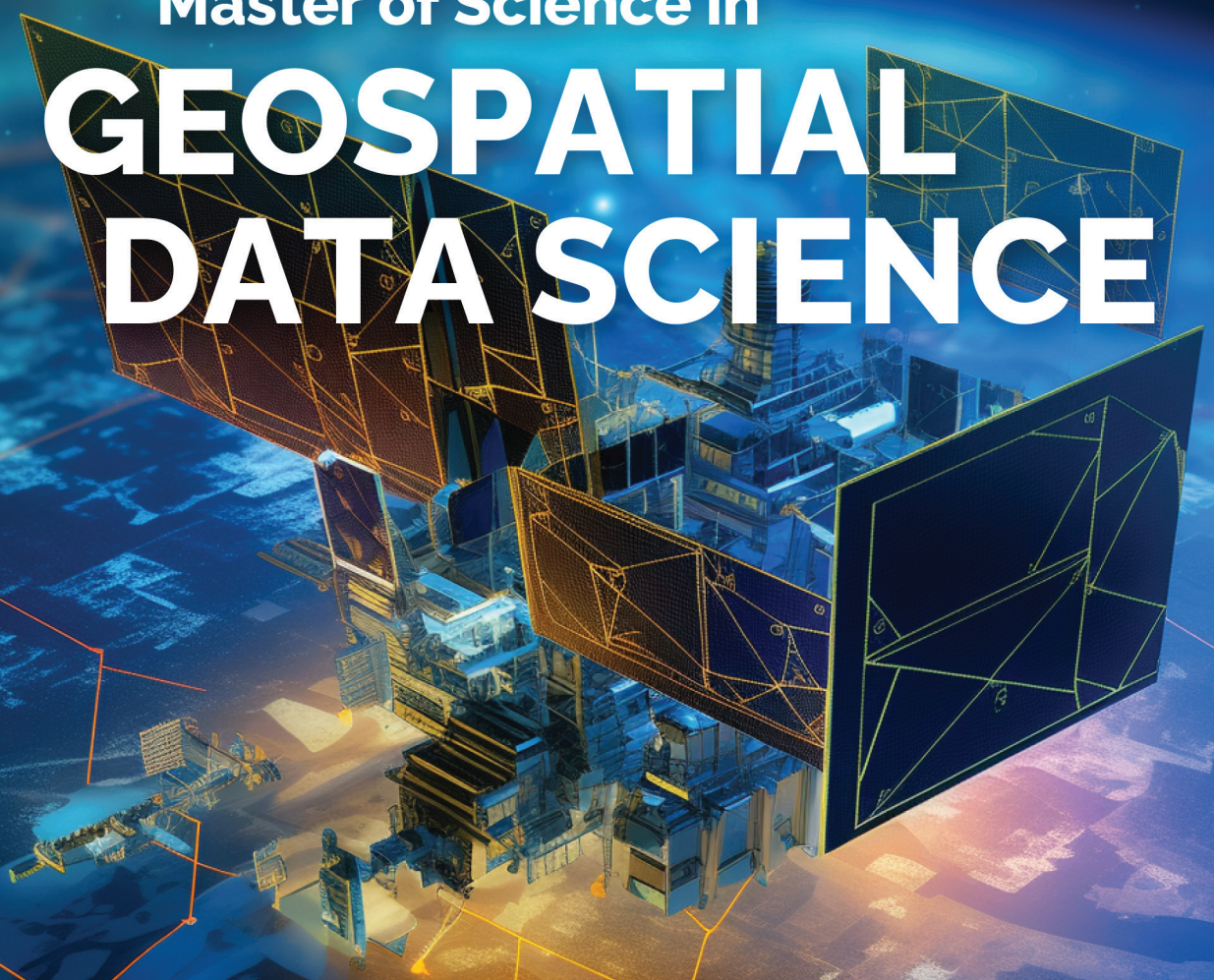
DEPARTMENT OF GEOGRAPHY
THE UNIVERSITY OF HONG KONG

Master of Science in
GEOSPATIAL DATA SCIENCE



ENQUIRIES:

geods@hku.hk

APPLICATION:

Online applications only.
Visit the programme website at:
geods.hku.hk

SECTION 1

Introduction

Established in 1931, the Department of Geography at HKU consistently ranks among the top departments in the world. In 2023, HKU Geography was ranked first in Hong Kong, second in Asia and thirteenth in the world in the QS ranking.

The program aims to provide advanced education and training in geospatial theory, technology, and applications to address diverse environmental, social, and economic issues for sustainable community development.

The program is interdisciplinary and focuses on advanced and specialized techniques, such as machine learning and artificial intelligence for big data exploration, visualization, modeling, and analytics

04

The program is designed primarily for new university graduates, mid-career professionals, and international students with Bachelor's degrees or equivalent qualification

05

The program will be housed in the Department of Geography and will have a quality assurance mechanism to ensure good quality and standard of the program

06

Geospatial data science have a wide range of application areas and demand for professionals is growing faster than supply. Graduates can have promising employment prospects such as Remote Sensing & GIS Software Analyst, professoriate/research staff, and Remote Sensing & GIS Technical Program Manager

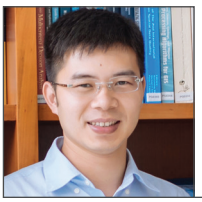
Our Team

Course Te

Dr. Shunlin LIANG

Chair Professor & Head
Department of Geography, HKU

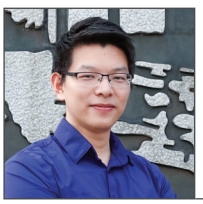
Programme Director



Dr. Hongsheng ZHANG

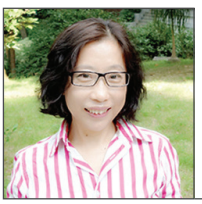
Assistant Professor
Department of Geography, HKU

Associate Programme Director



Dr. Bin CHEN

Assistant Professor
Faculty of Architecture, HKU

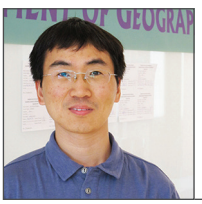


Dr. Wendy CHEN

Professor
Department of Geography, HKU

Dr. Nicky LAM

Associate Professor
Department of Geography, HKU



Dr. Jinbao LI

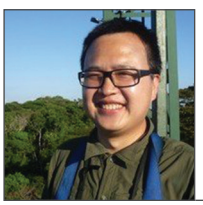
Associate Professor
Faculty of Architecture, HKU

Dr. Becky LOO

Professor
Department of Geography, HKU

Dr. Han MA

Research Assistant Professor
Department of Geography, HKU



Dr. Jin WU

Assistant Professor
School of Biological Sciences, HKU

Dr. Zhenci XU

Assistant Professor
Department of Geography, HKU

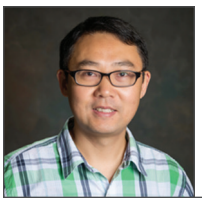
se Teachers and Dissertation Supervisors

Dr. Patrick ADLER
Assistant Professor
Department of Geography, HKU

Dr. Yanjia CAO
Assistant Professor
Department of Geography, HKU

Dr. Bo HUANG
Chair Professor
Department of Geography, HKU

Dr. K (Peter) KOH
Assistant Professor
Department of Geography, HKU



Dr. Jimmy LI
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Dr. Zhu LIU
Professor
Department of Geography, HKU

Dr. Lishan RAN
Associate Professor
Department of Geography, HKU

Dr. Frank VAN DER WOUDEN
Assistant Professor
Department of Geography, HKU

Dr. Yuyu ZHOU
Professor
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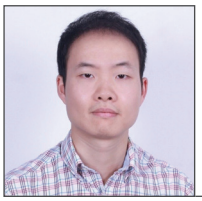
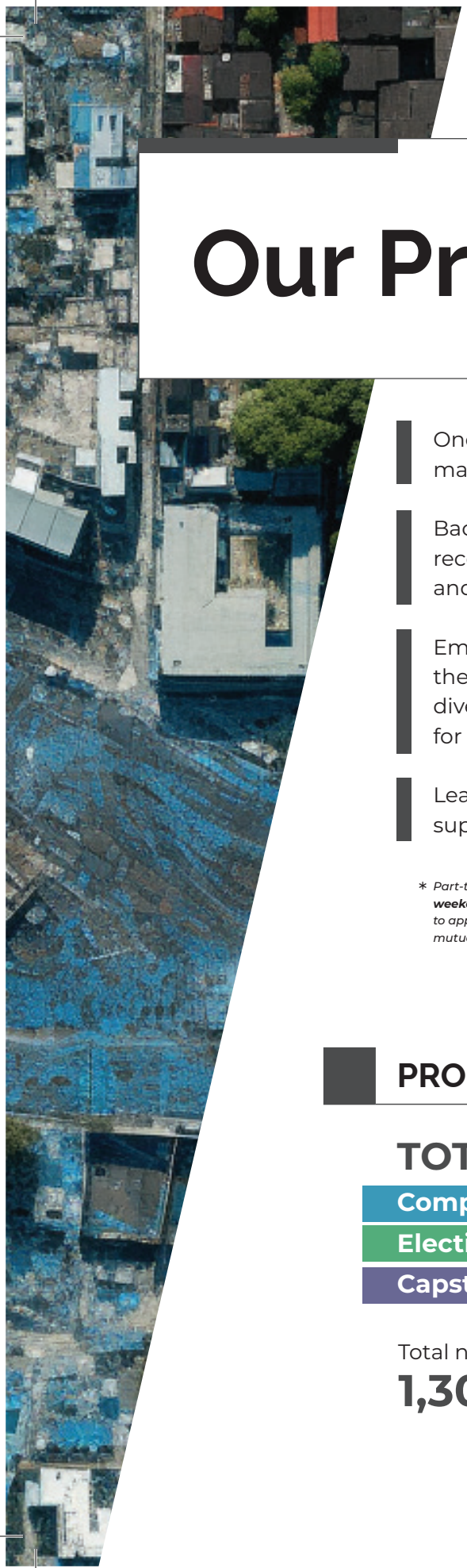


Dr. Peng ZHU
Assistant Professor
Department of Geography, HKU



SECTION 3

Our Program

- One-year full-time and two-year part-time* taught master programme
- Bachelor degree holders with honours from recognized universities or equivalent qualifications and/or experience are eligible to apply
- Emphasis on a broad understanding of geospatial theory, technology, and applications to address diverse environmental, social, and economic issues for sustainable community development
- Learning through courses, projects, seminars and supervised dissertation

* *Part-time students may be required to attend lectures with full-time students on **weekday afternoons**. Hence, part-time students with full-time jobs are recommended to apply for day release to attend the lectures or compromise with their employers on a mutually agreed work schedule before applying for this programme.*

PROGRAMME REQUIREMENTS

TOTAL	**60 credits**
Compulsory Courses	**30 credits**
Elective Courses	**18 credits**
Capstone Experience Courses	**12 credits**

Total number of learning hours:

1,300 hours

PROGRAMME STRUCTURE

COMPULSORY COURSES

GEOG7301 Introduction to geospatial data science
GEOG7302 Geographic information system for spatial analysis
GEOG7303 Spatial statistics
GEOG7304 Satellite data processing and information extraction
GEOG7305 Programming for geospatial data

ELECTIVE COURSES

GEOG7307 Big data analytics
GEOG7308 Machine learning for geospatial data
GEOG7309 Drones and data collection
GEOG7310 Cloud computing for geospatial data analytics
GEOG7311 Web GIS
GEOG7312 Geospatial data for climate change
GEOG7313 Geospatial data for sustainable development
GEOG7314 Land cover and land use

SHARED ELECTIVE COURSES (From MSocSc Social Data Analytics)

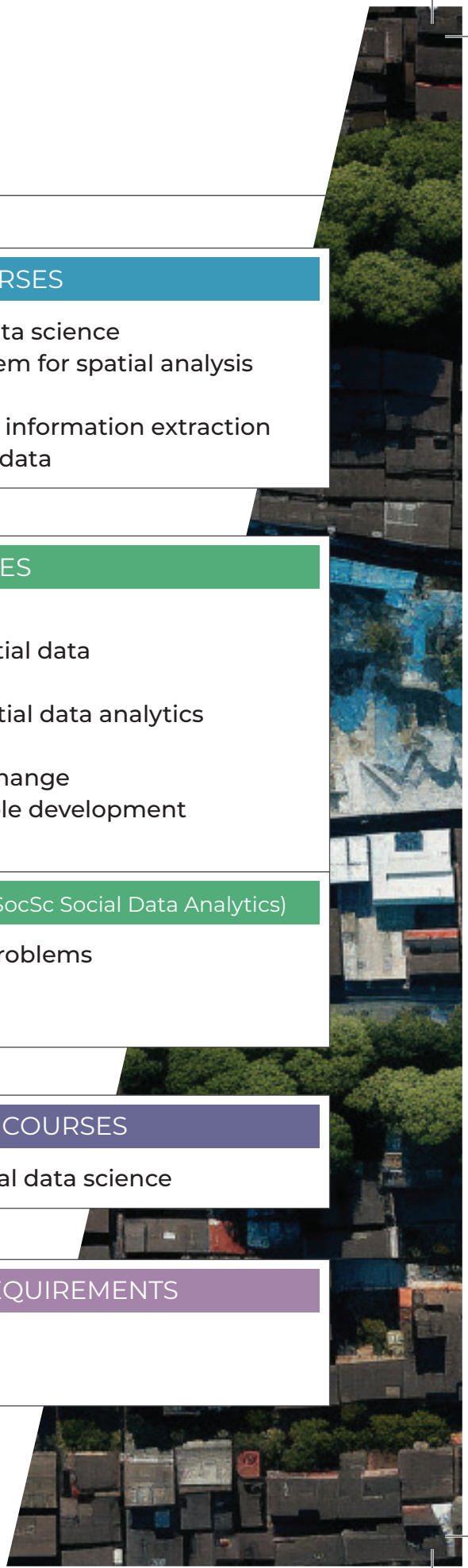
MSDA7001 Big data solutions to social problems
MSDA7004 Social network analysis
MSDA7005 Media data analysis

CAPSTONE EXPERIENCE COURSES

GEOG7306 Capstone project in geospatial data science

ADDITIONAL PEDAGOGIC REQUIREMENTS

Coursework
Geospatial Data Sciences Seminars



COMPULSORY COURSES

GEOG7301 Introduction to geospatial data science

This course offers an introduction to the principles and techniques of geospatial data sciences, covering the fundamentals of Geographic Information Systems (GIS), spatial data visualization, analysis, management, remote sensing, and ethical considerations. Students will gain hands-on experience using GIS software and learn how to apply geospatial techniques to real-world problems in various domains, such as urban planning, environmental management, public health, and transportation.

Assessment: 60% coursework; 40% examination | 6 credits

GEOG7302 Geographic information system for spatial analysis

This course provides an in-depth exploration of Geographic Information Systems (GIS) and their application in spatial analysis. Through a combination of theoretical concepts and hands-on exercises, students will learn how to use GIS tools and techniques to analyze and visualize spatial data. The course will cover topics such as data acquisition and management, geoprocessing, spatial analysis techniques, and cartographic visualization. By the end of the course, students will be able to apply GIS principles and techniques to address social, economic and environmental problems and make informed decisions using spatial data.

Assessment: 60% coursework; 40% examination | 6 credits

GEOG7303 Spatial statistics

This course is about quantitative analysis of spatial data. It is intended to provide a broad survey of various spatial analysis and statistic methods. The course is geared towards helping students: (1) develop an understanding of the important theoretical concepts in spatial data analysis; and (2) gain practical experience in application of spatial analysis and statistics to a variety of social and environmental problems using advanced statistical software. This course covers a wide range of topical areas including point pattern analysis, area data analysis, continuous data analysis, spatial sampling and multivariate spatial and temporal analysis.

Assessment: 100% coursework | 6 credits

GEOG7304 Satellite data processing and information extraction

This course introduces digital image processing and analysis applied to satellite and aircraft land remote sensing data. It will introduce principles of electromagnetic radiation, satellite remote sensing platforms and sensors, image statistics extraction, radiometric and geometric correction, image enhancement, and thematic classification. Students will gain hands-on experience with state-of-the-art software tools and methodologies for processing satellite imagery, extracting valuable information, and integrating these insights into decision-making processes across diverse fields, such as environmental monitoring, agriculture, urban planning, and disaster management.

Assessment: 60% coursework; 40% examination | 6 credits

GEOG7305 Programming for geospatial data

This course teaches programming and scripting for geospatial data users. Students will be introduced to how to use Python programming to manipulate, analyze, and visualize geospatial big data. Students will learn to employ various spatial statistics methods for advanced geospatial analysis and solve geospatial problems with a multi-petabyte catalog of satellite imagery and geospatial datasets.

Assessment: 60% coursework; 40% examination | 6 credits

ELECTIVES COURSES

GEOG7307 Big data analytics

This course is designed to introduce statistical analysis over big data sets (and tackling big data problems), primarily in geography and spatial sciences, but with broader appeal throughout the socio-behavioral sciences. Students will be introduced to a range of methods that can be applied to the exploration, modeling, and visualization of big quantitative data. This course explores data fusion, statistical analysis, and data-mining for geospatial and non-geospatial data in structured and unstructured form, with an emphasis on large silos of data across diverse sources and assumptions.

Assessment: 100% coursework | 6 credits

GEOG7308 Machine learning for geospatial data

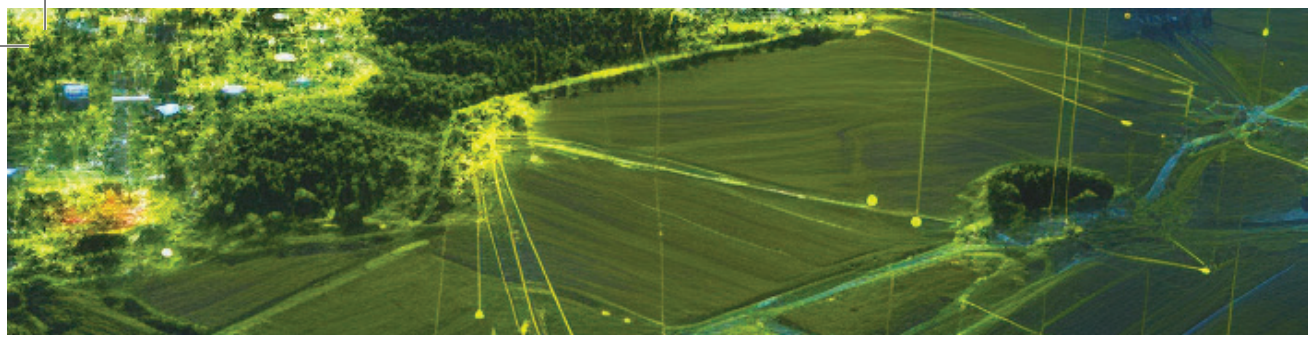
This course provides an in-depth understanding of machine learning algorithms and techniques for geospatial data analysis. The course covers the fundamentals of machine learning and its application in geospatial data analysis, including feature extraction, data preprocessing, and model selection. It also covers various machine learning algorithms, such as random forest and neural networks, and their application in geospatial data analysis. The course provides hands-on experience with real-world geospatial datasets and tools, such as Python and its relevant libraries, and Google Earth Engine. Upon completion of the course, students will have the skills and knowledge to apply machine learning algorithms to geospatial data analysis and solve real-world problems.

Assessment: 100% coursework | 6 credits

GEOG7309 Drones and data collection

This course explores the use of drones as a powerful tool for data collection in various industries, including agriculture, environmental monitoring, and infrastructure inspection. Students will learn the fundamentals of drone technology, data acquisition methods, and data processing techniques to transform multisource data observations into valuable insights of the natural and built systems. The course will also cover legal and ethical considerations, safety guidelines, and best practices in drone operations.

Assessment: 60% coursework, 40% examination | 6 credits



GEOG7310 Cloud computing for geospatial data analytics

This course provides an in-depth exploration of cloud computing with a focus on geospatial data analytics. Students will learn about cloud computing concepts, platforms, and services, and how they can be used to manage and analyze large geospatial datasets. Topics covered include cloud architecture, data storage and retrieval, processing and analysis, and visualization. Students will also gain hands-on experience with cloud-based tools and technologies, and develop skills for building and deploying cloud-based geospatial data applications.

Assessment: 100% coursework | 6 credits

GEOG7311 Web GIS

This course is designed to: (1) introduce the concepts and theories that are related to an increasingly important technology – Internet/Web GIS; (2) introduce various technologies or techniques for creating, analyzing, and disseminating GIS data and services via the Internet. The topics covered include the hardware/software structure of the Internet (e.g., server-client model, TCP/IP protocol), the evolution of Web GIS, and most importantly, different technology options. Students will be required to practice almost all of the Web GIS tools including Google Map API, ArcGIS Server, JavaScript API, GeoJSON, Mapbox, and Leaflet. Students will also be exposed to the experience of working with the cloud environment such as AWS EC2 and ArcGIS Online.

Assessment: 100% coursework | 6 credits

GEOG7312 Geospatial data for climate change

This course focuses on the science behind the challenges facing our planet's environment. Students will be introduced how to combine geospatial data with biology, chemistry, physics, earth science and human geography to address climate challenges such as flooding, permafrost thawing, drought and forest fires, peatland degradation, rising sea levels and coastal change, and changing economic opportunities in climate sensitive sectors. This course aims to provide students with knowledge of basic science of climate change and the potential applications of geospatial data in supporting climate change mitigation and adaptation. The role of human beings on climate change will be critically examined based on geospatial data.

Assessment: 100% coursework | 6 credits

GEOG7313 Geospatial data for sustainable development

This course is designed to introduce applications of geospatial data in local and global sustainable development. The course will focus on some specific United Nation's sustainable development goals (SDGs) that geospatial data have addressed, including SDG 1 (Zero hunger), SDG 2 (No poverty), SDG 13 (Climate action), SDG 14 (Life below water) and SDG 15 (Life on land). Popular geospatial data initiatives that greatly support sustainable development including Global Forest Watch, Global Fishing Watch, global near-real-time Carbon Monitor will also be introduced. Students will learn about how geospatial data, in particular remote sensing based Earth Observation (EO) data, can fulfill SDGs needs for SDG progress monitoring and interaction analysis.

Assessment: 100% coursework | 6 credits

GEOG7314 Land cover and land use

This course provides an in-depth understanding of Land Use and Land Cover (LULC) concepts and their applications in spatial planning, environmental impact assessment, carbon reduction, and nature conservation. Students will be introduced to advanced methods and software for LULC mapping and change detection using remote sensing data. The course covers all stages of LULC mapping, from acquiring satellite data to assessing map accuracy and designing change maps for selected areas. Upon completion of the course, students will be able to effectively use remote sensing data for land cover analysis and environmental impact assessment.

Assessment: 100% coursework | 6 credits

SHARED ELECTIVE COURSES

From MSocSc Social Data Analytics

MSDA7001 Big data solutions to social problems

Do Google and Facebook understand us better than we do ourselves? Are we becoming lab rats every time we go online? Is the impartially designed algorithm for predicting the probability of recidivism truly fair for sentencing individuals? What are the ethical issues underpinning big data science? When big data analytics are routinely applied in our daily lives, the ability to audit the adopted algorithms becomes crucial. This course aims to build students' big data literacy through three major areas of focus: (1) Defining what big data is; (2) Providing an overview of existing big data analytical techniques; and (3) Discussing opportunities and challenges of big data analytics in tackling social problems.

The course will focus on elaborating the core principles of a variety of techniques adopted when predicting future phenomena through the lens of big data. We will use a case study approach to provide an in-depth understanding of various big data analytics, with the goal inspiring the students to think creatively and critically about how big data analytics can be used to making scientific discoveries and do social good.

Assessment: 100% coursework | 6 credits

MSDA7004 Social network analysis

The basic premise of this course is that the social world is relational. We can not ignore that we are influenced by people we know, have met and respect; ideas and allegiances are formed and maintained in social settings and organisations; not all people have equal opportunities when it comes to finding a job; we communicate over networks, be they online or offline; etc. In this course we aim to produce a detailed understanding of the web of social contacts that structure our daily life and society. We will consider the network both as an object that is interesting in its own right and as something that creates co-dependencies between social units in terms of outcomes and properties of these social units themselves.

The overarching goal of the course is to provide us with tools that bridge theories on the one hand, and what we can actually observe in observational and archival empirics on the other. Put another way, we aim to avail ourselves of approaches that permits us to test if our theoretical ideas about social interaction are supported by what people, organisations and countries actually do. The course is structured around a collection of themes based on such theoretical concepts such as cohesion, embeddedness, homophily, transitivity, the Mathew effect, structural holes, influence, selection. We will examine these both from the perspective of how they structure the network and how these network effects structure behaviour, opinions and beliefs.

For the purposes of getting some practical understanding of the approaches presented, we will also explore analytic methods using block models, stochastic actor-oriented models, exponential random graph models, network autocorrelation and network effects models. It is not expected that the students become expert users in any of these methods but to appreciate the common goal across these models, namely to model and take into account the interdependencies. Data will mostly be handled in R but orientation to other analysis packages will be given.

Assessment: 100% coursework | 6 credits

MSDA7005 Media data analysis

This course is designed to train students to familiarize a list of essential techniques for media data and social media analytics. It covers a variety of tools that help the learner conduct a range of applications independently, including web scraping, API programming, natural language processing, sentiment analysis, network analysis, digital map, web app development, as well as data visualization. The course is designed and taught in problem-based or project-driven mode which aims to facilitate real life applications in a variety of scenarios in social data analysis.

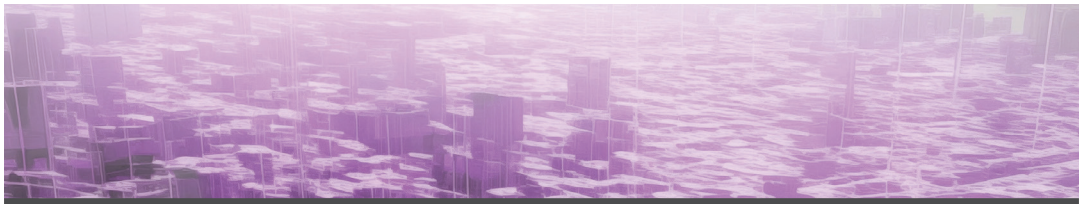
Assessment: 100% coursework | 6 credits

CAPSTONE EXPERIENCE COURSES

GEOG7306 Capstone project in geospatial data science

Each student must undertake a project as a demonstration of his/her competence in geospatial data science. The data and materials for this project can originate from an internship, or from relevant work experience at the student's current employer. The Department of Geography will work with each student individually to determine the best mechanism for obtaining the necessary data and experience. Under the direction of a faculty advisor, the student will prepare a project report which shall contain an explanation of the requirements for the work, a technical account of the activities undertaken, including a literature review, a description of the methods and approaches taken, a critical discussion of the results obtained, along with conclusions and recommendations developed from the project. The final project will consist of a full geospatial data analysis report and each student will need to give a presentation of a specific topic on using geospatial data to analysis climate, environmental, economic and social issues. This will enable the student to present potential employers with a portfolio containing an example of their ability to collect and analysis geospatial data on a project and will show that they understand how to apply the geospatial data to solve real world problems.

Assessment: 100% coursework | 12 credits



ADDITIONAL PEDAGOGIC REQUIREMENTS

Coursework

Candidates must satisfy the examiners in coursework assessment for each of the courses taken. The assessment of coursework will include written assignments, candidates' seminar presentations, their role as discussants in other candidates' seminars, their general contribution to seminars, and other relevant activities, including field trips.

Geospatial Data Sciences Seminars

Candidates will be required to attend a series of seminars to be presented by distinguished local and international scholars, government officials and industry entrepreneurs. They may also be required to present findings from their independent capstone projects in the seminar series. Attendance in the seminars is required.

AWARDS & SCHOLARSHIP

Geospatial Data Sciences Scholarship

The Geospatial Data Sciences Scholarship is open to application for all full-time students as an encouragement to support their GeoDS study and is awarded to a maximum of two students based on their performance in the first semester of the GeoDS study and proof of financial needs. The value of the Scholarship is HK$20,000.00 per awardee (deducted directly from the second instalment of the composition fee).

Geospatial Data Sciences Outstanding Graduate Award

The "Geospatial Data Sciences Outstanding Graduate Award" is awarded to outstanding graduates who has completed all the requirements and obtained a Distinction in his/her studies in that academic year.

Geospatial Data Sciences Dissertation Award

The "Geospatial Data Sciences Dissertation Award" is awarded to one student who received the highest mark among the grade A dissertations in that academic year.

Application

Application for admission for 2024-2025 would commence in around November 2023. Applications will be reviewed on a rolling basis. Applicants are required to hold a bachelor's degree or its equivalent in an appropriate subject. Applicants could visit the HKU website at: https://admissions.hku.hk/tpg/programme/master-science-geospatial-data-science

Part-time students may be required to attend lectures with the full-time students on weekday afternoons. Hence, part-time students with full-time jobs are recommended to apply for day release to attend the lectures or compromise with their employers on a mutually agreed work schedule before applying for this programme.

Composition fee

1-YEAR FULL-TIME

1st Instalment : HK$ 125,000
2nd Instalment : HK$ 125,000

TOTAL : HK$ 250,000

2-YEAR PART-TIME

1st Instalment : HK$ 62,500
2nd Instalment : HK$ 62,500
3rd Instalment : HK$ 62,500
4th Instalment : HK$ 62,500

TOTAL : HK$ 250,000

*** Subject to approval from the University Senate**

Local and non-local students pay the same composition fee for their study in the Programme. Local students are those who have the right of abode in Hong Kong, whilst non-local students are those who are required to apply for Student Visa to study at The University of Hong Kong.

Remark:

The first instalment shall be paid when accepting the admission offer before the start of study.
The second instalment shall be paid in January of the first year of study.
The third and fourth shall be paid in September and January of the second year of study.