AI-Assisted Academic Peer Review

From functional perspective

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《数据采集与处理》

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01

Previous work of our team

1 survey in 2018

3 papers in 2019

Previous work of our team

Zhang Tong，Zhou Yunxia，Cai Fei，Zhang Bei. Historical evolution of peer review of academic journals[J]. Chinese Journal of Scientific and Technical Periodicals,2019,30(6):588. (in Chinese)

张彤，周云霞，蔡斐，张蓓.学术期刊同行评议的历史演进[J].中国科技期刊研究,2019,30(6):588

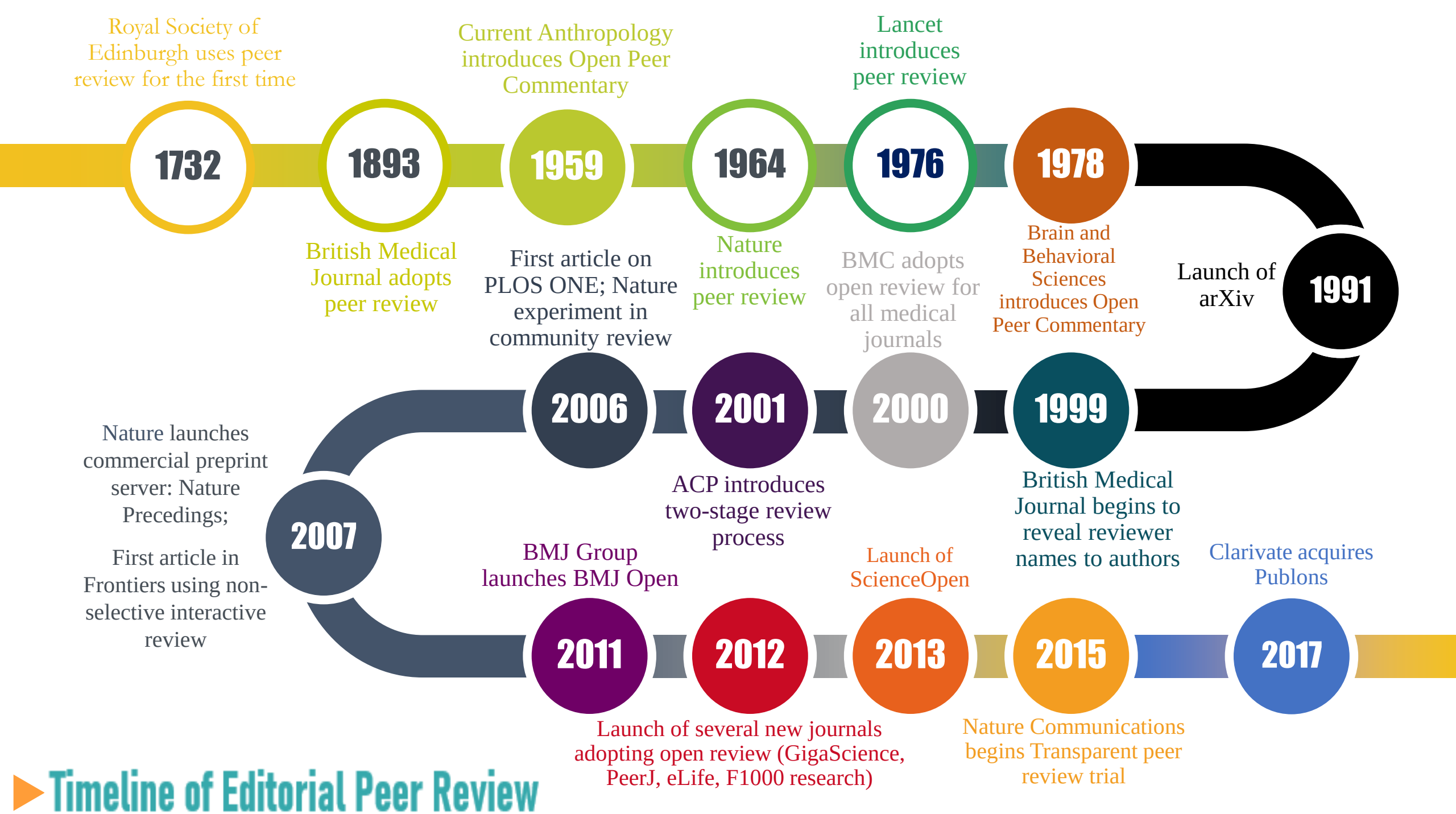
Zhang Tong. Multi-layer modularization of open peer review for academic journals[J]. Acta Editologica,2019,31(4)

张彤.学术期刊开放同行评议多层次模块化[J].编辑学报

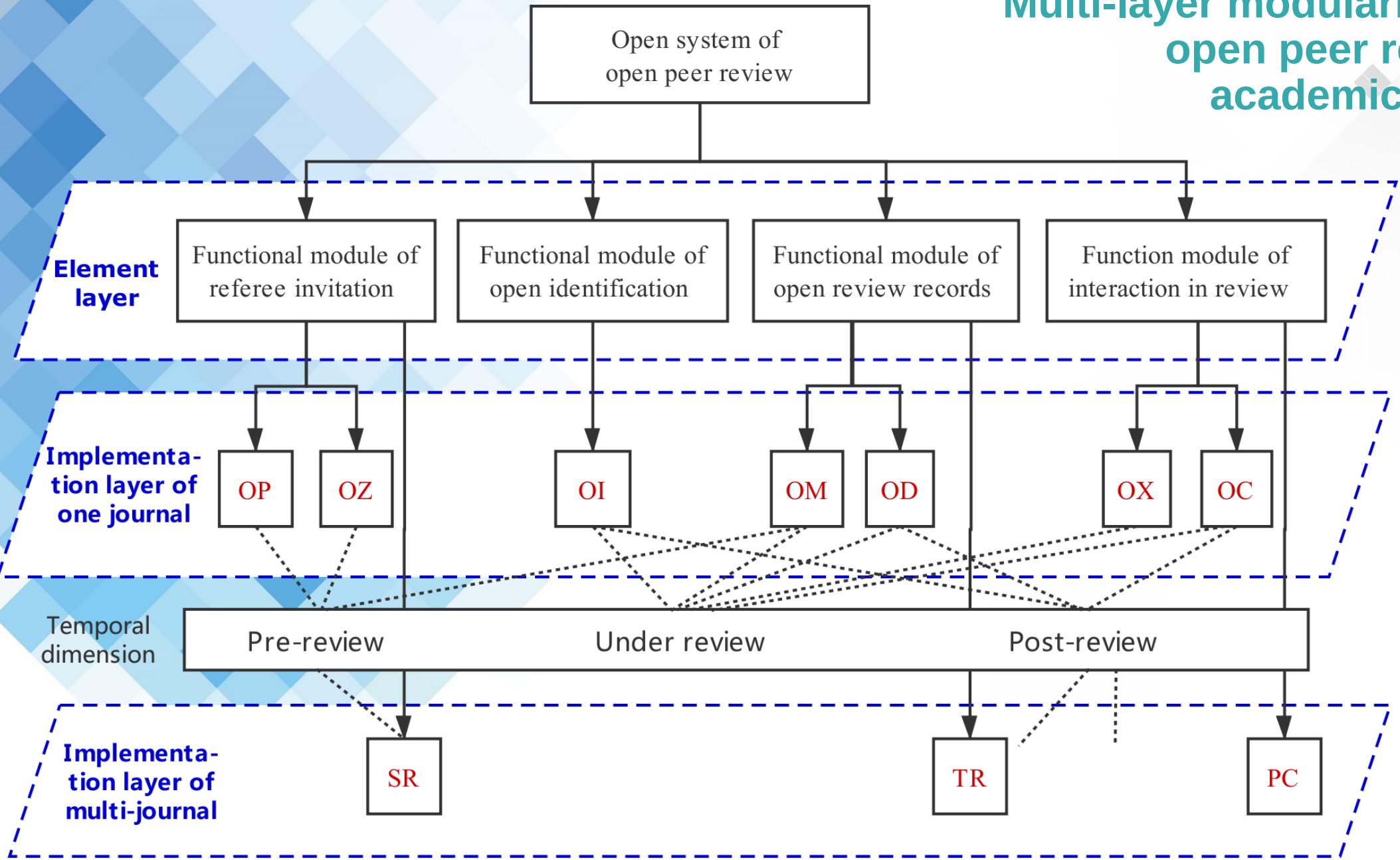
Zhang Tong, Yin Huan, Su Lei, Wang Jing, Xia Daojia. Functional classification of Artificial Intelligence-assisted academic peer review[C].Annual Conference for China Editology Society of Science Periodicals 2019, Beijing, 2019.

张彤，尹欢，苏磊，王静，夏道家.人工智能辅助学术同行评议功能分类[C].中国科学技术期刊编辑学会2019年学术年会,北京,2019.

Pluralistic review modes (Survey)　评议模式更多元（“关于审稿人的问卷调查”）


Royal Society of Edinburgh uses peer review for the first time
1732
1893
British Medical Journal adopts peer review
Current Anthropology introduces Open Peer Commentary
1959
First article on PLOS ONE; Nature experiment in community review
1964
Nature introduces peer review
Lancet introduces peer review
1976
BMC adopts open review for all medical journals
1978
Brain and Behavioral Sciences introduces Open Peer Commentary
Launch of arXiv
1991
1999
British Medical Journal begins to reveal reviewer names to authors
2000
2001
ACP introduces two-stage review process
2006
Nature launches commercial preprint server: Nature Precedings;
First article in Frontiers using non-selective interactive review
2007
BMJ Group launches BMJ Open
2011
2012
Launch of several new journals adopting open review (GigaScience, PeerJ, eLife, F1000 research)
Launch of ScienceOpen
2013
2015
Nature Communications begins Transparent peer review trial
Clarivate acquires Publons
2017
Timeline of Editorial Peer Review

Multi-layer modularization of open peer review for academic journals



02

Functions of AI-assisted peer review

To scan papers and check statistical data

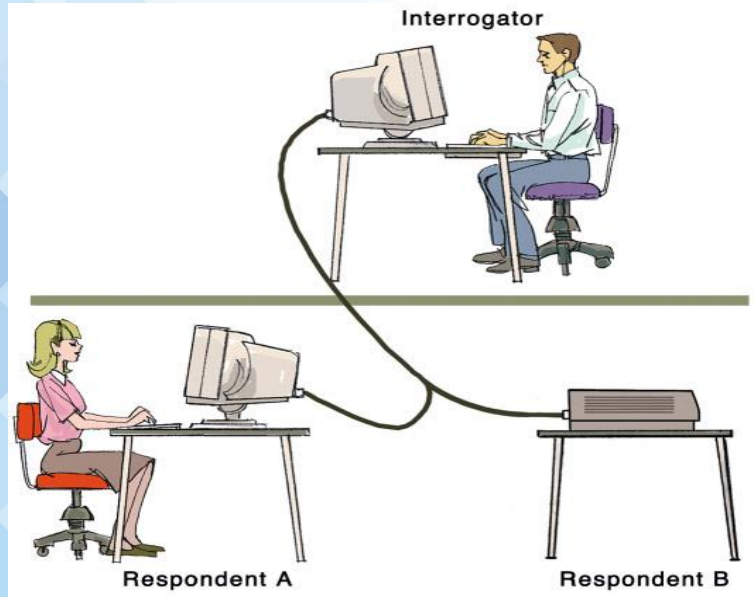
To check for plagiarism

To recommend reviewers

To predict manuscript impact

A rich history of AI

Alan Turing



Turing test, in which the interrogator must determine which respondent is the computer and which is the human (1950)

John McCarthy coined the phrase AI during the summer of 1956 at Dartmouth College in Hanover.

Dreyfus reported "*Alchemy and Artificial Intelligence*" in1965 for Rand Corporation.

AI has roots in a number of scientific disciplines

- Computer science and engineering (hardware and software)
- Mathematics (logic, algorithms, optimization)
- Philosophy (rules of reasoning)
- Neuroscience (modeling low level human/animal brain activity)
- Psychology (modeling high level human/animal thinking)
- Linguistics
- Control Theory

http://ai.stanford.edu/courses/

A rich history of AI

- The birth of AI (1943 – 1956)
  - McCulloch and Pitts (1943): simplified mathematical model of neurons (resting/firing states) can realize all propositional logic primitives (can compute all Turing computable functions)
  - Alan Turing: Turing machine and Turing test (1950)
  - Claude Shannon: information theory; possibility of chess playing computers
  - Boole, Aristotle, Euclid (logics, syllogisms)
- Early enthusiasm (1952 – 1969)
  - 1956 Dartmouth conference
    John McCarthy (Lisp);
    Marvin Minsky (first neural network machine)
    Alan Newell and Herbert Simon (GPS)
  - Emphasis on intelligent general problem solving
    GSP (means-ends analysis);
    Lisp (AI programming language);
    Resolution by John Robinson (basis for automatic theorem proving);
    Heuristic search (A*, AO*, game tree search)

A rich history of AI

- Emphasis on knowledge (1966 – 1974)
  - Domain specific knowledge is the key to overcome existing difficulties
  - Knowledge representation (KR) paradigms
  - Declarative v.s. procedural representation
- Knowledge-based systems (1969 – 1999)
  - DENDRAL: the first knowledge intensive system (determining 3D structures of complex chemical compounds)
  - MYCIN: first rule-based expert system (containing 450 rules for diagnosing blood infectious diseases)
  - EMYCIN: an ES shell
  - PROSPECTOR: first knowledge-based system that made significant profit (geological ES for mineral deposits)

A rich history of AI

- AI became an industry (1980 – 1989)
  - Wide applications in various domains
  - Commercially available tools
  - AI winter
- Current trends (1990 – present)
  - More realistic goals
  - More practical (application oriented)
  - Distributed AI and intelligent software agents
  - Resurgence of natural computation - neural networks and emergence of genetic algorithms – many applications
  - Dominance of machine learning (big apps)

AI is Controversial

- AI Winter – too much promised
  - 1966: the failure of machine translation,
  - 1970: the abandonment of connectionism,
  - 1971−1975: DARPA's frustration with the Speech Understanding Research program at Carnegie Mellon University
  - 1973: the large decrease in AI research in the United Kingdom in response to the Lighthill report,
  - 1973−74: DARPA's cutbacks to academic AI research in general,
  - 1987: the collapse of the Lisp machine market,
  - 1988: the cancellation of new spending on AI by the Strategic Computing Initiative
  - 1993: expert systems slowly reaching the bottom
  - 1990s: the quiet disappearance of the fifth-generation computer project's original goals,
- AI will cause
  - Social ills, unemployment
  - End of humanity

What is AI?

There is no clear consensus on the definition of AI.

What is artificial intelligence?

It is the science and engineering of making intelligent machines, especially intelligent computer programs. It is related to the similar task of using computers to understand human or other intelligence, but AI does not have to confine itself to methods that are biologically observable.

ANI, artificial narrow intelligence — Weak AI

AGI, artificial general intelligence — Strong AI

ASI, artificial super intelligence

Yes, but what is intelligence?

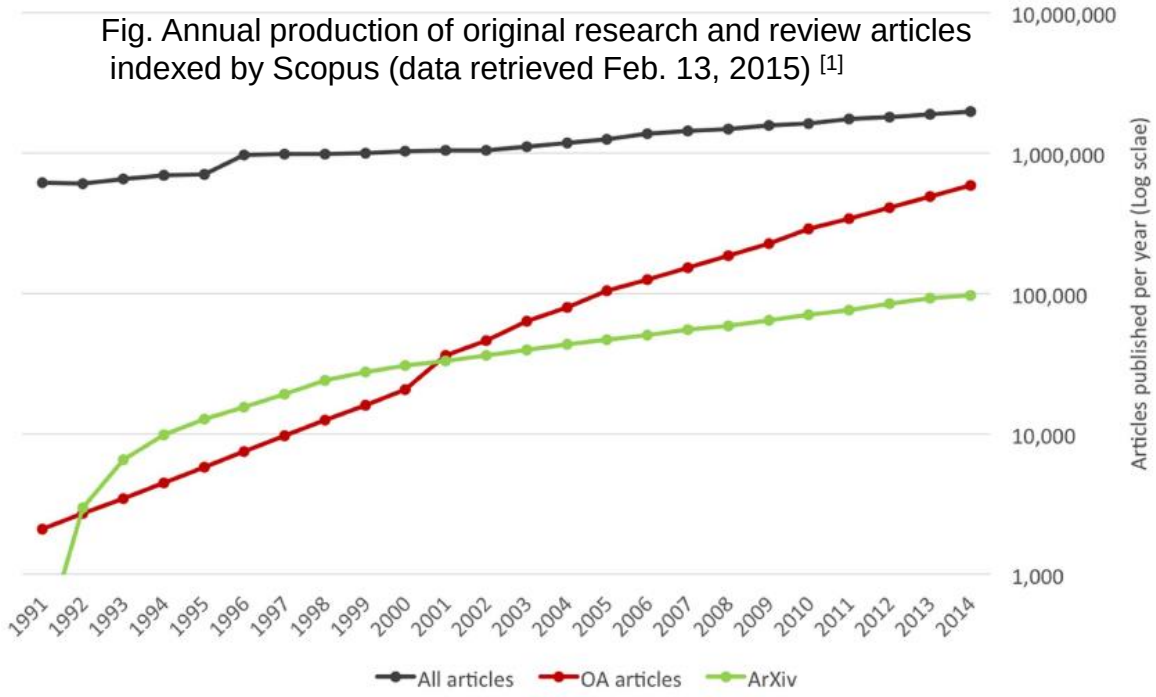
Intelligence is the computational part of the ability to achieve goals in the world. Varying kinds and degrees of intelligence occur in people, many animals and some machines.

"The exciting new effort to make computers think ... *machines with minds*, in the full and literal sense" (Haugeland, 1985) "[The automation of] activities that we associate with human thinking, activities such as decision-making, problem solving, learning ..." (Bellman, 1978)	"The study of mental faculties through the use of computational models" (Charniak and McDermott, 1985) "The study of the computations that make it possible to perceive, reason, and act" (Winston, 1992)
"The art of creating machines that perform functions that require intelligence when performed by people" (Kurzweil, 1990) "The study of how to make computers do things at which, at the moment, people are better" (Rich and Knight, 1991)	"A field of study that seeks to explain and emulate intelligent behavior in terms of computational processes" (Schalkoff, 1990) "The branch of computer science that is concerned with the automation of intelligent behavior" (Luger and Stubblefield, 1993)

Some definitions of AI. They are organized into four categories:

Systems that think like humans.	Systems that think rationally.
Systems that act like humans.	Systems that act rationally.

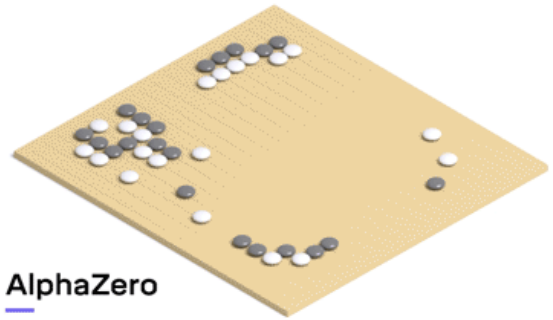
Fig. Annual production of original research and review articles indexed by Scopus (data retrieved Feb. 13, 2015) [1]

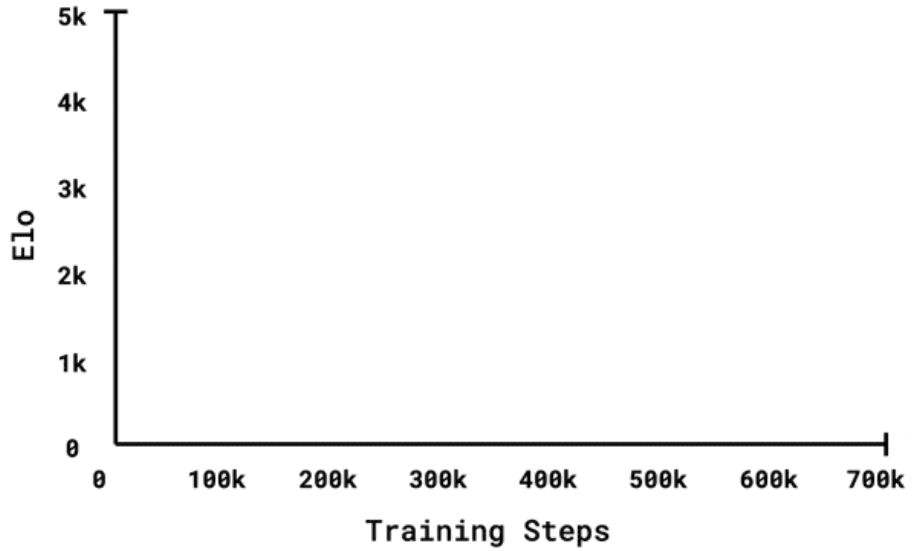


Why editors turn to AI for help?

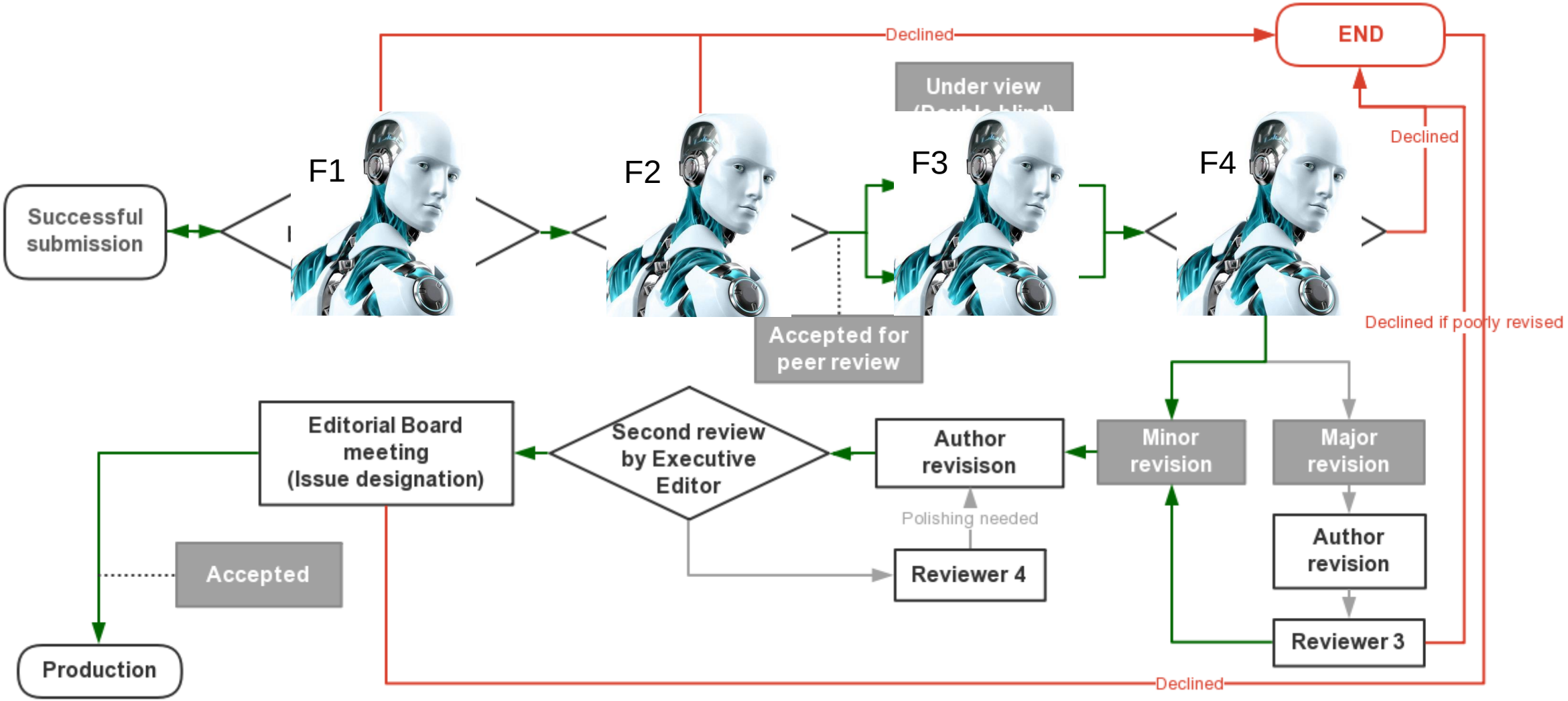
- Surge in global research output and enormous increase in the number of papers submitted worldwide
- Outstanding performance of AI

[1] Richard Walker, 2015: “Emerge trend in pair review a survey”





	Human Brain	Computer
Speed	Neurotransmitters travel at about 304 m/s	Electrons at speed of light
Memory	Roughly 100 billion neurons - about 50 trillion bits	Top super computers might approach this much memory
Other	Each neuron connected to 1000 others (roughly)	Perhaps 100 parallel processors



F1: To scan papers and check statistical data

F2: To check for plagiarism

F3: To recommend reviewers

F4: To predict manuscript impact

Figure Peer review process of Transactions of *Nanjing University of Aeronautics and Astronautics*

03

Case study

NSFC, Meta Bibliometric Intelligence

EDITORIAL

NSFC

Reform and cooperation in China

Since it was established as a science funding organization in 1986, the National Natural Science Foundation of China (NSFC) has seen its annual budget grow from CNY 80 million to 28.04 billion in 2018, as China underwent rapid transformation and became a global player in research. Now under the new leadership of President Li Jinghai, the NSFC has engaged in consultations about its future. To promote international dialogue, the NSFC convened representatives from 15 funding agencies around Europe to solicit feedback on proposed reforms. This September meeting in Paris marked a first major step by the NSFC to align its new strategies and policies with those of internaing its evaluation mechanisms following principles of responsibility, credit, and contribution of reviewers—avoiding nonacademic biases and conflicts of interest; assessing reviewers' performance; and contributing constructive feedback to proposers. Evaluating transdisciplinary proposals and finding reviewers with the necessary skills is challenging. The NSFC plans to test artificial intelligence–assisted approaches for identifying reviewers.

International collaboration with foreign funders is a priority of the NSFC. Regularly, partners are involved in joint calls for proposals for research projects, exchange initiatives, and bilateral or multilateral workshops. For international joint peer reviews,

"COOPERATION AND

Manfred Horvat
is honorary professor, Vienna University of Technology, Vienna, Austria; senior adviser

10.1126/science.aav9737

NSFC

AI is selecting reviewers in China

The tool is already saving time for the country's major grant funding agency.

BY DAVID CYRANOSKI

China's largest funder of basic science is piloting an artificial intelligence (AI) tool that selects researchers to review grant applications, in an attempt to make the process more efficient, faster and fairer. Some researchers say the approach by the National Natural Science Foundation of China (NSFC) is world-leading, but others are sceptical about whether AI can improve the process.

Choosing researchers to peer review project proposals or publications is time-consuming and prone to bias. Several academic publishers are experimenting with AI tools to select reviewers and carry out other tasks. And a few funding agencies, including some in North America and Europe, have trialled simple AI systems, some of which match keywords in grant applications to those in publications of other scientists to identify potential reviewers.

The NSFC is building a more sophisticated system that will crawl online scientific-literature databases and scientists' personal

composed of between three and seven people. The system is already cutting the time administrative staff have to spend looking for referees, says Yang. A similar approach will be used this year to select reviewers, he says.

The NSFC has become a world leader in reforming grant-review processes, says Patrick Nédellec, director of the international-cooperation department of the French CNRS, recommended by the applicants were more likely to endorse a project than were referees chosen by the foundation.

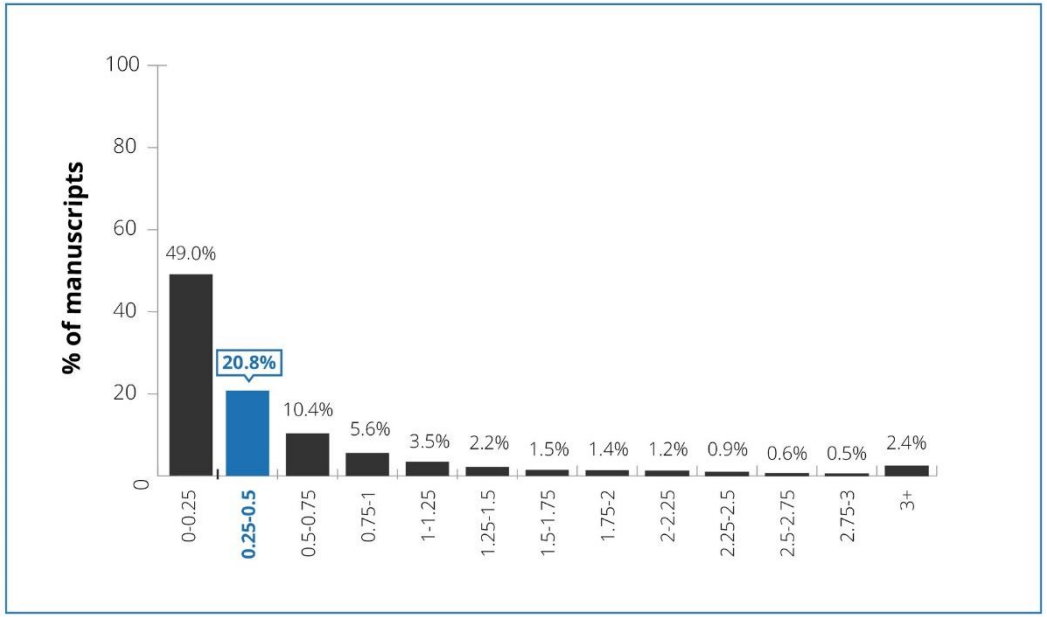
"Because the pressure is so high, China had no choice but to find the best way."

The NSFC's pilot AI system works on websites written in Chinese characters, but Li had conflicts of interest or were otherwise not qualified to evaluate the proposal. "While algorithm-based matching sounded attractive, there is a limit at this stage of artificial intelligence to what it can possibly achieve," an independent expert panel concluded.

Elizabeth Pier, a policy researcher at Education Analytics in Madison, Wisconsin, thinks AI will not remove selection bias. She

Meta Bibliometric Intelligence

Predicted 3-Year Impact

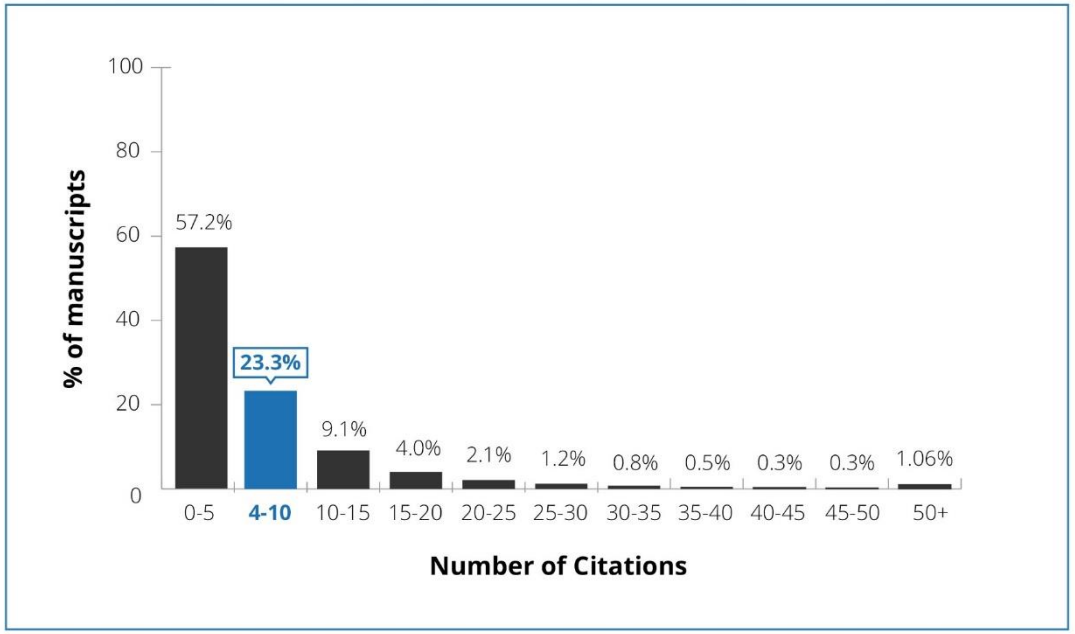


A manuscript's predicted 3-year impact is its projected importance to the scientific community in three years from today. This measure is determined by predicting the manuscript's future Eigenfactor®.

The predicted impact for this manuscript is **0.395** over the next three years. Out of over 500,000 manuscripts published in the last six months, **20.8%** fall within a range of **0.25-0.5**.

Meta Bibliometric Intelligence

Predicted 3-Year Citation Count

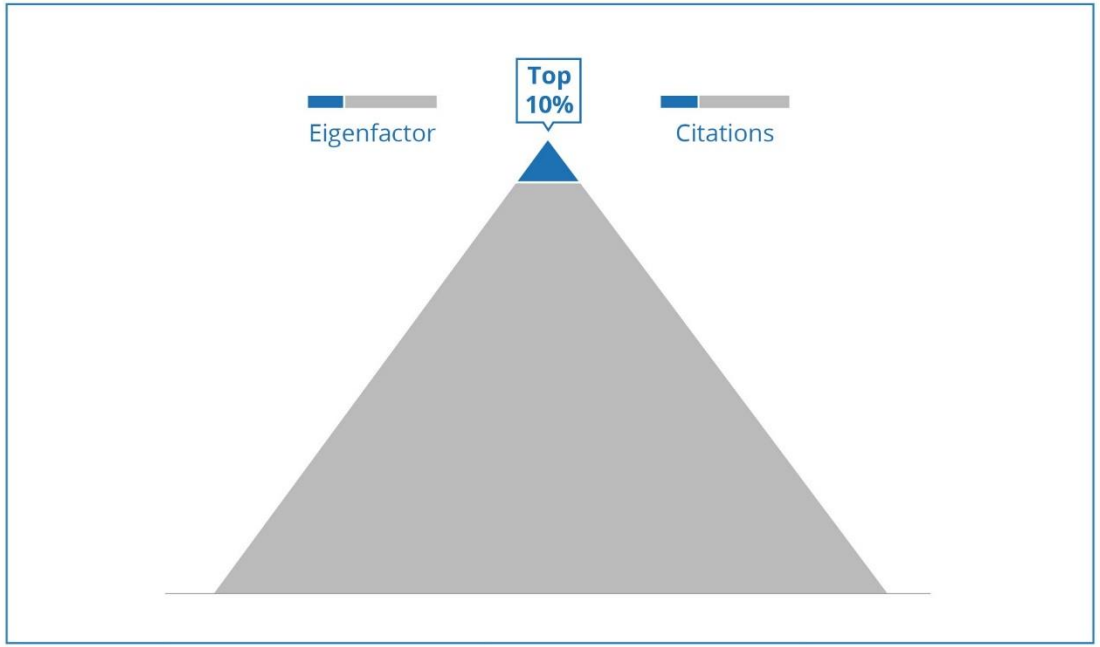


The predicted 3-year citation count for a manuscript is the projected number of citations that the manuscript will accrue over the next three years.

The predicted citation count for this manuscript is **4.064** over the next three years. Out of over 500,000 manuscripts published in the last six months, **23.3%** fall within a range of **4-10**.

Meta Bibliometric Intelligence

Predicted Manuscript Ranking



The predicted manuscript ranking is a projection of how the manuscript will rank compared to all other manuscripts that will be published in the next three years.

This manuscript is predicted to be within the **Top 10%** of all manuscripts published in the next three years.

Meta Bibliometric Intelligence

Journal Cascading

Journal Cascading is a ranking of the best journal matches for a submitted manuscript. It is derived using a classification model trained on over 15,000 articles across thousands of journals.

Based on analysis, **Current Hematologic Malignancy Reports** is the best journal match for this manuscript. This journal publishes articles consistent with the projected article-level impact and topical fingerprint of this manuscript.

Additional suggestions are listed below:

Blood Cancer Journal
Molecular Cancer
Current Oncology Reports
Nature Communications
Investigational New Drugs
Leukemia
Current Treatment Options in Oncology
Molecular Psychiatry
Stem Cell Research & Therapy

04

Discussion

Effect of AI on academic peer review /

Will you give your support to the AI reform in peer review?

What is the effect of AI technology on academic peer review?

Will you give your support to the AI reform in peer review?

Thanks

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