# Machine Learning

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A bit about Jie…

- Jie Tang, Professor, ACM/AAAI/IEEE Fellow, Computer Science of Tsinghua University. My interest is artificial general intelligence (**AGI**). Recently, I put all efforts into Large Language Models (LLMs): ChatGLM, CodeGeeX, etc.

- I have been visiting scholar at Cornell U. (working with John Hopcroft, Jon Kleinberg), UIUC (working with Jiawei Han), CUHK (with Jeffrey Yu), and HKUST (with Qiong Luo).

- My research received the SIGKDD Test-of-Time Award (10-year Best Paper).

- Have published more than 300 paper on international conf/journals, including KDD (30), IJCAI/AAAI (30), NIPS/ICML, IEEE Trans. (30), Machine Learning J

- #Citation: 31,607 and *h*-index: 92

- Have a notable system, AMiner.org for academic researcher network analysis. The system has attracted 30 million users from 220 countries/regions.

- **Homepage:** http://keg.cs.tsinghua.edu.cn/jietang/
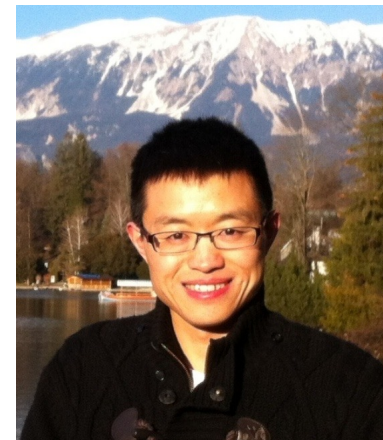
Contact Information

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  - Open hours: Tuesday/Wednesday afternoon 2:00pm-5:00pm
    - Better to make an appointment in advance

Teaching Assistant

- TA: Dan Zhang
  - FIT 1-308
  - E-mail: zd18@tsinghua.org.cn
  - Open hours: Anytime on demand☺

- TA: Wenyi Hong
  - FIT 1-308
  - E-mail: wenyi.hong@outlook.com
  - Open hours: Anytime on demand☺

Resources

- ## Conferences:
  - Theory: NIPS, COLT, STOC/FOCS
  - Algorithm: ICML, KDD, UAI, IJCAI/AAAI
  - App: SIGIR, WWW, ACL

- ## Journals:
  - JMLR, JAIR, MLJ, ACM TKDD, IEEE TKDE

- ## Handbooks
  - Yoshua Bengio, Ian J. Goodfellow, Aaron Courville. Deep Learning. 2016.
  - Christopher M. Bishop. Pattern Recognition and Machine Learning. Springer, 2007.
  - Daphne Koller, Nir Friedman. Probabilistic Graphical Models. MIT Press, 2009
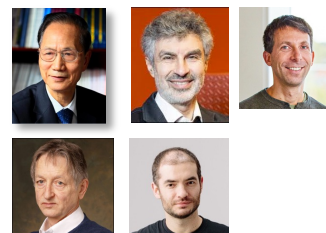
Artificial Intelligence

人工智能的发展（2019年的PPT）

符号AI
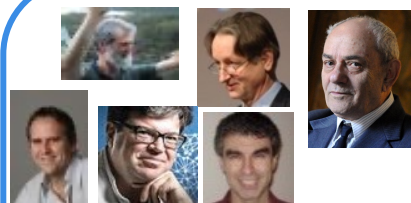

1956 Dartmouth Conference:
The Founding Fathers of AI

John MacCarthy　Marvin Minsky　Claude Shannon　Ray Solomonoff　Alan Newell

Herbert Simon　Arthur Samuel　Oliver Selfridge　Nathaniel Rochester　Trenchard More

符号模型/
规则模型/
感知机

认知智能

DARPA　Google DeepMind

OpenAI

张钹院士2016年提出第三代人工智能雏形，DARPA 2018年发布AI Next计划。核心思路是推进数据统计与知识推理融合的计算；与脑认知机理融合的计算。

第一代　第二代　第三代

amazon

Google DeepMind　Microsoft

大数据驱动的统计学习方法初步实现了针对文本、图像、语音等的感知与识别

感知智能

目前急需的是高质量超大规模知识图谱（AI的基础设施）以及对超大规模数据的深度理解能力（面向认知的深度学习）

AI趋势 （2019年的PPT）

表示、计算、存储与人机输入/出	文本内容识别、图像识别、语音识别	知识数据双驱动、认知推理、决策智能	自学习、记忆机理、有(无)意识处理器

计 算	感 知	认 知	意 识
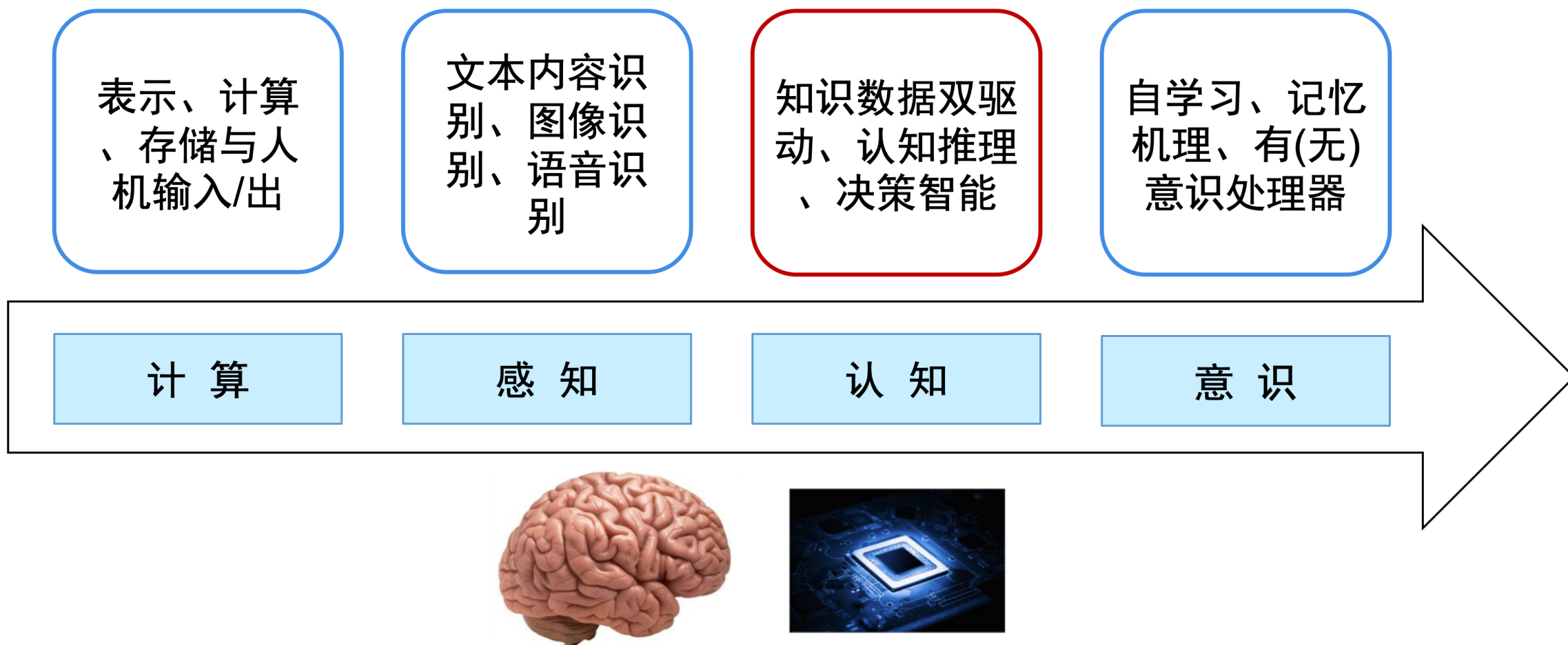
认知智能

趋势：用计算模型可描述的人类认知问题，计算机很快达到甚至超过人类水平。
很快=5-20年（2019年）

AI in Tsinghua

- In 2019/09, we established Tsinghua AI Institute
  - By Prof. Bo Zhang
- Focus
  - Fundamental theories and methodologies
  - Interdisciplinarity

Foundation Model in Tsinghua

- In 2023/06, we established Foundation Model Research Center in Tsinghua AI Institute

- Focus
  - Fundamental tech for LLM
  - Interdisciplinarity

Beijing AI Institute (BAAI)

- In 2019/11, Beijing launched Beijing AI Institute
  - By Dr. Hongjiang Zhang
- Focus
  - ground-breaking research

This Course

Overview of Class

- Introduction
- Deep learning basics
- Transformer
- Pre-training models
- P-tuning, LLM fine tune and prompt
- Training 100B-scale LLM
- Chat Models
- Visual Models: CNN, ViT, etc.
- Text to Image: DaLL.E, CogView
- Image to Text: CLIP, VisualGLM
- More abilities of LLM: protein, code, math

Grading

- ## Homeworks (40%)
  - 4 homeworks (10 points each time)
- ## Project (60%)
  - 2-3 students to form a team
  - Apply machine learning to solve a real problem
    - Choose one task at Kaggle (http://www.kaggle.com/competitions)
  - Submit materials:
    - a proposal (6th week), a mid-term report (9th week), a final report (17th week), and the implementation code (17th week)
  - All reports should be in NIPS format, written in English: (http://nips.cc/Conferences/2014/PaperInformation/StyleFiles)
  - Poster presentation (15th week)

Potential achievements

- Able to understand the underlying principles of classical ML algorithms

- Able to apply right ML algorithms to the applications at you hand

- Able to design effective ML algorithms to solve new problems

- We will try to provide necessary GPU platform for practicing large-scale deep learning…
  - Please apply first…

About final report

- We expect to see
    - Problems (what?)
    - Motivations (why?)
    - Techniques (how?)
    - Results & Analysis (did you verify what you claimed above?)
    - Conclusions

- The final report should look like a NeurIPS technical paper
    - Style file: https://neurips.cc/Conferences/2019/PaperInformation/StyleFiles

- Any suggestions?
- Any problems?
- Anything else you want to learn in class?

Thank you !

Jie Tang, KEG, Tsinghua U   http://keg.cs.tsinghua.edu.cn/jietang

Download data & Codes   https://github.com/THUDM