Machine Learning
Welcome

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چهار شاخه مرتبط

□ Statistics

□ Artificial Intelligence

□ Machine Learning

□ Data Mining

□ آمار

□ هوش مصنوعی
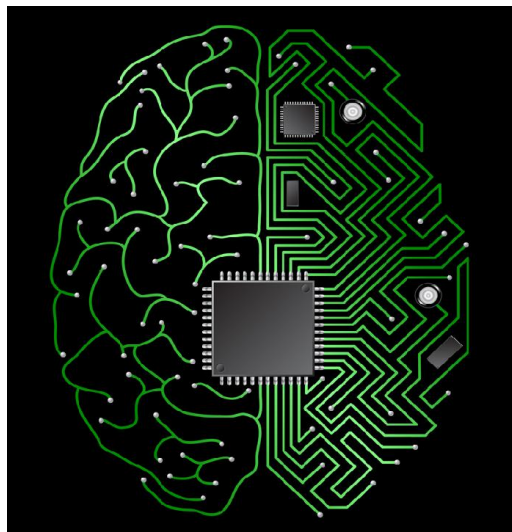
□ یادگیری ماشین

□ داده کاوی

Artificial Intelligence

□ Main AI problems:
- o Reasoning
- o Knowledge representation
- o Automated planning
- o Machine learning
- o Natural language processing
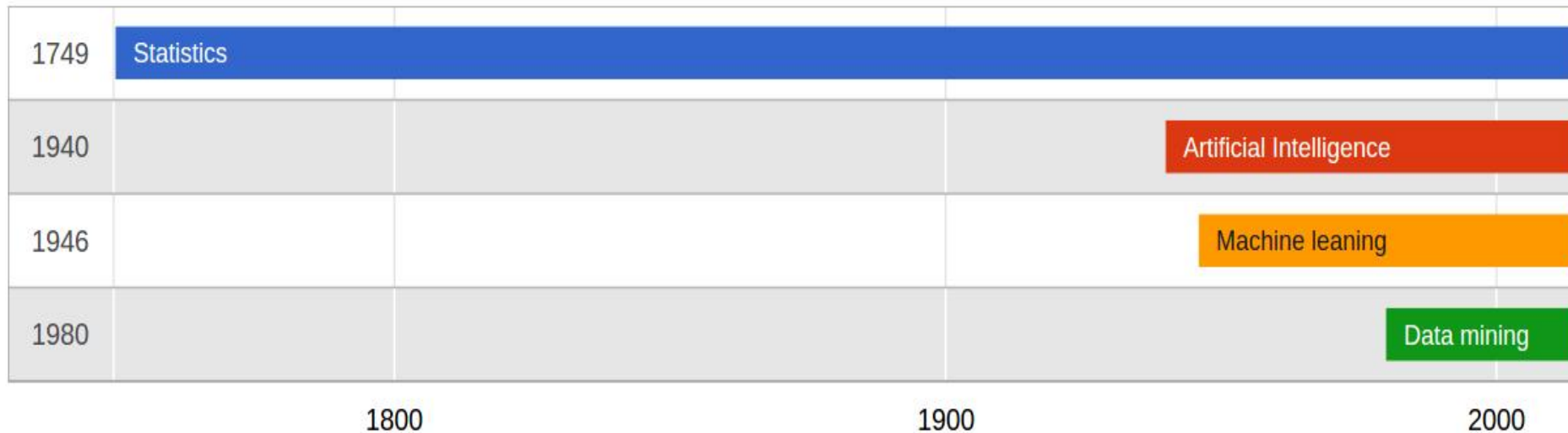- o Computer vision
- o Robotics
- o Chatbots:
  - • ALICE
  - • Oliver

□ مسائل اصلی هوش مصنوعی
- o استدلال
- o بازنمایی دانش
- o برنامه ریزی خودکار
- o یادگیری ماشین
- o پردازش زبان طبیعی
- o بینایی ماشین
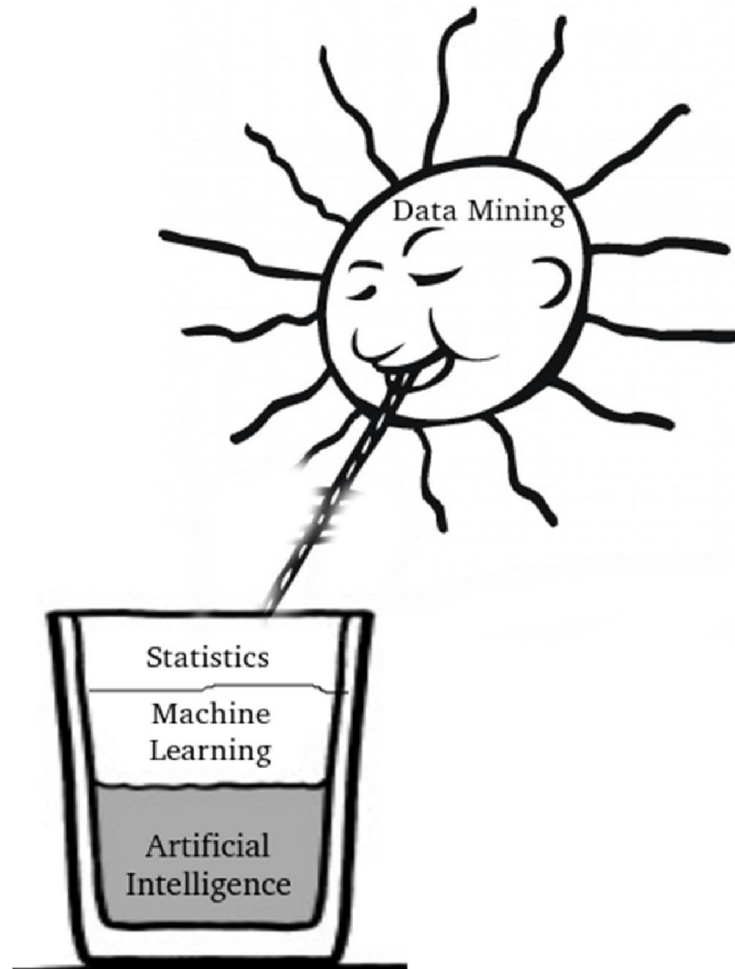- o رباتیک
- o اتاق گَپ
- o ...

Hierarchy

□ سلسه مراتب

Interdependency

□ ارتباط چهار شاخه

What is Machine Learning?

❑ Herbert Simon (1970)
  o Any process by which a system improves its performance.

❑ Tom Mitchell (1990)
  o A computer program that improves its performance at some task through experience.

❑ Ethem Alpaydin (2010)
  o Programming of computers to optimize a performance criterion using example data or past experience.

❑ Shai Ben-David (2014)
  o Automated detection of meaningful patterns in (large) datasets.

Machine Learning

❑ Machine learning is the study of algorithms that learn from data and experience.

○ Any area in which you need to make sense of data is a potential consumer of machine learning.

Machine Learning (cont.)

❑ Machine learning (ML) develops algorithms for making predictions from data.

○ What does "prediction" mean here?

When ML is Used?

❑ Three criteria:

1. A pattern exists.
2. We cannot pin it down mathematically.
3. We have data on it ++

Learning Types

□ Types of machine learning algorithms:

  o Supervised learning
  o Unsupervised learning
  o <u>Reinforcement learning</u>
           – – –

    • Semi-supervised learning
    • Deep Learning
    • Transfer learning
    • Active learning
    • Multilabel prediction
    • …

□انواع الگوریتمهای یادگیری ماشین:

  o یادگیری تحت نظارت/با معلم
  o یادگیری بدون نظارت/بدون معلم
  o یادگیری تقویتی
       – – –

    • یادگیری نیمه تحت نظارت
    • یادگیری عمیق
    • یادگیری از طریق انتقال
    • یادگیری فعال
    • پیش بینی چند برچسبی
    • ...

Machine Learning Scholars

Robert Tibshirani   Cited by 277501
Professor of Biomedical Data Sciences, and of Statistics, Stanford University
Verified email at stanford.edu

Statistics   Applied Statistics   Statistical learning   machine learning   data science

Geoffrey Hinton   Cited by 239729
Emeritus Prof. Comp Sci, U.Toronto & Engineering Fellow, Google
Verified email at cs.toronto.edu

machine learning   neural networks   artificial intelligence   cognitive science
computer science

Anil K. Jain ·   Cited by 182724
Michigan State University
Verified email at cse.msu.edu

Biometrics   Computer vision   Pattern recognition   Machine learning
Image processing

Trevor Hastie   Cited by 179240
Professor of Statistics, Stanford University
Verified email at stanford.edu

Statistical learning and modeling   data mining   machine learning

vapnik   Cited by 169396
Professor of Columbia, Fellow of NEC Labs America,
Verified email at nec-labs.com

machine learning   statistics   computer science

Machine Learning Scholars

Jitendra Malik
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Professor of EECS, UC Berkeley
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Computer Vision   Computer Graphics   Machine Learning

Michael I. Jordan
Cited by 140992

Professor of EECS and Professor of Statistics, University of California, Berkeley
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machine learning   statistics   computational biology   artificial intelligence   optimization

Yoshua Bengio
Cited by 132603

Professor, U. Montreal (Computer Sc. & Op. Res.), MILA, CIFAR, CRM, REPARTI, GRSNC
Verified email at umontreal.ca

Machine learning   deep learning   artificial intelligence

Thomas Huang
Cited by 123083

University of Illinois, Urbana-Champaign
Verified email at ifp.uiuc.edu

AI   Image Processing   Computer Vision   Pattern Recognition   Machine Learning

Bernhard Schölkopf
Cited by 118758

Director, Max Planck Institute for Intelligent Systems; and Distinguished Amazon Scholar
Verified email at tuebingen.mpg.de

Machine Learning   Causal Inference   Artificial Intelligence
Computational Photography   Statistics

Applications

- Image & Speech Recognition
- Natural Language Processing
- Handwriting Recognition
- Autonomous Control (Planes, Trains, Automobiles, ...)
- Anomaly Detection in E-commerce (Fraud Detection)
- Twitter Topic Modeling
- Targeted Marketing
- Medical Diagnosis
- Rank Webpages in Search Engines
- Email Spam Filtering
- Recommender Systems
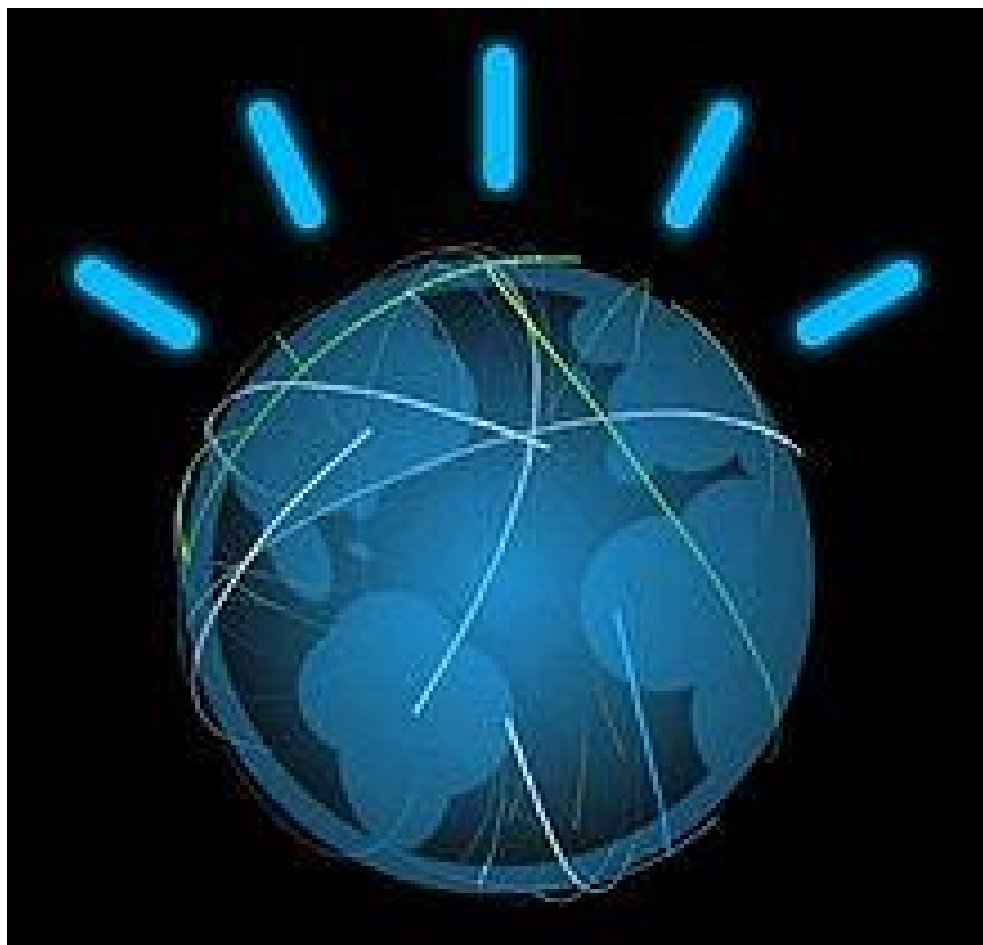- Bioinformatics
- Sleep Quality Detection
- ...

Heritage Health Prize
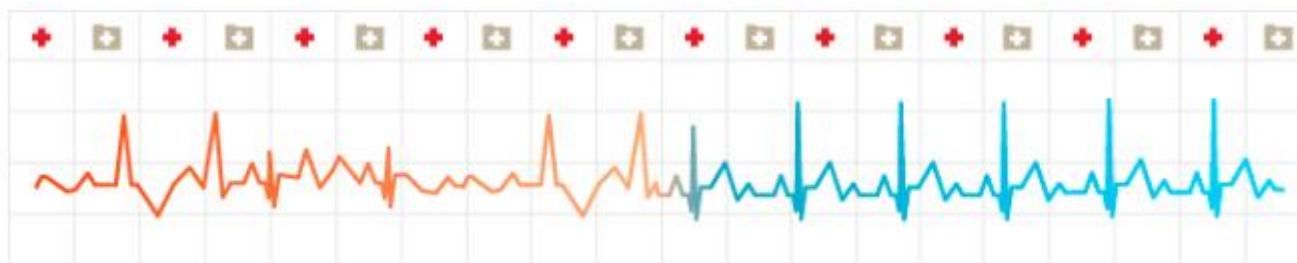
Improve Healthcare, Win $3,000,000.

Identify patients who will be admitted to a hospital within the next year using historical claims data.

IBM Watson

Microsoft Seeing AI Project

Robotics

□ Which of the following choices matches this figure?

   A. ROBI
   B. NAO
   C. ASIMO
   D. PEPPER
   E. CHEETAH

References

❑ Question & answer websites, including (not limited to):

  o shakthydoss.com
  o www.stackoverflow.com
  o stats.stackexchange.com
  o www.quora.com
  o …