

Fundamental of Artificial Intelligence (CSC3180)

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Instructor

❑ Academic Position

Chair Professor (2005-18) & Emeritus Professor (2018-) in HK PolyU
Presidential Chair Professor (2018-20) in CUHKSZ
X.Q. Deng Presidential Chair Professor since 2021 in CUHKSZ
Founding Lecturer (CSC3180) since 2018 in CUHKSZ
Web: <https://www4.comp.polyu.edu.hk/~csdzhang/>
<https://sds.cuhk.edu.cn/en/teacher/315>



❑ Professional Honors

Fellow, Royal Society of Canada; Fellow, Canadian Academy of Engineering;
IEEE Life Fellow; IAPR Fellow; AAIA Fellow

❑ Research Interests

Biometrics, Artificial Intelligence, Image Processing & Pattern Recognition

❑ Office Hour

16:20-17:20

Wednesday

ZX_110 / DY513

哈工大：第一个博士学位



- ❑ The first batch of postgraduate students admitted after the promulgation of the Degree Law (1980)
- ❑ Obtained the first PhD degree in computer science from HIT (1985);
- ❑ Published in 2023年《中国人工智能简史》verified "新中国培养的AI领域的第一个博士" (P207)



A fingerprint recognition system with micro-computer

[More information on this document](#)

[Li, Z. / Zhang, D.](#)

in [Seventh Int. Conf. on Pattern Recognition](#); 2; 939-941; Seventh Int. Conf. on Pattern Recognition ; 1984

[Abstract](#)

[Similar documents](#)

- Z. Li, and D. Zhang, 1984, "A Fingerprint Recognition System with Micro-Computer", 7th International Conference on Pattern Recognition, Motreal, Canada, July, 939-941.
- D. Zhang and Z.Li, 1983, "Image Recognition System for Fingerprint identification", The first Pattern Recognition Conference, Shanghai, April.

Teaching Arrangement

□ Schedule

Lectures:	15:30-17:20	Monday	ZX_110
	15:30-16:20	Wednesday	ZX_110
Tutorials	19:00-19:50	Wednesday	TD_307
	20:00-20:50	Wednesday	TD_307

□ Assessment

Mid-term Exam	30%
Personal Code Assignment	10%
Group Project	20%
Final Exam	40%

□ Teaching Materials

1) comp.polyu.edu.hk/~csdzhang; 2) bb.cuhk.edu.cn

Teaching Arrangement

□ TAs:

TA1: Dandan Fan (范丹丹) (224040371@link.cuhk.edu.cn)

Phone: **18091289264**

Office Hour: 15:00-16:00 Thursday DY_318

TA2: Chaoxun Guo (郭超勋) (222010062@link.cuhk.edu.cn)

Phone: **18361245369**

Office Hour: 10:30-11:30 Friday DY_318

□ USTF:

Nikita Tanjaya (121040027@link.cuhk.edu.cn)

Phone: **15217763089**

Office Hour: 17:00-18:00 Tuesday DY_326

Bryan Jonathan (121040015@link.cuhk.edu.cn)

Phone: **15012485190**

Office Hour: 18:00 - 19:00 Tuesday DY_326

Fundamentals of Artificial Intelligence (AI)

- Aim: Understand the basic technologies and some typical applications

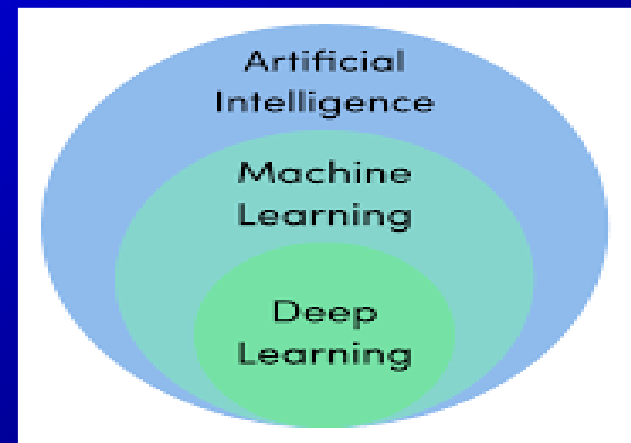
- Main topics

 - Introduction to AI

 - **Part I:** AI Basic Functions
(Problem solving agent & Logical agent, etc.)

 - **Part II:** General AI approaches – Machine Learning
(DM, PCA and Sparse)

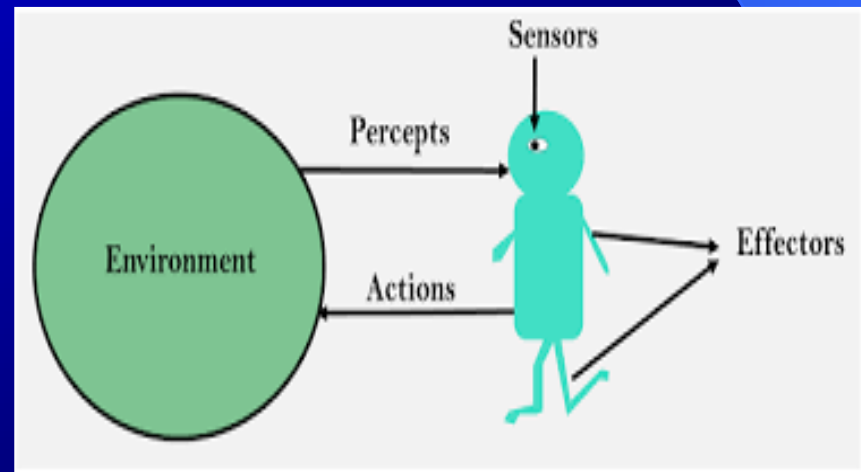
 - **Part III:** Recent AI development – Deep Learning
(ANN, DL)



Why to learn Part I: AI Basic Functions?

Artificial Intelligence is not a new word and not a new technology for researchers. This technology is much older than you would imagine. Even there are the myths of Mechanical men in Ancient Greek and Egyptian Myths.

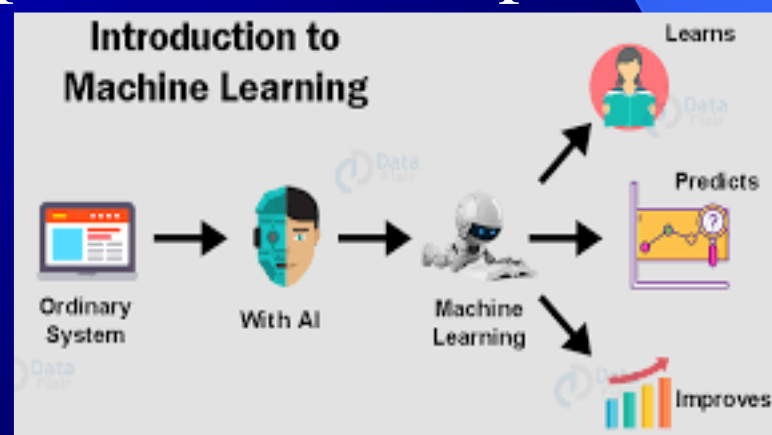
- Intelligent agents
- Solving problems by searching
- Logic and inference



Why to learn Part II: Machine Learning?

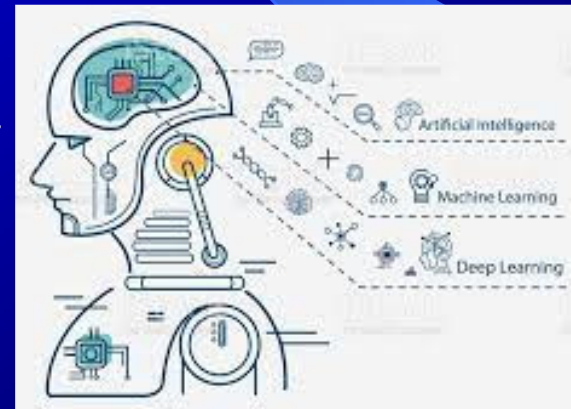
Machine learning (ML) is a **type of artificial intelligence (AI)** that allows software applications to become more accurate at predicting outcomes without being explicitly programmed to do so. ML algorithms use historical data as input to predict new output values.

- Data mining
- Feature extraction
- Classification & clustering



Why to learn Part III: Recent AI Developments?

- ❑ Neural networks, a **beautiful** biologically-inspired programming paradigm which enables a computer to learn from observational data.
- ❑ Deep learning, a **powerful** set of techniques for learning in ANN.
- ❑ Neural networks and deep learning currently provide the **best solutions** to many problems in image recognition, speech recognition, and natural language processing.



Learning Outcomes

Upon completing this course, students will be able to:

- **Understand** the concept of AI and its basic functions;
- **Use** the traditional AI approaches by some typical examples;
- **Know** recent AI developments for future work;
- **Apply** the AI knowledge into some real applications.

Background Knowledge

Except *Internet* and *Computer System*, the main background is needed as follows:

- CSC1001: Introduction to Computer Science: Programming Methodologies
- STA2001: Probability and Statistics I
- CSC3100: Data Structures

Class Requirement

According to University Regulation, the register this course requires your attendance in the lecture. Otherwise, you could miss many key points and have lower scores in exams. Only reading the lecture notes alone are not enough for your deep understanding.

Class Management

According to SDS arrangement, each student who attends class should sign-up 2D code (每个上课的学生都应该注册二维码).

It allows sign-up at designated time/ location twice a week. The same 2D code is effective the whole semester.

You need to scan it at the start of each lecture. Valid from 10 minutes before the start of each class to 20 minutes after the start of each class (每节课开始前10分钟到开始20分钟内有效).

Someone who does not join the class will reduce the mark at the end of this semester.



Mid-Term Test and Assignment

- Mid-term test:

- Explain the requirement in the lecture time

- Assignments:

- 1) Personal Code Assignment: Week 4 - Week 7

It is necessary to arrange the environment & homework on the school OJ(Online Judge) website in advance.

- 2) Group Assignment: Week 3 - Week 14

- Midterm report/Short introduction (Week 8)
- Submit Complete Video (Week 13)
- Final Presentation (Week 14)

Group Assignment Arrangement

- ❑ In this project, you are required to implement AI into **real-world applications**. The AI algorithm and application topic in this project are not limited, so you can implement on the field you are familiar with. You can choose to directly implement existing AI algorithm in your field, or you can improve current AI algorithms for **your specific application**.
- ❑ This is a **group project**. Each group should have **FOUR** students. **In the middle of this term**, each group should submit a project proposal for us to check your topic and progress. These proposals will be public to all students (anonymous) so you can compare yours with others' proposals. **In the end of this term**, each group should record a presentation video and write a final report to introduce your project.

Recommended Texts

- Stuart Russell and Peter Norvig, *Artificial Intelligence: A modern approach*, 3rd edition, Prentice Hall International, 2010.
- Wolfgang Ertel, *Introduction to Artificial Intelligence*, Springer, 2011.
- Witten I H, Frank E, Hall M A, et al, *Data Mining: Practical Machine Learning Tools and Techniques*, Morgan Kaufmann, 2016.
- *Neural Networks and Deep Learning*, free online book. (<http://neuralnetworksanddeeplearning.com/>)