1. **Workshop name/title (and acronym is applicable)**

   **Mapping Minds: Exploring the Intersection of Spatial Cognition, Computational Design, Neuroscience and Spatial Data Science**

2. **Description of the workshop by listing topic(s), objective(s) and planned outcome(s)**

   **2.1 Topic(s)**

   While spatial cognition is an established field in environmental psychology and has been studied in GIScience to gain insight into how individual understand and interact with the space around them, its development is still emerging from an architectural, urban, and general design perspective. Specifically, we consider spatial cognition as a relatively new field in design encompassing studies at the intersection between spatial data science, neuroscience, and computational design (Caetano et al., 2020). While each of these disciplinary fields includes comprehensive studies on the impact of spatial elements on individuals, to date there is a limited number of studies that combine these three areas of work. Successful attempts include the works of Nica et al. (2023), Dalton et al. (2018), Montello (2014), Dara-Abrams (2006), Penn (2003) and Kim (1999), among others. However, more attention is needed to spatial cognition from the perspective of the built environment, architecture, and computational design in order to consider new approaches that are developed in the recent years, like generative AI, LLMs etc., specifically applied to architecture and design. Studying spatial cognition allow us to understand how we comprehend, reason and remember the spatial aspects about our environment and our interactions within it. One example as follows: understanding how people navigate and interact with spaces through spatial cognition studies, urban planners and architects can accomplish more effective design which optimise space utilisation and accessibility, meet their inhabitants' needs and promote sustainability.

   We propose a thematic workshop on spatial cognition to bring together experts from computer science, urban science, GIScience, architecture, and neuroscience. With this workshop we want to consolidate expertise around spatial cognition as an interdisciplinary subject within computation and spatial data science, and their direct applications in design and architecture.

   In the context of this workshop, spatial cognition encompasses the exploration of how spatial and computational design influence cognitive load and human perception. It also examines...
their effects on human behaviour, including aspects such as attention, wayfinding, and overall wellbeing. Specifically, GIS-based approaches offer a powerful suite of tools and models for visualising and analysing spatial data at multiple scales.

We are interested in contributions that address the built environment in broad terms, including multiple scales, from urban and territorial, to architectural and the interior space. We welcome explorations in both realistic and speculative applications utilising geospatial data in architecture through the lens of cognitive load. We are particularly interested in applying advanced tools and methods for modelling spatial conditions. Additionally, we are interested in the deployment of computational techniques to tackle pressing and significant problems such as health and wellness, poverty, disparity, and broadly speaking, addressing one or more Sustainable Development Goals (SDGs)\(^1\) challenges.

This workshop is open to researchers working in different fields, including data and cognitive scientists, architects, urban geographers, landscape designers, planners, and social scientists.

We expect contributions from researchers at various stages of their career, including Early Career Researchers, PhD and MRes students, as well as more advanced researchers.

References:


2.2 **Objective(s)**

With this workshop we want to:

\(^1\) [https://sdgs.un.org/goals](https://sdgs.un.org/goals)
- Consolidate knowledge and expertise around the subject of spatial cognition as the intersection of computer science, neuroscience, cognitive psychology, and computational design in architecture.
- Reinforce an existing network of researchers working on spatial cognition.
- Create a subgroup of the AGILE network with expertise on spatial cognition, particularly architectural cognition.

2.3 **Planned outcome(s)**

An outcome can be e.g., the publication of a report, a special issue of an International Journal, a white paper, a book, etc. If you already know the publisher, please provide this information as well. The workshop can also be a hands-on tutorial in which the participants are taught a new method or software relevant to one of the conference topics.

1. A report capturing the highlights of the workshop sessions and individual contributions. The report will include an initial mapping of researchers and other groups and centres working on spatial cognition and related areas. The report will be circulated to all workshop attendees and used internally by AGILE members.
2. Publication in a special issue on Spatial Cognition in Computational Sustainability and Design (Silvio Carta is Section Editor), part of City and Built Environment (Springer). [https://www.springer.com/journal/44213](https://www.springer.com/journal/44213)

3. **Abstract**

*This is how you want your workshop to be presented on the conference webpages (maximum 1000 characters)*

Spatial cognition is an emerging field in design that encompasses studies at the intersection between computer science, neuroscience, spatial data science and computational design in architecture. While each of these disciplinary fields includes comprehensive studies on the effect that spatial elements may have on people, to date there is a limited number of studies that combine these areas of work.

This full day workshop brings together researchers from computer science, urban science, GIScience, architecture, human geography, and neuroscience. We welcome researchers at different stages of their career, including Early Career Researchers, PhD and MRes students, as well as more advanced researchers. The workshop is also open to architects, landscape designers, urban planners and social scientists who are interested in spatial cognition.

We are seeking contributions that encompass a broad understanding of the built environment, considering various scales ranging from urban and territorial to architectural and interior spaces. We are particularly interested in exploring both practical and speculative applications of geospatial data science within the context of architecture and the built environment, with a focus on cognitive load. We welcome the use of advanced tools and methods for representation and modelling. Additionally, we encourage the utilisation of computational and cognitive techniques to address pressing issues such as
health and wellness, poverty, disparity, and other challenges related to the Sustainable Development Goals (SDGs).

We welcome submissions covering but not limited to the following topics:

- Effective and sustainable design informed by spatial cognition research
- Cognitive load and its impact on human behaviour (attention, wayfinding, and overall wellbeing)
- The integration of big geospatial data and AI to improve cognition and memory
- Computational design, cognitive load and emergency responses
- Spatial cognition, intelligent navigation strategies (e.g., landmark-based wayfinding) and realisations
- Spatial cognition in virtual and augmented reality

The format of the workshop, deadlines and guidelines for submission will follow (in discussion with organisers) when the workshop gets approved.

4. **Short description of the intended length (half or full day) and the format of the workshop**

We suggest a full-day workshop that could be structured as follows:

- **Kick-off with introduction of the workshop** (Jia Wang and Silvio Carta) (10 minutes)
  - Keynote speaker 1 (30 minutes including Q&A)
  - Session 1 (2 groups of 3/4 presenters, combination of PhD students and ERC/mid-careers) (120 minutes with 30min coffee break)

- **Lunch breakout**
  - Keynote speaker 2 (30 minutes including Q&A)
  - Session 2 (2 groups of 3/4 presenters, combination of ERC/mid-careers and senior researchers) (120 minutes with 30min coffee break)

- **Final roundtable** (to summarise discussions of the day and sketch out general findings) (Jia Wang and Silvio Carta) (15 minutes)

- **Close**

5. **Brief statement of the relevance of the workshop for AGILE**

This proposal aligns with the conference theme “Geographic Information Science for a Sustainable Future” by looking at sustainable aspects (through architecture and computational design) to spatial data science. We will gather contributions to sustainable design proposals and ideas that focus on GI Science either from a conceptual, methodological or application perspective.
6. **What is the approximate number of expected participants?**

We foresee to have the following participants (in total 20-35 participants):

- 5-10 MSc and PhD students
- ~10 ECR/mid-career researchers
- 5-10 senior scholars
- 2 Keynotes speakers

To note that we already identified possible participants (both from the UK and Europe). If this workshop is approved, we will contact them directly encouraging their participation.

7. **Names and e-mail addresses of the organizing member(s)**

**Leading AGILE member (or sponsor) and contact person:** Jia Wang (j.wang@gre.ac.uk)

**Contributing AGILE members (including the persons involved) — at least one seconding AGILE member is needed:** Jia Wang, Silvio Carta, Sabine Timpf

**Contributing non-AGILE members (including the persons involved) — if applicable:**

**Organizing Committee (if applicable):** Jia Wang, Silvio Carta

**Programme Committee (if applicable):** Possible members of the Programme Committee include:

- Prof. Alessio Malizia, Department of Computer Science, University of Pisa, Italy
- Prof. Angela Schwering, Institute for Geoinformatics, University of Muenster, Germany
- Dr. David Sánchez-Ruano, Instituto Tecnológico y de Estudios Superiores de Monterrey, Mexico
- Dr. David Schaumann, Intelligent Place Laboratory (IPL), Technion, Israel
- Dr. Eduardo Benitez Sandoval, UNSW, Sydney, Australia
- Assoc Prof. Fabio Caraffini, Swansea University, UK
- Dr. George Guida, Harvard Laboratory for Design Technologies, USA
- Prof. Philip Plowright, Laurence Tech University, USA
- Dr. Ian Nazareth, RMIT, Australia
- Jun.-Prof. Dr. Jakub Krukar, Institute for Geoinformatics, University of Muenster, Germany
- Prof. Sabine Timpf, Institute of Geography, University of Augsburg
- Dr. Tom Turchi, Department of Computer Science, University of Pisa, Italy
- Dr. Xin Liang, Department of Networks and digital Media, University of Kingston
8. **Additional information about previous workshops, if held.**

Silvio Carta has experience in organising and chairing thematic workshops, conferences and related events including:

- 2024. IUI 2024 Workshop on Adaptive eXplainable AI. Part of the 29th International ACM Conference on Intelligent User Interfaces (ACM IUI 2024). Greenville, South Carolina, USA. March 18-21, 2024 [https://iui.acm.org/2024/](https://iui.acm.org/2024/) Member of the Programme Committee
- June 2023. IS-EUD (International Symposium on End User Development) – Member of the Programme Committee.
- July 2021. IS-EUD (International Symposium on End User Development) – Member of the Programme Committee.
- June 2021. General Chair of the AMPS international conference Urban Assemblage: The City as Architecture, Media, AI and Big Data (Hatfield June 2021).

Jia Wang organised the following workshop in conjunction with GIScience 2023:


9. **Expected resources needed**

*Explain here if you have any special needs (e.g. internet connection, break-out room(s), etc.), what are the expected resources needed. Please take into account that the fixed fee for the workshop (1 day) only covers the basic expenses made (coffee breaks, ...). If you need additional support, this request should be directed towards the AGILE Council, but this support cannot be guaranteed.*

All sessions are scheduled to be held in a lecture/seminar room that can accommodate 30-50 people. We will require a lectern, projector, or similar setup with internet access.
10. Other information

We mention the opportunity of inviting the companies below as possible conference sponsors. To be further discussed with the organisers.

- Project EU. http://www.project.eu.com/
- Genmar IT business. https://genmar.co.uk/

Submission by e-mail to:

Dr Qunshan Zhao: Qunshan.Zhao@glasgow.ac.uk

Or Dr John Xiaogang Shi: John.Shi@glasgow.ac.uk