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Inaugural Editorial of *Transactions on Artificial Intelligence in Space (TAIS)*

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I am honoured to take on the role of Editor-in-Chief (EiC) of the journal *Transactions on Artificial Intelligence in Space (TAIS)*. It is a timely strategy to establish the dedicated journal which would play an essential role in fostering the rapid advancements of the involved inter- and multi-disciplinary fields. As artificial intelligence (AI) and machine learning (ML) applications proliferate in space research and exploration, from data analysis and space weather modelling to autonomous navigation, predictive maintenance and astronaut assistance, there is a growing need for a focused platform to disseminate specialised research. Existing journals often cover broader areas, potentially diluting the impact and discoverability of pioneering work in this crucial domain. A specialised journal would offer a dedicated forum for researchers, engineers, and scientists to share breakthroughs, discuss challenges like limitations and validations of existing and presently available techniques, and establish best practices, thereby accelerating innovation and collaboration within this increasingly vital interdisciplinary area.

In this Inaugural Editorial, I would like to present information and perspective on the journal, including

aims, scope, vision, and current state and trends of AI and ML in space research and exploration which are described as follows.

1 Aims

The journal will serve as a venue and forum for researchers to exchange and debate opinions, ideas, practices, and visions of AI and ML in space research. The journal is publicly available online.

2 Scope

TAIS publishes articles that present novel and innovative research results and findings, reflecting advances in using AI and ML techniques to solve challenging research questions or problems in the field of space exploration and related fields. *TAIS* accepts papers on new AI and ML methods or innovative applications of AI and ML with illustrative example, convincing result, and comparative studies. The journal also welcomes review papers on critical appraisals of the applications of AI and ML in space-related fields and visions of the trends in these and related fields.

3 Vision

The journal will serve as a venue and forum for researchers to exchange and debate opinions, ideas,



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practices, and visions of artificial intelligence and machine learning in space exploration. The journal is publicly available online.

Launching the new academic journal *TAIS* is an exciting endeavor. One of our primary goals over the next five years is to position the journal as the premier outlet for AI-driven space research through consistently high-impact publications.

4 Current State and Trends of Artificial Intelligence in Space

AI and ML are rapidly transforming space research technologies. AI and ML potentially revolutionise our understanding of space weather and space climate, enhance the autonomy of spacecraft and robotics, and enable independent navigation. These technologies are also vital for processing and analysing the vast datasets generated by satellites and telescopes, facilitating faster discoveries like identifying exoplanets and studying cosmic phenomena. AI assists in Earth observation, monitoring climate change, and predicting natural disasters. Moreover, AI is improving mission planning, optimising resources, and enhancing astronaut safety through advanced health monitoring systems. The future of AI and ML in space holds immense potential for enabling more ambitious missions, but challenges remain in addressing hardware constraints, data quality, cybersecurity, AI trustworthiness and ethical regulations. *TAIS* welcomes papers on a wide range of current-state and trend topics, which include but are not limited to:

- Autonomous spacecraft systems
- Space weather and space climate
- Satellite communication
- Satellite data analytics and analysis
- Space situational awareness
- Remote sensing and earth observation
- Planetary exploration
- Deep space navigation

Last, but not least, I would like to thank in advance the Editorial Board, the reviewers and all the other

dedicated contributors including authors for this journal; we will have a lot of work to do in the near future. It is not always easy to commit to contributing when there is much that has to be done within a specified limited time window. A BIG thanks to you all: You are the ones who do hard work to maintain the quality of the journal. We genuinely appreciate your support and contribution to this journal! Yours

Sincerely,

Hua-Liang Wei

Founding Editor-in-Chief

Transactions on Artificial Intelligence in Space (TAIS)

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Conflicts of Interest

The author declares no conflicts of interest.

Ethical Approval and Consent to Participate

Not applicable.



Hua-Liang Wei received the Ph.D. degree from the University of Sheffield in complex systems modelling and neural networks, Sheffield, UK, in 2004. He leads research in signal processing, system identification and data-driven modelling of nonlinear complex systems, artificial intelligence, interpretable machine learning, deep learning, and intelligent diagnosis, with applications in many multi-disciplinary

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