The Institution of Engineering and Technology

GLOBAL INDUSTRY ORGANIZATIONS

“AI for Science - Scientific Research for universities”

Setepmber 2024

Paulo Lopes

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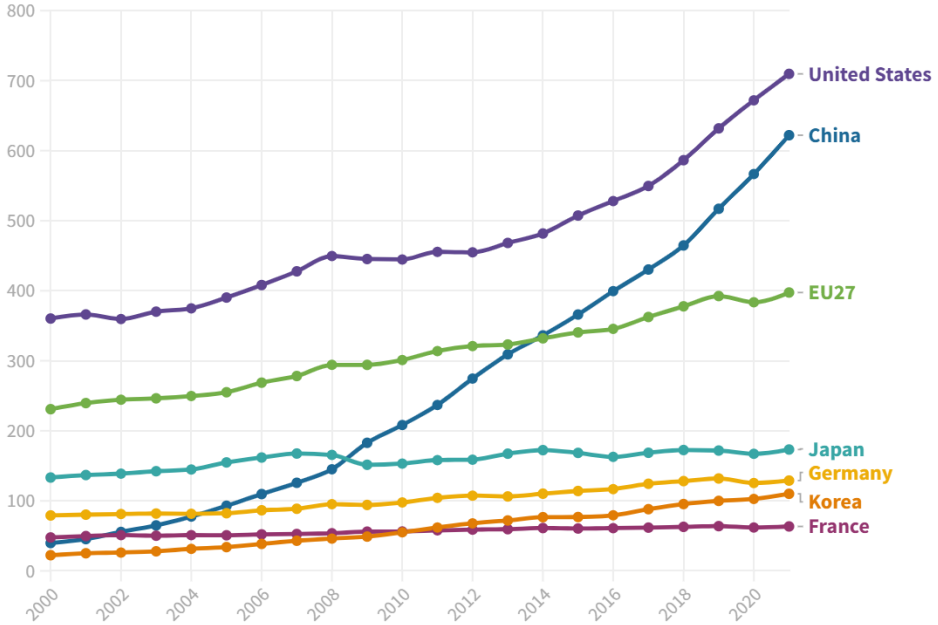
Key statistics about research globally

Gross domestic expenditure on R&D, selected economies, 2000-2021

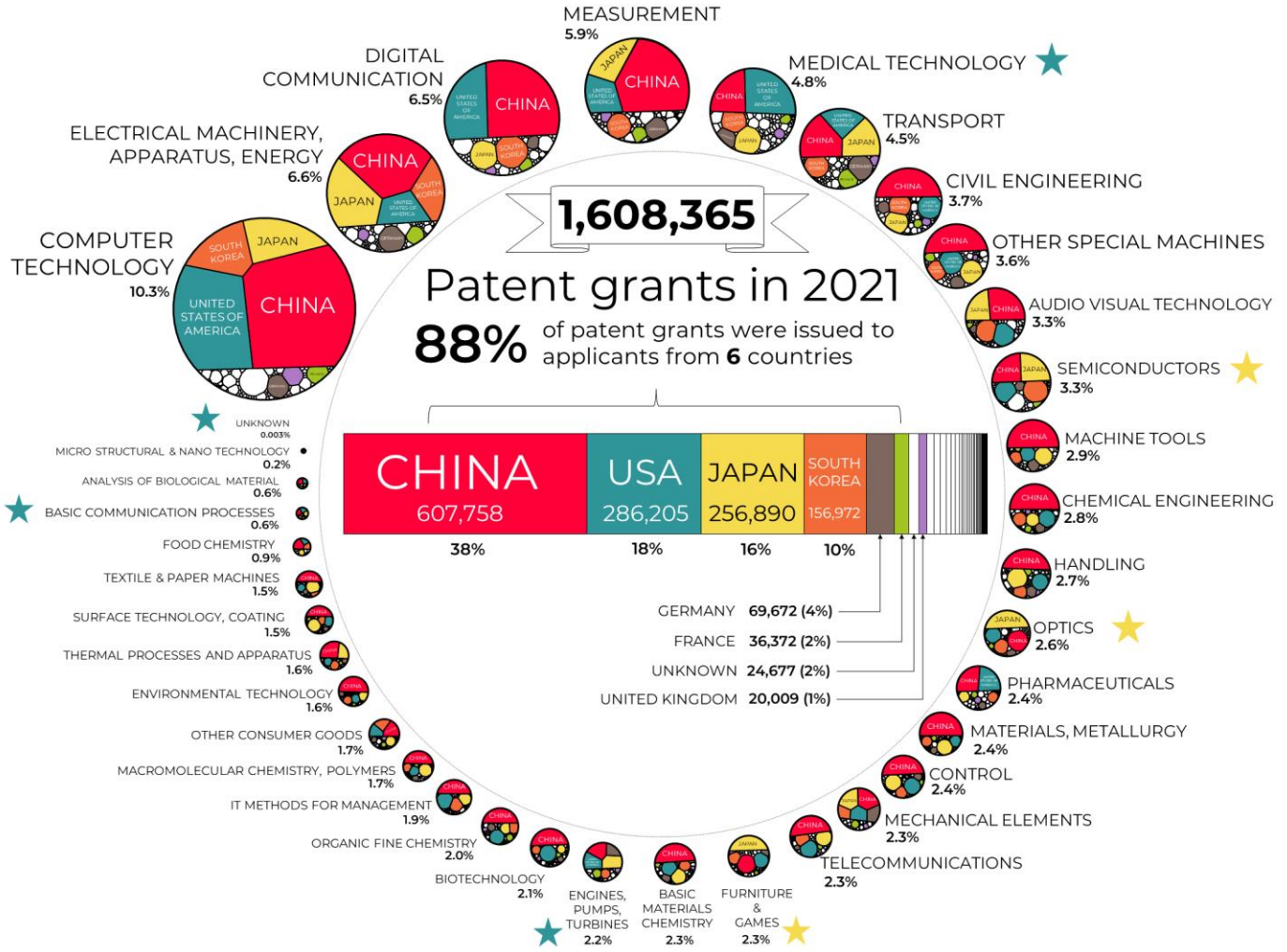
USD billions in constant PPP prices



Source: OECD R&D statistics, February 2023 • See OECD Main Science and Technology Indicators at oe.cd/msti for most up-to-date indicators.

OECD

PATENT GRANTS BY ORIGIN COUNTRY & FIELD OF TECHNOLOGY

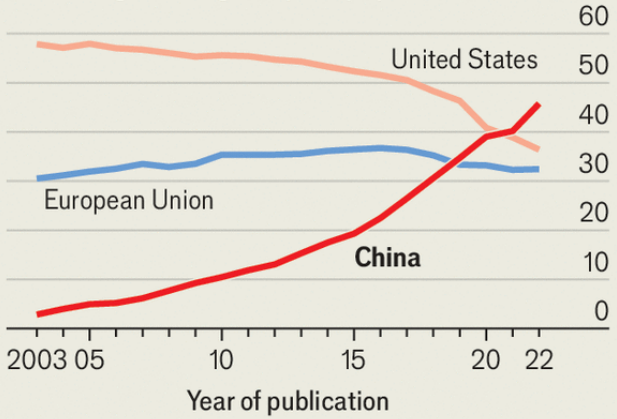


Red moon rising

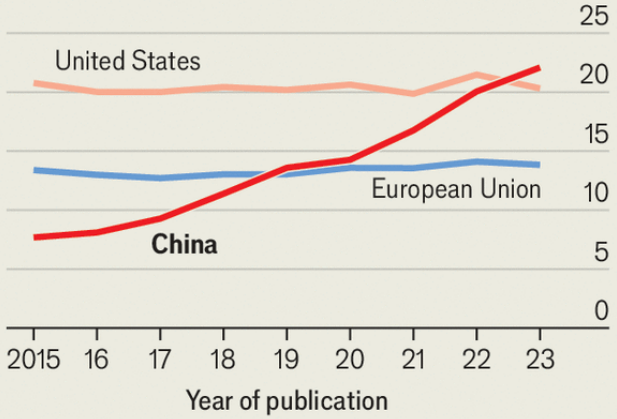
1

High-quality science papers, by author location, selected countries/regions

Share of global high-impact papers*, %†



Nature Index, contributions to papers published‡, '000

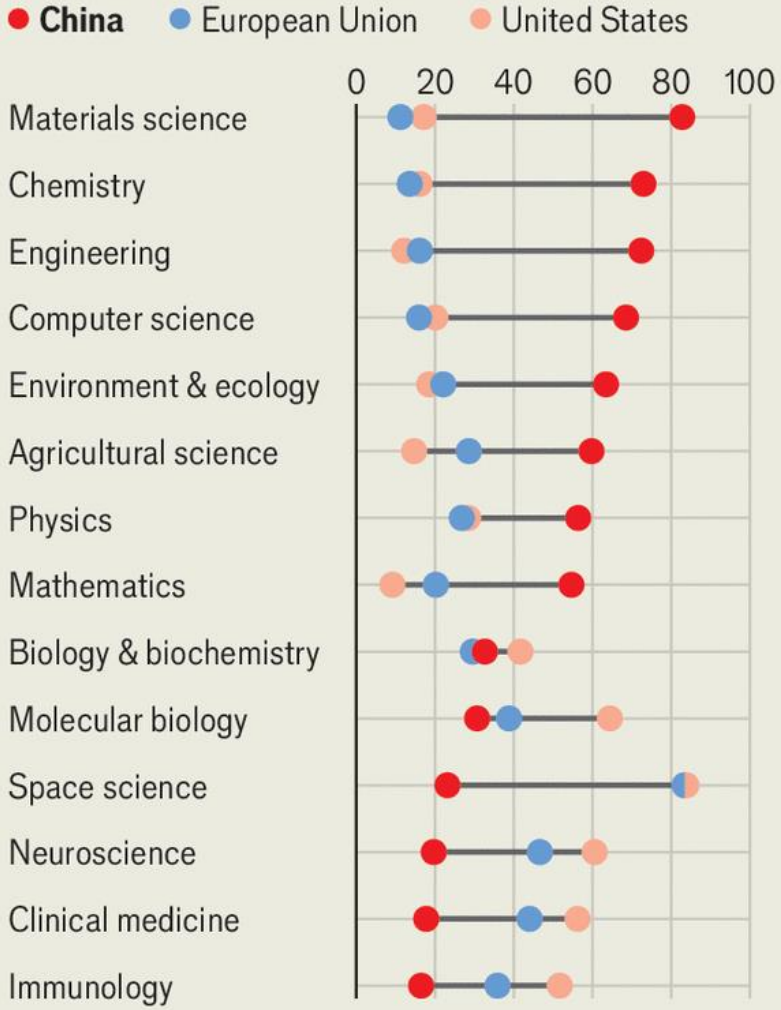


*Top 1% by number of citations, Web of Science platform
†Percentages can add up to more than 100 due to co-authorships ‡In prestigious journals
Sources: *Nature*; Clarivate, Web of Science; *The Economist*

Scientific discipline

2

Share of global high-impact papers* by author location, selected countries/regions, 2022, %†

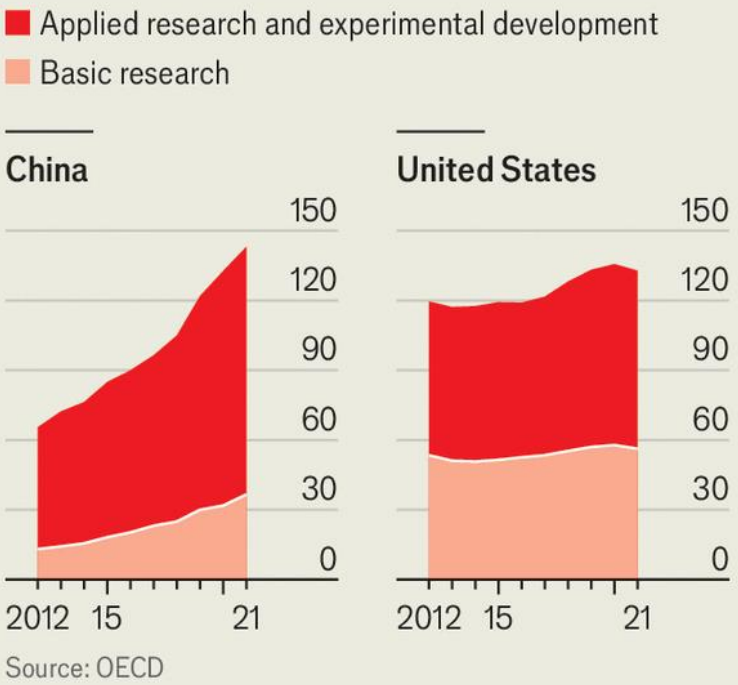


*Top 1% by number of citations, Web of Science platform
†Percentages can add up to more than 100 due to co-authorships
Sources: Clarivate, Web of Science; *The Economist*

Money, money, money

3

Spending on university and government research
$bn at purchasing-power parity, 2015 prices



Source: The Economist (2024) China has become a scientific superpower (economist.com)

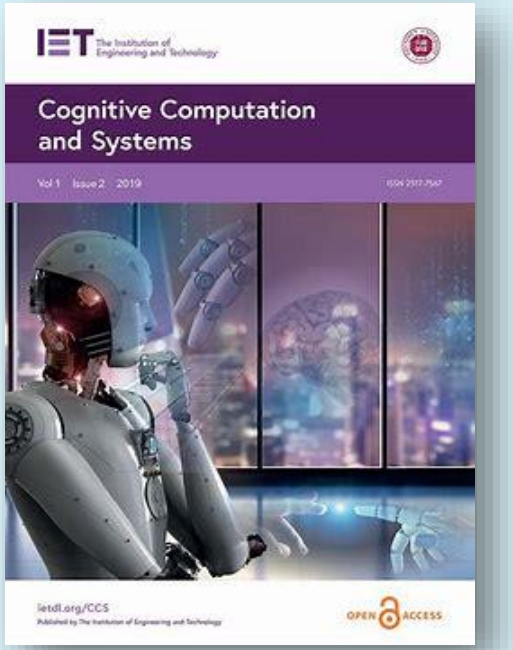
IET Journals

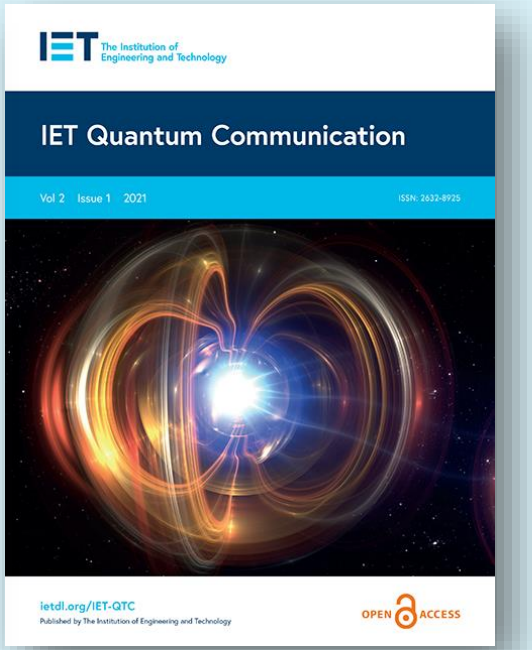
- IET publishes **46 Gold Open Access Journals**
- Partnership with Wiley

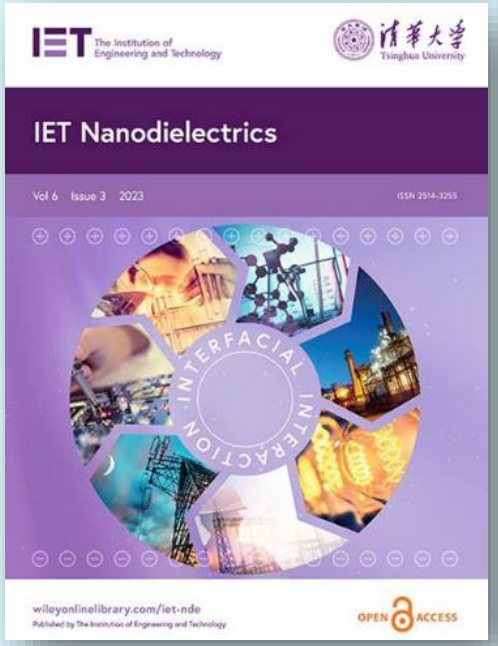
国家电网 STATE GRID
国网经济技术研究院有限公司
STATE GRID ECONOMIC AND TECHNOLOGICAL RESEARCH INSTITUTE CO., LTD.

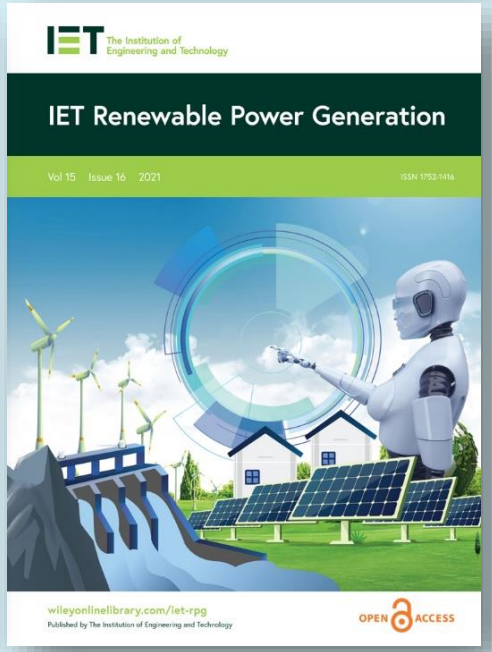
国家电网 STATE GRID
中国电力科学研究院
CHINA ELECTRIC POWER RESEARCH INSTITUTE

国家电网 STATE GRID
国网智能电网研究院有限公司
STATE GRID SMART GRID RESEARCH INSTITUTE CO.,LTD.









Source: IET (2024) https://ietresearch.onlinelibrary.wiley.com/

AI Transforming Academic Research

AI has significantly transformed academic research over the past few years.

Data Analysis	Literature Review	Hypothesis Generation	Automated Repetitive Tasks	Ethical Considerations
Enhanced Search Capabilities	Predictive Analytics	Personalized Learning	Collaboration Tools	Funding and Resource Allocation

These impacts highlight how AI is not only enhancing the efficiency and effectiveness of academic research but also opening up new avenues for exploration and innovation.

Challenges using AI in academic research

Using AI in academic research comes with several challenges that have only intensified more and more as the technology improves daily.

Data Bias	Transparency	Ethical Concerns	Quality of Data	Resource Intensive
Over-reliance	Regulatory Issues	Integration	Skill Gap	Reproducibility

These challenges highlight the need for careful consideration and balanced integration of AI in academic research.

Abuse in Academic Research with AI

Using AI to create fake academic papers poses significant challenges to research integrity.

- Plagiarism
- Fabrication
- Loss of authorship
- Quality Control
- Ethical Concerns
- Detection Difficulties
- Misleading Information
- Regulatory Challenges
- Bias and Fairness
- Educational Impact

These issues highlight the need for careful and responsible use of AI in academic research to ensure that it enhances rather than undermines the integrity of scholarly work.

Maintaining Research Integrity

Measures for Journals	Measures for Researchers
• Rigorous Peer Review • Plagiarism Detection • Data Transparency • Clear Ethical Guidelines • Conflict of Interest Disclosure • Post-Publication Review • Training and Education • Retraction Policies • Encouraging Replication Studies • Ethical Review Boards	• Adhere to Ethical Guidelines • Maintain Accurate Records • Transparent Data Management • Proper Authorship Practices • Regular Training • Peer Review and Collaboration • Use of Plagiarism Detection Tools • Report Misconduct • Ethical Data Use • Stay Informed

The Application of AI in Functional Safety

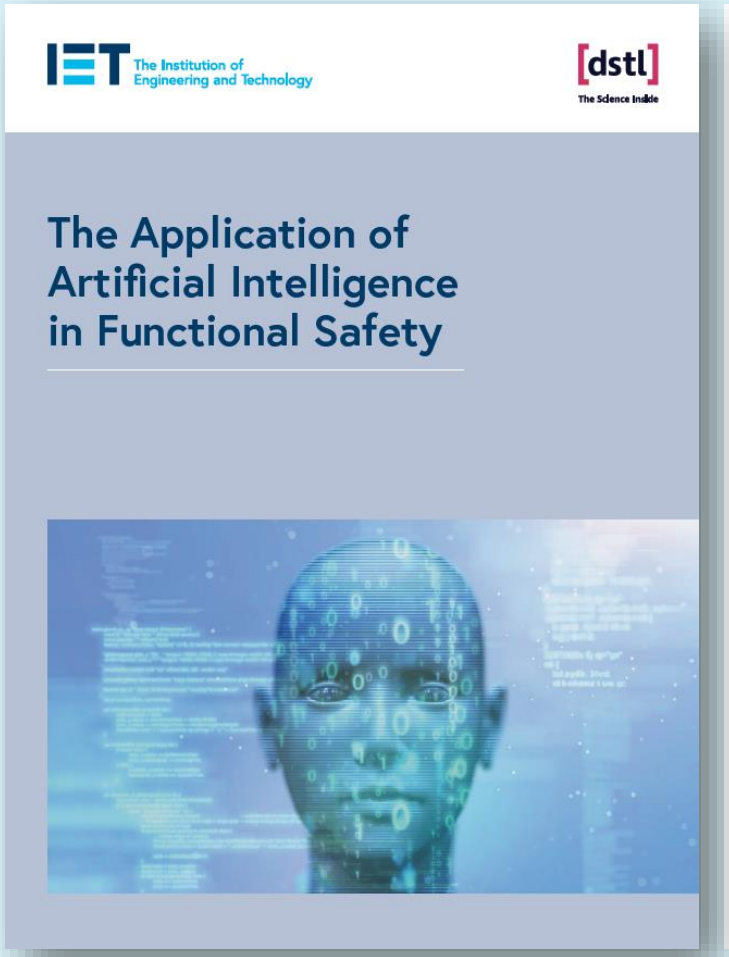
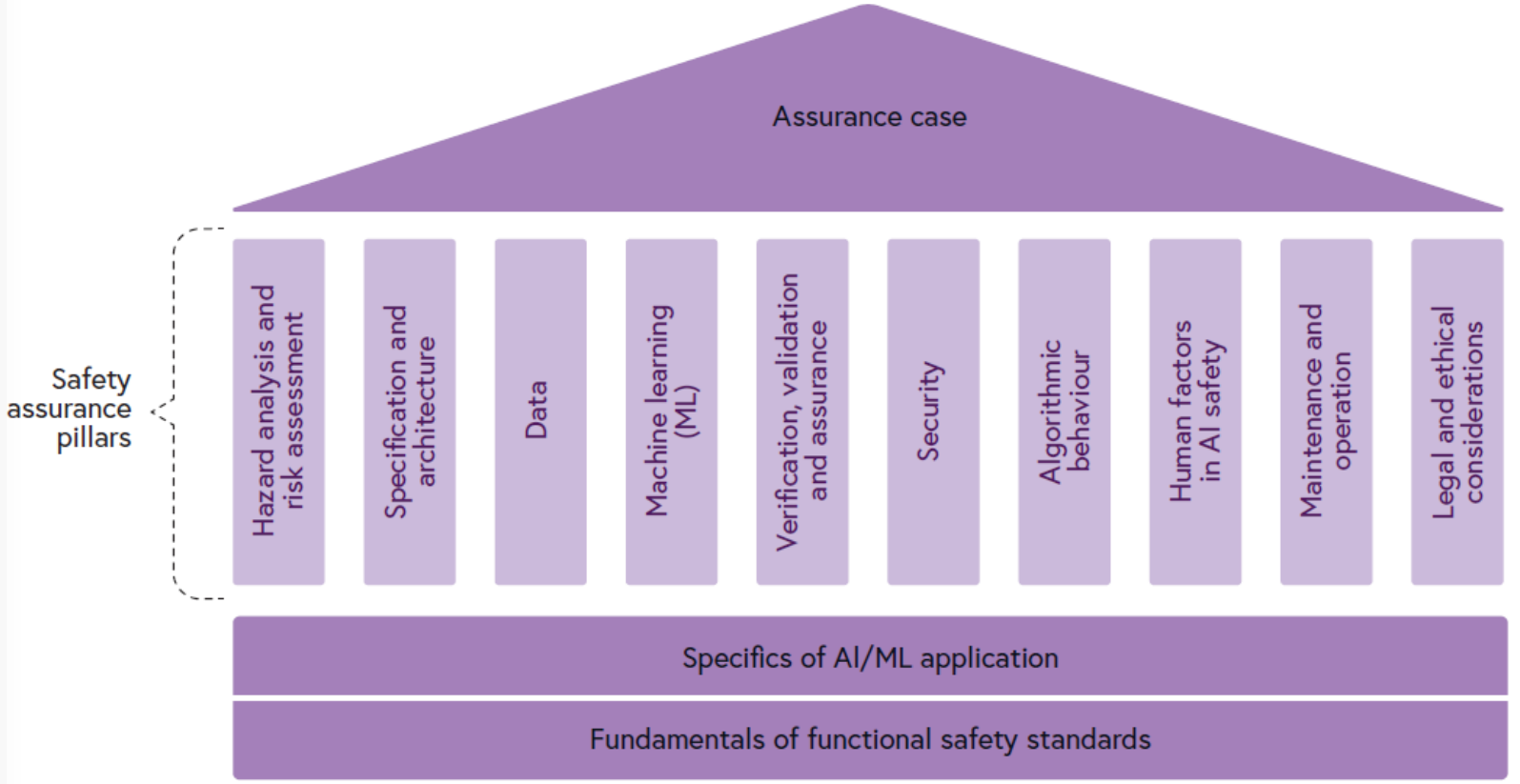
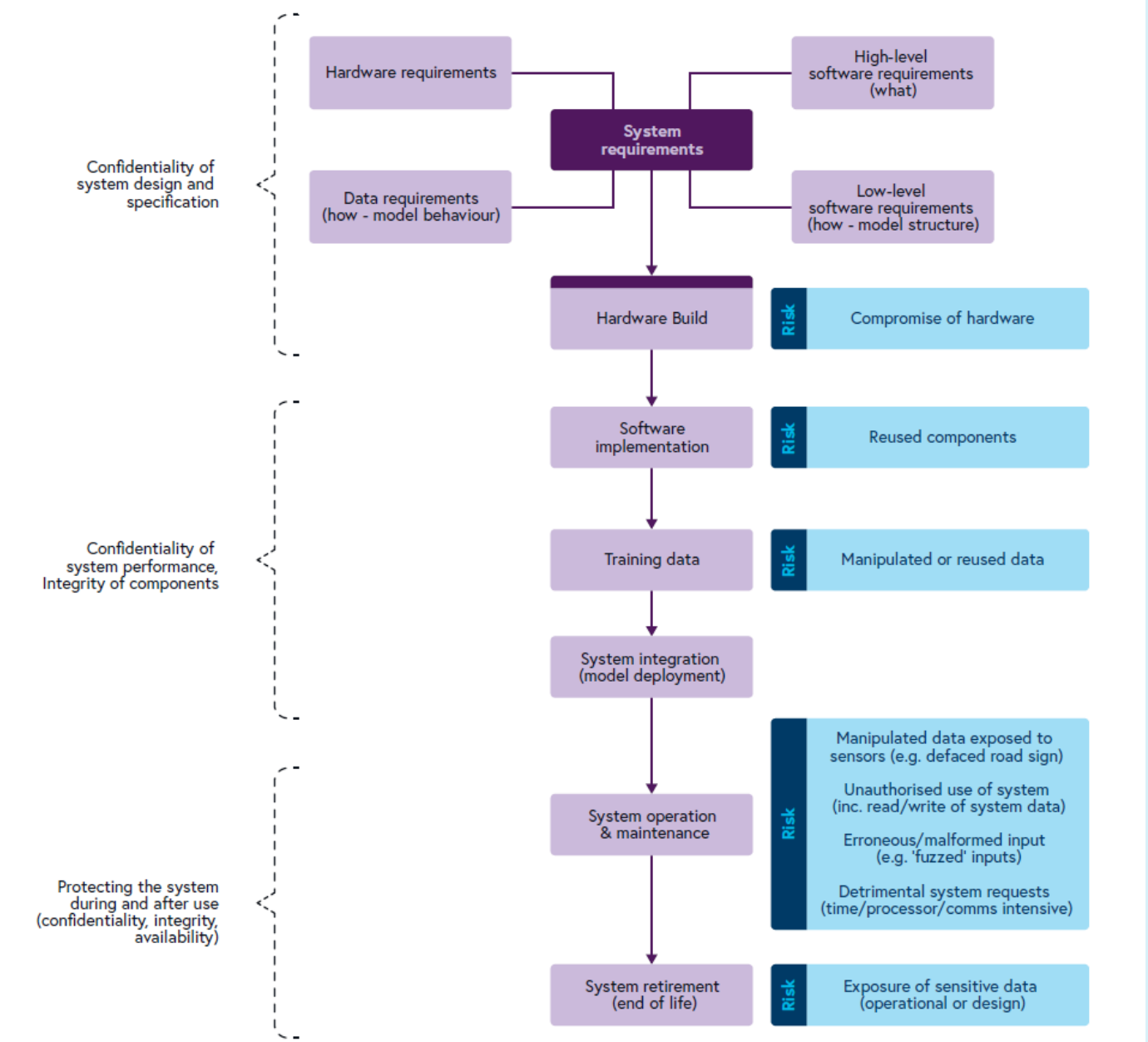


Figure 1.1 Key pillars for evaluating the risk of using AI for safety-related applications



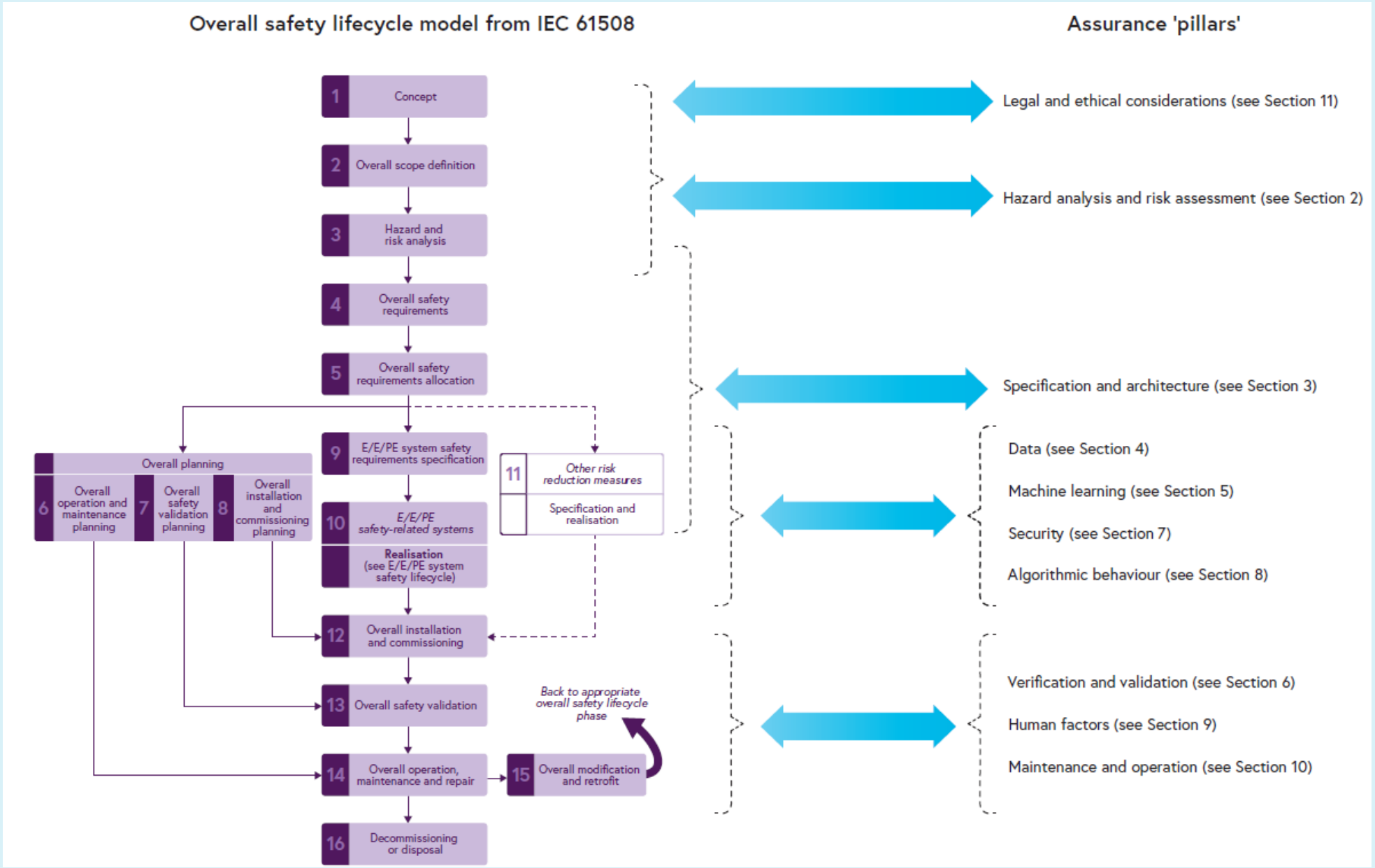
Source: IET Website: https://www.theiet.org/membership/member-news/member-news-2022/member-news-april-to-june-2022/launch-of-our-new-report-on-artificial-intelligence-in-safety-related-systems

System lifecycle for a system incorporating AI

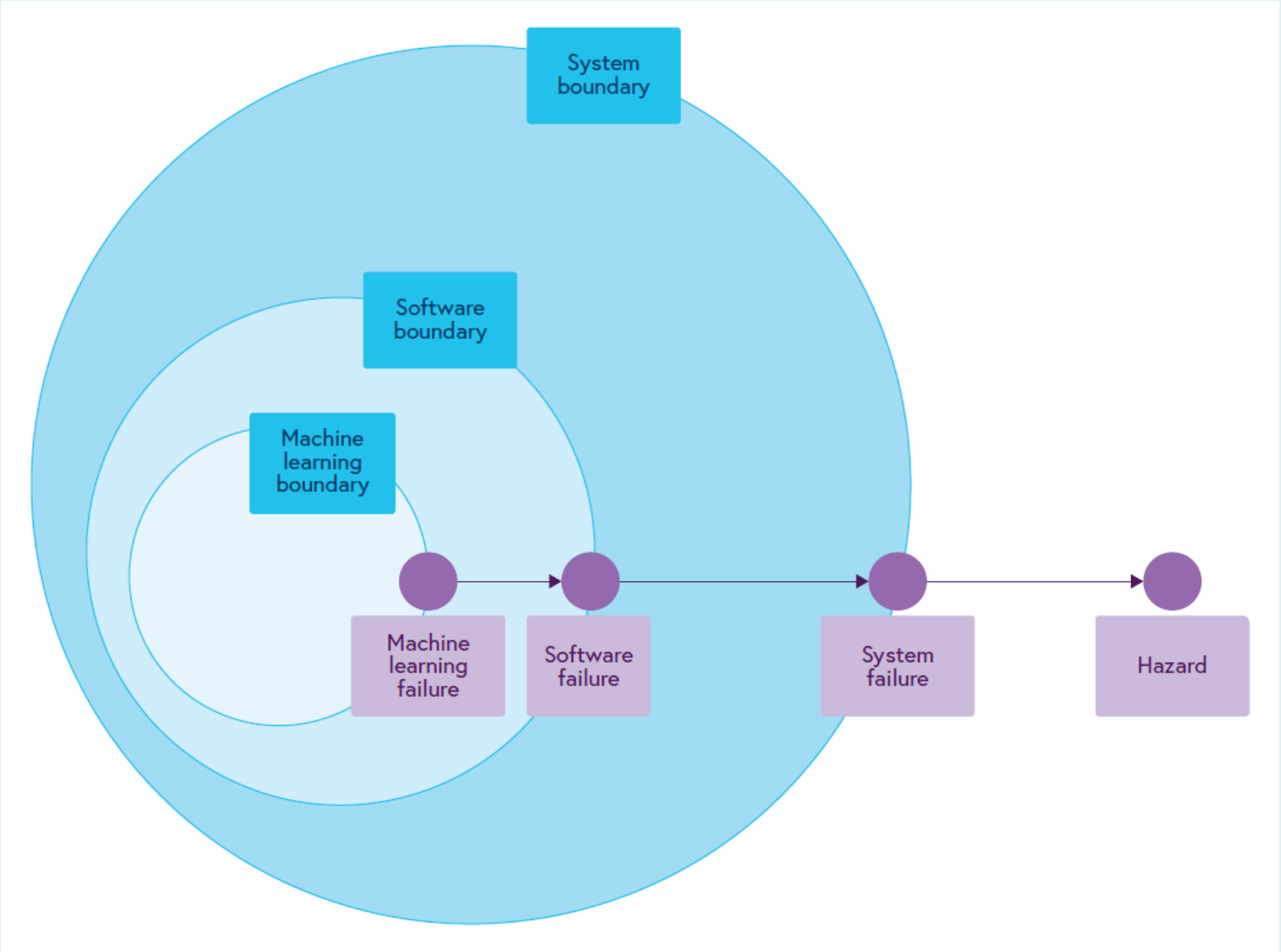


Source: IET Website: https://www.theiet.org/membership/member-news/member-news-2022/member-news-april-to-june-2022/launch-of-our-new-report-on-artificial-intelligence-in-safety-related-systems

Alignment of pillars of assurance to phases in the overall safety lifecycle model



Simplified chain of failure events



About the IET

Institution of Engineering and Technology

The IET at a glance

Multi-Disciplinary

The UK's only multi-disciplinary institution working across key sectors:

Members in

156,000+
Members

4,000+
Volunteers

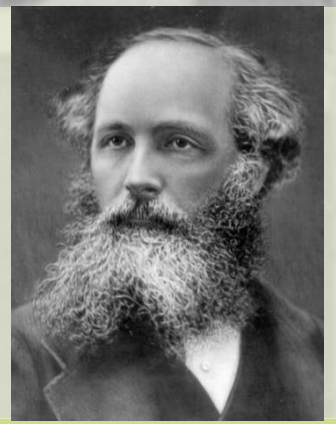
历史上著名的会长和成员
Historical Prestigious Presidents and Members

Charles Wheatstone爵士
Sir Charles Wheatstone
(1802-1875)
学会的共同创始人
Co-inventor of the Telegraph

Silvanus Thompson
(1851-1916)
公认的电学、磁学权威
Recognized authority on Electricity, Magnetism

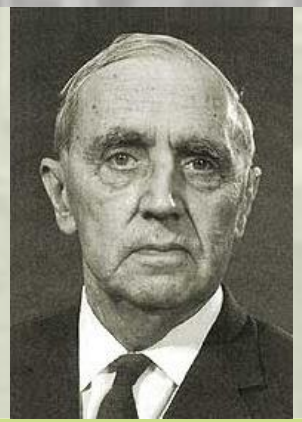
Frederick H. Royce爵士
Sir Frederick H. Royce
(1863-1933)
劳斯莱斯公司创始人
Founder of Rolls Royce

William Siemens爵士
Sir William Siemens
(1823-1883)
西门子工程（英国分公司）创始人
Founder of Siemens Engineering (British branch)
STE第一任会长
1st President of STE



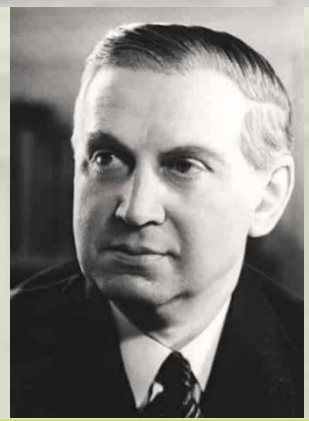
James Clerk Maxwell
(1831-1879)
电磁学和气体动力学理论先驱
Pioneer in Electromagnetism and kinetic theory of gases
麦克斯韦分布公式发明人
Formula Maxwell Distribution

Charles Kuen Kao
(1933-2018)
“光纤通信之父”和“宽带教父”
Electrical engineer / physicist
Father of fiber optics in telecommunications



Alec H. Reeves
(1902-1971)
脉冲编码调制 (PCM) 的发明人
Inventor of Pulse Code Modulation (PCM)
“信息时代之父”
“Father of Information Age”

Amy Johnson
(1903-1941)
首位独自从英国飞往澳大利亚的女性（1930年）
First woman to fly solo from the UK to Australia in 1930



Sir Edward Appleton
(1892-1965)
发现电离层阿普尔顿层的诺贝尔奖得主
Nobel Prize winner for discovering the Appleton Layer on the ionosphere

Marchese Marconi
(1874-1937)
发明无线电报的诺贝尔奖得主
Nobel Prize winner for creating the wireless telegraphy

Recent IET Presidents

IET President
Dr Gopichand Katragadda BE MS PhD CEng FIET

- Founder and CEO of **Myelin Foundry** – an AI company
- Independent Director of **Bosch India Limited** and **ICICI Securities**
- Former Group Chief Technology Officer and Innovation Head of **Tata Sons**
- Former Chairman and Managing Director of **GE India Technology Centre**

Emeritus President
Professor Bob Cryan CBE DL FREng MBA DSc CEng FIET

- **Fellow of the Royal Academy of Engineering**
- Vice-Chancellor of the **University of Huddersfield**
- Expert in **telecommunication**
- holds 6 degrees including 2 **first class honours** (engineering, mathematics), an **MBA** and 2 **doctorates**

Next President
Warren East CBE FREng FRS MA MBA CEng FIET

- **Fellow of the Royal Academy of Engineering**
- 30 years in **semiconductor industry,** 11 years in **Texas Instruments**; 19 years in **ARM**, 12 of those were as CEO
- CEO of **Rolls-Royce** for 7 years
- Board member of **BT**, **Dyson**, **Micron**; non-executive at **ASML** and **Tokamak Energy**
- Advisory board for **Avina Clean Hydrogen**
- **University of Oxford**, Executive in Residence at the Saïd Business School; Honorary Fellow at Wadham College

Institutional Partners

中国科学技术协会 China Association for Science and Technology

中国电机工程学会 CHINESE SOCIETY FOR ELECTRICAL ENGINEERING

中国工程师联合体 CHINESE SOCIETY OF ENGINEERS

中国通信学会 CHINA INSTITUTE OF COMMUNICATIONS

CMES

中国对外承包工程商会 China International Contractors Association

中国水利学会 CHES

BIE THE BEIJING INSTITUTION OF ENGINEERS 北京工程师学会

中国仪器仪表学会 CHINA INSTRUMENT AND CONTROL SOCIETY

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清華大學 Tsinghua University

Imperial College London

澳門理工大學 Universidade Politécnica de Macau Macao Polytechnic University

北京郵電大學 Beijing University of Posts and Telecommunications

SBC The Sino-British College, USST 上海理工大学中英国际学院

电子科技大学 University of Electronic Science and Technology of China

Xi'an Jiaotong-Liverpool University 西交利物浦大学

西南交通大学 Southwest Jiaotong University

The University of Nottingham UNITED KINGDOM · CHINA · MALAYSIA

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accenture

Pearson

GE Power Conversion

THALES

TATA

Journal Partners

SOUTHWEST JIAOTONG UNIVERSITY

ZHEJIANG UNIVERSITY 1897

SHENZHEN UNIVERSITY 1983

TIANJIN UNIVERSITY (PEIYANG UNIVERSITY) 1895

SEE

AAI

CHONGQING UNIVERSITY OF TECHNOLOGY 1940

国家电网 STATE GRID

国网经济技术研究院有限公司 STATE GRID ECONOMIC AND TECHNOLOGICAL RESEARCH INSTITUTE CO., LTD.

国家电网 STATE GRID

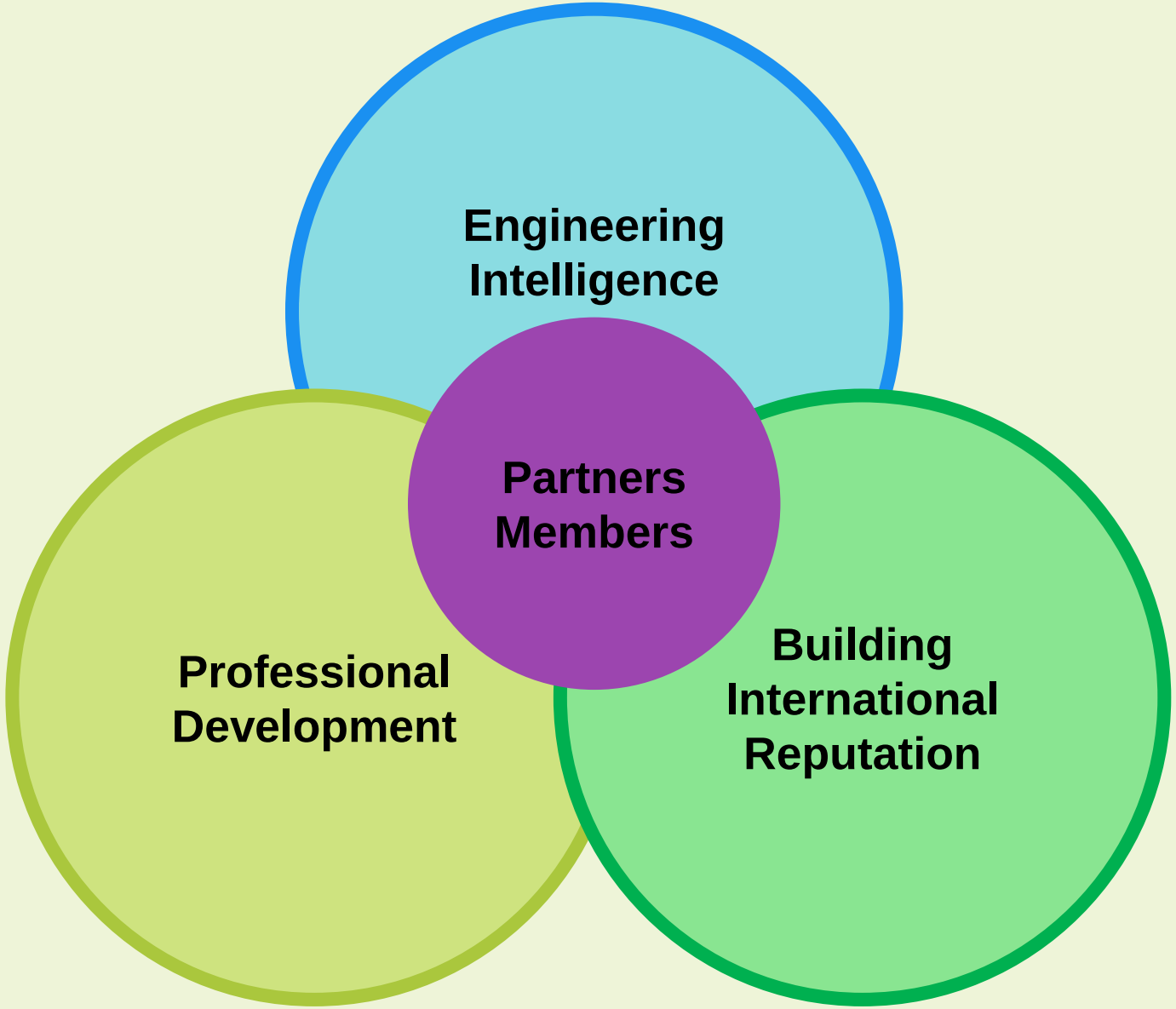
中国电力科学研究院 CHINA ELECTRIC POWER RESEARCH INSTITUTE

国家电网 STATE GRID

国网智能电网研究院有限公司 STATE GRID SMART GRID RESEARCH INSTITUTE CO.,LTD.

Working together

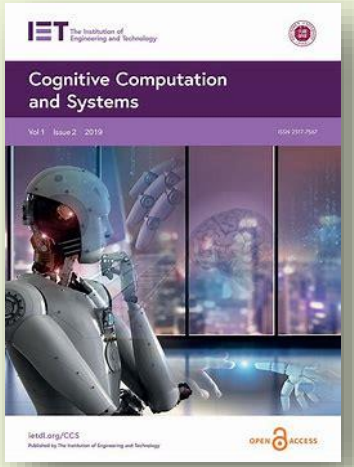
IET offering for partners and members

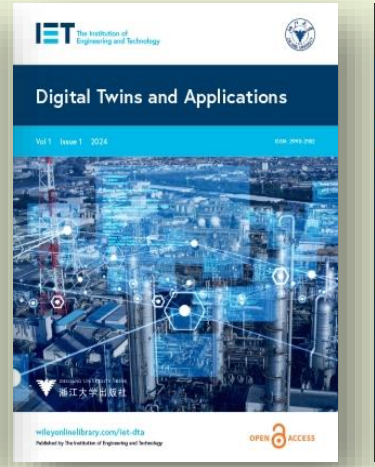


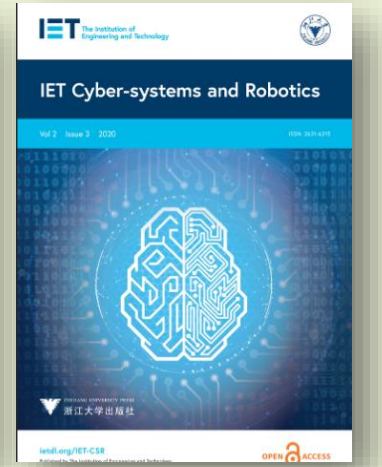
IET Engineering Intelligence

Engineering Intelligence

- 46 IET Journals + books + INSPEC
- 20 Call-for-Papers events in China
- 21 Technical Networks
- Thought Leadership such as International Skills Survey
- Hub of knowledge such as IET.TV, Digital Library







IET Professional Development

Professional Development

- Professional Registration Chartered Engineer
- IET Fellow
- Continuous Professional Development
- Training
- Volunteering


The Institution of Engineering and Technology
Founded 1871 Incorporated by Royal Charter 1921

Member of the Institution of Engineering and Technology
was registered on 17 March 2022 as a

Chartered Engineer

Chief Executive and Secretary

President

Valid with current IET membership Membership number: 1100988776
The IET is licensed by the Engineering Council to award the professional engineering qualifications


The Institution of Engineering and Technology
Founded 1871 Incorporated by Royal Charter 1921

This is to certify that on

13 September 2017

was elected to

Fellow

of the Institution of Engineering and Technology

President

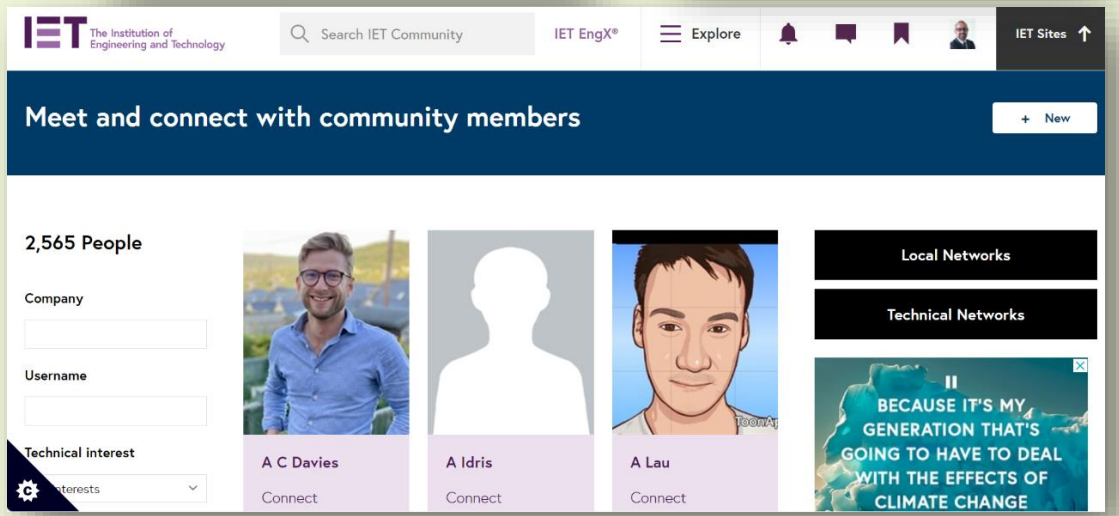
Member of the Board of Trustees

Chief Executive and Secretary

IET International Reputation

Building International Reputation

- International Awards
- International Scholarships
- University Accreditation
- Institutional, Academic, Corporate Partnerships
- EngX – connect with thousands of experts globally



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谢谢!