

Birmingham, 2017 Visiting Professors Conference: what is excellent teaching in engineering?

New Engineering Education in Artificial Intelligence Era

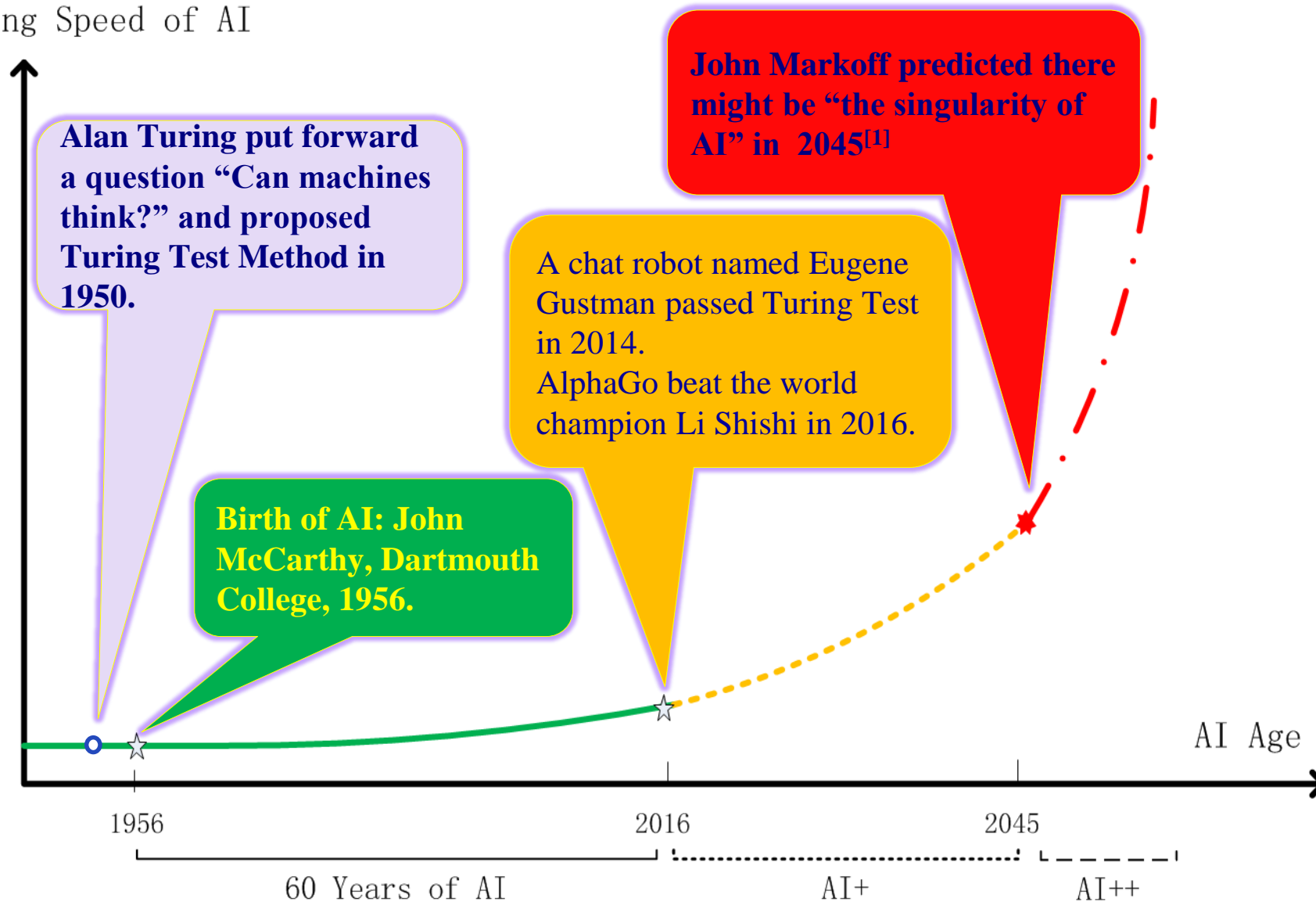
Prof. Bao Hong

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I. Artificial Intelligence creates the future , which is around the corner

Developing Speed of AI



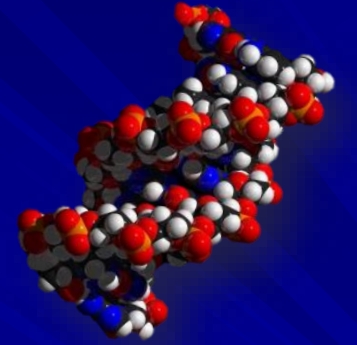
1956-2016
THE AI RACE IS ON

[1] 《Machines of Loving Grace : The Quest for Common Ground Between Humans and Robots

II. Education should come first in the AI Era

*Brain: Finally the greatest research frontier ... is **the most complex material known in the universe.***

---- James Watson



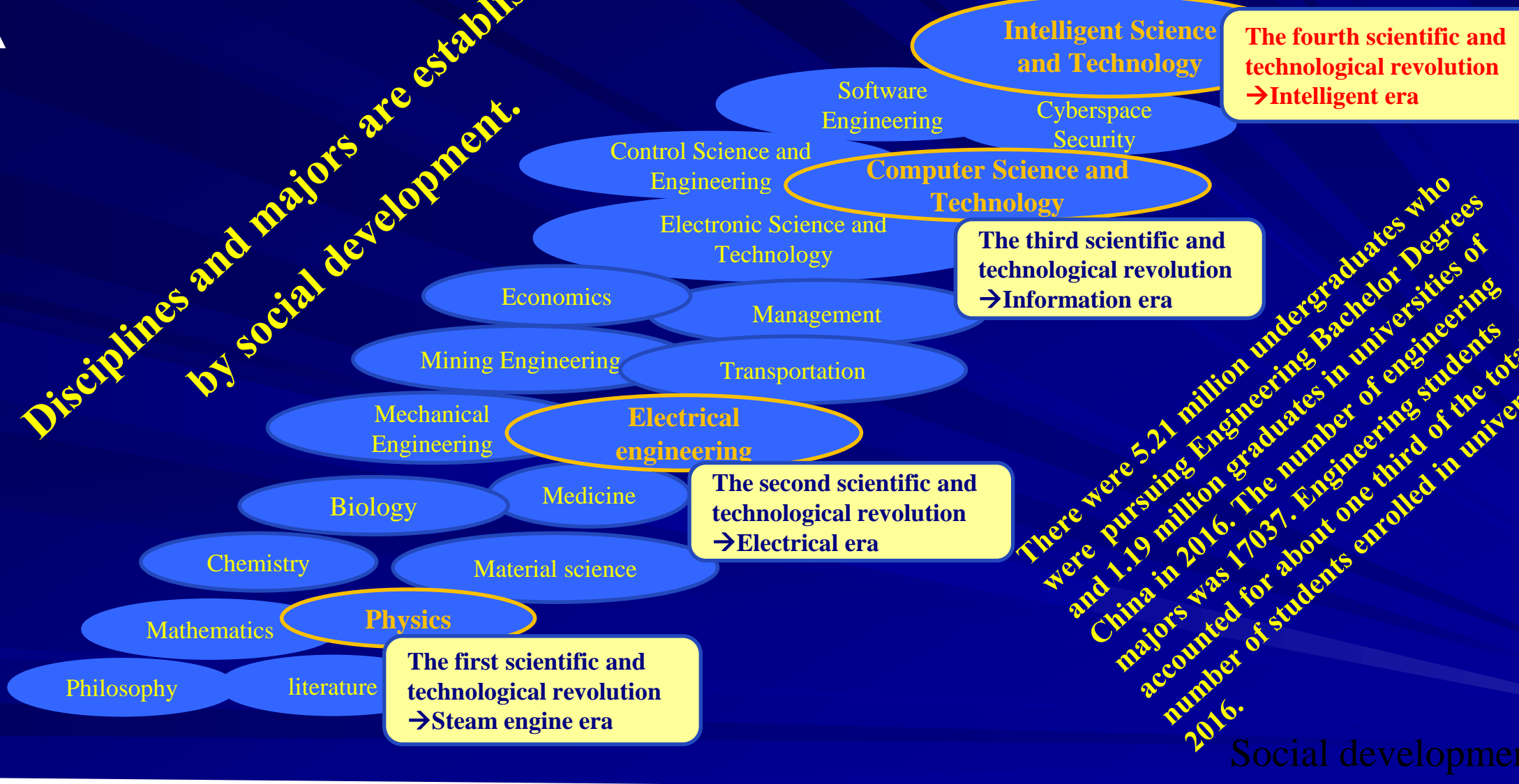
***Software and artificial intelligence** are my whole life love. If I start a company, I hope to engage in the field of artificial intelligence research.*

----- Bill Gates



Evolution of Disciplines and Majors

Disciplines and majors are established by social development.



There were 5.21 million undergraduates who were pursuing Engineering Bachelor Degrees and 1.19 million graduates in universities of majors in 2016. The number of engineering majors was 17037. Engineering students accounted for about one third of the total number of students enrolled in universities in 2016.

Farming society

Industrial society

Information society

Intelligent society

Social development

New Software Engineering Major and Industry -Taking Beijing Union University as an Example

Intelligent software: Driving brain Led by Academician Li Deyi

National ITO Industry Demand
National First Prize of Teaching
Achievement:



C programming
Edited by Prof Tan Haoqiang,
has been issued 11 million copies,
Guinness World Record



Major revolution

Cloud Computing
Big Data
Artificial Intelligence
Machine Learning

The fourth scientific and
technological revolution
is coming.



Major reform

Object-oriented
Service-oriented

Change of software mode

Improvement of software
tools

Data-driven
Software definition

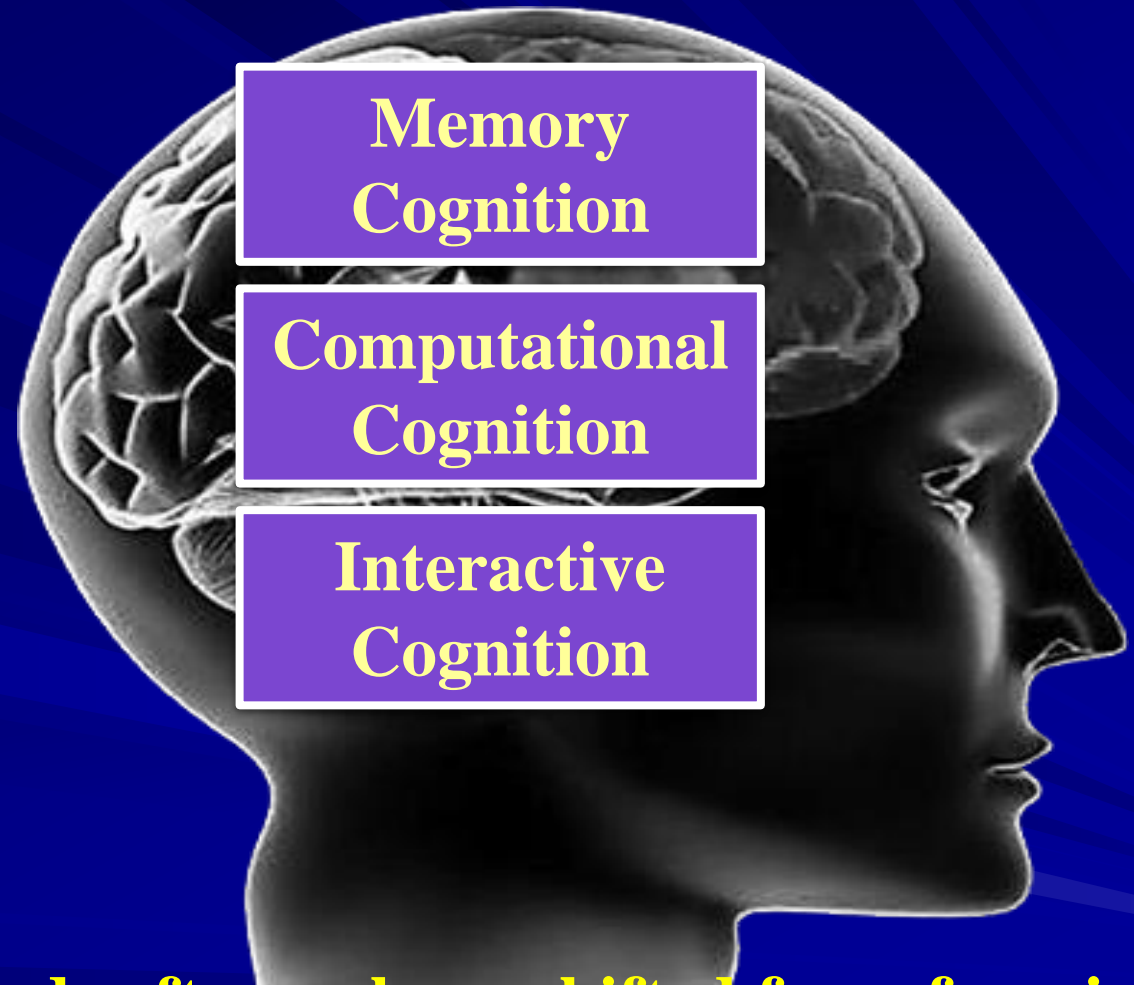
Initial stage of the major

Programming language
Process-Oriented



The meaning of brain cognition:

How to think?



Disciplines and majors of computer and software have shifted from focusing on 'computing' to 'brain cognitive technology'.

New era, New thinking

The author of *'Big Data: A Revolution That Will Transform How We Live, Work, and Think'*, Viktor Mayer-Schönberger, delivered a speech on “Algorithm | Data” at the 2017 World Intelligence Conference in Tianjin, China.

With the new progress of Big Data, Cloud Computing and Neural Networks and other areas, the era of Artificial Intelligence driven by both knowledge and intelligence is coming. Therefore, the key to moving towards the era of Artificial Intelligence is how to **master huge amounts of data**.

New Engineering Education in the New Era Needs New Thinking Mode

Natural sciences field:

Computing thinking

Data thinking

Interactive thinking

Social sciences field:

Philosophical thinking

Ethical thinking

Aesthetic thinking

Major and Industry of New Hardware

“Internet +” → “AI +”

- ✓ Mobile internet + Smartphone (Smart wearable device)
- ✓ Internet of Things + Intelligent Manufacturing
- ✓ Connected Vehicle + Intelligent Vehicle

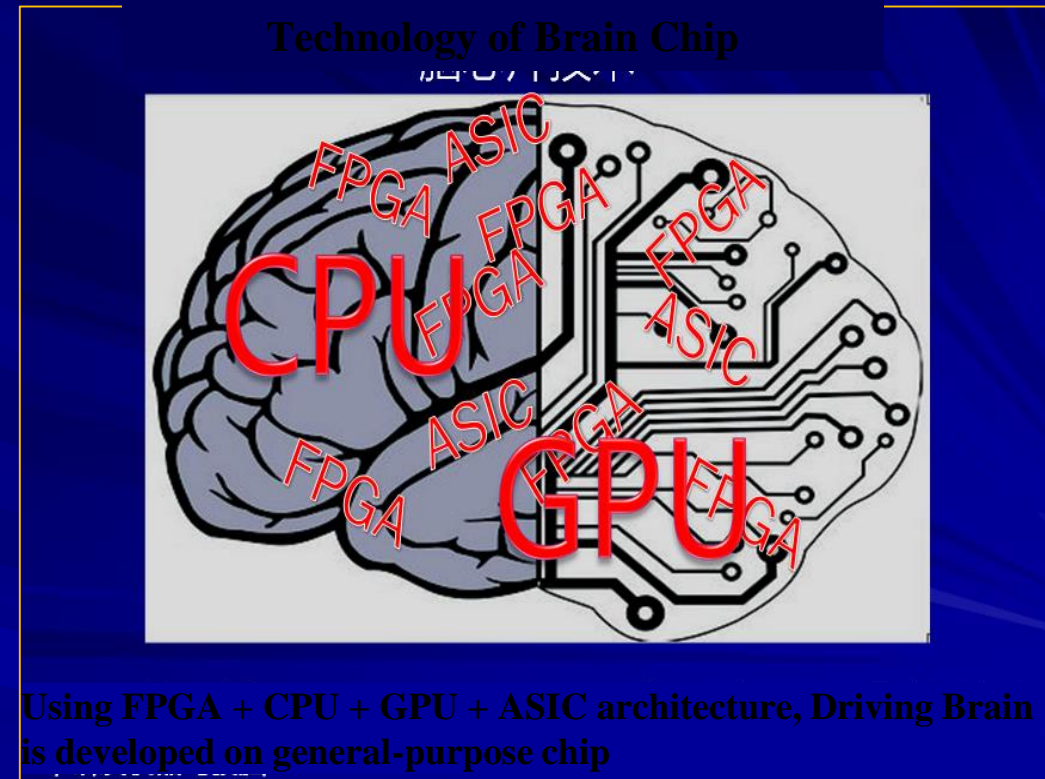
Nurturing new hardware industry

U.S.A. : New hardware (Geek, Maker)

Germany : Industry 4.0 (Intelligent factory, intelligent production, intelligent logistics)

.....

China : ‘Made in China 2025’ Plan (China's Intelligent manufacturing, mass entrepreneurship and innovation)





Wrist wearing smart watches



Intelligent machine dogs



Wearable smart glasses



Service robots



Intelligent factory



The first automatic driving truck on the road in the world



Logging robot



Unmanned aerial vehicle

Note: pictures above are cited from the following website: www.baidu.com .

III. Exploration and Practice of New Engineering Education

Scientific tasks promote research and talents cultivation.



Li Deyi et.al.: Cooperating with Imperial College London, Beijing Union University (College of Robotics) was approved of a project of UK-China IAPP (Industry Academia Partnership Programme) by Royal Academy of Engineering, i.e. *Talents Cultivation and Cooperation Oriented to Intelligent Vehicle Industrialization* (UK-CIAPP_324).

Prof Li Deyi: Academician at both the Chinese Academy of Engineering and International Academy of Sciences for Europe and Asia, Dean of College of Robotics in BUU, President of Chinese Association for Artificial Intelligence.



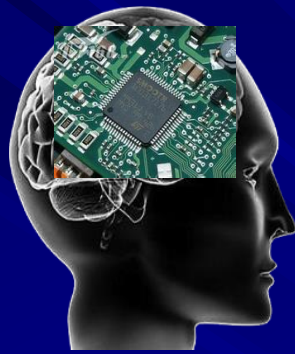
Bao Hong, et.al.: Projects such as “Intelligent Vehicle Driving Brain Technology, Platform and Transformation” from major plan of National Natural Science Foundation of China (NSFC) –“Cognitive Computation of Audiovisual Information” promote the scientific research work and talents cultivation significantly.

Prof Bao Hong: Vice President of Beijing Union University, Director of Beijing Key Laboratory of Information Service Engineering, Deputy Director of Intelligent Driving Professional Committee of China Artificial Intelligence Society.

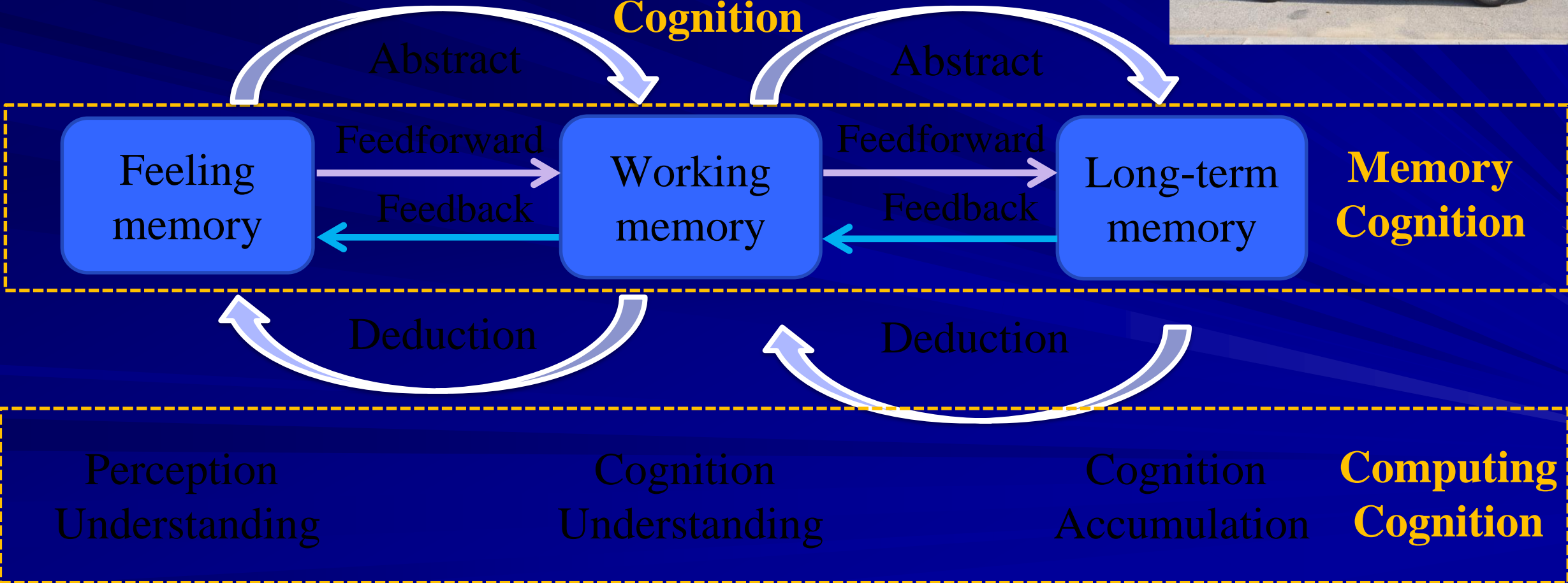


We proposed the 'Driving Brain' concept, and developed Driving Brain hardware and software systems owning the ability of the **computing cognition, memory cognition and interactive cognition** in our self-driving vehicles.

Driving Brain



Interactive Cognition





Jing Long No. 1, Jing Long No. 2: the self-driving vehicles developed by intelligent driving team of Beijing Union University on the basis of BAIC MOTOR C70 car and BAIC MOTOR EV150 pure electric car, achieved excellent grades in China Intelligent Vehicle Future Challenge from 2014 to 2016, and broadcast live on CCTV news for many times.



The first self-driving bus in China, developed by the R&D team led by Academician Li Deyi, completed Open Avenue Test From Zhengzhou to Kaifeng in 2015 (reported by 'Wired' Journal of US).



Graduates from Beijing Union University established a company and developed the first self-driving camper in China on the basis of Mercedes-Benz car.

Scientific Tasks Promote Talents Cultivation

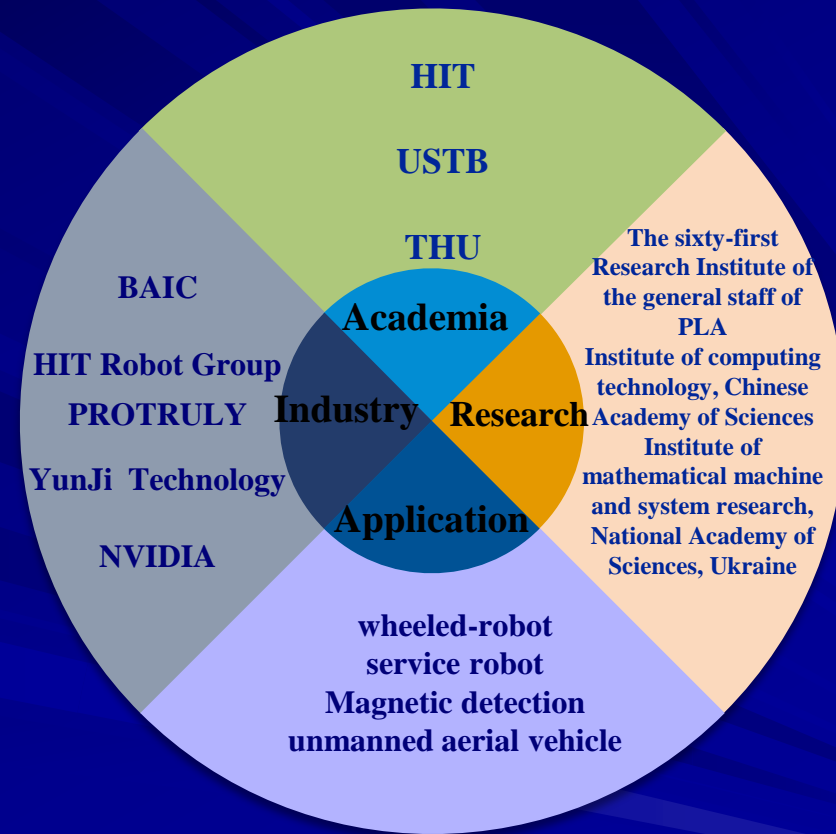


“Face to Face with Academician Li Deyi”- Beijing Union University ‘Small Tornado’ Activity Project Review

The team led by the Academician Li Deyi, undertakes more than 10 scientific research projects, whose scientific achievements and industry application promote the talents cultivation of new engineering in the era of intelligence.

Deep cooperation among industry, academia, research, and application

- ✓ **Strengthening cooperation between Industry and Academia:** Besides Zhongguancun Software Park, National Software Export Base, Neusoft Group, BAIC MOTOR Group and other enterprises, we cooperate with PROTRULY VISION TECHNOLOGY GROUP, which establishes 10-million-yuan special-purpose growth fund. Tedu.cn Group joins us and establish the talents cultivating program which is driven by practical R & D projects. As one project partner of UK-CIAPP\324 project, Beijing Zoominbot Automotive Technology Co., Ltd join us and develop driverless vehicles and cultivate engineers.
- ✓ **Deepening cooperation among universities:** We cooperate with Tsinghua University, Beijing Institute of Technology to develop practice teaching platform. We jointly cultivate undergraduates with Beijing University of Posts and Telecommunications, and exchange undergraduates with University of Science and Technology Beijing.
- ✓ **Enhancing international cooperation:** With the Newton Fund support (UK-CIAPP\324), we cooperated with Imperial College London to carry out R& D of driverless vehicles and talents cultivation. We also have cooperative relationship with University of California, Berkeley.



Realization of open cooperation
Deep cooperation among industry, academia,
research, and application

Scientific Tasks Promote Talents Cultivation

- ✓ **First driverless electric vehicle platform** of ‘Small Tornado’ series
- ✓ Taking different intelligent vehicles as teaching practice tools for undergraduates and graduates, which breaks the traditional teaching mode of software and hardware engineering majors



The screenshot shows a news article from China Education Daily, dated April 28, 2017. The article is titled 'Beijing Union University: "Real Swords, Real Guns" Cultivating Intelligent Talents' and is written by reporter Yu Yan. The article discusses the university's efforts to integrate AI and robotics into its curriculum, using self-driving vehicles as practical teaching tools. It mentions the 'Small Tornado' series of driverless electric vehicles and the involvement of Professor Li Deguo, president of the Chinese Association of Artificial Intelligence. The article highlights the university's approach of using real-world research projects to cultivate talent in the AI field.

中国教育报
CHINA EDUCATION DAILY
2017年04月28日 星期五
返回首页 | 广告刊例
上一篇 下一篇

北京联合大学：“真刀真枪”培养智能化人才

记者 余闯


本报讯（记者 余闯）近日，北京联合大学机器人学院举行“小旋风”兴趣活动启动会暨李德毅院士专题报告会。该院深化智能化时代新工科教育改革，整合学科专业资源，从学生一入学就提供真实无人驾驶汽车作为载体，贯穿大学4年教育教学全过程，开展科学任务导向的教学创新实践，培养新时代需要的智能化人才。

中国人工智能学会理事长、北京联合大学机器人学院院长李德毅，围绕“自动驾驶技术变迁”作了专题报告。他根据最有可能被人工智能替代的工作场景的预测，阐述了无人驾驶技术替代汽车驾驶员是未来必然趋势的观点。

据介绍，北京联合大学机器人学院“小旋风”兴趣活动遵循“科学任务带动人才培养，载体汇聚不同学科，创新驱动发展”的模式，以专用低速电动车辆为开发平台，平台有巡逻车、救护车等10种类型，每种类型两队，组建“小旋风”系列车队。学生可跨专业、跨年级自由组合，共同聚焦科学任务，以专业交叉融合解决科学问题。

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three-dimensional professional curriculum resources
and set up open projects for students. Undergraduates participate in self-driving vehicles step by step and improve their engineering skills in groups including driverless park patrol vehicle, driverless guided by experienced teachers.



Report from *China Education News*: “Beijing Union University : Cultivating talents in AI field based on real research projects and practical self-driving vehicles.”

The biggest intelligent vehicle group among Chinese Universities



Intelligent vehicles of 'Jing Long' series and 'Small Tornado' series of Beijing Union University

Scientific tasks promote talents cultivation and carriers converge different disciplines



Using intelligent vehicles as teaching carriers;
Providing undergraduates opportunities to participate in scientific tasks;
Guaranteeing the quality of talents cultivation.

Undergraduates of College of Robotics carried out scientific and technological activities in Robot Innovation Centre



Hope | Dream

what is excellent teaching in engineering?

Those who can help realize the dreams of young people from different backgrounds are excellent universities and majors!



On the Exhibition of 2015 Beijing Science and Technology Week, teenagers had strong interests in Jing Long No. 2 Self-driving Vehicle of Beijing Union University.

Thank you!



In 2016 Enrollment publicity site of College of Robotics in a high school of the Xichuan County, students who were going to attend entrance examination to colleges watched unmanned aerial vehicle with great enthusiasm.