" and learns how to better filter spam based on that.

What is the task of T in this setting?

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What is the task of T in this setting?

- ◯ Classify emails as spam or not as spam.
- ◯ Observe how you label/flag emails as spam or not as spam
- ◯ The number (or fraction) of emails correctly classified as spam/not spam
- ◯ None of the above, it's not a problem with machine learning.

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Z D W

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Machine Learning Algorithms:

- Supervised learning
- Unsupervised learning

Other: Reinforcement learning, recommender systems

Practical advice on the use of learning algorithms.

Introduction to Supervised Learning

Forecast of cases

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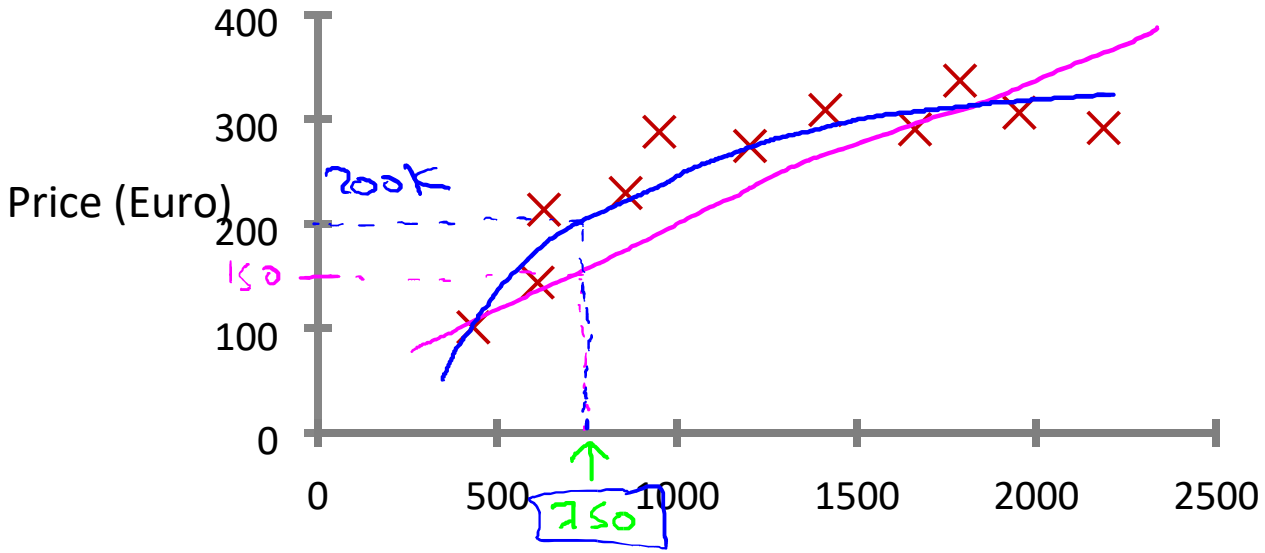
Introduction to Supervised Learning



Supervised learning

"appropriate answers" given

Regression: Continuity prediction

Output value (price)

Introduction to Supervised Learning

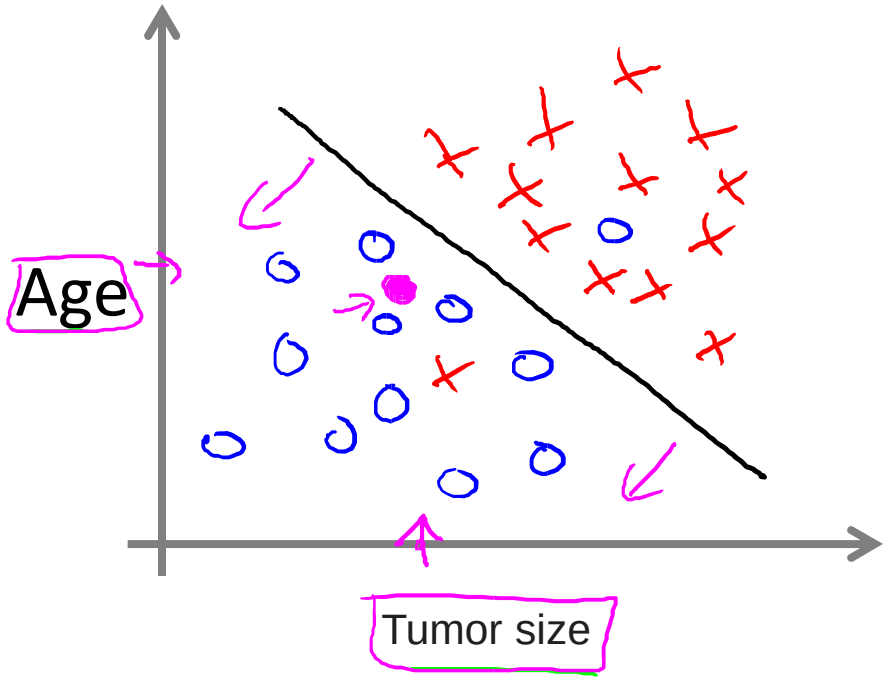
Breast cancer (malignant, benign).

Supervised Learnig

Tumor sponginess structure

Uniformity of cell size

Uniformity of cell shape...



Introduction to Supervised Learning

You run a business and want to develop learning algorithms to solve each of the two problems.

Problem 1: You have a large inventory of identical items. You want to predict how many of these items will sell in the next 3 months.

Problem 2: You want the software to check individual customer accounts and decide for each account if it has been hacked/compromised.

Should they be treated as classification or regression problems?

Introduction to Supervised Learning

You run a business and want to develop learning algorithms to solve each of the two problems.

1000s

Problem 1: You have a large inventory ~~of identical items~~s. You want to predict how many of these items will sell in the next 3 months.

Problem 2: You want the software to check individual customer accounts and decide for each account if it has been hacked/compromised.

0 – not hacked
1 – hacked

Should they be treated as classification or regression problems?

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Introduction to Supervised Learning

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Problem 2: You want the software to check individual customer accounts and decide for each account if it has been hacked/compromised.

- ○ Treat both as classification problems.
- ○ Treat problem 1 as a classification problem, problem 2 as a regression problem.
- ○ Treat problem 1 as a regression problem, problem 2 as a classification problem.
- ○ Think of both as regression problems.

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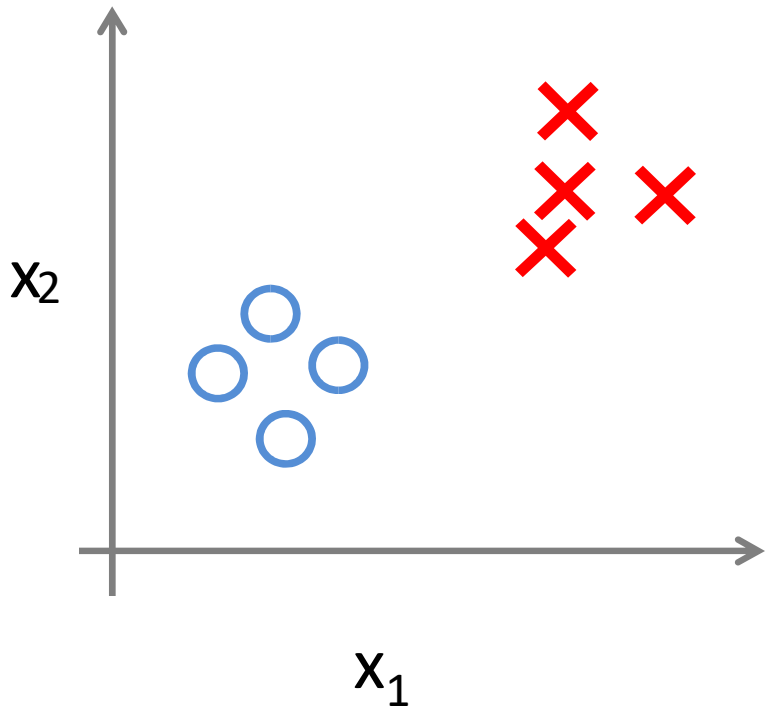
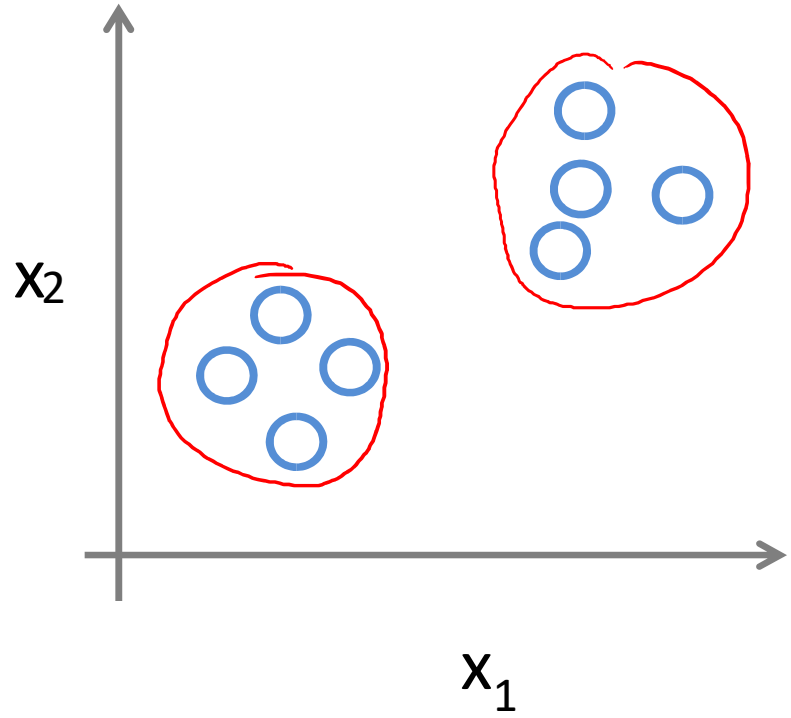
Supervised learning



Unsupervised learning



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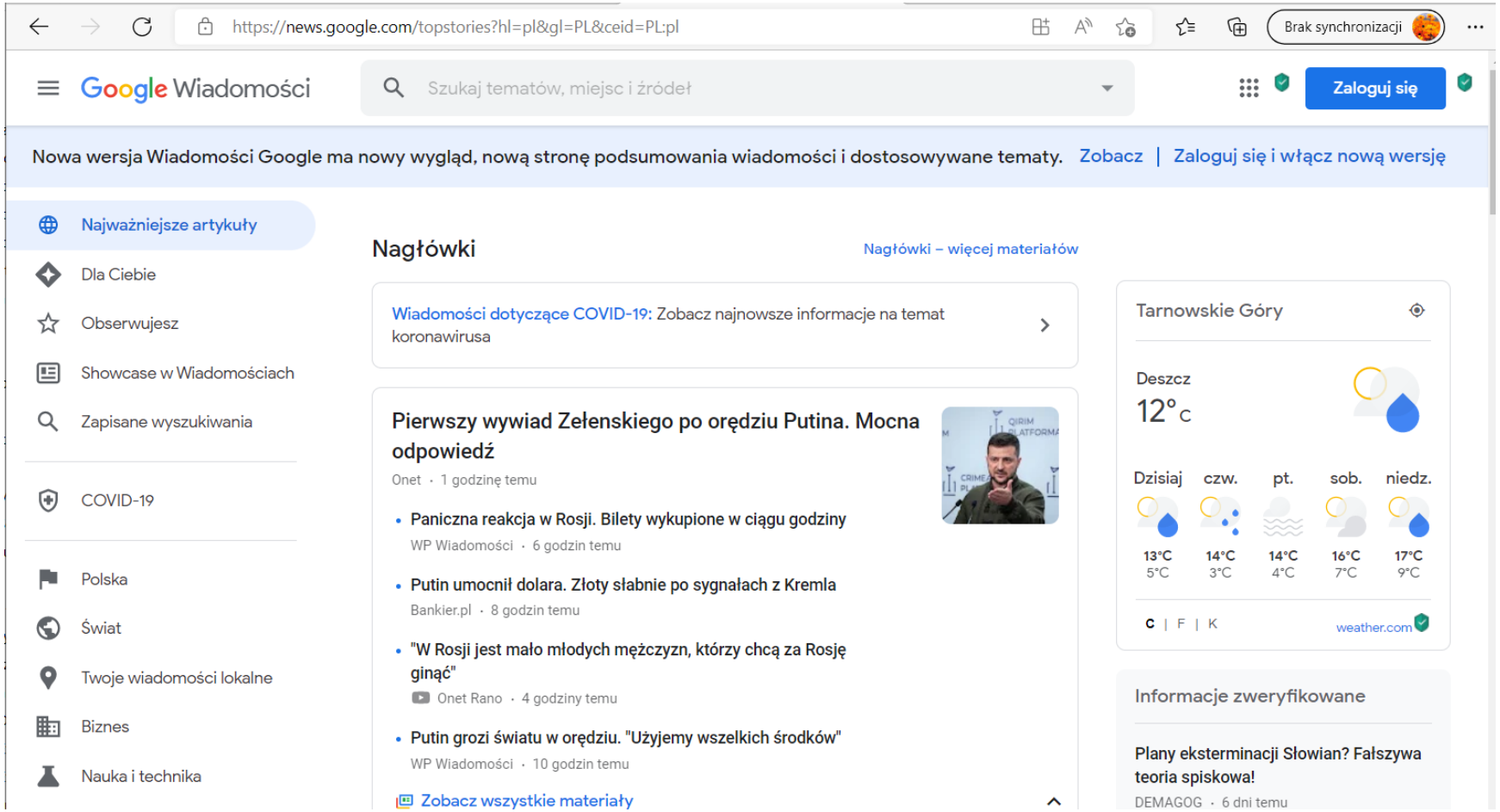

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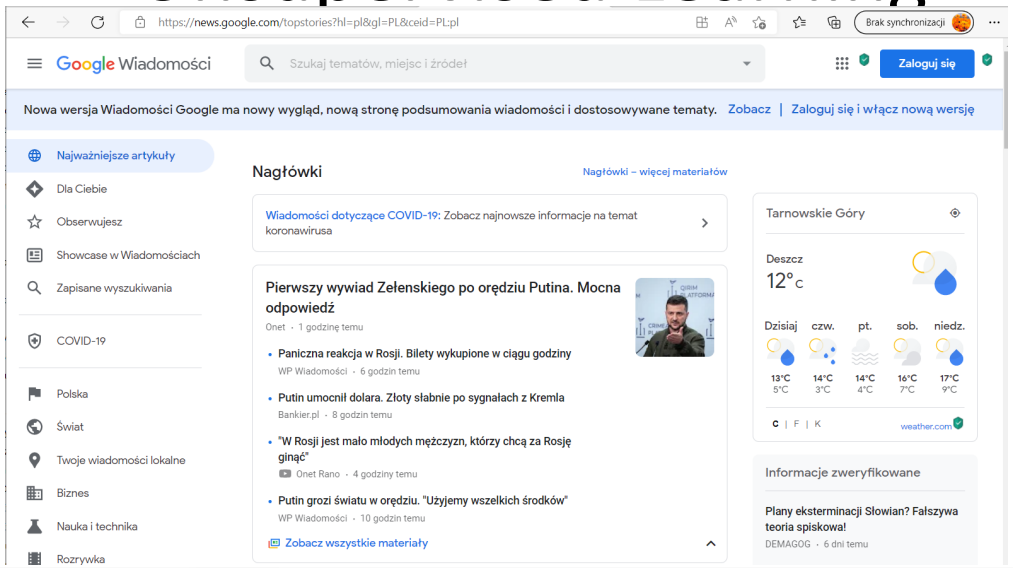


Zełenski u Niemców odpowiedział na orędzie Putina. Mocne słowa prezydenta Ukrainy

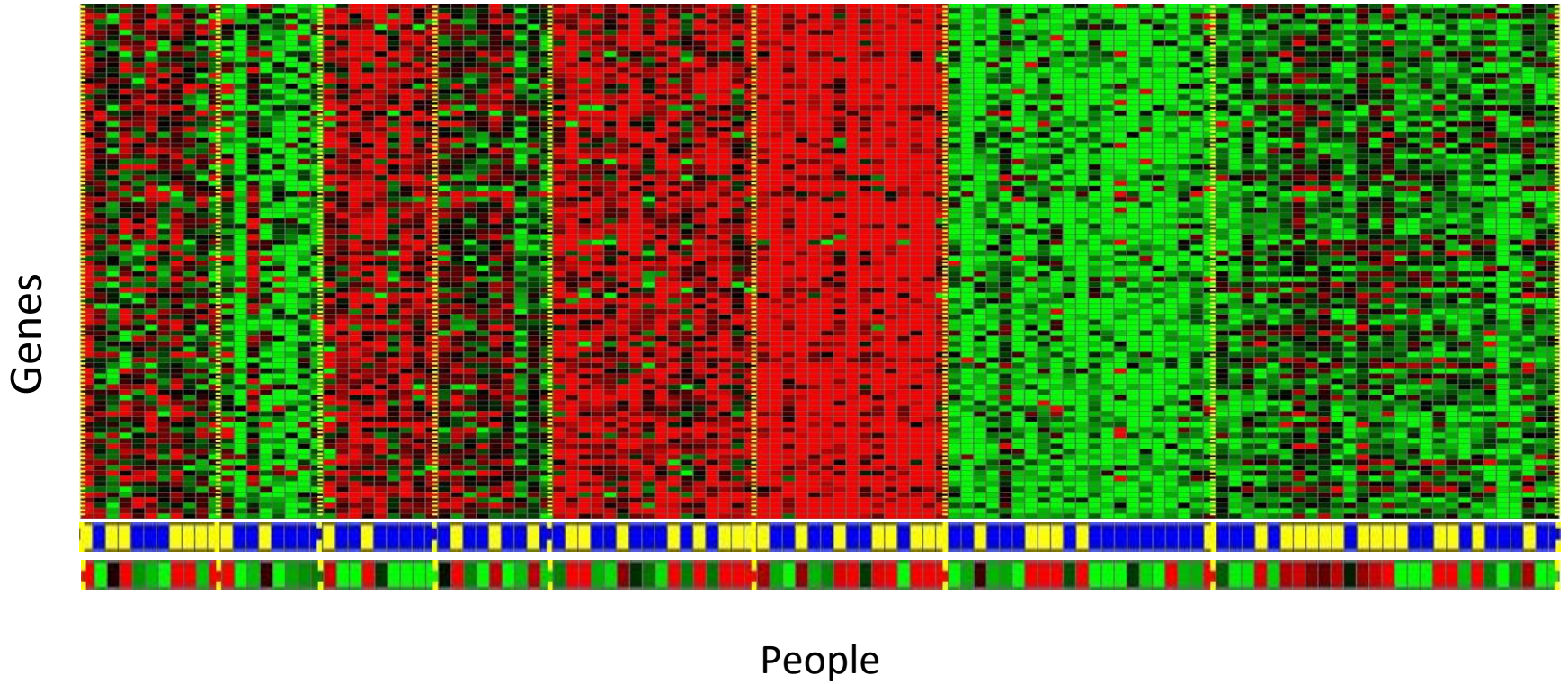
Adam Nowiński - 2 godz. temu

Zareaguj

Więcej ciekawych artykułów znajdziesz na stronie głównej naTemat.pl >>

- W środę w rosyjskiej telewizji pojawiło się orędzie Władimira Putina, który ogłosił częściową mobilizację w kraju oraz zagroził Zachodowi użyciem broni atomowej
- Wołodymyr Zełenski odpowiedział na groźby Putina i udzielił komentarza niemieckiemu dziennikowi "Bild"

Introduction to Unsupervised Learning



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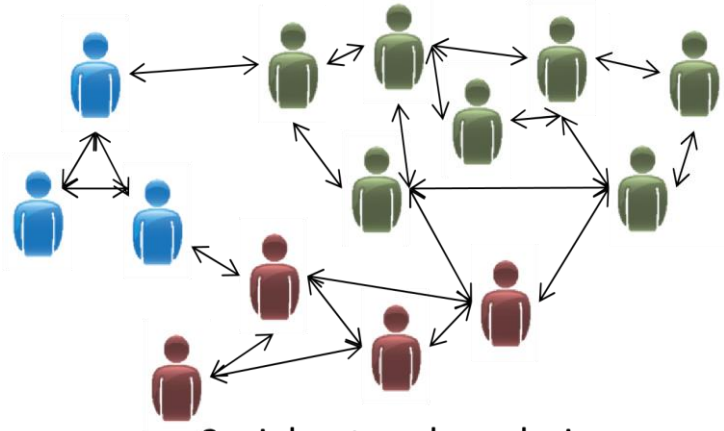
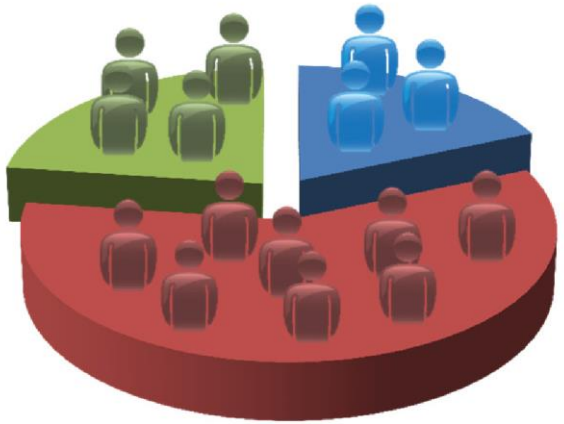
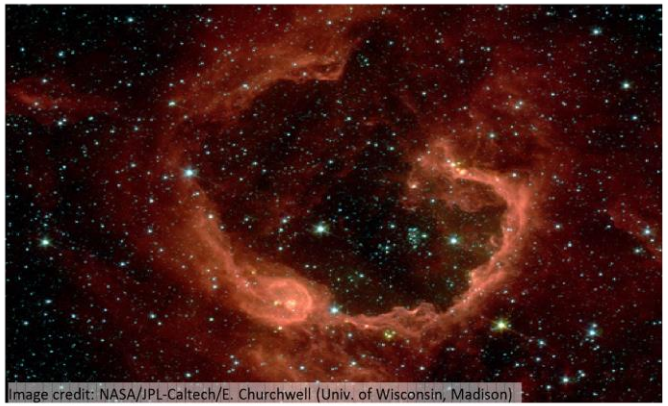
Organize computing clusters



Social network analysis



Market segmentation



Astronomical data analysis

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Introduction to Unsupervised Learning

The problem with eavesdropping at OWL and FRIENDS

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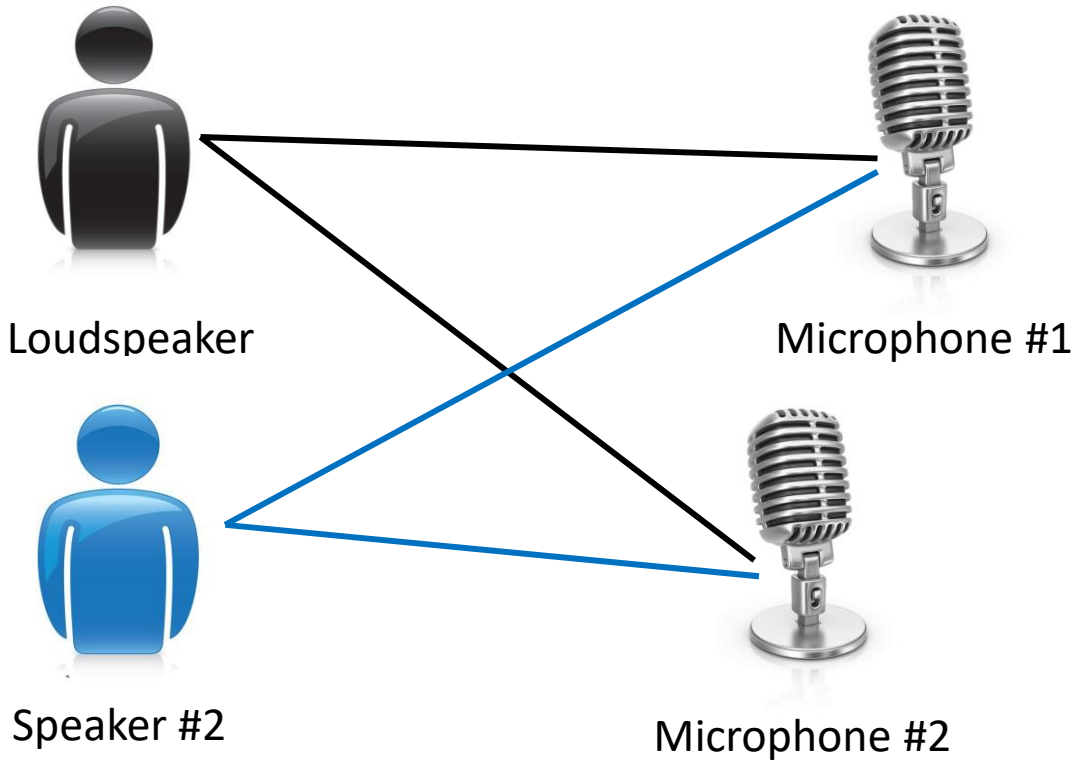

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Introduction to Unsupervised Learning

The problem with eavesdropping at OWL and FRIENDS

Algorithm of the wiretapping problem:

```
[W,s,v] =  svd((repmat(sum(x.*x,1),size(x,1),1).*x)*x');
```

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Introduction to Unsupervised Learning

From the following examples, which solutions would you refer to using an unsupervised learning algorithm?
(Check everything that applies.)

- [ ] Given emails marked as spam/not spam,
  Get to know the spam filter.

- [ ] Given a set of news articles
  found on the Internet, group them into a set of articles with the same story.

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Introduction to Unsupervised Learning

From the following examples, which solutions would you refer to using an unsupervised learning algorithm?
(Check everything that applies.)

- [ ] Given the customer database, the automated ally discovers market segments and groups clients into different segments of the real estate market

- [ ] Given the dataset of patients diagnosed with or not diagnosed with diabetes, Learn to classify new patients as having diabetes or not.

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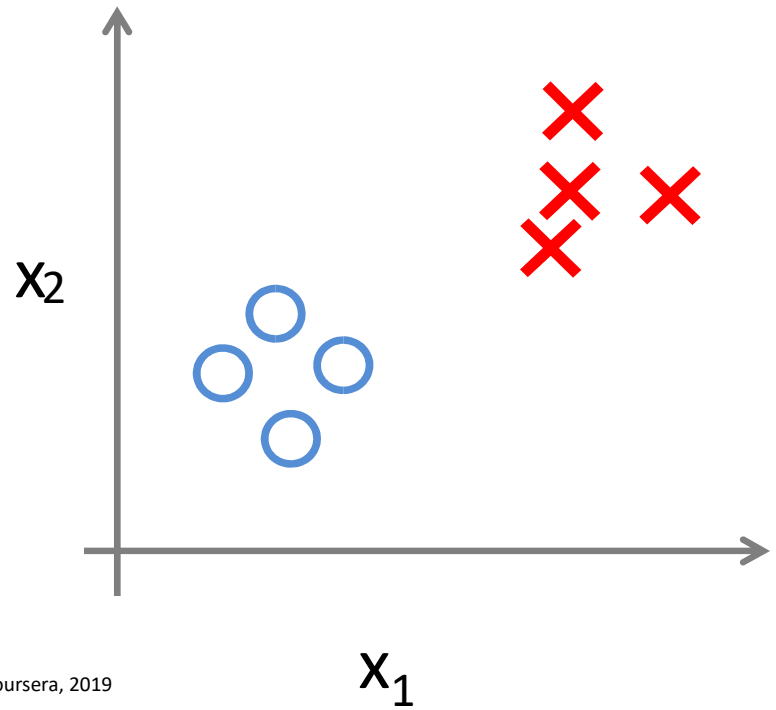
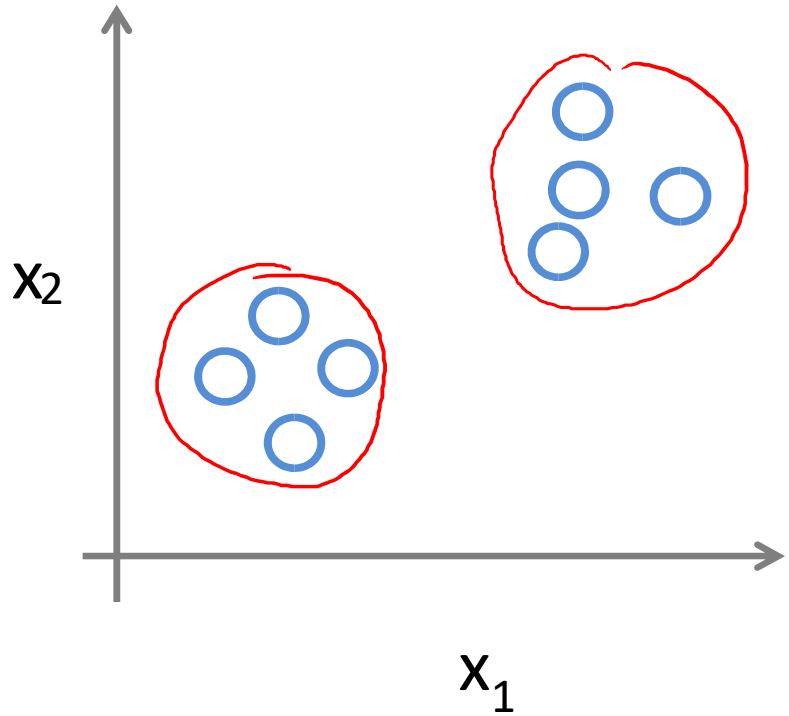
Supervised learning



Unsupervised learning



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