Posts and Telecommunication Institute of Technology
Faculty of Information Technology 1

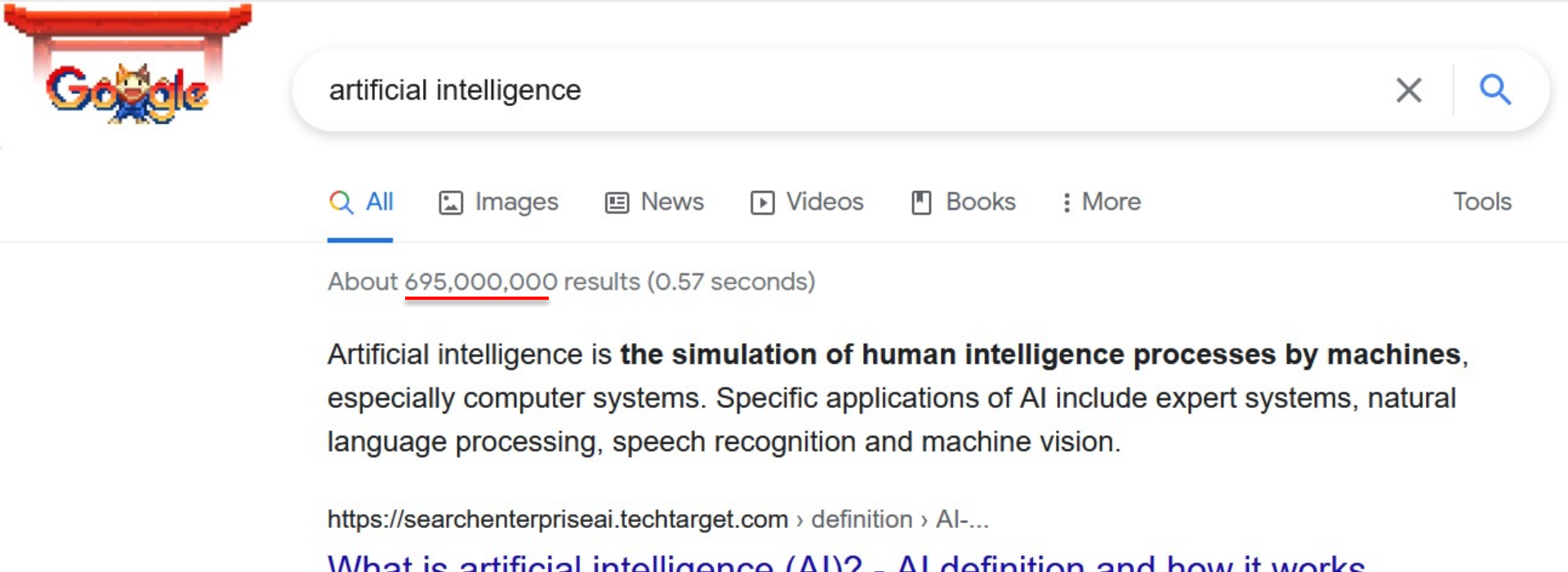
Introduction to Artificial Intelligence

Introduction

Ngo Xuan Bach

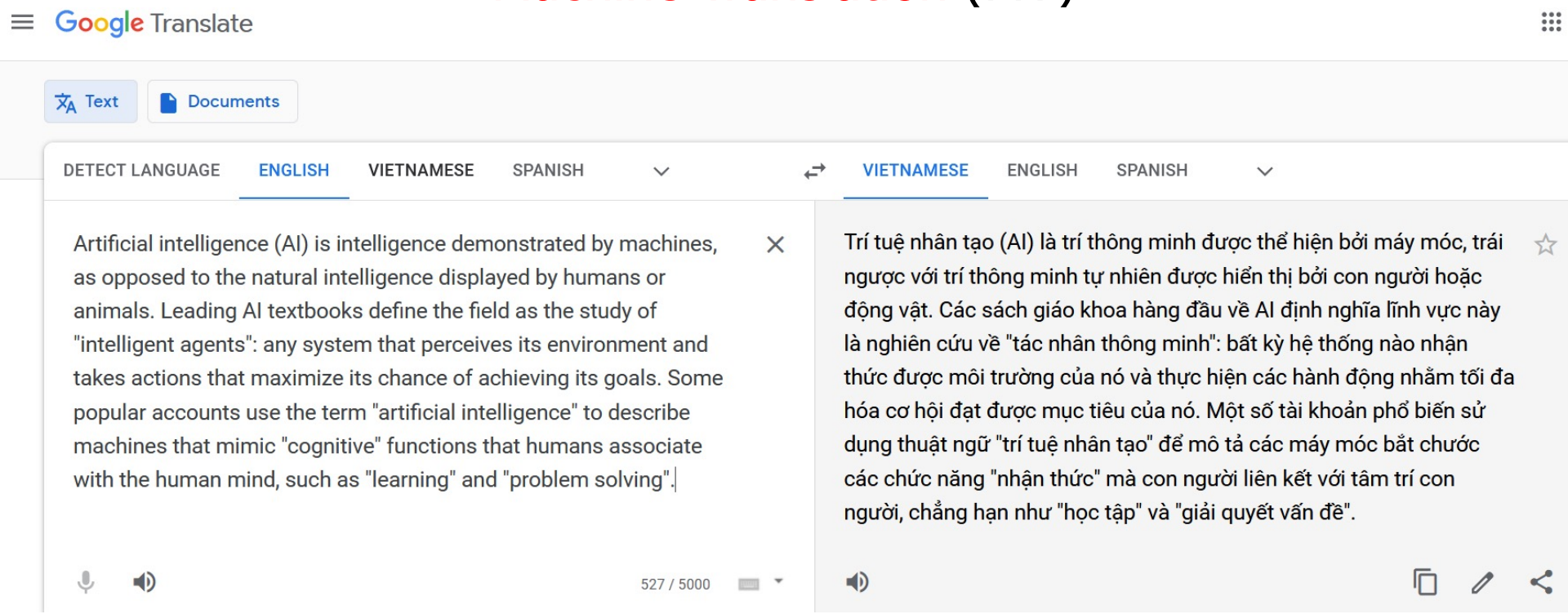
What can AI do? (1/14)

Web page ranking (Information Retrieval-IR)



What can AI do? (2/14)

Machine Translation (MT)



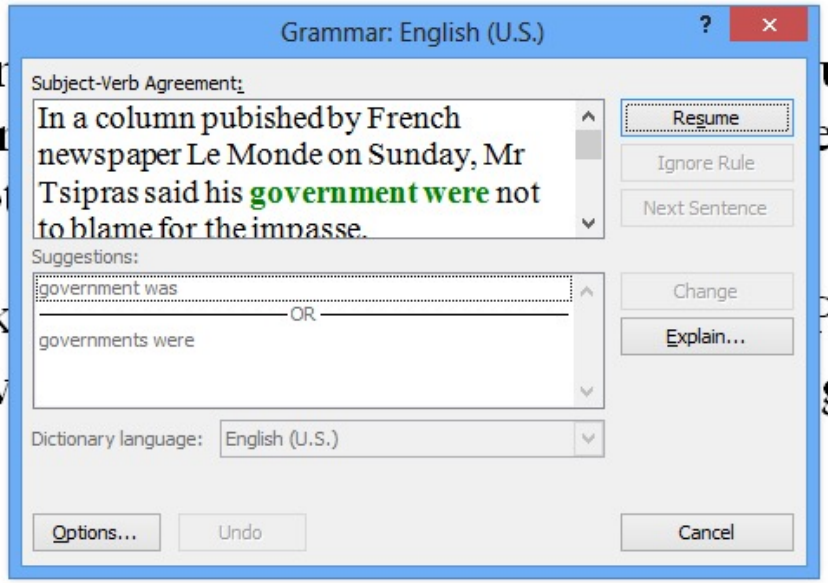
What can AI do? (3/14)

Grammar and Spelling Check

In a column pubished by French newspaper Le Monde on Sunday, Mr Tsipras said his government were not to blame for the impasse.

"It is due to the insister ubmitting absurd proposals and displayir emocratic choice of the Greek people," he wrot

After the mting, a spok news agncy only that the quintet agreed to w g days and would stay in "close contact".



What can AI do? (4/14)

Automatic Speech Recognition (ASR)

Speech to Text (STT)

What can AI do? (5/14)

Speech Synthesis - Text to Speech (TTS)

Watson™ Text to Speech / Text to Speech Demo

https://text-to-speech-demo.mybluemix.net/

DÂN TRÍ

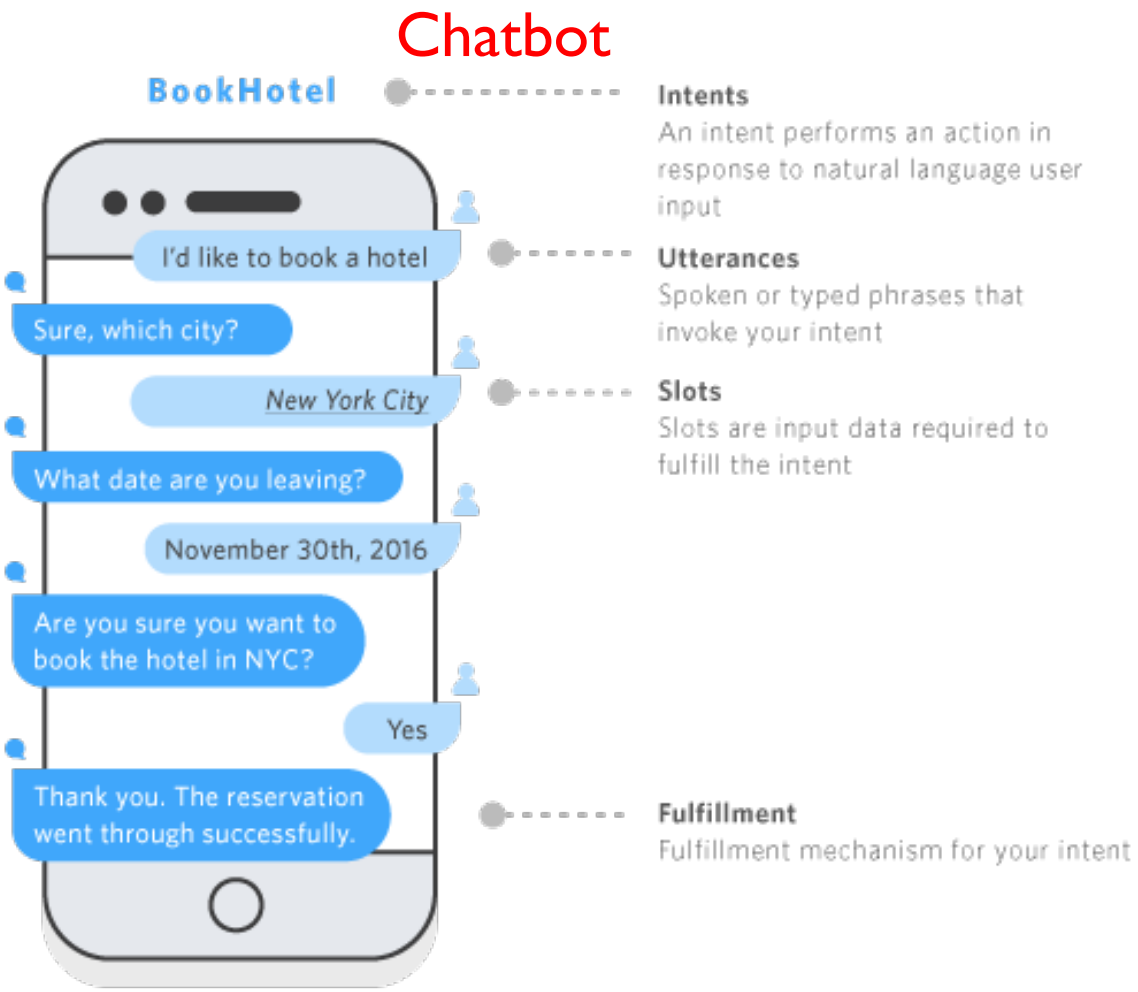
Hà Nội siết chặt việc đi lại, yêu cầu thêm các loại giấy tờ khi ra đường

0:00/0:00 Phía Bắc

What can AI do? (6/14)

Question Answering (QA)

What can AI do? (7/14)

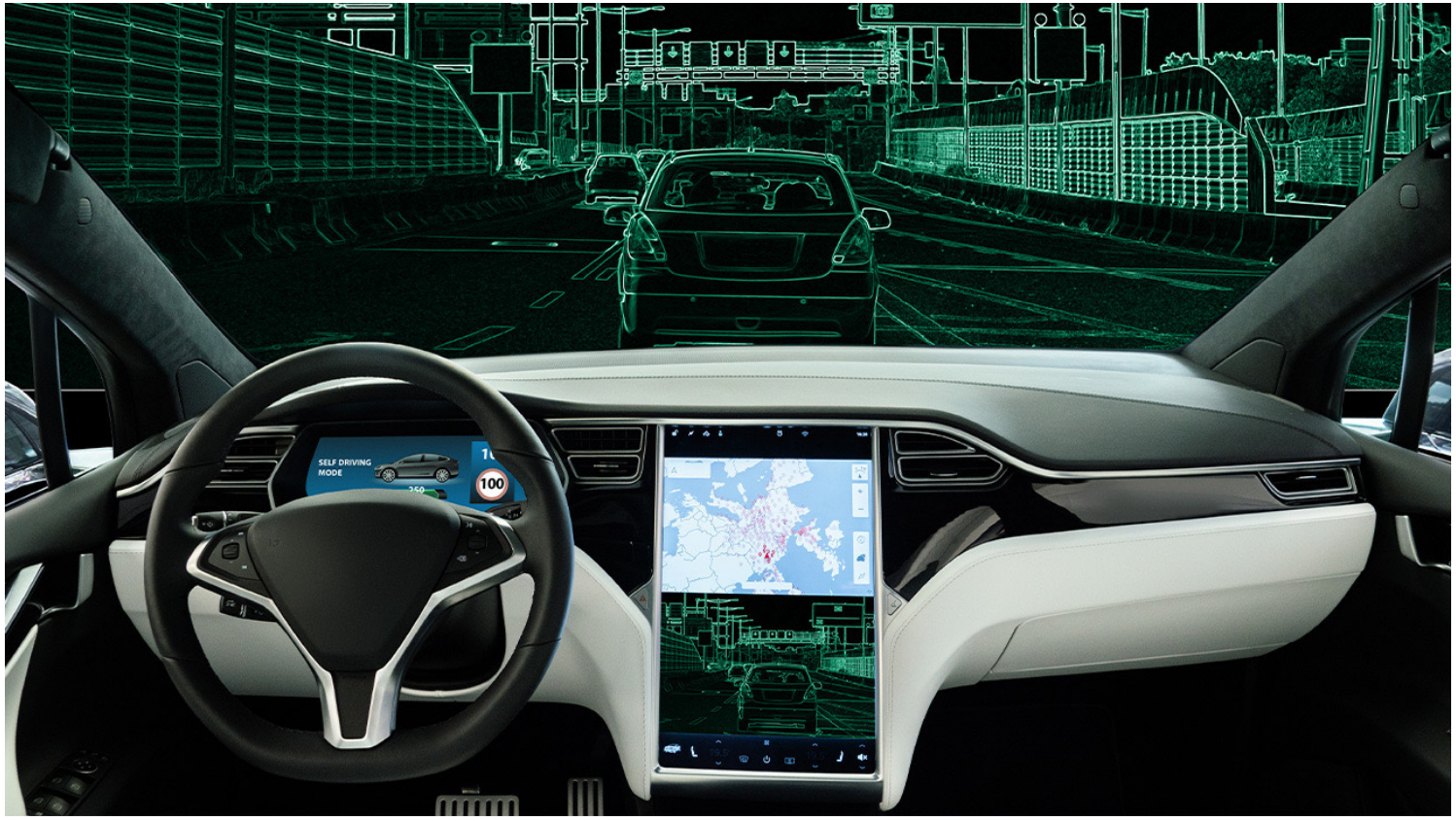


What can AI do? (8/14)

Face Detection & Recognition

What can AI do? (9/14)

Autonomous/Self-Driving/Driverless Cars

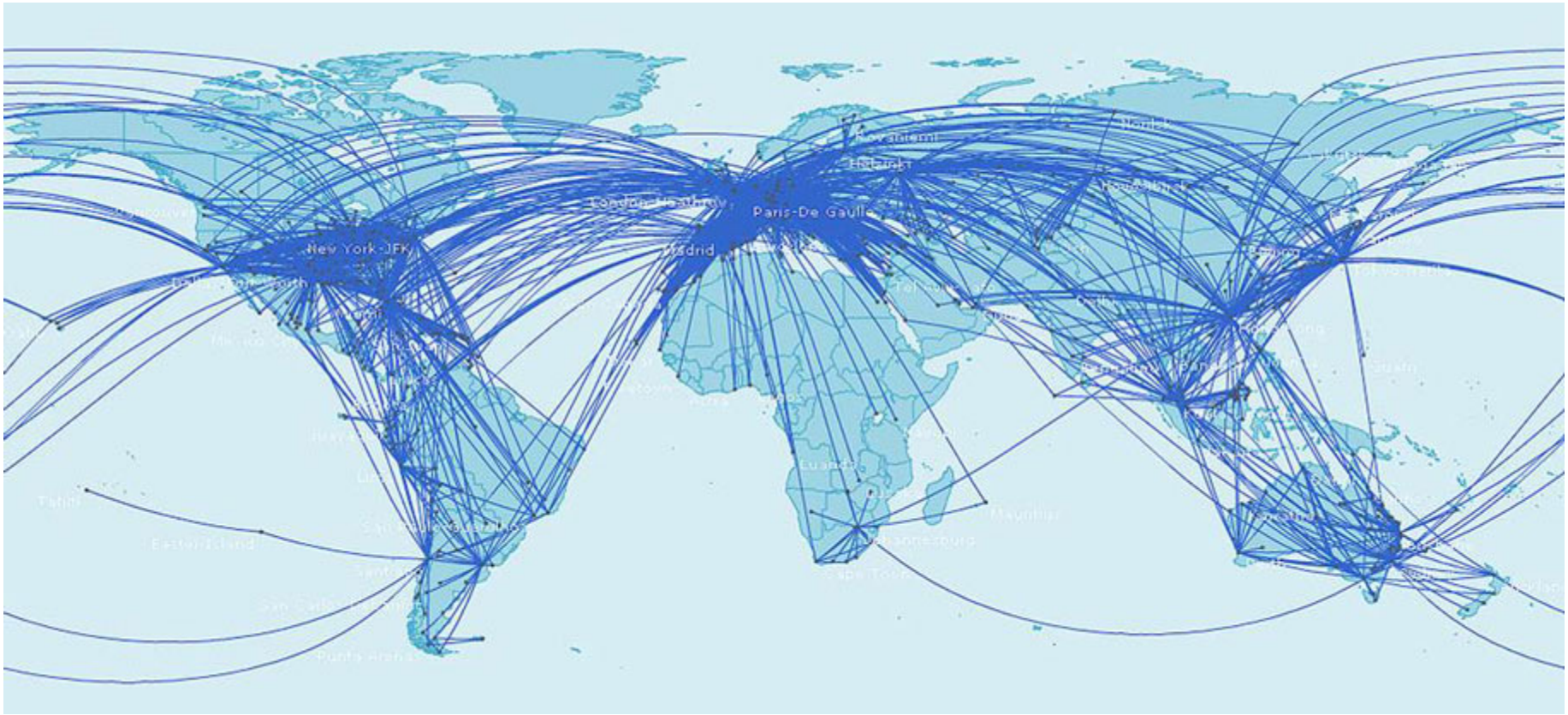


What can AI do? (10/14)

Recommender Systems

What can AI do? (11/14)

Planning



What can AI do? (12/14)

Robotics

What can AI do? (13/14)

AI and Games

- Chess: 1997 (Deep Blue of IBM)
- Go: 2016 (AlphaGo of Google)
- Poker: 2017 (Poker Computer of CMU)

What can AI do? (14/14)

and many other applications

...
Web search
Speech recognition
Handwriting recognition
Machine translation
Information extraction
Document summarization
Question answering
Spelling correction
Image recognition
3D scene reconstruction
Human activity recognition
Autonomous driving
Music information retrieval
Automatic composition
Social network analysis
...

...
Product recommendation
Advertisement placement
Smart-grid energy optimization
Household robotics
Robotic surgery
Robot exploration
Spam filtering
Fraud detection
Fault diagnostics
AI for video games
Character animation
Financial trading
Protein folding
Medical diagnosis
Medical imaging
...

(Liang, 2013)

What is AI?

- A subfield of computer science that aims to create intelligent entities
  - What is an intelligent entity?

Thinking humanly	Thinking rationally
Acting humanly	Acting rationally

A brief history of AI (1/3)

- Before the beginning (1943-1955)
  - No concept/definition of AI; some research results related to AI
    - 1943: the first artificial neural network model
    - 1950: Alan Turing published a paper about machine intelligence, Turing test, machine learning, genetic algorithm, and reinforcement learning
- The birth of AI (1956)
  - Ten scientists led by John McCarthy organized a two-month workshop at Dartmouth university that laid the first foundation and official name of AI
- The beginning stage (1952-1969)
  - Some programs had the ability to prove mathematical theorems in a way similar to human thinking
  - Some game programs had the ability to learn and beat amateur players
  - 1958: John McCarthy proposed LISP language
  - Artificial neural networks had some new achievements

A brief history of AI (2/3)

- Knowledge-based systems (1969-1979)
  - Focus on using a lot of knowledge and information specific to the narrow field to solve the problem
    - DENDRAL (1967): Expert system for predicting molecular structures
    - MYCIN (1974): Expert system for predicting blood infections
    - Machine translation systems use knowledge to understand natural language
- AI has commercial products (1980-now)
  - Expert systems were commercialized, especially in the period 1980-1988
  - The return of the artificial neural networks, especially in the last 10 years, deep networks are receiving special attention

A brief history of AI (3/3)

- AI becomes a science (1987-now)
  - AI has its own research methods, following the general requirements for scientific research methods
- AI winters
  - Periods of reduced funding and interest in AI research (1974 – 1980 and 1987 – 1993)
- Machine learning and Big data (2001-now)
  - The generated digitized data increases very rapidly
  - Many studies show that using the right data is more important than building complex algorithms
  - Big data: volume, variety, velocity (3V)
  - Deep learning (2011-now)

AI research areas (1/2)

- A complete AI system usually has the following capabilities:
  - Perception
    - The system has a mechanism to receive information from the environment (camera, sensor, …)
  - Reasoning/Inference
    - The system is capable of making conclusions about actions based on information obtained from the environment and internal knowledge
  - Action
    - The system is capable of reacting the environment (taking action or giving information)

AI research areas (2/2)

- Perception
  - Computer vision
  - Natural language processing
- Reasoning/inference
  - Knowledge representation
  - Search
  - Reasoning/Inference
  - Machine learning
  - Planning
- Action
  - Robotics

Course outline

- Part 1: Solving problems by searching
  - Uninformed search (blind search)
  - Informed search (heuristic search)
  - Local search
- Part 2: Knowledge representation and reasoning
  - Propositional logic
  - Predicate logic (First-order logic)
- Part 3: Probabilistic inference
  - Bayesian networks
- Part 4: Machine learning
  - Decision trees
  - Naïve Bayes classification
  - Example-based learning (KNN)

Course information

- Lecturer
  - Assoc. Prof. Ngo Xuan Bach, Vice Dean of Faculty of Information Technology
  - Website: https://sites.google.com/site/nxbachcs/home
  - Email: bachnx@ptit.edu.vn, ngoxuanbachkcn@gmail.com
- References
  - Từ Minh Phương. Giáo trình Nhập môn trí tuệ nhân tạo. Nhà xuất bản Thông tin và truyền thông, 2016.
  - Đinh Mạnh Tường. Trí tuệ nhân tạo. Nhà xuất bản Khoa học kỹ thuật. 2002.
  - S. Russell, P. Norvig. Artificial intelligence: a modern approach. 3rd edition. Prentice Hall. 2010.
- Assessment
  - Attendance (10%)
  - Exercises (10%)
  - Mid-term exam (10%)
  - Final exam (70%)

Missing any component point or missing more than 20% of lectures will not be able to take part in the final exam!!!