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International cooperation in using space for sustainable development: Towards a 'Space2030' agenda (1)

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STRENGTHENING COOPERATION FOR GLOBAL HEALTH: MAPPING CONSENSUS ON AN AI ETHICAL FRAMEWORK FOR SPACE MEDICINE APPLICATIONS

Abstract

Purpose: Space medical innovations (wearables, telemedicine, etc) can be translated to provide medical care and diagnostics not only in space but also on Earth, especially in marginalised communities and ICE (isolated, confined, and extreme) environments. The convergence of artificial intelligence (AI) and space medical technologies will augment our capabilities in space, but their relevance in terrestrial applications relies on forging an international cooperative framework that will prioritize the objectives of SDGs to retain ethical standards for emerging technologies. In order to harness AI applications in space medicine to support global health, we need to build an ethical AI framework that will include access to data, talent and computing capacity. International cooperation aspirations (e.g. OECD, UN AI for Good Standards, economic forums) do not currently specify the particular conditions of emerging AI technologies in space and the needs of interagency cooperation for interplanetary space missions.

Methodology: This project proposes the establishment of an ethical AI framework for space applications that is comprised of: a) interoperability mechanisms, b) digital trade issues, c) data flow structure between space agencies, d) security safety issues (IT mitigations, data model attacks), e) technical requirements (data quality and provenance, verification and validation of machine learning(ML) algorithms), f) transparency principles (digital forensics, predictability and reliability of ML models) g) accountability and fairness of AI intelligent systems (AI repositories, governance of AI over lifetime, equality, equity, and bias mitigation). By defining these standards, we enable the safe and ethical adoption of emerging space medicine technologies on Earth. To demonstrate the utility of the framework, we use medical cases on space that can be translated on Earth. For example, Airway Monitoring experiments have been conducted in the ISS to measure the nitric oxide exhaled by astronauts. This space healthcare data could be used to create proof-of-concept AI models to develop quick and cost-effective ways to diagnose respiratory problems both in space and on Earth.

Results and Conclusions: The proposed AI ethical framework for space applications will advance the 'Space2030' agenda by globalizing the adoption and deployment of AI regulations across all key-stakeholders in space. Trustworthy AI in space will be the stepping stone towards a roadmap for governments and organizations to tailor practices by implementing space sustainability and inform policy

decision-making with an array of ethical AI standards that will foster innovations and mitigate the risks and challenges.