

IGU Task Force on Geographical Artificial Intelligence (GeoAI)

Proposal

Date: 10-04-2026

IGU Statutes 5: The Executive Committee

H. It is the task of the Executive Committee to monitor new trends and developments in the field of geographical education and research, to bring these to the knowledge of the committees of the IGU and to take all action required to ensure an optimal participation of the Union in international science programs. Further duties of the Executive Committee shall include those which have been entrusted to it from time to time by the General Assembly, and in particular:

5. the establishment of special or temporary committees or task forces for particular tasks;

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Rationale behind establishment of GeoAI Task Force

The rapid development of Artificial Intelligence (AI), machine learning, deep learning, data mining and large scale data analytics is profoundly transforming geographical research and practice transforming the way in which geographical information is collected, analysed and interpreted. Geography is inherently spatial, contextual, and multiscalar, making it uniquely positioned to contribute to and benefit from AI-driven analytical frameworks. The convergence of geography, geospatial technologies and AI has given rise to Geographical Artificial Intelligence (GeoAI) an emerging field focused on extracting knowledge from complex spatiotemporal data. AI enables the rapid analysis of vast and complex datasets, while GeoAI integrates this capability with spatial and spatiotemporal intelligence, allowing decision-makers to understand *where*, *when*, *how* and *why* risks and impacts occur.

GeoAI thrives on large-scale spatial datasets and computational tools to reveal patterns in climate variability, land use land cover analysis, urban and regional studies, socio-economic processes, disaster risk, transportation and mobility, public health, environmental change and study of sustainability science; however, without open, FAIR data and responsible governance frameworks that protect individual privacy and respect data sovereignty, such insights risk being biased, exclusionary, or ethically problematic. For these reasons, the increasing operational GeoAI use, policy relevance, and societal impact make this a timely moment to establish shared standards, governance frameworks, and coordinated international capacity-building efforts.

In an era of Open Science and Big Data, where transparent, accessible, and interoperable research infrastructures are essential for global scientific progress, the integration of open platforms, open software, and ethical data governance grounded in geoprivacy and FAIR (Findable, Accessible, Interoperable, Reusable) principles is indispensable especially in spatial-explicit AI environment.

Despite these advances, GeoAI research remains fragmented across disciplines and regions owing to digital divide in dissemination of knowledge. Many AI driven spatial studies lack explicit engagement with geographical theory, spatial reasoning, scale, place based analysis and human environment interactions. At the same time, access to GeoAI expertise, computational resources and training opportunities remains uneven particularly in developing and least developed countries.

While existing IGU Commissions address important aspects of Geographical Information Science, and modeling the inherently interdisciplinary and rapidly evolving nature of Geographical Artificial Intelligence (GeoAI) necessitates a dedicated Task Force to ensure that

geographers take a leading role in the teaching, research, and governance of spatially explicit artificial intelligence. The establishment of an IGU Task Force on GeoAI would directly advance IGU's strategic objectives to consolidate international geographical knowledge and strengthen global cooperation in addressing pressing environmental and societal challenges.

Mission

To foster Geographical Artificial Intelligence (GeoAI) by promoting the integration of geographical theory, spatial thinking, and AI methods, and by supporting responsible, inclusive, and internationally coordinated research, education, and applications.

Objectives

Following objectives has been listed based on mission statement of GeoAI Task Force:

Foster geographically grounded GeoAI by promoting shared conceptual frameworks and best practices that explicitly connect fundamental geographical concepts (location, space, place, scale, spatial pattern, and spatial interaction) with AI models, analytical workflows, and evaluation protocols.

Facilitate the development, evaluation, and dissemination of spatial and spatiotemporal GeoAI modelling approaches, including shared benchmarks and uncertainty-aware validation practices, to support research and decision-making on complex geographical processes (e.g., climate change, hazards, mobility, and socio-environmental systems).

Foster intelligent and explainable GeoAI systems that respect geographical context and uncertainty, enhancing decision support and policy relevance across multiple spatial and temporal scales.

Strengthen Open Science practices in GeoAI by encouraging the use of open data, open platforms, open software, and reproducible workflows in accordance with FAIR principles, ensuring interoperability of data, methods, and tools across regions and disciplines.

Promote ethical GeoAI research and responsible data governance, with particular attention to data privacy, geoprivacy, bias, transparency, and data sovereignty, especially when working with sensitive spatial and human-related data.

Enhance international and interdisciplinary collaboration by building bridges between geographers, GIScientists, computer scientists, data scientists, social scientists, and

practitioners, facilitating the global exchange of knowledge, expertise, and best practices in GeoAI.

Support GeoAI research and capacity building worldwide, with a strong focus on early-career researchers and scholars from developing and least developed countries, through training, mentoring, and access to open resources and networks.

Apply GeoAI to pressing global challenges and the Sustainable Development Goals (SDGs) by enabling spatially explicit assessment, monitoring, and evidence-based interventions that address inequality, resilience, sustainability, and environmental change. GeoAI's unique value in SDGs scenarios lies in addressing spatial inequality, regional heterogeneity, and context-dependent issues, which are precisely what general AI and non-spatial intelligence models struggle to handle.

Activities

Scientific Coordination and Knowledge Exchange

Organizing regular GeoAI focused scientific sessions, panels, and workshops at IGU Congresses and Regional Conferences and Thematic conferences along with GeoAI webinar, symposia series (online/offline) to foster sustained international dialogue on theory, methods, and applications across physical and human geography.

Methodological Development and Spatial Modelling

Promote the development, evaluation, and comparison of spatial and spatiotemporal GeoAI models for understanding, simulation, and future prediction. Encourage research on explainable, interpretable AI, with emphasis on uncertainty, scale-dependence, spatial heterogeneity, strengthening theory informed and hybrid modelling frameworks working closely with IGU commission Modelling Geographical System.

Open Science, Interoperability, and Reproducibility

Facilitate the sharing of open GeoAI datasets, benchmark problems, workflows, and model architectures in accordance with FAIR principles to enhance interoperability of data, methods, and tools in close cooperation with IGU Commission Geography of Digital Society and Connected World.

Promote the use and co-development of open platforms and open-source software for GeoAI research, education, and applied decision support. Encourage reproducible research practices, including transparent documentation, open code repositories, and standardized evaluation protocols for spatial modelling.

Ethics, Data Governance, and Geoprivacy

Organize focused discussions, panels, and guidance documents on ethical GeoAI, addressing data privacy, geoprivacy, bias, fairness, transparency, and responsible use of AI in spatial decision-making based on IGU-SAFE principles.

Contribute to the development of best-practice recommendations for ethical data governance, particularly for human-centered, sensitive, and cross-border spatial data. Promote awareness of data sovereignty, equity, and inclusive data-sharing practices across regions and communities.

Capacity Building and Education

Develop and deliver training workshops, short courses, and online tutorials on GeoAI theory, spatial modelling, and open tools, linked to IGU events where possible. Support mentoring, networking, and professional development activities for early-career researchers, including doctoral students and postdoctoral scholars of developing and least developed countries with involvement of IGU Commission on Young and Early Career Geographers (IYECG), Geographical Education and Geographical Information Science.

Working Ecosystem of the GeoAI Task Force

The working structure of **GeoAI** is designed as a **multi-layered, integrative framework** that connects the core vision and strategy of the International Geographical Union (IGU) with its commissions, task forces, and a broader ecosystem of international partner organizations. This structure ensures that GeoAI activities remain scientifically robust, policy-relevant, ethically grounded, and globally collaborative.

At the **core of the structure** lies the **GeoAI Task Force (GeoAI TF)**. This central unit acts as the operational and intellectual hub for advancing research, capacity building, and governance related to Artificial Intelligence in Geography. The GeoAI TF functions under the guidance of **IGU Vision and IGU Strategy**, ensuring that all initiatives align with the long-term goals and values of the IGU.

The GeoAI TF is formally anchored within the **IGU Statutes**, which provide legitimacy, institutional continuity, and accountability. The statutes define the mandate of the task force and establish its relationship with other IGU bodies. Flowing directly from the statutes are the **Task Force working principles**, which outline ethical standards, inclusivity, transparency, interdisciplinarity, and responsible AI use in geographical research and applications.

Supporting and shaping the GeoAI TF from within the IGU framework are the **IGU Commissions**. These commissions represent specialized domains of geographical scholarship and provide thematic expertise to the GeoAI agenda. Key commissions contributing to the GeoAI structure include:

- **Geographical Information Science**, which supports spatial data analytics, geospatial AI, and computational geography
- **Modelling Geographical Systems**, which contributes system dynamics, simulation, and predictive modeling approaches
- **Geographical Education**, which emphasizes GeoAI literacy, curriculum development, and capacity building
- **Geography of Digital Society and the Connected World**, extends its exploration of digital issues by considering AI as a new driver of spatial planning. The commission examines how AI shapes urban governance and public action in transport, security, and facilities, grounded in concrete case studies.

Through these commissions, GeoAI benefits from domain-specific insights while simultaneously fostering cross-disciplinary collaboration.

Closely linked to the commissions is the IGU Statement on Academic Freedom and Ethics (**IGU-SAFE**), which emphasizes responsible science, ethical AI, and risk-aware deployment of GeoAI technologies. IGU-SAFE ensures that GeoAI initiatives consider data privacy, bias mitigation, transparency, and societal impacts, particularly in sensitive or vulnerable contexts. Surrounding the IGU's internal framework is a broader ring of **sister organizations working on AI, GeoAI, and data governance**. These organizations provide complementary expertise, global standards, and platforms for collaboration. Key partners include:

- **UN-GGIM** (United Nations Committee of Experts on Global Geospatial Information Management), supporting global geospatial governance
- **UN-GKIC** and **UNITAR**, contributing to capacity development, training, and policy engagement
- **ISC** (International Science Council), strengthening interdisciplinary science-policy interfaces
- **CODATA** and **WDS**, advancing open data principles, data stewardship, and FAIR data practices
- **RDA** (Research Data Alliance), facilitating international data sharing and interoperability
- **ESRI** and **GeoUnions**, bridging academic research with applied geospatial technologies and professional networks

These external partnerships ensure that GeoAI activities are globally connected, technologically current, and aligned with international data and AI governance frameworks.

Overall, the working structure of GeoAI is **circular and interconnected**, symbolizing continuous knowledge exchange between strategy, science, education, ethics, and global collaboration. The GeoAI Task Force operates not as an isolated entity, but as a **convergence point** where IGU vision, disciplinary expertise, and international cooperation intersect. This structure enables GeoAI to support innovation while maintaining responsibility, inclusivity, and relevance in an increasingly AI-driven geographical landscape.

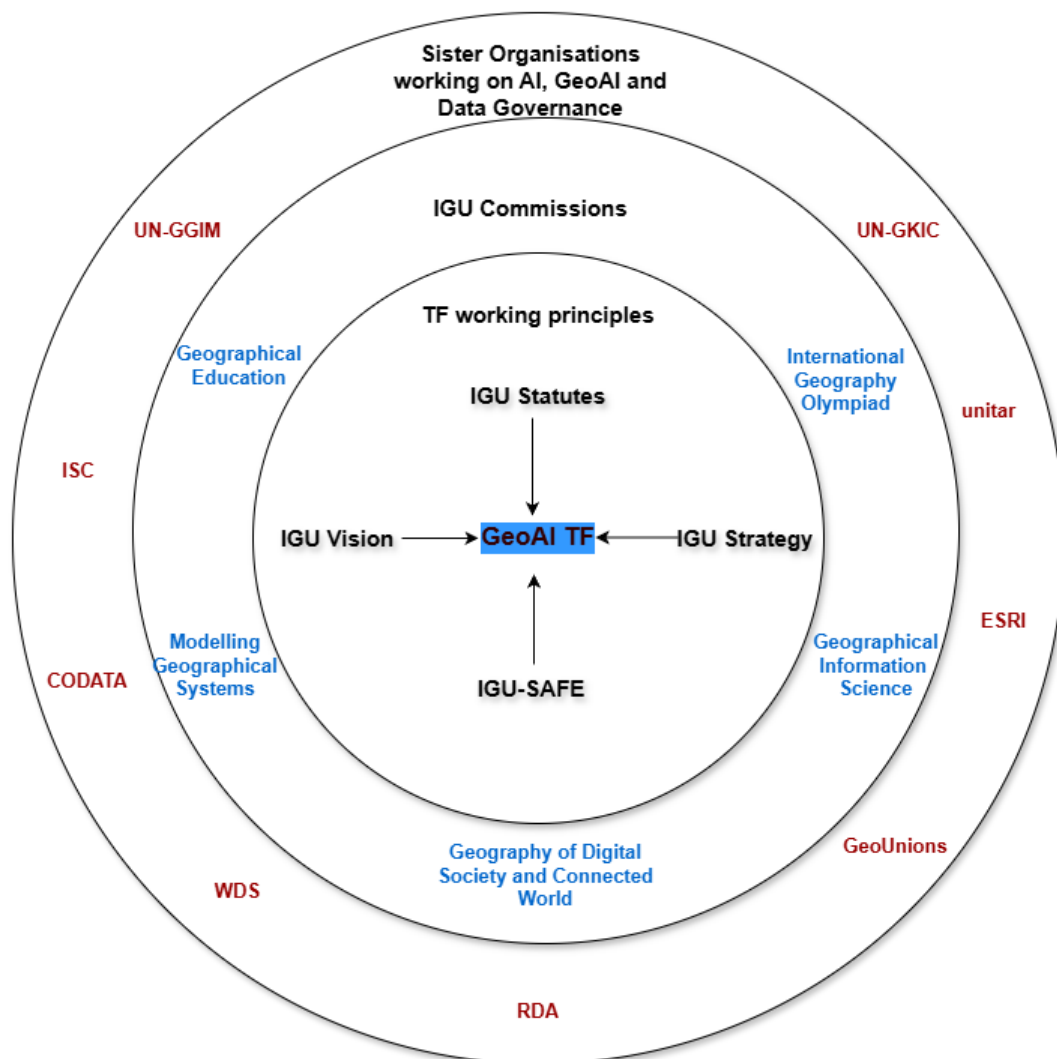


Fig.1 GeoAI Task Force working principles and ecosystem within and outside IGU

Task Force Duration

The Task Force is proposed for an initial period of **four (4) years**, in line with IGU practice for temporary bodies, subject to review by the IGU Executive Committee and possible renewal.

Organization and Steering Committee (will be dealt at later stage)

The Task Force will be coordinated by:

- **Chair** – an internationally recognized scholar with expertise in geography, GIScience, or GeoAI.
- **Co-Chair(s)** – representing complementary expertise and different world regions.
- **Steering Committee Members** – an international and interdisciplinary group of experts from physical geography, human geography, GIScience, remote sensing, spatial data science, and AI.