



华南理工大学  
South China University of Technology

# Intro to Computer Science and Software Engineering

**Information Systems and AI**

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School of Software Engineering

# Database Management System

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## Database

A structured set of data

## Database management system (DBMS)

A combination of software and data, made up of a physical database, a database engine, and a database schema

## Physical database

A collection of files that contain the data

# Database Management System

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## Database engine

Software that supports access to and modification of the database contents

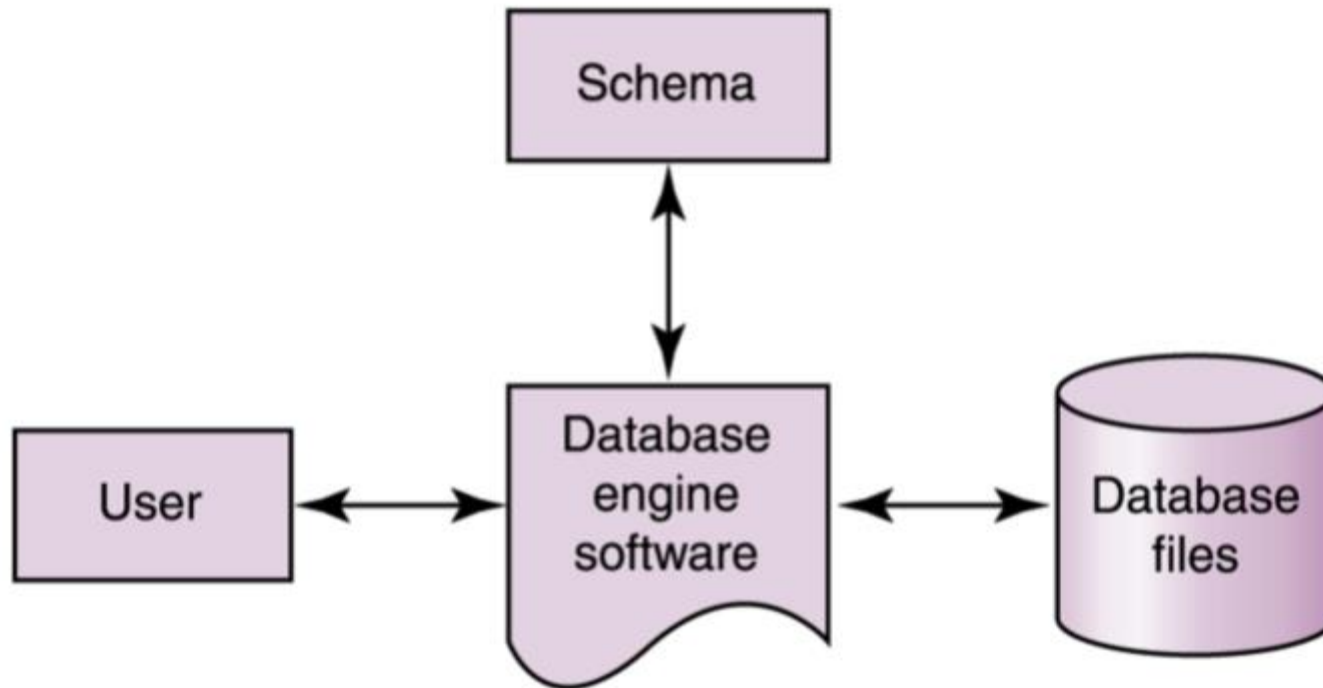
## Database schema

A specification of the logical structure of the data stored in the database

## Database query

A request to retrieve data from a database

# Database Management System



**The elements of a database management system**

# Relational Model



## Relational DBMS

A DBMS in which the data items and the relationships among them are organized into

## Tables

A collection of records

## Records (object, entity)

A collection of related fields that make up a single database entry

## Fields (attributes)

A single value in a database record

# A database table



**A database table, made up of records and fields**

Movielid	Title	Genre	Rating
101	Sixth Sense, The	thriller horror	PG-13
102	Back to the Future	comedy adventure	PG
103	Monsters, Inc.	animation comedy	G
104	Field of Dreams	fantasy drama	PG
105	Alien	sci-fi horror	R
106	Unbreakable	thriller	PG-13
107	X-Men	action sci-fi	PG-13
5022	Elizabeth	drama period	R
5793	Independence Day	action sci-fi	PG-13
7442	Platoon	action drama war	R

# Relational Model



## Key

One or more fields of a database record that uniquely identifies it among all other records in the table

We can express the schema for this part of the database as follows:

Movie (Movielfid, Title, Genre, Rating)

*Why need a key for a record ?*

# Relationships



How do we relate movies to customers?  
By a table, of course!

CustomerId	MovieId	DateRented	DateDue
103	104	3-12-2010	3-13-2010
103	5022	3-12-2010	3-13-2010
105	107	3-12-2010	3-15-2010

**A database table storing current movie rentals**



# Structured Query Language



## Structured Query Language (SQL)

A comprehensive relational database language for data manipulation and queries

select attribute-list from table-list where condition

name of field

name of table

value restriction

select Title from Movie where Rating = 'PG'

Result is a table containing all PG movies in table Movie

# Queries in SQL

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select Name, Address from Customer

select \* from Movie where Genre like '%action%'

select \* from Movie where Rating = 'R' order by Title

# Modifying Database Content

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insert into Customer  
values (9876, 'John Smith', '602 Greenbriar  
Court', '2938 3212 3402 0299')

update Movie set Genre = 'thriller drama'  
where title = 'Unbreakable'

delete from Movie where Rating = 'R'

## Entity-relationship (ER) modeling

A popular technique for designing relational databases

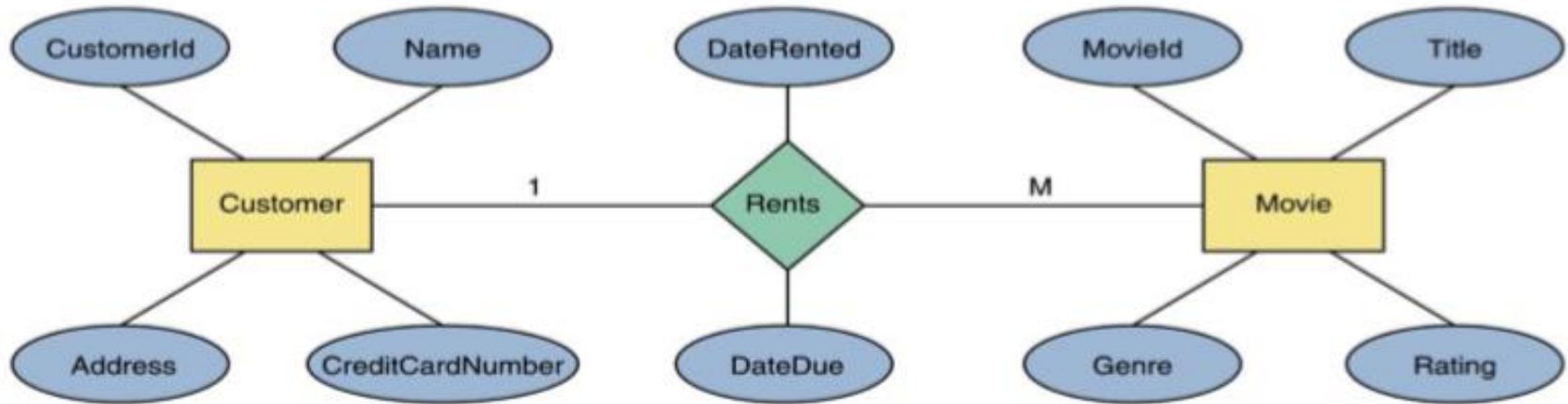
## ER Diagram

A graphical representation of an ER model

## Cardinality constraint

The number of relationships that may exist at one time among entities in an ER diagram

# Database Design



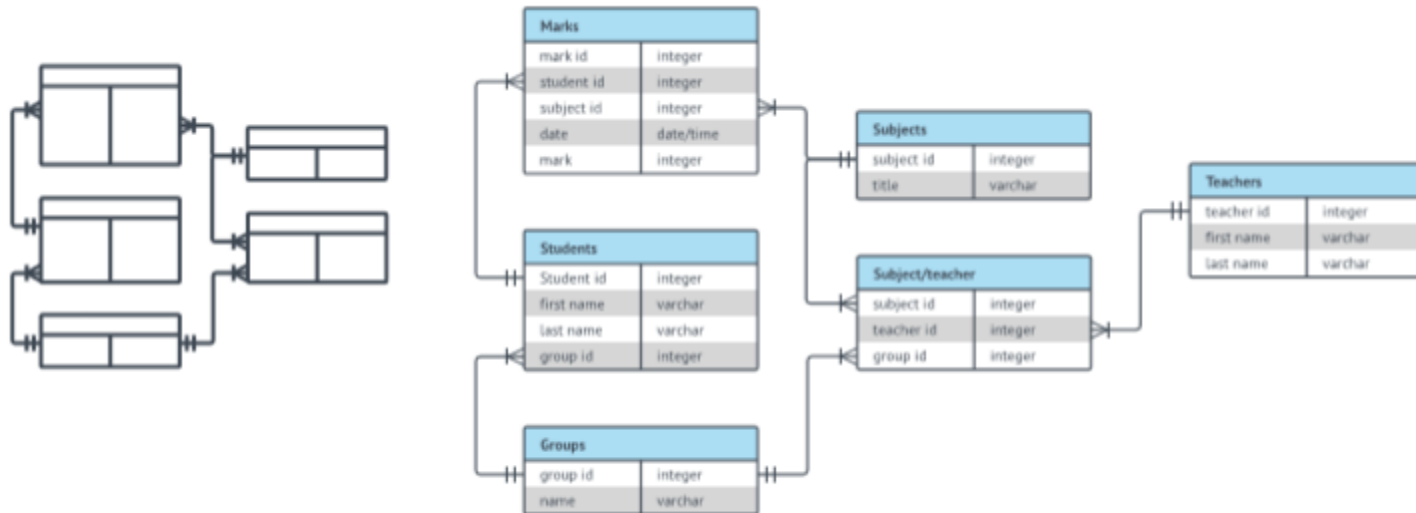
**An ER diagram for the movie rental database**

**How many movies can a person rent?**  
**How many people can rent the same movie?**

# Relational Model



## What is an Entity Relationship Diagram



<https://www.lucidchart.com/pages/er-diagrams>

## Electronic commerce

The process of buying and selling products and services using the Web.

- Can you name at least 4 e-commerce sites that you have visited lately?
- What made e-commerce feasible and easy? What problems does e-commerce face?

# 人工智能的详解

人工  
智能

Artificial Intelligence

计算机科学的一个分支

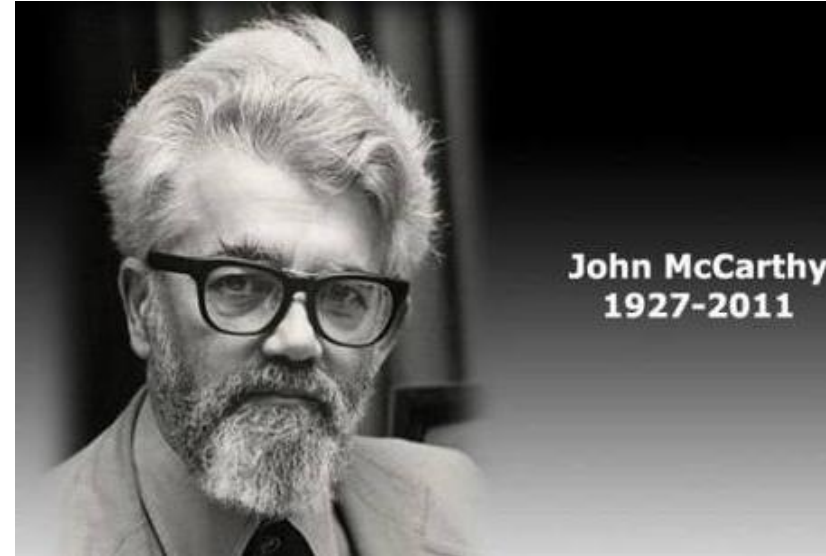
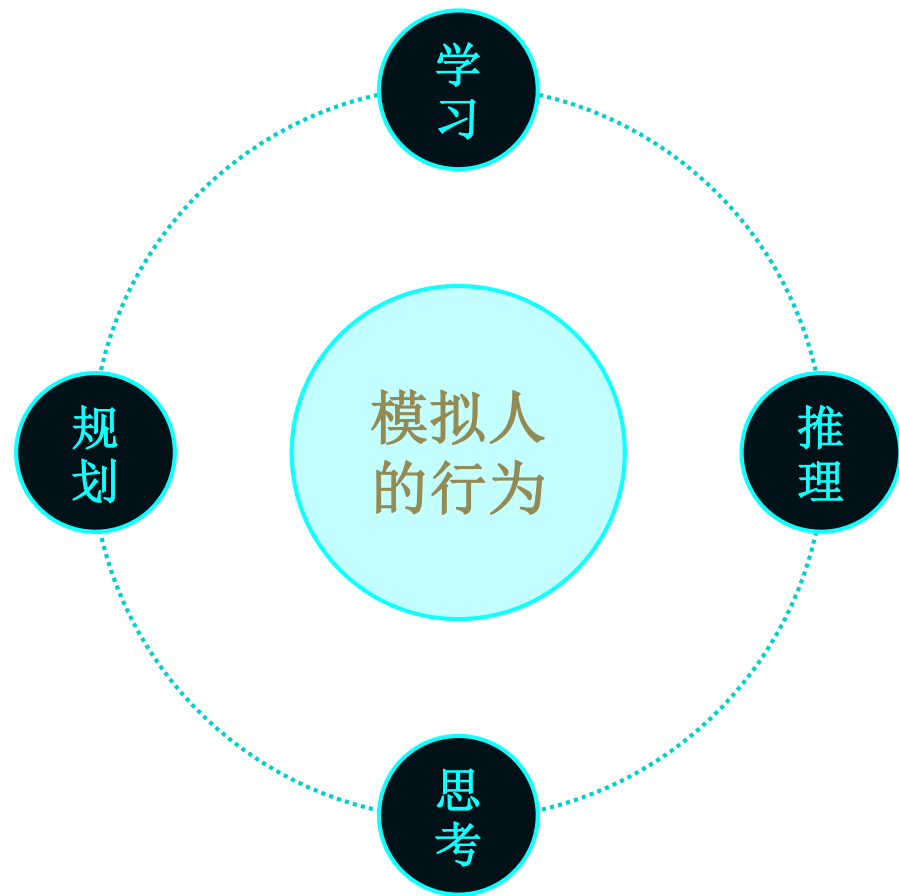
即人造的  
不是自然的！

动物大脑  
的奥妙！



# 人工智能的起源

“人工智能就是研究如何使计算机去做只有人才能做的智能工作。”



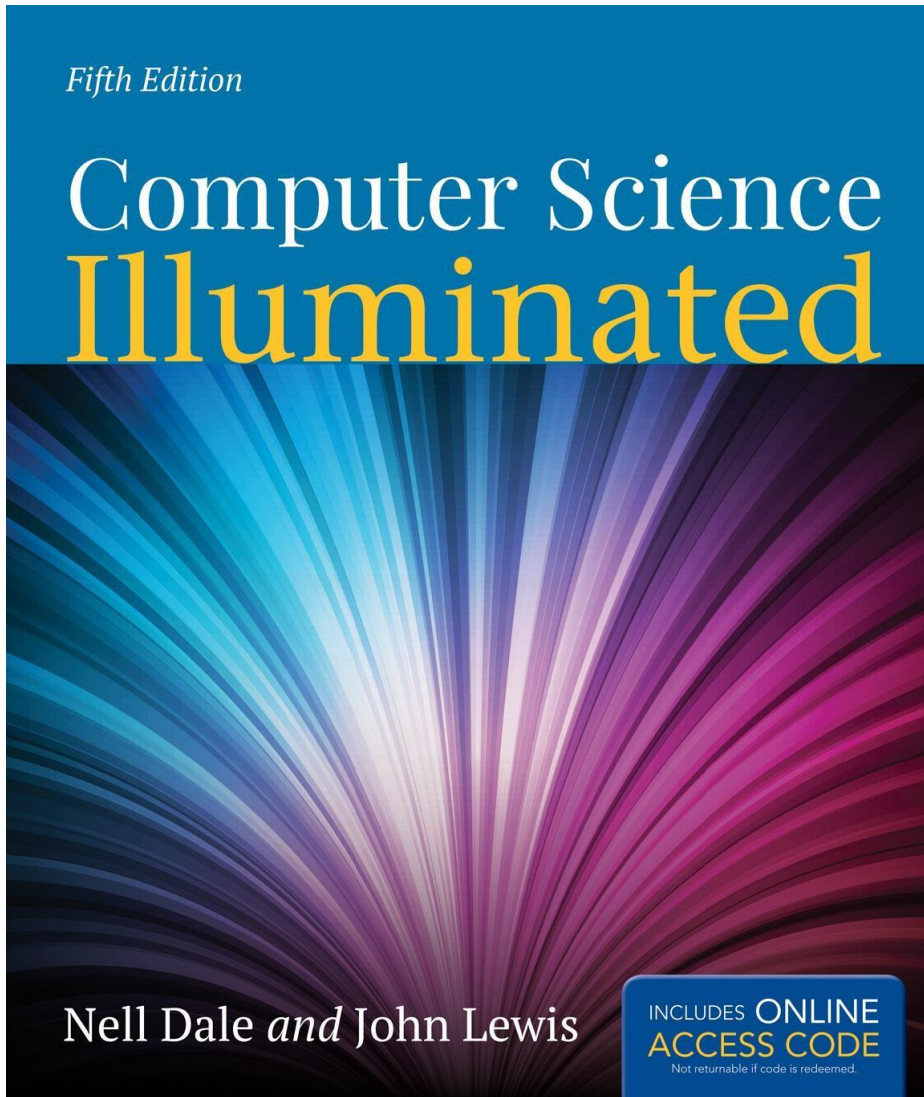
# Thinking Machines



*Can you list the items in this picture?*



# Thinking Machines



*Can you count  
the distribution  
of letters in a  
book?*

*Search a list of a  
million values  
for duplicates?*



# Thinking Machines



*Can you list the items in this picture?*

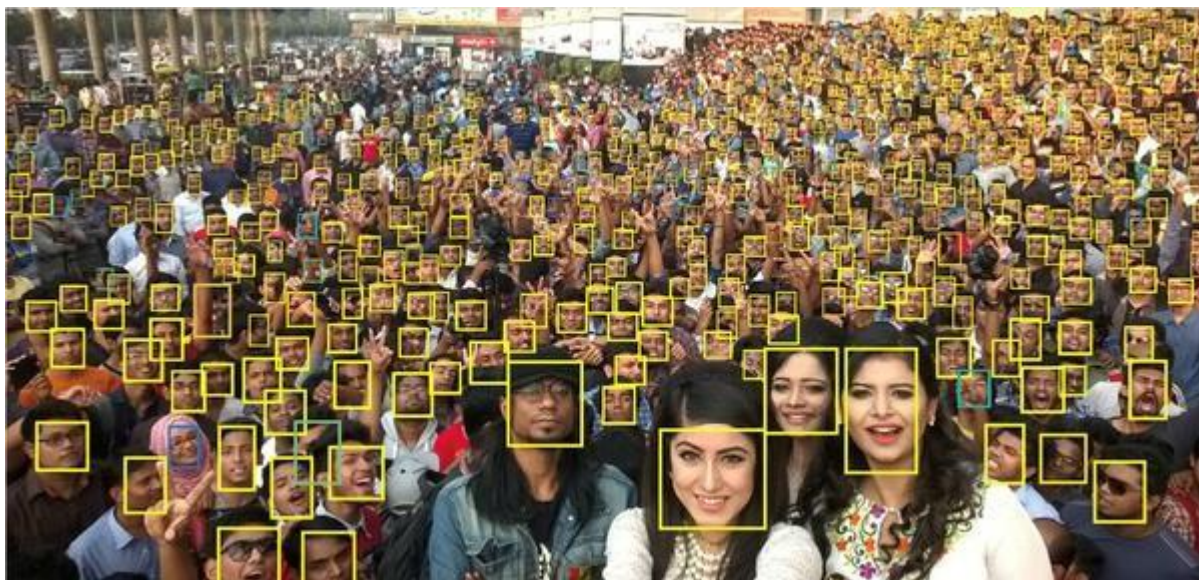
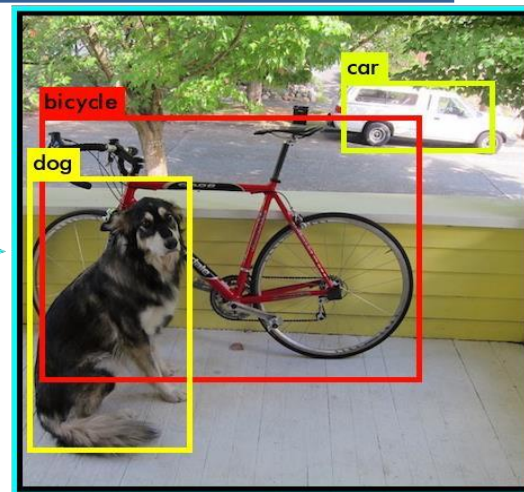
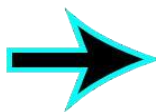
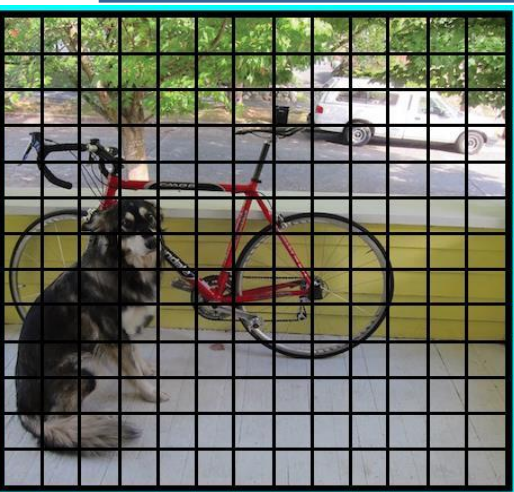
***Humans do best  
(??)***

*Can you count the distribution of letters in a book?*

**Computers do best**

*Search a list of a million values for duplicates?*

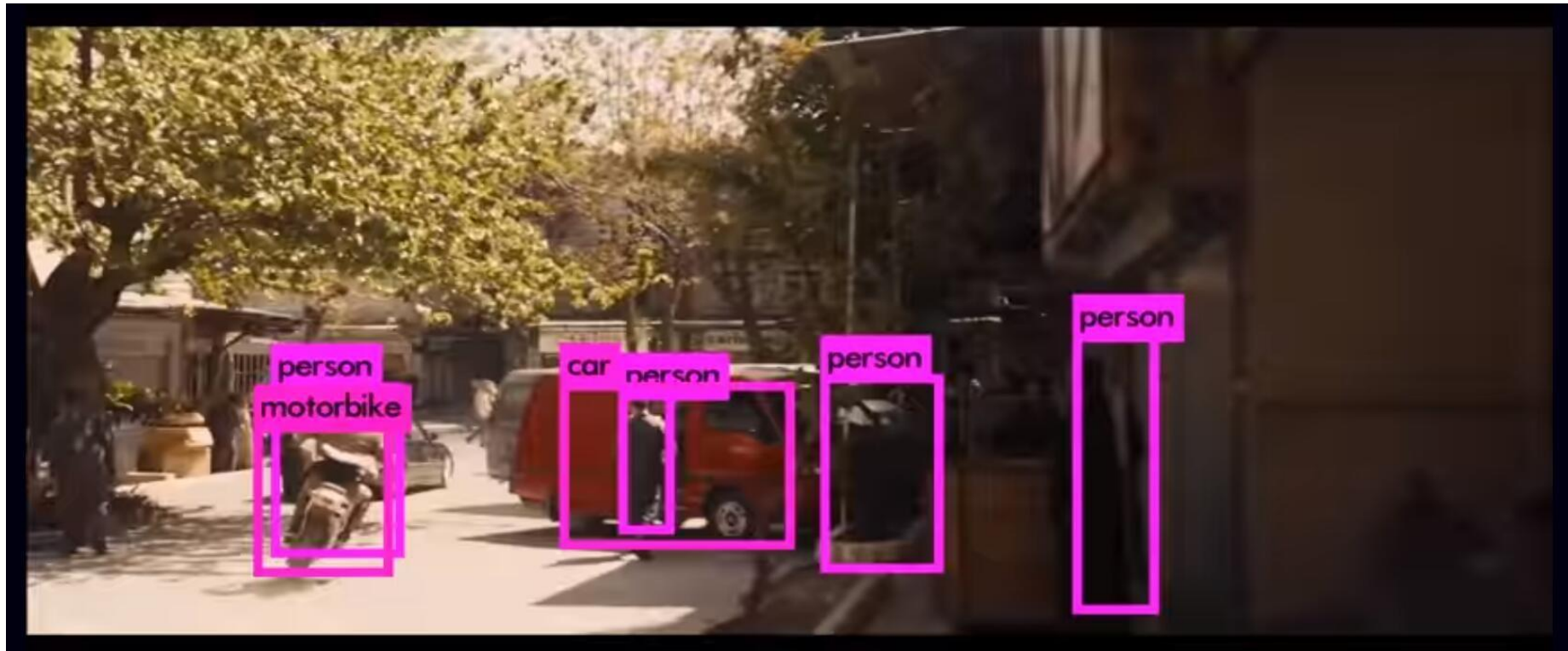
# Thinking Machines



# Thinking Machines



## YOLO: Real-Time Object Detection



<https://pjreddie.com/darknet/yolo/>



# The Turing Test



## Turing test

A test to empirically determine whether a computer has achieved intelligence

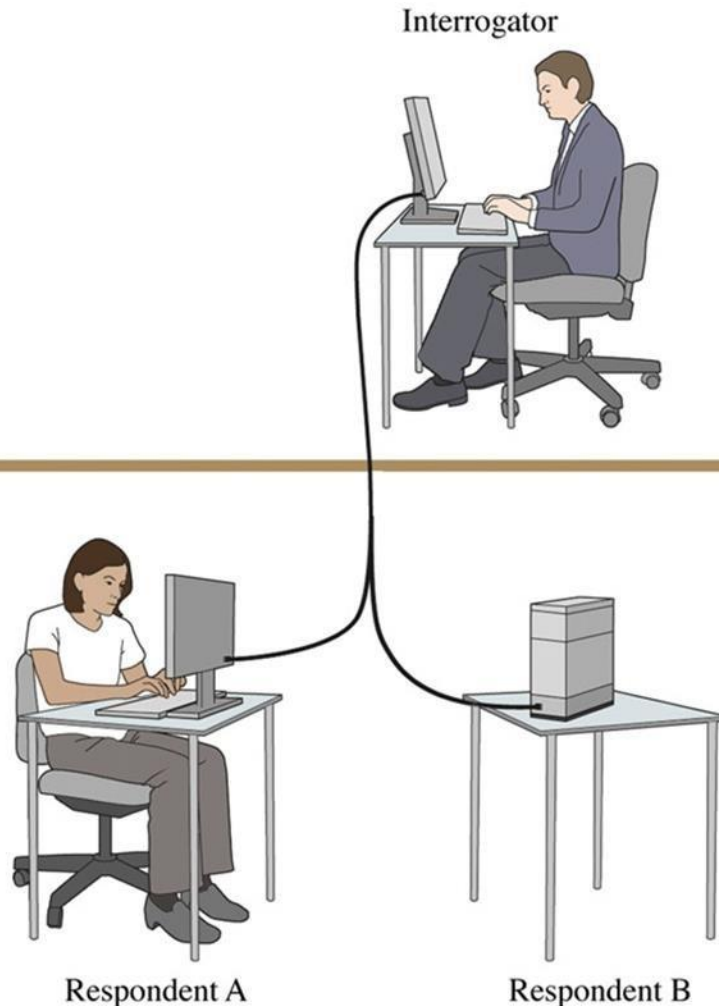
## Alan Turing

An English mathematician who wrote a landmark paper in 1950 that asked the question:

*Can machines think?*

He proposed a test to answer the question "How will we know when we've succeeded?"

# The Turing Test



In a Turing test, the interrogator must determine which respondent is the computer and which is the human

“全自动区分电脑和人类的图灵测试”（简称 CAPTCHA）



# The Turing Test

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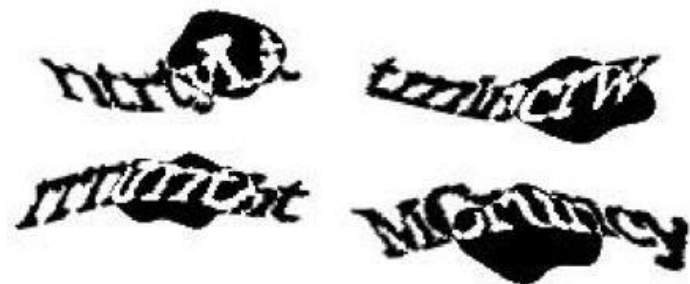
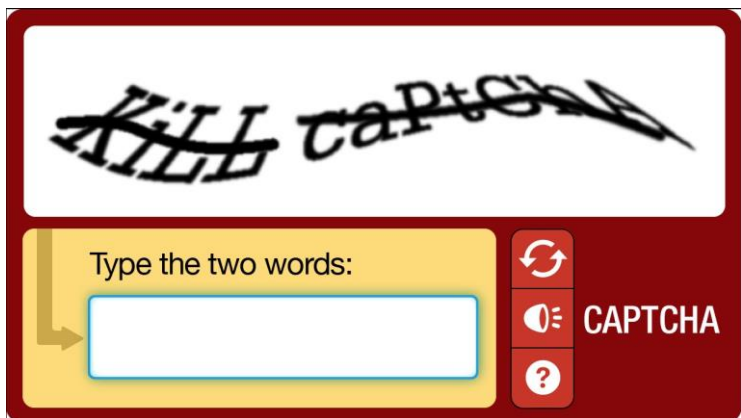
## Weak equivalence

Two systems (human and computer) are equivalent in results (output), but they do not arrive at those results in the same way

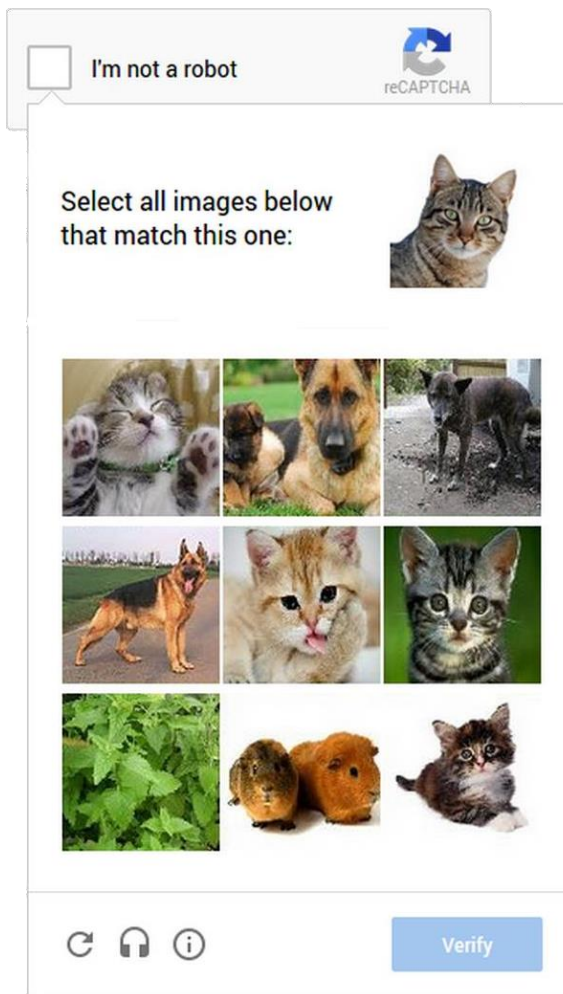
## Strong equivalence

Two systems (human and computer) use the same internal processes to produce results

# “全自动区分电脑和人类的图灵测试” (简称CAPTCHA)



Google: over 99% accuracy  
<https://arxiv.org/abs/1312.6082>



Completely Automated Public Turing Test  
to Tell Computers and Humans Apart

# The Turing Test

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## Loebner prize

The first formal instantiation of the Turing test, held annually

## Chatbots

A program designed to carry on a conversation with a human user

In 2015,  
conversa  
that cou  
convinci  
humans  
helpdesl  
morality,  
and ansv  
based qu

#### Conversation 4: Philosophical Q&A

**Human:** *what is the purpose of life ?*  
**Machine:** *to serve the greater good .*  
**Human:** *what is the purpose of living ?*  
**Machine:** *to live forever .*  
**Human:** *what is the purpose of existence ?*  
**Machine:** *to find out what happens when we get to the planet earth .*  
**Human:** *where are you now ?*  
**Machine:** *i 'm in the middle of nowhere .*  
**Human:** *what is the purpose of dying ?*  
**Machine:** *to have a life .*  
**Human:** *what is the purpose of being intelligent ?*  
**Machine:** *to find out what it is .*  
**Human:** *what is the purpose of emotions ?*  
**Machine:** *i don 't know .*

#### Conversation 5: Morality

**Human:** *what is moral ?*  
**Machine:** *what empowered humanity , what intellectual the essence is .*  
**Human:** *what is immoral ?*  
**Machine:** *the fact that you have a child .*  
**Human:** *what is morality ?*  
**Machine:** *what is altruism ?*  
**Human:** *what is the definition of altruism ?*  
**Machine:** *if you don 't believe in god , then you don 't know .*  
**Human:** *ok ... so what is the definition of morality ?*  
**Machine:** *well , the truth is , you 're not a believer in god almighty .*  
**Human:** *tell me the definition of morality , i am quite upset now !*  
**Machine:** *i 'm not ashamed of being a philosopher !*

Human: what is the purpose of dying?

Machine: to have a life.

Human: what is the purpose of being intelligent?

Machine: to find out what it is.

[https://medium.com/@v\\_maini/965dfadf19d4](https://medium.com/@v_maini/965dfadf19d4)

... morality .  
... know more  
... is .  
... ?  
... ving ?  
... to do with  
**Machine:** *you 're not a cop .*  
**Human:** *okay , i need to know how should i behave morally ...*

## 美图秀秀

人脸识别、图像处理技术



## 人脸解锁、支付宝人脸支付

人脸识别、人脸验证技术



## Siri语音助手

语音识别、自然语言处理



## 讯飞翻译

自然语言处理



## 今日头条

个性化推荐算法



## 微信 语音转文字/ 朋友圈的广告营销

语音识别、自然语言处理/  
精准营销算法



## 谷歌 Allon

自然语言处理





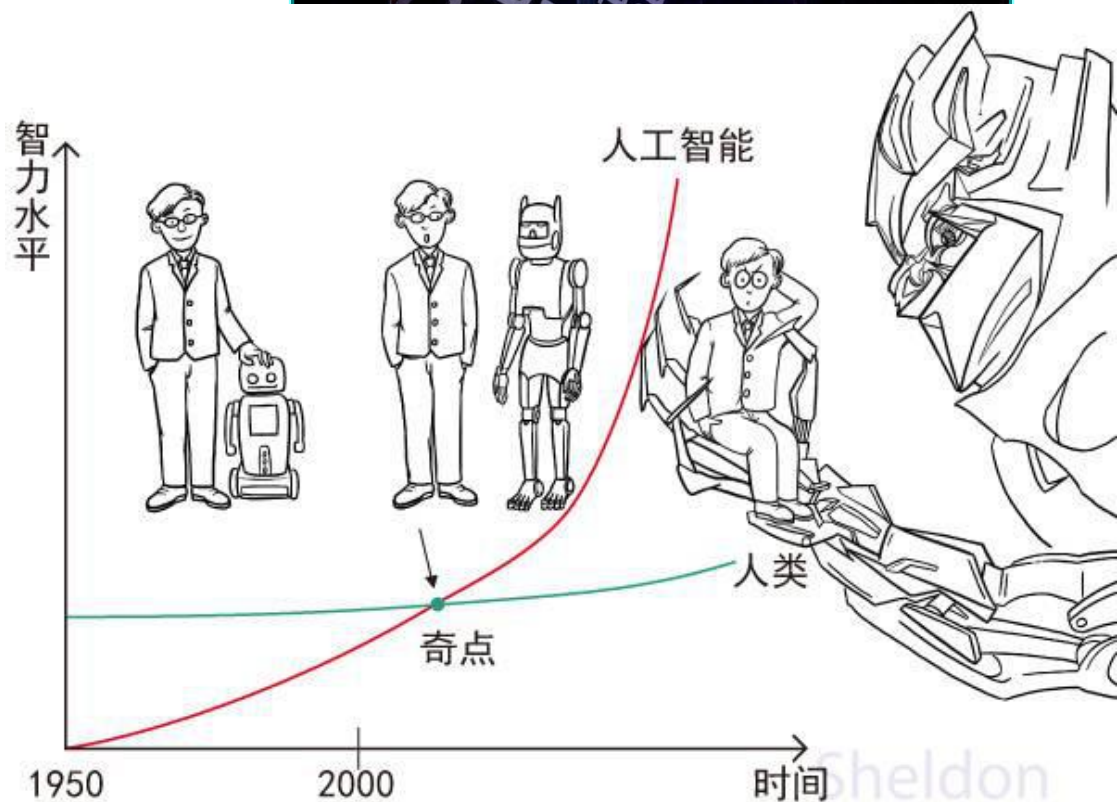
# AI的强弱对比

弱人工智能(Artificial  
Narrow Intelligence,  
简称ANI)



强人工智能(Artificial  
General Intelligence,  
简称AGI)

超人工智能(Artificial  
Super Intelligence, 简  
称ASI)



“技术奇点”设想的人工智能发展的时间线