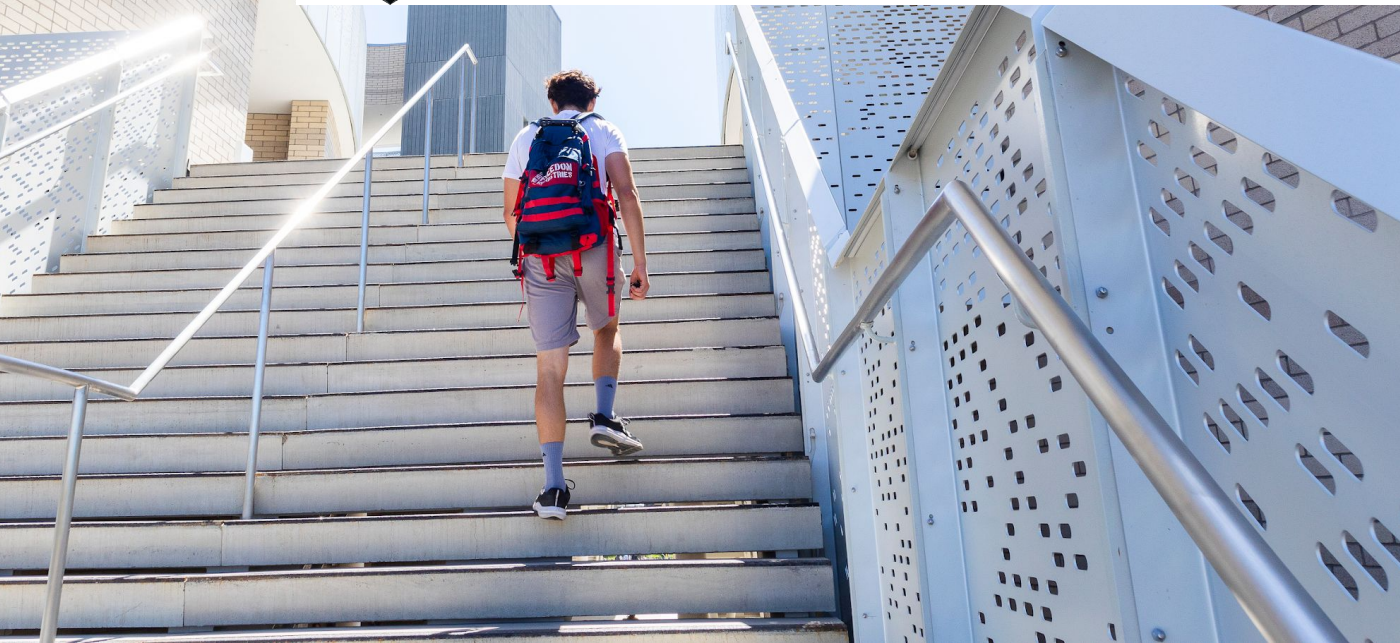


Ethics of GIS in the Age of AI

The UCSB Guide to the geographic approach



Dr. Sarigai (Rose) Sarigai

Center for Spatial Science
UC Santa Barbara



The UCSB Guide Integrates Many Exciting Elements



Ethical Lessons

Modules features an ethical lesson, using **videos and case studies** to explore real-world impacts.

Students will learn to identify and address bias in geographic analysis.



Competencies

Built on a set of **evolving spatial concepts**, balancing core principles with **emerging technologies**.

Students master traditional concepts/skills while also learning to apply new tools like AI, Web GIS, and big data.

Applied Problems

Modules center on an applied problem, introduced with a real-world story.

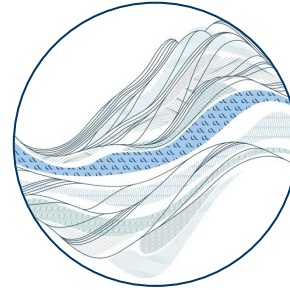
Students address challenges by applying their knowledge in a hands-on, **problem-based lab**.

Ethics Integration within the UCSB Guide



Ethical Foundation

Building on the foundational work of the [GIS Professional Ethics Project](#), ethical training is incorporated into all modules of the UCSB Guide.



Ethical Reasoning

The UCSB Guide uses the AAC&U [Ethical Reasoning VALUE Rubric](#) to guide and assess ethical reasoning in GIScience education.



Ethical Lessons

Short 3-5 minute videos introduce an ethical issue linked to the module's applied problem or GIS skill, building foundational ethical awareness and recognition.



Ethical Case Studies

Students analyze real dilemmas with competing values, using the 7-Step Ethical Decision Making Framework to practice higher-order ethical reasoning.

Mapping Ethical Lessons Across Modules



Unlock digital cartography

- How to lie with map
- Equitable maps



Evaluate safe biking through integrated spatial data

Data representation



Support conservation decisions with GIS

Justice and ethics in conservation remote sensing



Assess hazards with GeoAI

Ethics of GeoAI



Manage supply chains with a location-centric approach

Ethical consideration in supply chain mapping



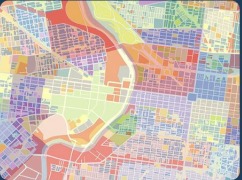
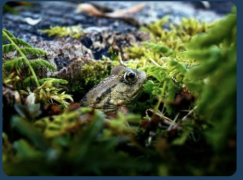
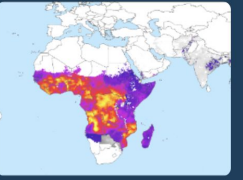
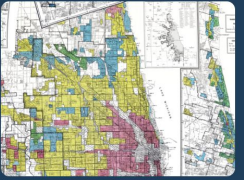
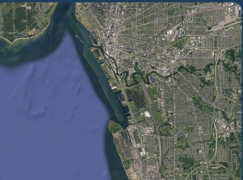




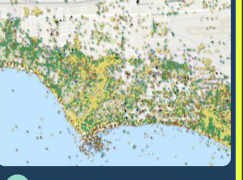


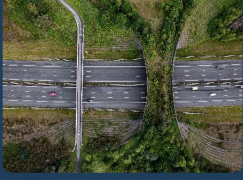



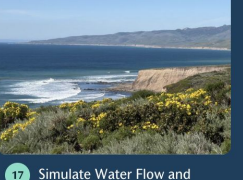




Prepare and enhance satellite imagery for interpretation

Accuracy is not the same as appearance

Curriculum Overview: 20 Modules



 <p>1 Understand disease outbreaks</p>	 <p>2 Evaluate safe biking through integrated spatial data</p>	 <p>3 Unlock digital cartography</p>	 <p>10 Forecast future habitat suitability under climate change</p>	 <p>11 Identify areas of Malaria risk</p>	 <p>12 Enrich spatial data to analyze inequity</p>	 <p>19 Prepare and enhance satellite imagery for interpretation</p>
 <p>4 Analyze healthcare access during extreme weather events</p>	 <p>5 Support conservation decisions with GIS</p>	 <p>6 Determine planting locations for urban trees</p>	 <p>13 Expand a Business Using Location Analytics</p>	 <p>14 Capture urban biodiversity through mobile GIS</p>	 <p>15 Navigate ethics in GeoAI</p>	 <p>20 Monitor disaster signals in social media</p>
 <p>7 Analyze wildlife movement in a changing climate</p>	 <p>8 Assess Hazards with Geo AI</p>	 <p>9 Manage wildfire emergencies with real-time data</p>	 <p>16 Leverage AI Assistants in geospatial workflows & design</p>	 <p>17 Simulate Water Flow and Flooding at the Dangermond Preserve</p>	 <p>18 Manage supply chains with a location-centric approach</p>	 <p>One Ethics Module</p>

Leverage AI assistants in geospatial workflows & design



Ethical Lessons

Two Types of AI

- GeoAI - Machine learning models designed for specific, mathematical tasks, like extracting building footprints from imagery or classifying land cover.
- Generative AI - Large Language Models (LLMs) that interpret human speech to write text or code. This is what powers the ArcGIS Arcade Assistant.

Key concepts covered in video lectures:

- Hallucinations and verification
- Human-in-the-loop
- Limitations and professional responsibility

Ethics Module - Navigate Ethics in GeoAI



Ethical Lessons

Key concepts covered in video lectures:

- Algorithmic bias and fairness in spatial AI
- Privacy and consent in geospatial data collection
- Professional responsibility in AI-assisted decision making
- Transparency and explainability of GeoAI outputs
- Equity impacts of automated spatial analysis

Ethical Resources

The collection of resources:

- [AAG Statement on Professional Ethics](#)
- [The GIS Professional Ethics Project](#)
- [UCGIS Body of Knowledge: Ethics Domain](#)
- [GISCI Code of Ethics](#)
- [Data Science Ethos Lifecycle](#)

Case Studies and Applied Problems

7-Step Ethical Framework

Students apply the 7-Step Ethical Framework to evaluate a real-world ethical scenario in GIS.

Navigate Ethics in GeoAI - 7 Steps Ethical Framework



“Most ethical harm in GIS is not caused by malicious intent, but by incrementalism.”

— The UCSB Guide, Navigate Ethics in GeoAI

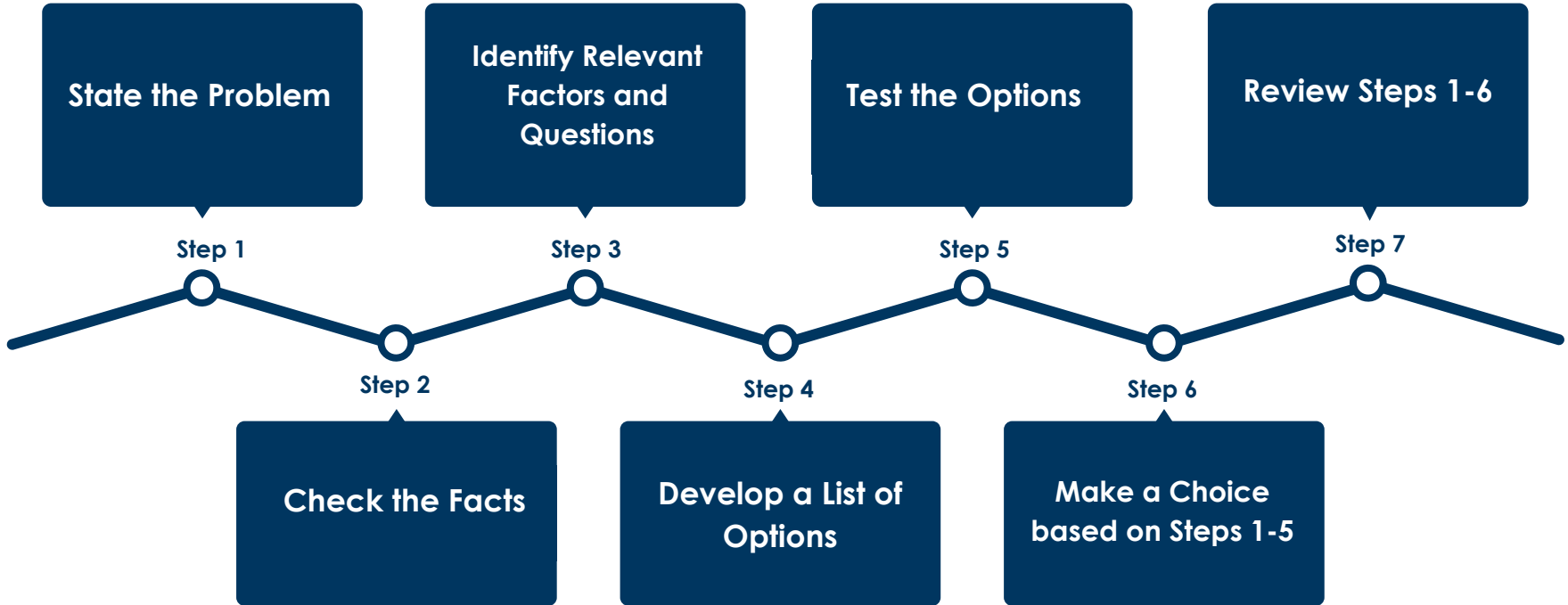
Foundation

First adopted from the GIS Professional Ethics Project (DiBiase et al., 2009) and initially developed by Michael Davis.(1999)

Incorporation

The approach directly incorporates key ethical obligations identified in the GISCI Code of Ethics and conceptual lenses on ethics presented by researchers

Navigate Ethics in GeoAI - 7 Steps Ethical Framework



Step 1 - State the Problem



Clearly articulate the ethical dilemma and identify who is involved in the situation. Identify what makes this situation uncomfortable or problematic

Step 1



Who are all the stakeholders involved in this situation?



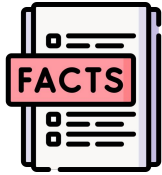
What makes this situation ethically uncomfortable?



What values or principles are in conflict?



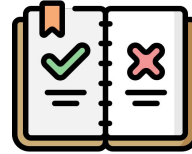
Step 2 - Check the Facts



What are the confirmed facts?
What do you know for certain?



What laws, regulations, or policies apply?



What professional standards are relevant?



What are the potential consequences of different actions?

Step 2

Gather all relevant information from the case. Separate facts from opinions

Step 3 - Identify Relevant Factors and Questions



Apply the four GISC Code of Ethics obligations: to Society, to Employers & Funders, to Colleagues & the Profession, and to Individuals

Step 3



Obligations to Society



Obligations to Employers and Funders



Obligations to Colleagues and the Profession



Obligations to Individuals in Society

Step 4 - Develop a List of Options



- Direct compliance - do what's requested
- Direct refusal - refuse the request
- Modification - suggest alternative approaches
- Consultation - seek guidance from others
- Compromise - find middle ground
- Escalation- involve higher authorities



1

Positionality

How do your own experiences shape the options you see?

2

Power

Who has influence over decisions and outcomes here?

3

Sociotechnical

How do people and technology constrain your options?

4

Narrative

What assumptions made you miss certain options?

Step 4

Brainstorm 3-4 reasonable responses and examine each through four ethical lenses.

Step 5 - Test the Options



Apply ethical tests to each option: Harm Test, Publicity Test, Defensibility Test, Reversibility Test, Colleague Test, Professional Test, Organization Test.

Step 5



Harm Test



Publicity Test



Defensibility Test



Reversibility Test



Colleague Test



Professional Test



Organization Test

Step 6 - Make a Choice based on Steps 1-5



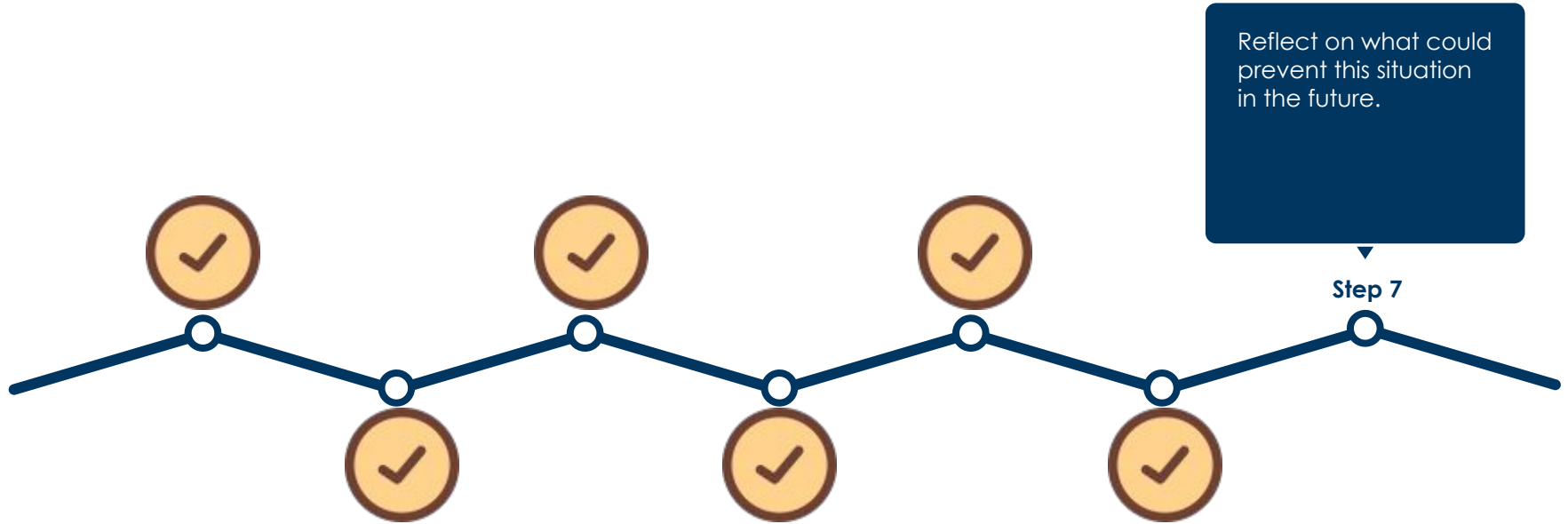
THE GISCI RULE
"Obligations to Society shall be paramount when in conflict with other obligations."



Step 6

Choose the option you can best defend.

Step 7 - Review Steps 1-6



Case Study 1 – The Location Data Broker



Maria Rodriguez, GISP · Lead Spatial Analyst, OptiMarket Retail

The Scenario

Maria's GeoAI platform uses anonymous phone location data to infer sensitive personal details — addiction clinic visits, payday lender stops, religious counseling — and targets individuals with predatory ad campaigns.

She can add a geofence filter. The VP has forbidden it.

The Conflict

Obligation to
Employers
Maximize profit from
unfiltered location data

vs

Obligation to
Individuals
Protect privacy and
autonomy (GISCI Code)

The Question

How can Maria resolve the conflict between her duty to the business and her duty to protect the privacy of individuals whose data she is using?

→ Apply the 7-Step Framework on the previous slide to analyze this dilemma

Moving Forward - There is More to Come!



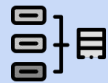
GIS/RS Communities

Community modules,
concepts, lessons



Artificial Intelligence

Curricula for LLMs,
GeoAI, AI Spatial
Assistants



Search Tools

Curricular maps,
recommendations,
and search tools



Modules

Materials that introduce
new concepts and skills

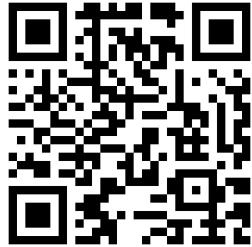
Stay Informed & Get Involved

<https://www.theucsbguide.com/>

Access and request materials



Modules



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Join the community





Questions

spatial-geographicapproach@ucsb.edu

