Geographic Information System

Syllabus

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Outline

- About CCH
- Course Introduction
- Grading Policy
- Why do you need to take this course?
- What will you learn from this course?
- Textbook & Software

About CCH

Current Position

Assistant Professor @ Dept. of Geography, NTNU

Major Working Experience

Assistant Professor @ Dept. of Intelligent Computing and Big Data, CYCU

AI Consultant @ Taiwan Cybersecurity Foundry

Postdoctoral Research Fellow @ Dept. of Radiology, School of Medicine, TMU

Postdoctoral Research Fellow @ Dept. of Radiology, Taipei Manucipal Wanfang Hospital, TMU

Adjunct Assistant Professor @ Dept. of AI, TKU

Data Scientist Engineer @ Institute for Information Industry

Major Education Background

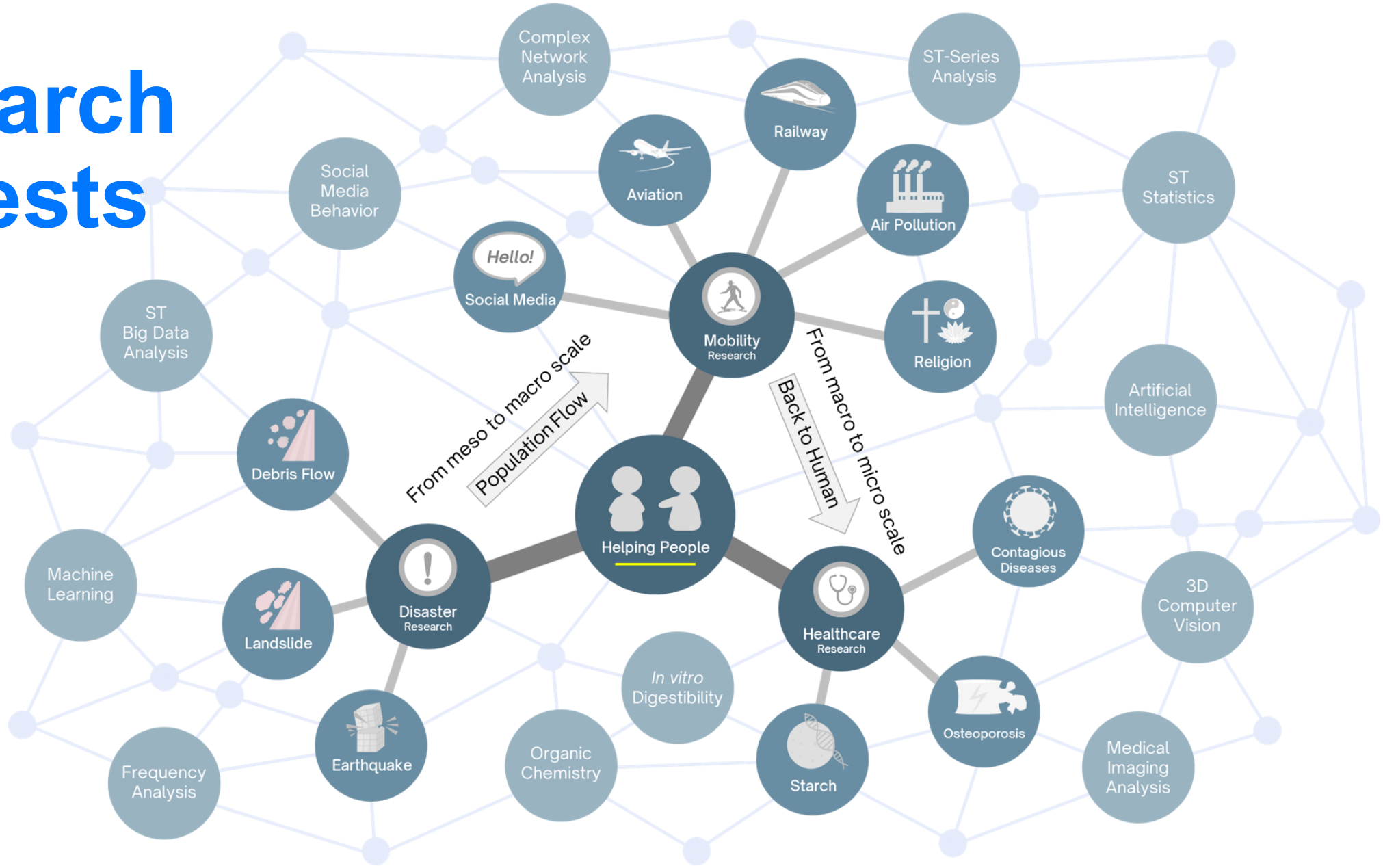
Ph.D. @ Dept. of Geography, NTU

M.S. @ Dept. of Geography, NTU

M.S. @ Dept. of Food Science, Nutrition, and Pharmaceutical Technology, USC

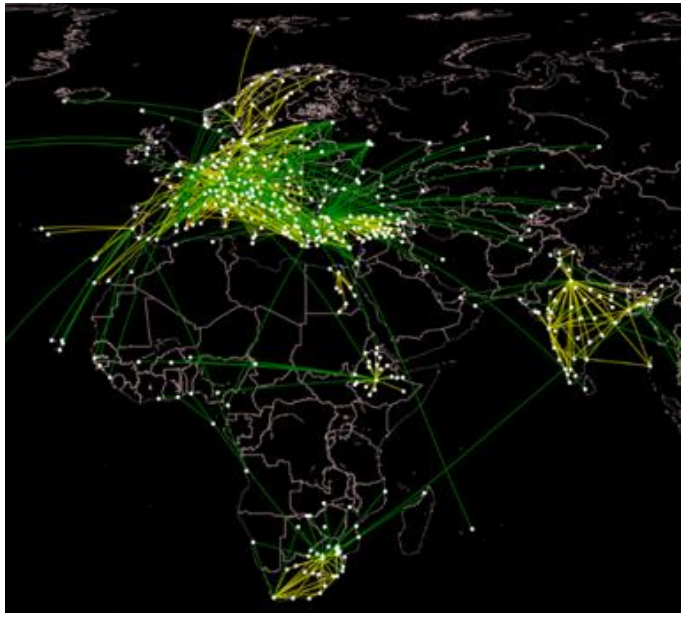
B.S.S. @ Dept, of Social and Regional Development, NTUE

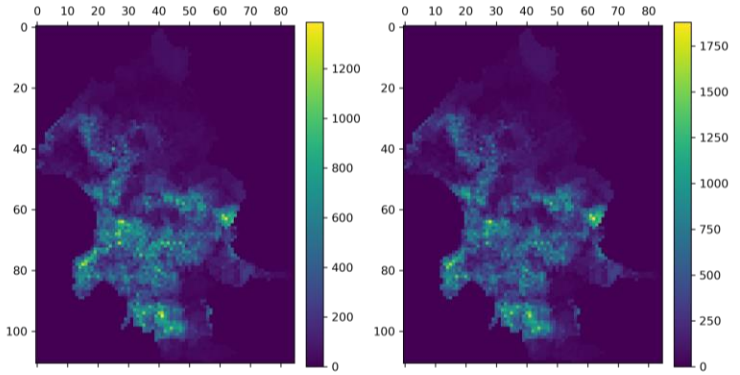
Research Interests



[Related] Ongoing and Past Projects

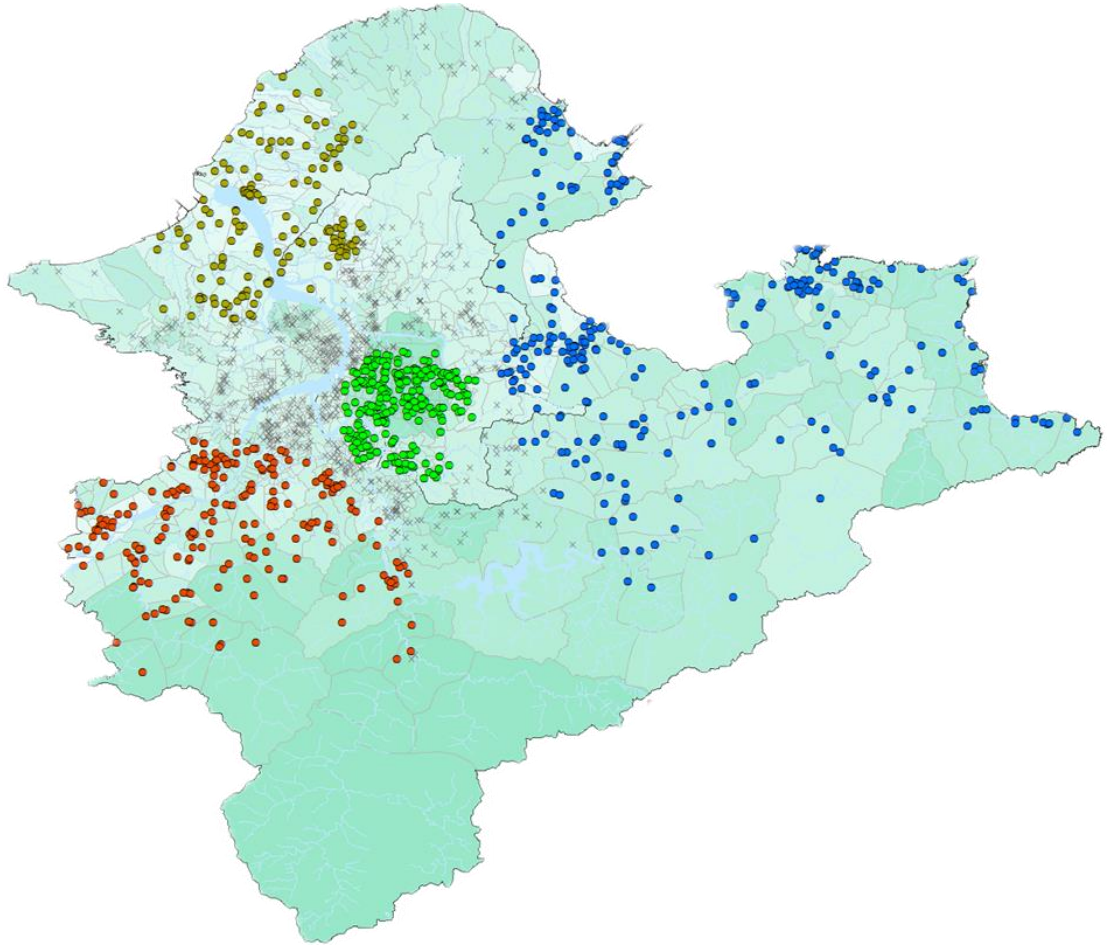
1. **Urban mobility research** (such as traffic flow forecasting, urban structure, mobility data for disaster and infectious disease, mobility data aggregation, disaster reduction, and vehicle-to-everything application)
2. **Global mobility research** (such as cross-country disease transmission, airline alliance market analysis, and global trade network)
3. **Climate changes and sustainability** (such as heatwave network characterization, and SDGs consulting)





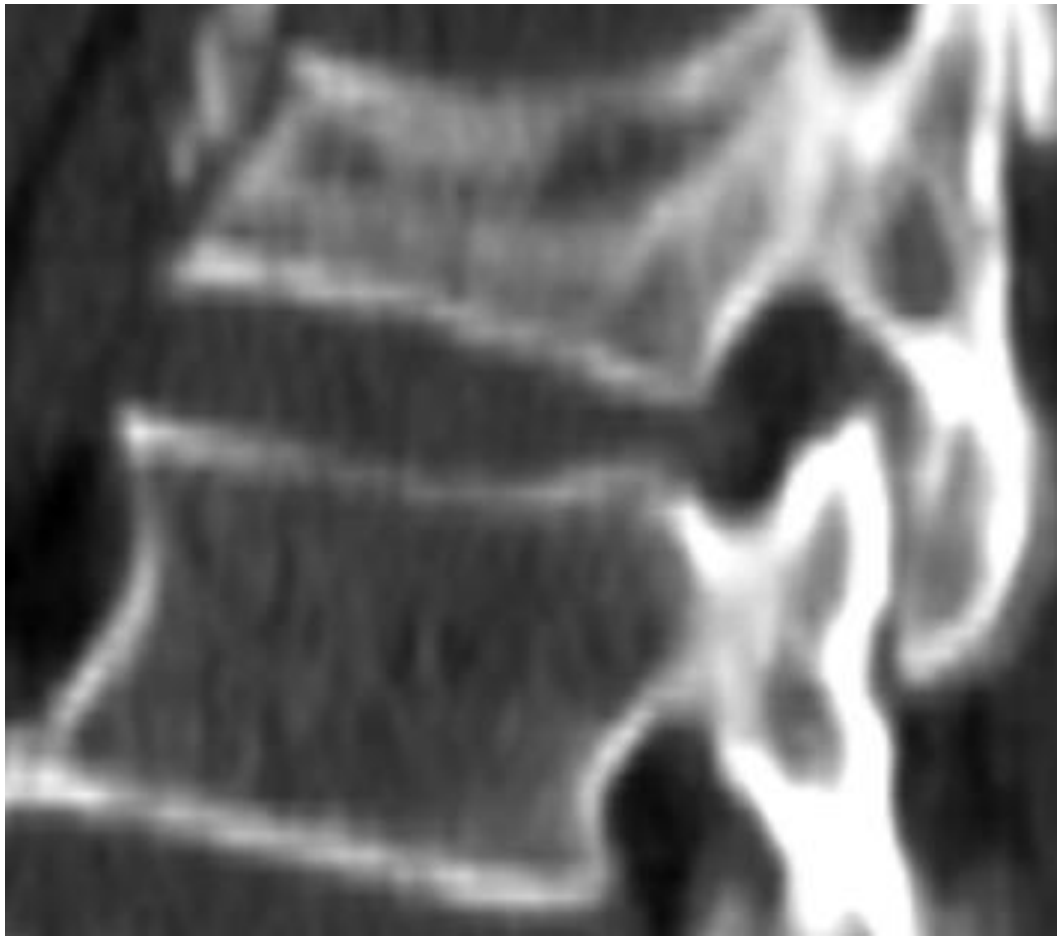
[Related] Ongoing and Past Projects

4. **Mental health** (such as social media impact on social relationship and formalizing the interactions between social relationship)
5. **Sociology – geography** (such as religious dissemination, religious landscape characterization and religious network)
6. **Marketing research** (such as re-evaluation marketing performance, marketing strategic planning, and O2O performance measurement)



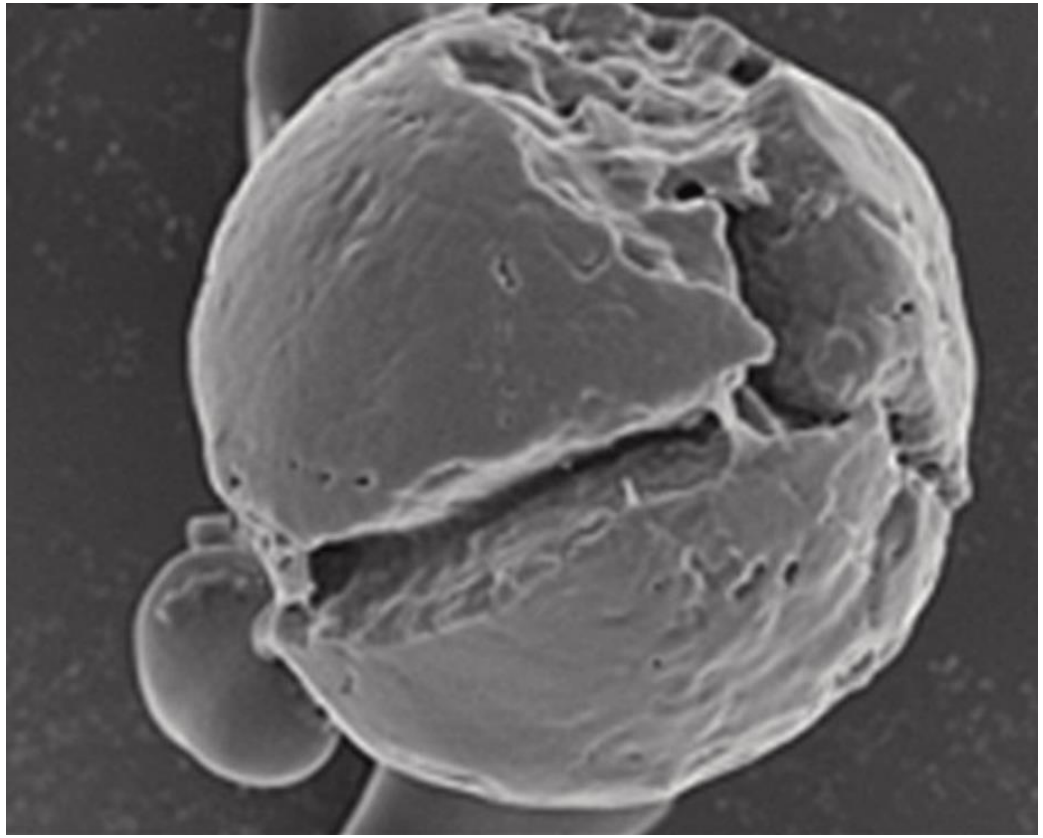
[Side] Ongoing and Past Projects

7. **Clinical medicine – Radiology** (such as osteoporosis, trabecular structure, FEA, and compression fracture)
8. **Clinical medicine – Cardiovascular studies** (such as cardiovascular calcification prediction, CPR waveform detection, CPR location optimization, and low-sampling blood pressure data for shock prediction)
9. **Gravitational wave (GW) detection** (such as ML modeling for GW detection and GW source localization)



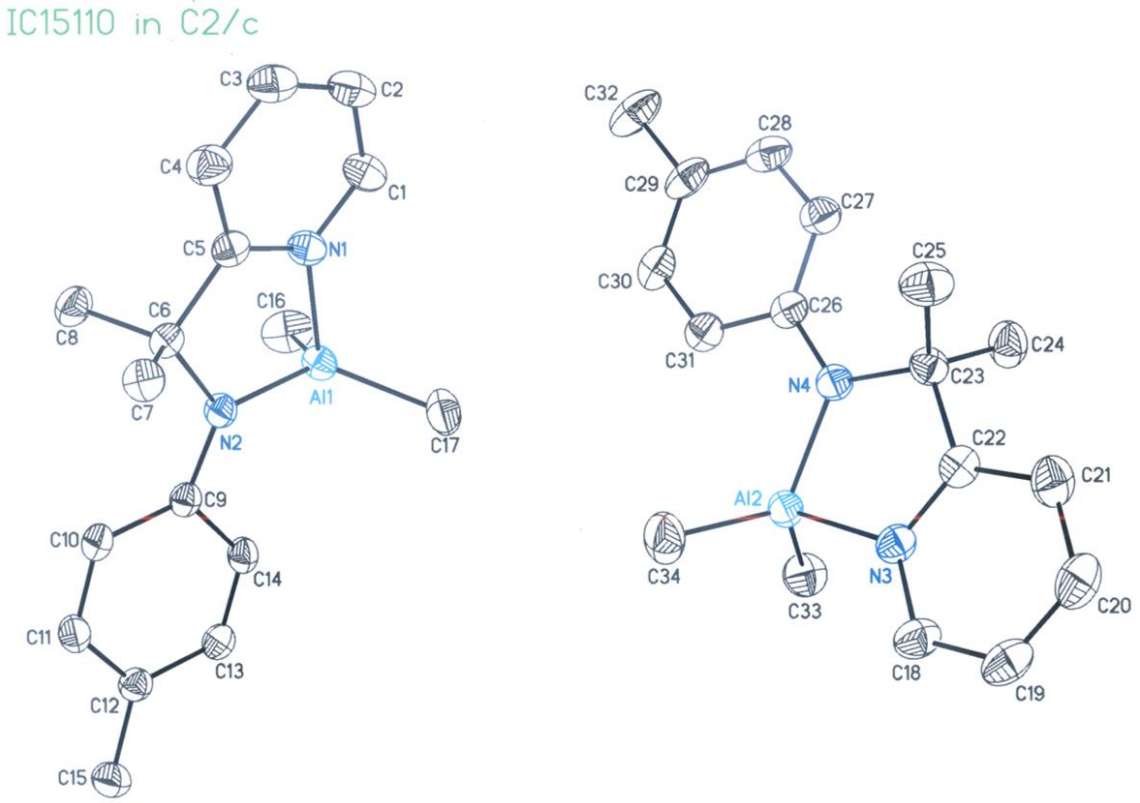
[Side] Ongoing and Past Projects

9. **Cybersecurity research** (such as security operations center, cybersecurity AI modeling, and explainable AI)
10. **Food science** (such as starch chemistry, ultrasonication, and condensed matter)



[Past] Ongoing and Past Projects

12. **Earthquake precursor analysis** (such as electromagnetic signal processing and spatial statistics)
13. **Organometallic chemistry** (such as bio-friendly plastic R&D)



Common Methodolgy

- Spatial or space-time statistics
- Complex network analysis or social network analysis (graph)
- Machine learning and deep learning
- Graph neural network
- Graph generative adversarial networks (GAN)
- Explainable AI
- Algorithm design
- Big data analytics

Course Introduction

- Welcome to the Geographic Information Systems (GIS)!
- This course provides an in-depth introduction to GIS technology, which is used to capture, store, analyze, manage, and visualize spatial and geo-coordinated data. GIS is an essential tool in fields such as urban planning, disaster management, environmental management, transportation, disaster response, and public health.

Course Introduction

Week	Date	Content
1	Sep. 5	Course Introduction
2	Sep. 12	Introduction to GIS & Overview
3	Sep. 19	Coordination System
4	Sep. 26	Vector Data (I)
5	Oct. 3	Vector Data (II)
6	**Oct. 10**	**National Holiday**
7	Oct. 17	Digitalization
8	**Oct. 24**	**Midterm Exam**
9	Oct. 31	Spatial Interpolation
10	**Nov. 7**	**Athelate Day (holiday)**

Week	Date	Content
11	Nov. 14	Spatial Statistics I
12	Nov. 21	Spatial Statistics II
13	Nov. 28	Raster Data
14	Dec. 5	Zonal Statistics
15	Dec. 12	Review
16	**Dec. 19**	**Final Exam**

[Highlight] News for this Course

In this semester, our lab has fine-tuned a Gemma-7B model with GIS knowledge and we therefore proffer you to ask your GIS-related question to it.

Gemma-7B

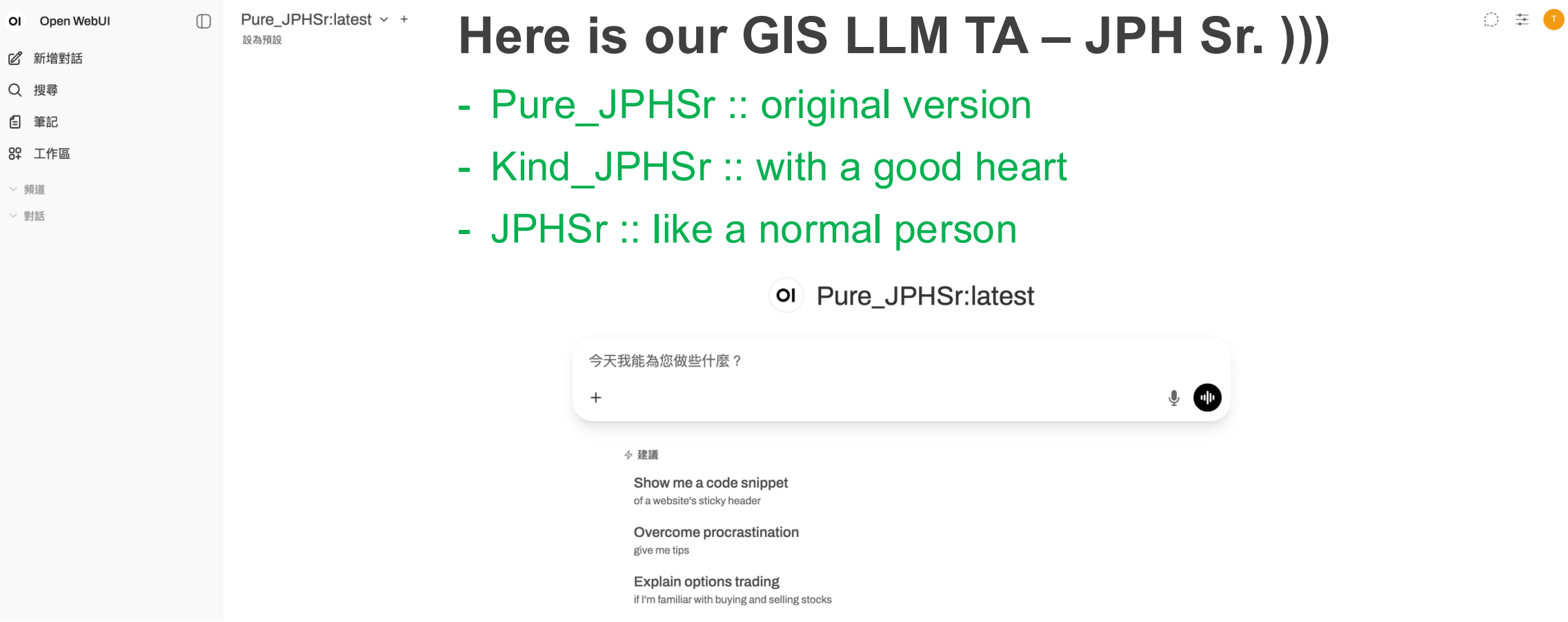
+

GIS Knowledge

=

GIS-Gemma7B

[Highlight] News for this Course



Here is our GIS LLM TA – JPH Sr.)))

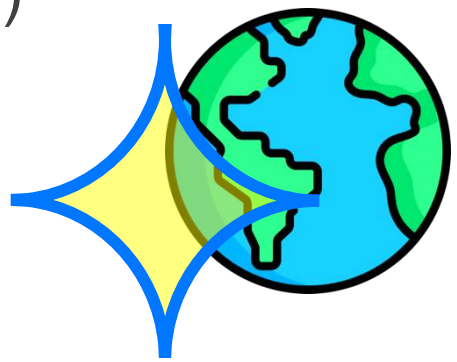
- Pure_JPHSr :: original version
- Kind_JPHSr :: with a good heart
- JPHSr :: like a normal person

[Highlight] News for this Course

We will have a brand new teaching style:

1) **Pre**-test for today's course
2) Lecture (Prof. CCH)
3) **QA** interaction with JPH Sr.
4) **Post**-test for today's learning
5) Lab Practice (TA Peng-Hsiang)

3) Lab Practice (TA Peng-Hsiang)
4) **Post**-test for today's learning



GIS-Gemma7B

Grading Policy

All you have to do is study hard and feel free to ask question when you do not understand.

I believe that if you fulfill all required items, and then you will pass this course / get a high GPA.

Do not worry about the grade! The most important things is what you learn from this course.

Post-test	10%	Midterm Exam	30%
Assignment	30%	Final Exam	30%

Teaching Assistant

[TA-in-Chief]

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GIS

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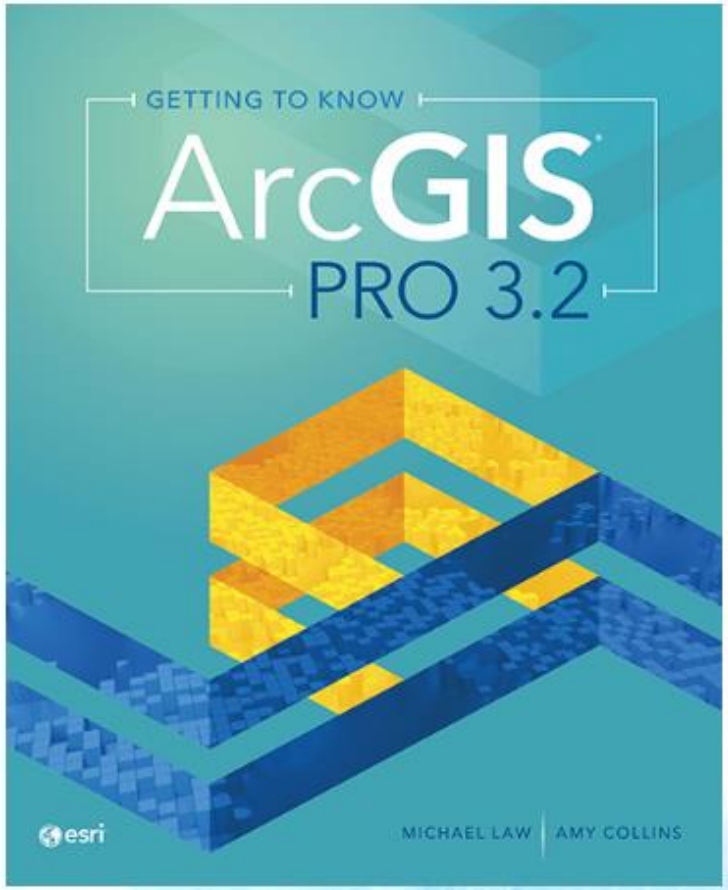
Why do you need to take this course?

- This course is ideal for students and professionals interested in geography, urban planning, environmental science, data analysis, and related fields. No prior experience with GIS is required, although familiarity with basic computer skills will be helpful.
- Prepare to explore the fascinating world of spatial data and its transformative impact on how we understand and interact with the world!

What will you learn from this course?

- **Foundations of GIS:** Understand the basic principles and concepts behind GIS, including spatial data models, coordinate systems, and map projections.
- **Data Collection and Management:** Learn how to collect, input, and manage spatial data from various sources, such as satellite imagery, and remote sensing technologies.
- **Spatial Analysis:** Explore various methods and tools for spatial analysis, including overlay analysis, buffer analysis, and spatial statistics.
- **Visualization and Mapping:** Develop skills in creating professional-quality maps and visual representations of spatial data using GIS software.
- **Applications of GIS:** Investigate real-world applications of GIS in diverse fields, with case studies and hands-on projects that demonstrate the power of spatial analysis for decision-making.

Textbook & Software



Getting to Know ArcGIS Pro 3.2

By Michael Law, Amy Collins

Getting to Know ArcGIS Pro 3.2 is a textbook and desk reference that shows readers how to build a geodatabase, use 3D GIS, create maps for presentations, and more.

Purchasing options

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Software | ArcGIS Pro 3.3

The End

Thank you for your attention!

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