



SpaceTimeLab

The 30th International Conference on Geoinformatics 2023

CPGIS 2023

Space-Time AI and Urban Analytics

July 19-21, 2023

1-19 Torrington Pl, London, WC1E 7HB, UK

Conference Website: <https://www.cpgis.org/>

Table of Contents

Foreword from the Chairs	i
Contributors and Acknowledgements	iii
Local Organising Committee	iii
International Steering Committee	1
Conference General Chairs	2
Programme Committee	2
Publication Committee	4
Student Competition Committee	4
Conference Volunteers (in order of surname alphabet)	5
Conference Reviewers (in order of surname alphabet)	5
Additional Thanks and Acknowledgments	5
Campus Map	6
Conference Map	7
Map to UCL South Cloister (Poster and Reception Event, Wednesday 19 July)	9
Map to Imperial China (Gala Dinner, CPGIS night, Thursday 20 July)	10
Map to Tower Bridge Quay (Boat Trip, Friday 21 July)	11
Accessibility and Inclusivity Information	12
Baby changing facilities	13
Keynotes (in order of appearance)	14
Conference Schedule	18
Presentation Sessions	20
SpaceTimeLab 10-year Anniversary Event Schedule (Friday 21 July)	20

Foreword from the Chairs

Dear attendees,

Welcome to University College London for CPGIS 2023. We are thrilled to have you here in this vibrant and culturally diverse city, and we hope to showcase some of London's rich heritage throughout the conference. Established in 1826, University College London is a leading multidisciplinary institution known for its commitment to challenging norms, questioning assumptions, and fostering innovative thinking. Our esteemed faculty, inquisitive students, and dedicated staff continuously strive for excellence, pushing boundaries, and making a real-world impact.

The GeoInformatics Conference series, initiated by the International Association of Chinese Professionals in Geographic Information Sciences (CPGIS) in 1992, has successfully organised twenty-nine annual international conferences on geographic informatics around the globe. This conference series provides a unique platform for GIScience professionals worldwide to exchange novel ideas and share cutting-edge knowledge in the field of geographic information sciences and technologies.

GeoInformatics 2023, the 30th CPGIS Annual Conference, will take place from July 19th to July 21st at University College London. The primary conference theme is "Space-Time AI and Urban Analytics," encompassing thematic presentations, group discussions, paper competitions, special forums, and more. All accepted full papers will be officially published as conference proceedings with EI retrieval. Furthermore, the conference will facilitate the submission of selected excellent papers to international relevant journals after a rigorous peer-review process.

Additionally, UCL SpaceTimeLab will be hosting a 10-year anniversary event in the afternoon of July 21st, immediately following the closure of GeoInformatics 2023, at the same venue. The event will commence with a workshop (13:00-18:00), bringing together current researchers, alumni, academic partners, and government and industry collaborators to reflect on the achievements of the past decade and set sights on the future. Subsequently, we will celebrate this milestone with a Thames river cruise and banquet (19:00-23:00). This event is free and open to all participants of GeoInformatics 2023. Please note that registration for this event is separate and must be completed by June 30th. Spaces are limited, and registrations will be accepted on a first-come, first-served basis. Please fill in this survey to register: <https://forms.office.com/e/xBB2JriwqG>.

We express our sincere gratitude to all the individuals and organisations whose efforts have made this event possible. Our heartfelt thanks go out to our sponsors: UCL Department of Civil Environmental and Geomatic Engineering, UCL Centre for Advanced Spatial Analysis, Dalian Maritime University, and University of Electronic Science and Technology of China. We would also like to acknowledge the invaluable contributions of our conference

volunteers who have assisted with organization, coordination, communication, and logistics. Furthermore, we extend our appreciation to the peer reviewers for their time, effort, and constructive feedback on the submitted papers. Finally, we extend our gratitude to all attendees, whose active participation continues to foster an environment of collaboration and support at CPGIS.

Once again, a warm welcome to University College London and GeoInformatics 2023. We wish you an enriching and memorable conference experience.

Best regards,

Chairs of CPGIS2023



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Xiaolin Zhu	Hong Kong Polytechnic University

Conference Volunteers (in order of surname alphabet)

We would like to thank for the generous assistance from the following volunteers to the conference.

Dr Meixu Chen, Mr Xiaowei Gao, Dr Yunzhe Liu, Ms Meihui Wang, Mr Xinglei Wang, Mr Yikang Wang, Mr Xianghui Zhang, Ms Fangzhou Zhou.

Conference Reviewers (in order of surname alphabet)

We would like to thank for the generous contribution of the following to the reviewers of the abstracts too.

Dr Huanfa Chen, Dr Song Gao, Dr Qili Gao, Dr Yi Gong, Dr Yuhao Kang, Prof Chaogui Kang, Dr Tian Lan, Dr Yijing Li, Dr Ziqi Li, Prof Bin Li, Prof Lan Mu, Dr Mingshu Wang, Dr Qingling Wu, Dr Fan Zhang, Dr Qunshan Zhao, Dr Di Zhu, Dr Rui Zhu (University of Bristol), Dr Rui Zhu (A*STAR, Singapore)

Additional Thanks and Acknowledgments

We would like to express our sincere gratitude to all the session chairs who generously volunteered their time and expertise to ensure the smooth operation of the conference. Your dedication and commitment to overseeing the sessions and facilitating fruitful discussions are greatly appreciated. Thank you for your invaluable contributions to the success of the conference.

Campus Map

The conference site is the Bloomsbury campus of University College London (UCL), London, UK.

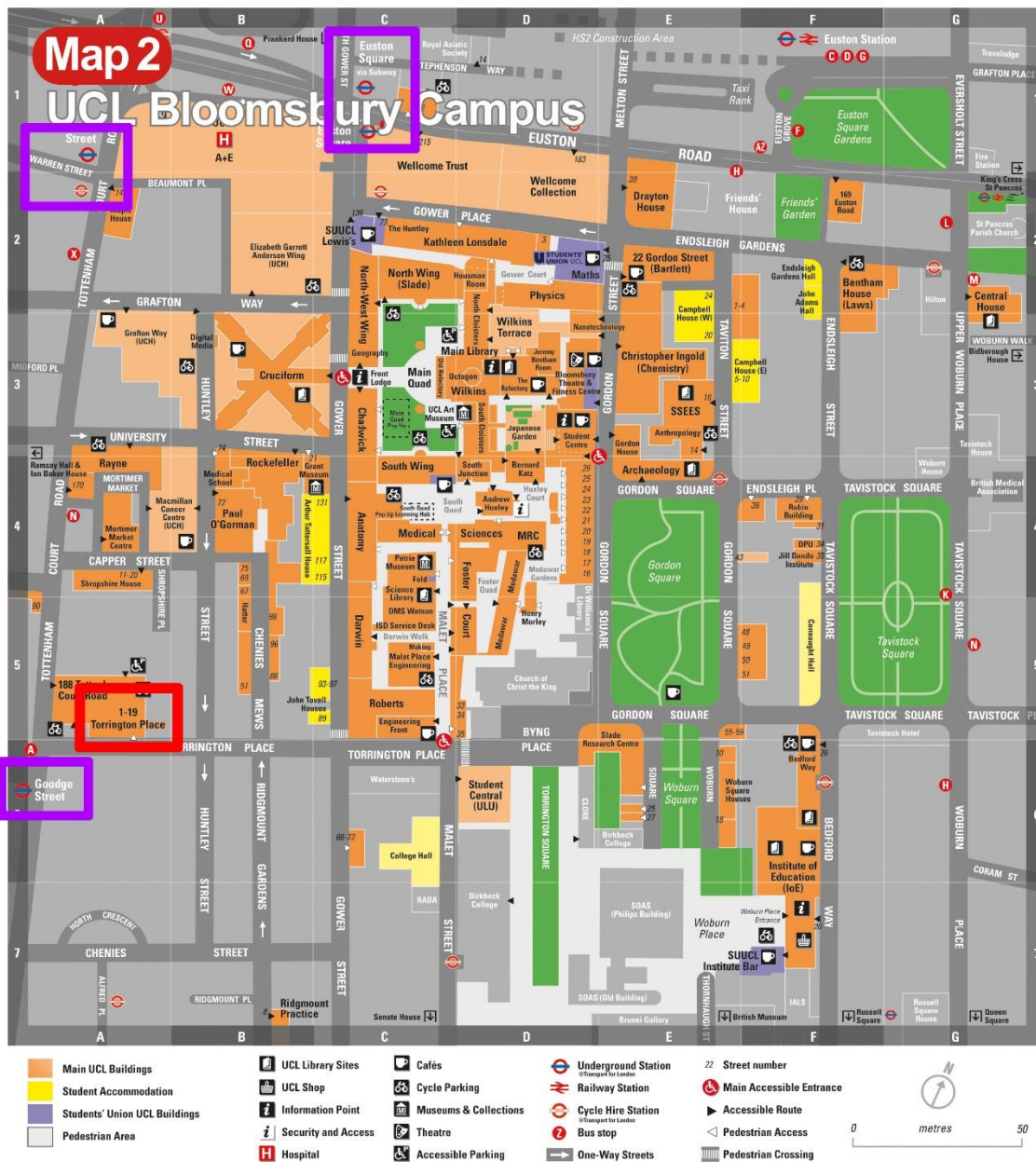
UCL was established in 1826 and is ranked 8th in the 2022 QS World University Rankings. UCL features several world-leading GIS research groups or centres, including SpaceTimeLab, CASA (Centre for Advanced Spatial Analysis), and CDRC (Consumer Data Research Centre).

The Bloomsbury campus of UCL is located in central London. It has good transport accessibility, as it is close to several major railway stations including Euston, King's Cross, and St Pancras within walking distance. Moreover, the campus is close to a number of important institutions, including the British Museum and British Library.

CPGIS 2023 will be held at the 1-19 Torrington Pl, London, WC1E 7HB, which is marked in red on the map. Building entrance for the conference is from the South side of the building. See [this link](#) for a high-resolution version of the campus map.

Conference Map

The conference venue 1-19 Torrington Pl is highlighted in red, while the three underground stations are marked in purple. The nearest underground station is Godge Street Station, which is on the Northern line's Charing Cross branch between Warren Street and Tottenham Court Road stations. The station has stepped and elevator access to platforms. Other nearby underground stations including Warren Street Station (Northern and Victoria Line) and Euston Square Station (Metropolitan, Hammersmith & City and Circle lines).



Outside Access (Main Entrance)



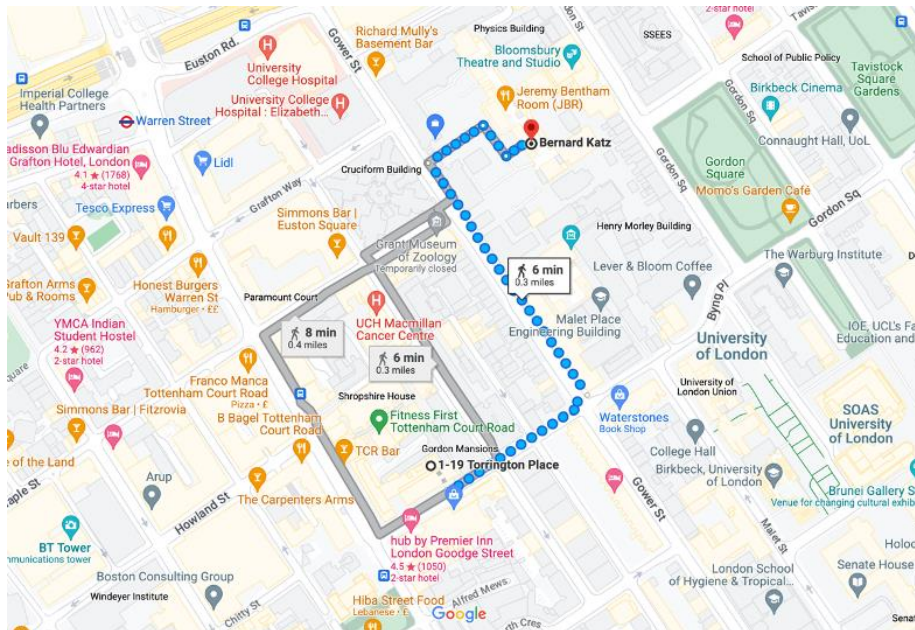
The reception area is clearly visible from the entrance of the building.



Map to UCL South Cloister (Poster and Reception Event, Wednesday 19 July)

Link to Google Maps directions: [1-19 Torrington Pl to UCL South Cloister](#)

Address: Gower Street, London WC1E 6AE

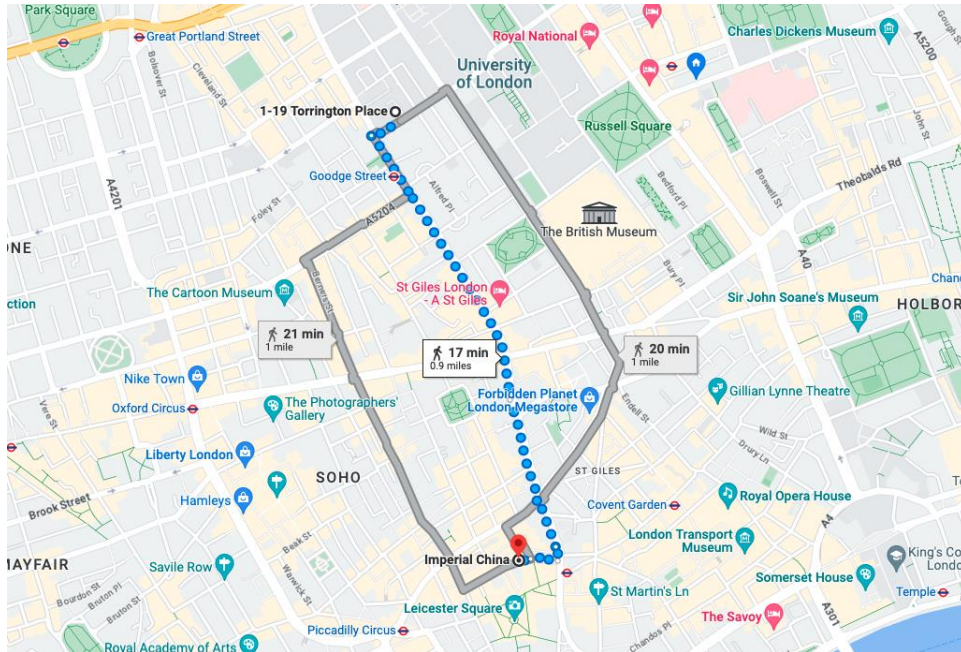


The UCL South Cloister is part of the main UCL building. The enclosed south cloisters connect the Octagon dome to the south wings of the quad. It is one of the main thoroughfares of the College, and accommodate a series of exhibitions and events throughout the year (for example shows from students of the Slade School of Art and from the UCL special collections).

Map to Imperial China (Gala Dinner, CPGIS night, Thursday 20 July)

Link to Google Maps directions: [1-19 Torrington Pl to Imperial China](#)

Address: 25a White Bear Yard, Lisle St, London WC2H 7BA

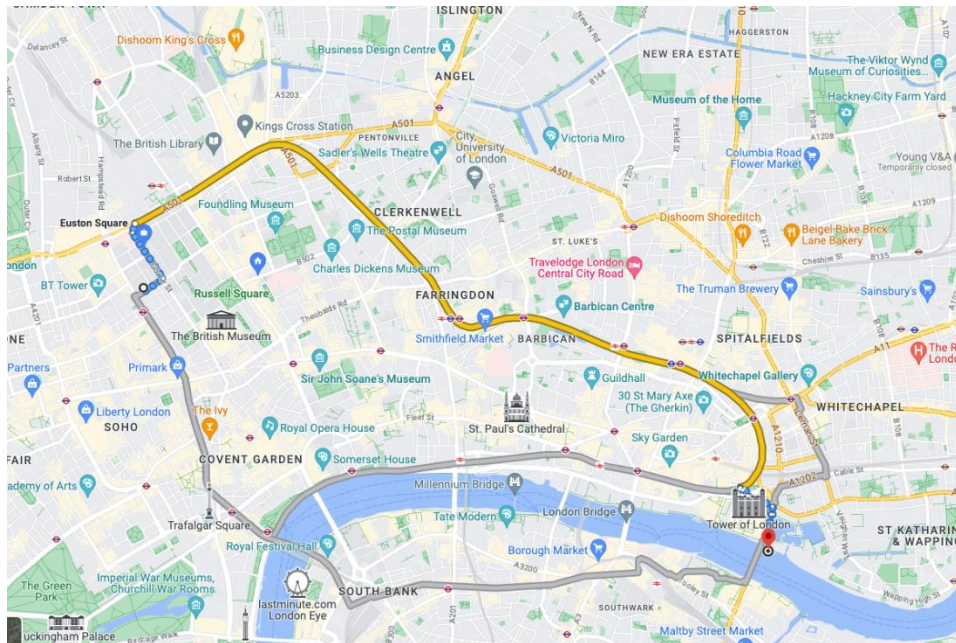


Founded in 1993, Imperial China London is a familiar sight in the area. It is quietly hidden within the bustling surroundings of Leicester Square and China Town. Imperial China is one of the largest Cantonese restaurants in China Town spanning over three floors with 8 private dining rooms.

Map to Tower Bridge Quay (Boat Trip, Friday 21 July)

Link to Google Maps directions: [1-19 Torrington Pl to Tower Bridge Quay](#)

Address: St Katharine's Way, London E1W 1LD



There is plenty to do around Tower Bridge Quay which is next to one of the world's most recognised tourist icons, Tower Bridge. It is also next door to the Tower of London which offers a thousand years of history in just one visit. The pier is on the edge of St Katharine Docks, a lovely relaxed marina where you can wander around looking at the moored yachts. If you're interested in larger water-going vessels, the Second World War warship HMS Belfast – now a museum about life onboard during a conflict – is a short walk along the southern bank of the river.

Accessibility and Inclusivity Information

You can use the University's interactive [campus map](#). The map provides an introduction to each building, which is linked to Google Maps, allowing you to switch to Street View mode by clicking. At the same time, you can find routes from one building to another on the campus in the map, including wheelchair-friendly routes. You can also locate the water fountains in each building, indicating on which floor and at what location they are situated.



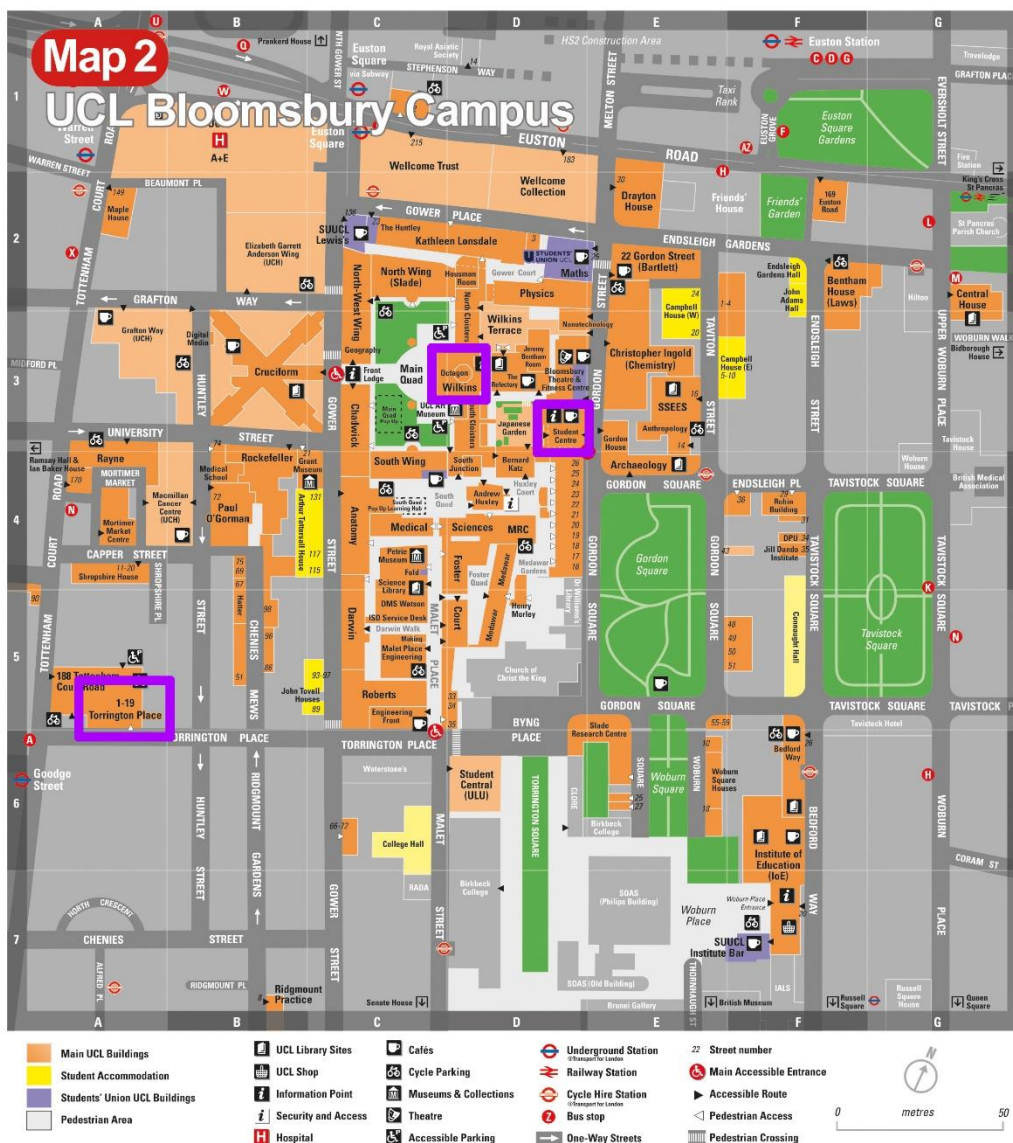
Additional information

- If you are a wheelchair user or have other access requirements, you may need to [adapt routes to meet your needs](#).
- Campus Maps are available from the official UCL student app, UCLGO! (for Apple, Android and Blackberry). Search for 'UCL' within the app store

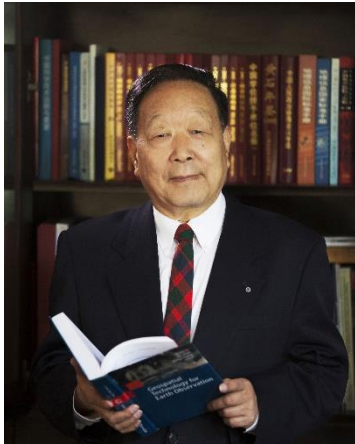
Baby changing facilities

Baby feeding and changing facilities are available at the following 3 locations.

- **1-19 Torrington Place Room 359, Third Floor**
 - Accessible WC and baby-changing facilities: Baby-changing facilities available in the accessible women's WC located on the 3rd floor, opposite the west end lift lobby.
- **The Student Centre, Gordon Street Room G04, Level 00**
 - Baby-changing and first-aid room
- **Wilkins Building Rooms B03, B05 and B45, Lower Ground Floor**
 - Men's WC and baby-changing: Located in Room B03
 - Women's WC and baby-changing: Located in Room B05
 - Gender-neutral WC and baby-changing: Located in Room B45



Keynotes (in order of appearance)



Luojia3-1 Satellite-Intelligent Remote Sensing Satellite Based on Internet

Bio: Professor Deren Li is a scientist in surveying, mapping and remote sensing from Wuhan University, China. He enjoys dual memberships of both Chinese Academy of Sciences and Chinese Academy of Engineering. He is also the member of International Eurasia Academy of Sciences and International Academy of Astronautics. He received doctor degree from University of Stuttgart in 1985 and honorary doctorate from ETH Zürich in 2008. In 2012, International Society for Photogrammetry and Remote Sensing awarded him the Honorary Member, the number of which ISPRS limits to a maximum of ten at any time as the highest honor. In 2020, ISPRS awarded him the Brock Gold Medal in recognition of outstanding contributions to photogrammetry.

Prof. Deren Li was the president of Wuhan Technical University of Surveying and Mapping, and director of State Key Laboratory of Information Engineering in Surveying, Mapping and Remote Sensing (LIESMARS). At present, he is the honorary director of academic committee of LIESMARS, director of Collaborative Innovation Center of Geospatial Technology, chairman of Wuhan Association for Science and Technology, and chief scientist of Optics Valley of China in Wuhan.

Abstract: This paper mainly describes the first intelligent remote sensing satellite based on internet, namely the Luojia3-1. Focusing on the significant demand for Fast, Accurate and Flexible remote sensing information service to customers, this satellite creates a new mode of real-time service for intelligent remote sensing satellites on the internet, breaks through mission-driven high orientation and intelligent processing technology on orbit, and develops new generation remote sensing satellites with multimode open intelligent interconnection.



Designing Future Cities Using Artificial Intelligence

Bio: Professor Michael Batty is Bartlett Professor of Planning, University College London; Chair, Centre for Advanced Spatial Analysis (CASA); Co-Founder & Chair of the Digital Task Force for Planning. Mike has worked on computer models of cities and their visualisation since the 1970s and his recent publications *Cities and Complexity* (2005), *The New Science of Cities* (2013), and *Inventing Future Cities* (2018) all from The MIT Press. His forthcoming book *The Computable City* (MIT Press, 2023) is a history of how computers and digital technologies have and are changing the form and function of cities. He is a Fellow of the British Academy (FBA), the Royal Society (FRS), the Academy of Social Sciences and the RTPI. He was awarded the CBE in the Birthday Honours List in 2004. He received the Gold Medal of the Royal Geographical Society (2015) and the Gold Medal of the Royal Town Planning Institute. He has been the editor of *Environment and Planning B: Urban Analytics and City Science*, since 1982.

Abstract: Figuring out the best locations for urban development has been the quest of urban planning for a century or more. The notion that the determinants of optimal development are based on conflicting degrees of land suitability which can be overlaid and integrated to determine the most suitable locations has been at the basis of plan-design methods since the late 19th century. These methods now represent the essence of GIS and geo-design. In this talk, I will illustrate how we can integrate a series of factors or features using various kinds of weighting structures which can be represented as networks, first linking these ideas to social networks where the factors can be associated with different actors or stakeholders who then resolve their differences between using averaging or pooling processes that can be formalised as recurrent Markov chains. These weighting structures can be thought of as neural nets but with the nets being fixed in advance to optimise the way the factors merge to produce optimal locations. The corollary to these design methods is to determine the weights by training the process of averaging to meet spatial patterns known in advance and we can thus exploit various algorithms based on deep learning to determine the best weighting structures through feedforward neural nets. The association between designing an optimal urban system and understanding an existing one through machine learning has considerable potential for enriching our understanding of how best designs might be accomplished.

Reference: M. Batty (2021) Conflict Resolution and Opinion Pooling in City Planning, In Z. Neal and C. Rozenblat (Editors) *Handbook of Cities and Networks*, Edward Elgar Publishing Ltd, Cheltenham, UK, 389-408.



Spatiotemporal Analytics, Human Mobility and Health Research

Bio: Professor Meipo Kwan is a Choh-Ming Li professor of Geography and Resource Management and a director of Institute of Space and Earth Information Science at The Chinese University of Hong Kong. Kwan is a Guggenheim Fellow and a Fellow of the U.K. Academy of Social Sciences, the American Association for the Advancement of Science (AAAS), and the American Association of Geographers (AAG). She was named to the 2019 Highly Cited Researchers List compiled by the Web of Science Group as one of the world's most influential researchers. She has received many prestigious honors and awards, including the Distinguished Scholarship Honors, the Wilbanks Prize for Transformational Research in Geography, and the Stanley Brunn Award for Creativity in Geography from the AAG.

Kwan had served as an editor of *Annals of the American Association of Geographers* for 12 years. She has received over US\$58.5 million grant support from sources including the U.S. National Institutes of Health, the U.S. National Science Foundation, the U.S. Department of Transportation, the National Natural Science Foundation of China, and the Hong Kong Research Grants Council. She has published over 330 books, journal articles and book chapters. She has delivered over 340 keynote addresses, invited lectures and other invited presentations in more than 20 countries.

Abstract: The rapid development and widespread use of advanced geospatial technologies such as GPS, remote sensing, mobile sensing, and location-aware devices in recent years have greatly facilitated the acquisition of enormous amounts of high-resolution space-time data. To build smart and healthy cities, we need to integrate these multi-source geospatial big data acquired by earth observation technologies and mobile sensing technologies to provide more accurate assessments of individual exposures to environmental or social risk factors, and to develop planning policies to improve health for all. In this presentation, I will discuss how these new developments can provide new insights into the relationships between people's mobility, health behaviors, and the complex spatiotemporal dynamics of environmental influence. Drawing upon my recent projects on individual exposures to green/blue spaces, light-at-night, and air and noise pollution, as well as on COVID-19, I explore how the collection, integration, and analysis of high-resolution space-time data enabled by advanced geospatial and mobile technologies (e.g., real-time mobile sensing and GPS tracking) can help identify the "truly relevant geographic context in space and time" and provide new insights into the relationships between human health, people's daily mobility, and the complex spatiotemporal dynamics of environmental influences.



Digital Twins for Cities and Regions—An Opportunity, or a Distraction?

Bio: Professor Mark Birkin is Professor of Spatial Analysis and Policy in the School of Geography, University of Leeds, and is Programme Director for Urban Analytics and Fellow at The Alan Turing Institute. He has longstanding interests in mathematical modelling of urban and regional systems including geodemographic, microsimulation, agent-based modelling, and spatial decision-support systems. Mark has a notable track record of collaboration, including ten years as an executive director of Geographical Modelling and Planning (GMAP) Limited. In this time, GMAP developed from occasional consulting projects into a market analytics business with 120 employees and global reach, working with household name partners such as Ford Motor Company, Asda-Walmart, HBoS, Exxon-Mobil and GSK. An ethos of collaboration with external partners in business and the public sector continues in his current role as Director of the Consumer Data Research Centre (CDRC), a national investment within the UKRI Digital Footprints programme. He is also PI for the ESRC Centre for Doctoral Training in Data Analytics, which coordinates more than eighty postgraduate research projects in tandem with external partners. Since 2014, Mark has been Director of the Leeds Institute for Data Analytics (LIDA). Having started as a partnership between CDRC and the MRC Medical Bioinformatics, LIDA now supports over 90 projects and programmes with more than £60M of funded research, bringing together over 200 researchers from across all eight faculties at the University. He is a Fellow of the Academy of Social Sciences and a Fellow of the Royal Geographical Society. In 2019, Mark was the recipient to the RGS-IBG Murchison Award for 'pioneering contributions to urban analytics'

Abstract: From origins in applied science, digital twins have begun to attract attention within the geoinformatics community. As with many scientific novelties, debates regarding their value can quickly become polarised and a nascent backlash is already in evidence. In this talk I will provide a brief review of the digital twin concept, and contextualise the idea within the frame of ongoing research priorities in regional science and geoinformatics. I'll provide some examples from ongoing work at the Alan Turing Institute and across its network of partners, and comment on the relative merits, actual and potential impact of the work. I will also suggest future pathways and attempt an evaluation of the long-term importance of digital twins for our discipline.

Conference Schedule

		7/18 TUESDAY	7/19 WEDNESDAY			7/20 THURSDAY		7/21 FRIDAY	
08:00	09:00		Registration (1-19 Torrington Place)						
09:00	09:15		Opening Ceremony			KEYNOTE Prof Michael Batty (1h, incl. Q&A)		Session 6A (4*18 mins)	Session 6B (4*18 mins)
09:15	09:30		KEYNOTE Prof Deren Li (1h, incl. Q & A)						
09:30	09:45								
09:45	10:00								
10:00	10:15								
10:00	10:15		TEA BREAK			TEA BREAK		TEA BREAK	
10:15	10:30		TEA BREAK						
10:30	10:45								
10:45	11:00		Session 1A (5*18 mins)	Session 1B (5*18 mins)	Session 1C (5*18 mins)	Session 4A (5*18 mins)	Session 4B (5*18 mins)	KEYNOTE Prof Mark Birkin (1h, incl. Q&A)	
11:00	11:15								
11:15	11:30								
11:30	11:45								
11:45	12:00							Closing Ceremony	
12:00	12:15								
12:15	12:30		LUNCH			LUNCH		LUNCH	
12:30	12:45								
12:45	13:00								
13:00	13:15								
13:15	13:30		Session 2A (5*18 mins)	Session 2B (5*18 mins)	Session 2C (5*18 mins)	Session 5A (5*18 mins)	Session 5B (5*18 mins)	SpaceTimeLab 10- year anniversary event (organised by SpaceTimeLab) (G12)	
13:30	13:45								
13:45	14:00								
14:00	14:15								
14:00	14:15								

14:15	14:30							
14:30	14:45							
14:45	15:00		TEA BREAK			TEA BREAK		
15:00	15:15							
15:15	15:30		Session 3A (5*18 mins)	Session 3B (5*18 mins)	Session 3C (5*18 mins)	KEYNOTE Prof Meipo Kwan (1h, incl. Q&A)		
15:30	15:45							
15:45	16:00							
16:00	16:15							
16:15	16:30					TEA BREAK		
16:30	16:45							
16:45	17:00		TEA BREAK					
17:00	17:15							
17:15	17:45		Poster session (UCL South Cloister)			GISalon Seminar (organised by GISphere) (G12)		
17:45	18:15							
18:15	18:45	Ice- breaking, Registration (1-19 Torrington Place)	Reception (UCL South Cloister)					
18:45	19:15					Gala dinner, CPGIS night (Imperial China, London WC2H 7BA)		Boat Trip (Tower Bridge Quay, E1W 1LA)
19:15	19:45							
19:45	20:15							
20:15	20:45							
20:45	21:15							

Presentation Sessions

TBC

SpaceTimeLab 10-year Anniversary Event Schedule (Friday 21 July)

Time	Title	Speaker
12:00-13:00	Registration/coffee	
13:00-13:15	Opening Session	Tao Cheng
13:15-14:00	SpaceTimeLab Show & Tell	Researchers at SpaceTimeLab
14:00-15:00	ESRI Roger Tomlinson Prize Session	Adel Bolbol (chair), Huanfa Chen, Mohamed Ibrahim
15:00-15:30	Coffee	
15:30-16:30	Panel Discussion – Future AI and Smart Cities	Sarah Wise (chair), Andy Emmonds, Chris Gale, Olga Feldman, , Washington Ochieng
16:30-17:00	Break	
17:00-18:00	Keynote – Prof Ed Manley	Ed Manley
18:00-19:00	Travel to boat trip	
19:00-23:00	Boat Trip	