GIS as the Hub for Landscape Archaeology

or...

Toward Integrative GIS for Landscape Archaeology

SAA 2025 Interdisciplinary Approaches to Landscape Archaeology Symposium | Sponsored by CAA-NA

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The Challenge: Fragmentation in Landscape Archaeology

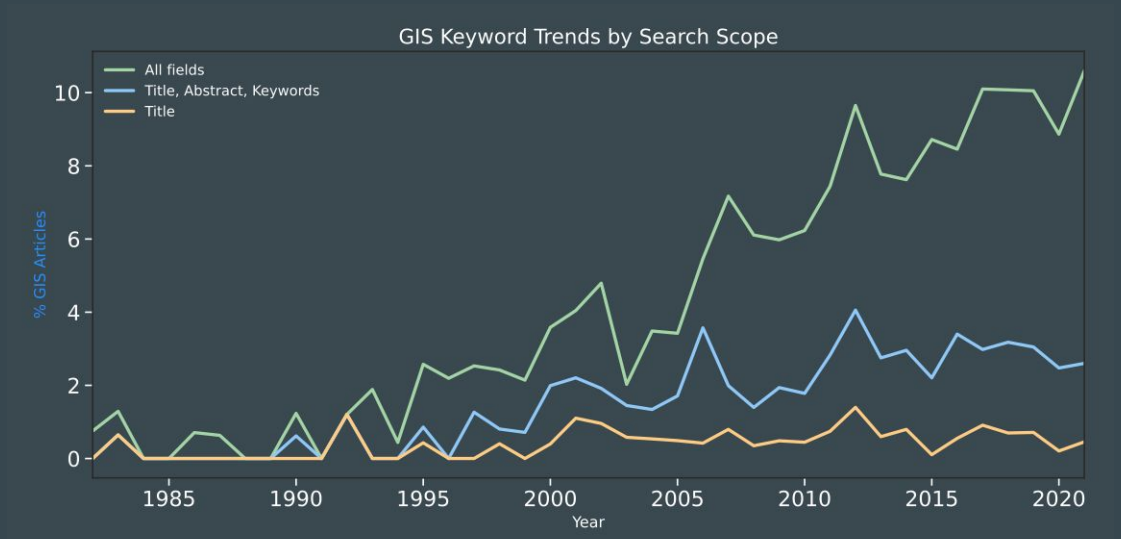
"We cannot help but look in wonder at the theoretical labyrinth that seems to have been erected… the almost impenetrable jungle of archaeological theoretical writing has not helped us very much towards a better integration of quantitative modeling in archaeological research."

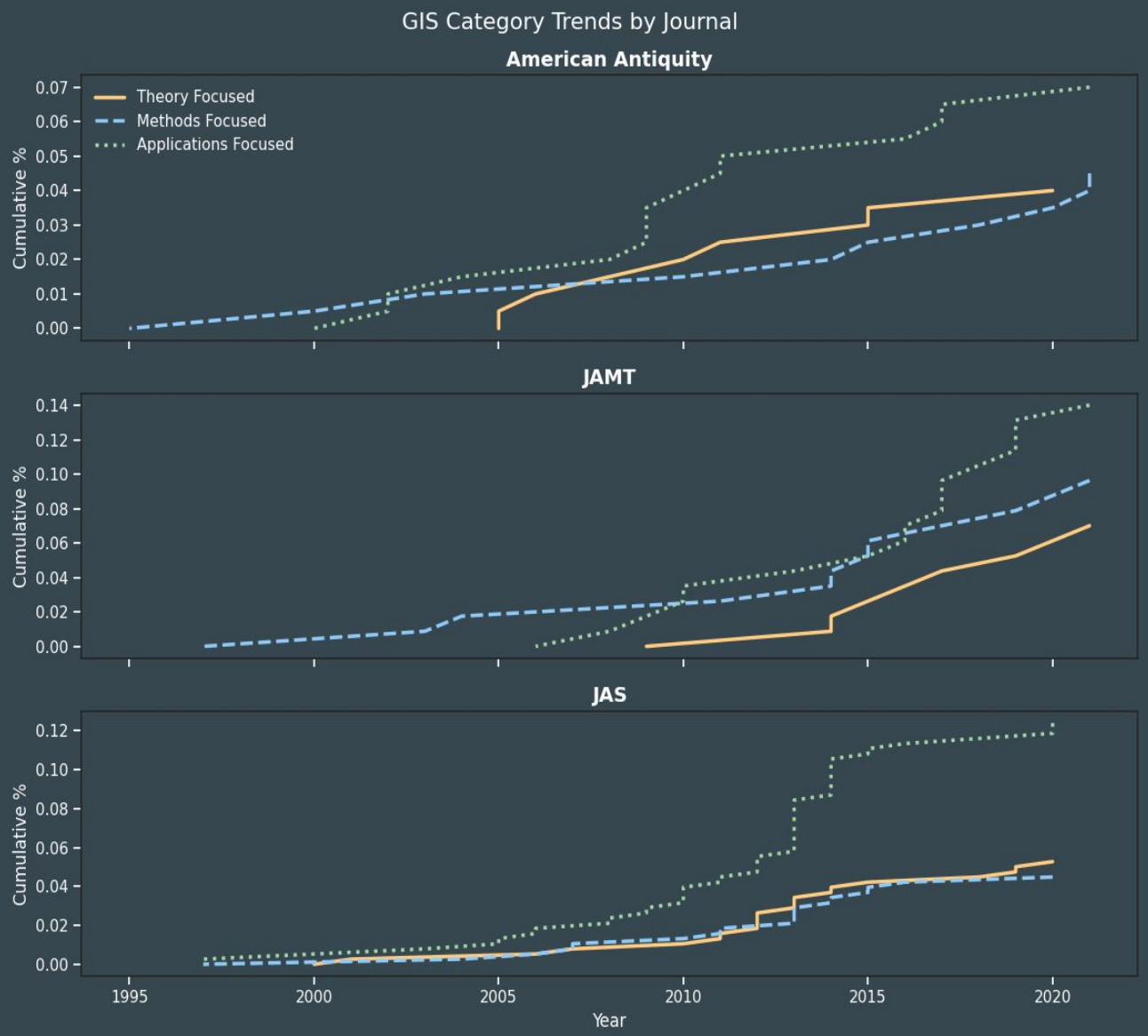
— Verhagen & Whitley (2012). Integrating Archaeological Theory and Predictive Modeling: a Live Report from the Scene. JAMT.

- **Methods:** Survey, remote sensing and LiDAR, paleoclimate modeling, ABM and simulation, historical ecology, ethnoarchaeology, geoarchaeology, paleoecology, etc.
- **Data:** Multi-scalar, heterogeneous, sometimes siloed and often constrained to what we can fit into the typical raster (surface) and vector (object) data models.
- **Theory:** Compartmentalized and often discipline-specific; the spectrum ranges from positivist through interpretive.
- **Pedagogy:** Tool-focused rather than concept-focused; adding skills to a GIS skillset.

GIS Is Ubiquitous... But Still Under-Theorized

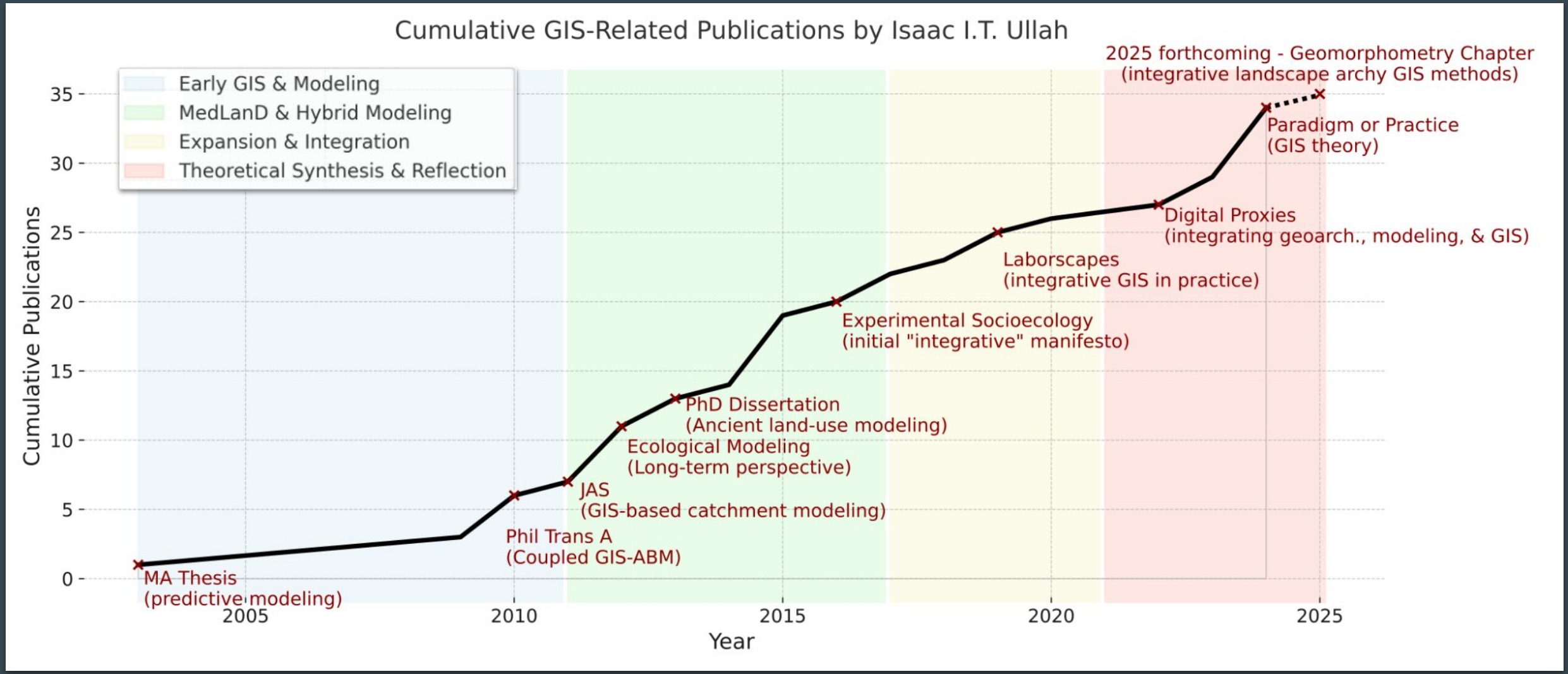
There has been explosive growth in GIS use in archaeology since early 2000s. However, most usage remains applied or technical; there has been limited engagement with GIS as a mode of interpretation or theory-making in archaeology.





Ullah, I. I. T., Clow, Z., & Meling, J. (2024). *Paradigm or practice? Situating GIS in contemporary archaeological method and theory*. **Journal of Archaeological Method and Theory, 31(3), 1185–1231.**

A personal reflection on my own landscape archaeology GIS journey:



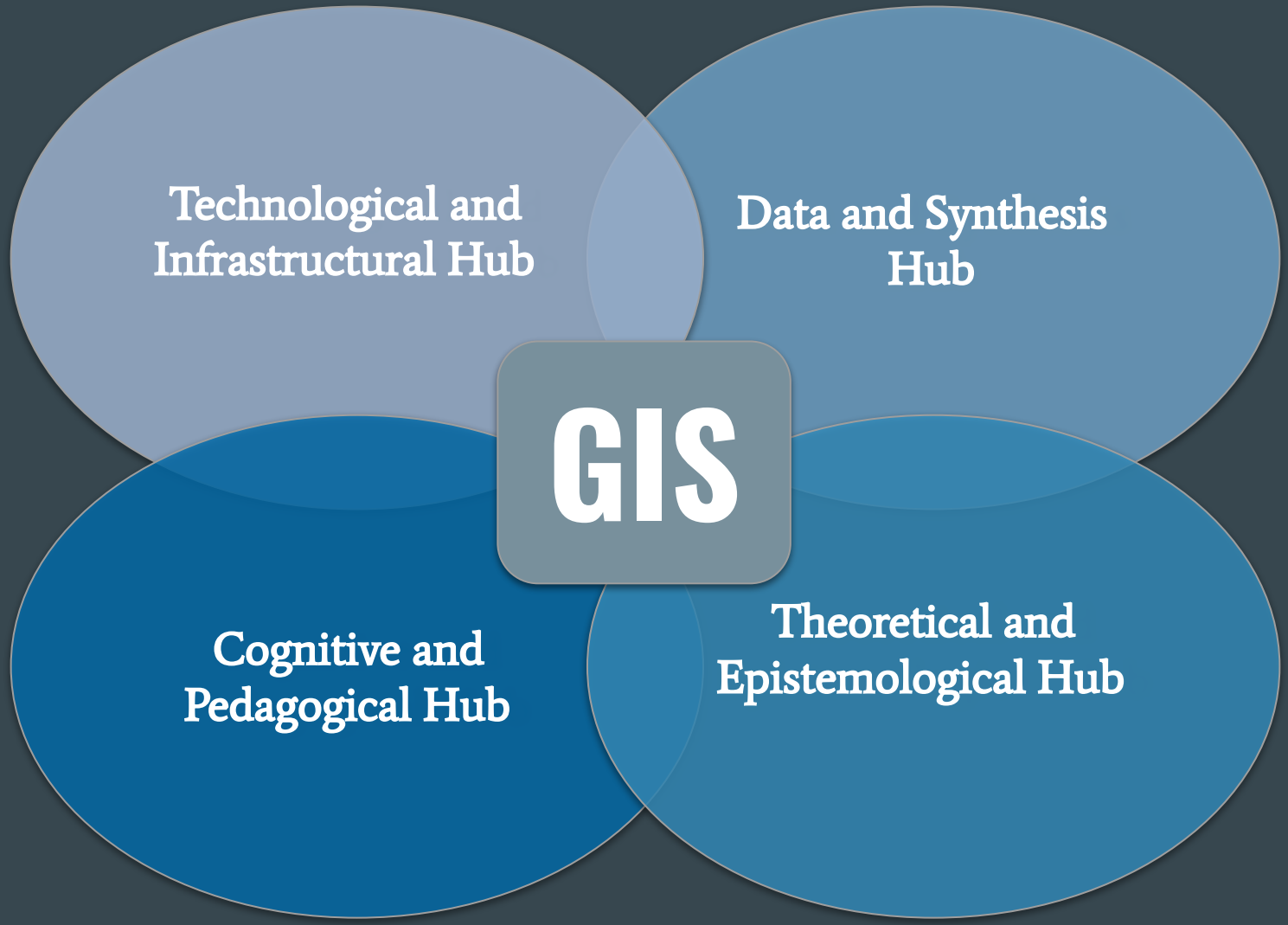
"Despite its ubiquity, GIS remains a methodologically–driven practice. Five roadblocks continue to hinder its emergence as a theory-rich framework."

– Ullah, Clow, & Meling (2023). Paradigm or Practice? Situating GIS in Contemporary Archaeological Method and Theory. JAMT.

Roadblocks to a Theory-Rich Archaeological GIS

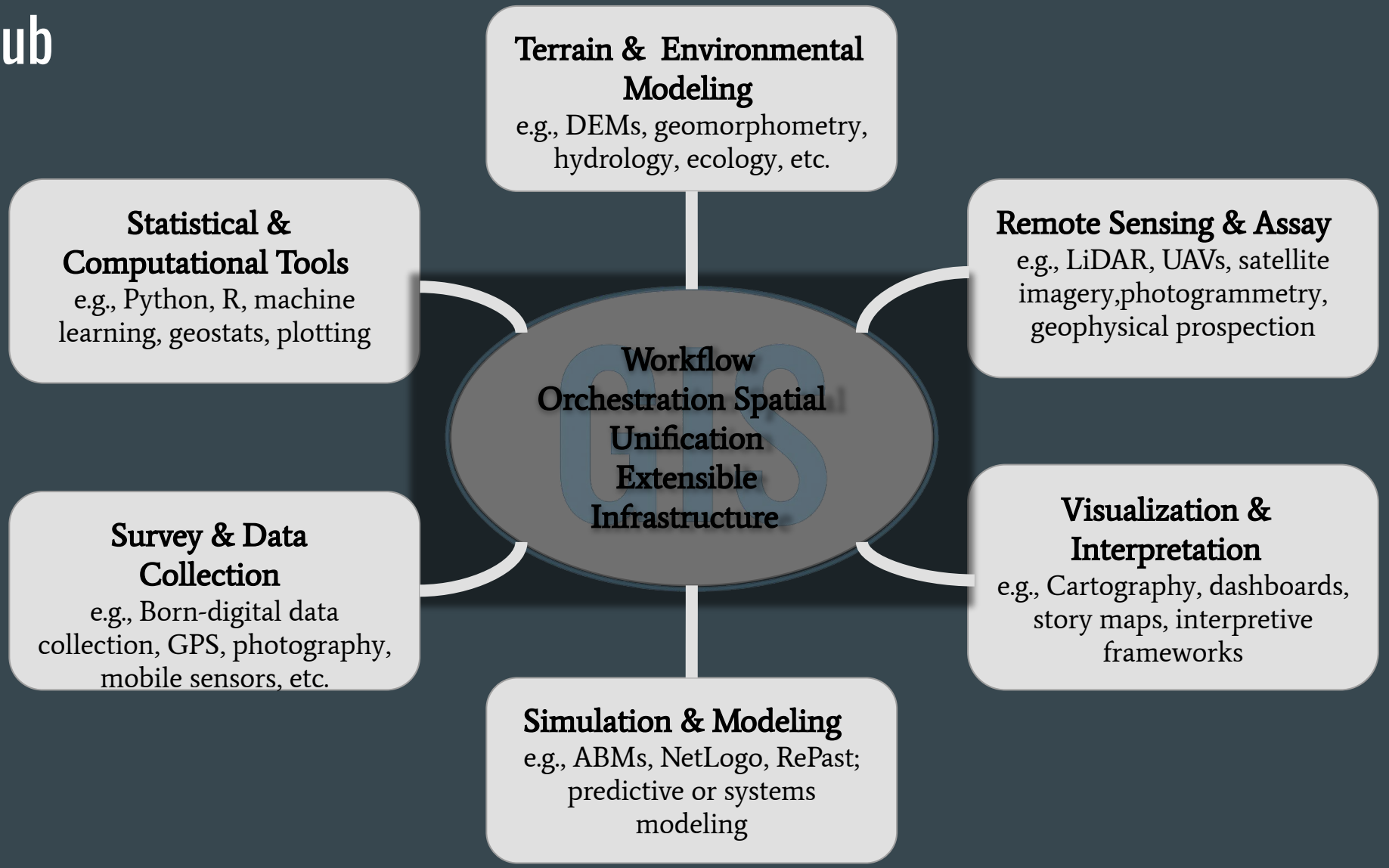
- Deficiencies in the archaeological GIS education model
- Over-reliance on commercial software
- Technical/technological barriers
- Gaps in acceptance of GIS
- The perception of GIS as 'just a tool'

GIS as the Hub: A Four-Dimensional Integrative Framework



GIS as a Technological and Infrastructural Hub

GIS orchestrates workflows across a range of software and hardware platforms with explicit or implicit data processing pipelines. We can either choose to continue to use this piecemeal or consider how to more holistically envision how this infrastructure enables a broader conceptual approach to integrative archaeological landscape studies.

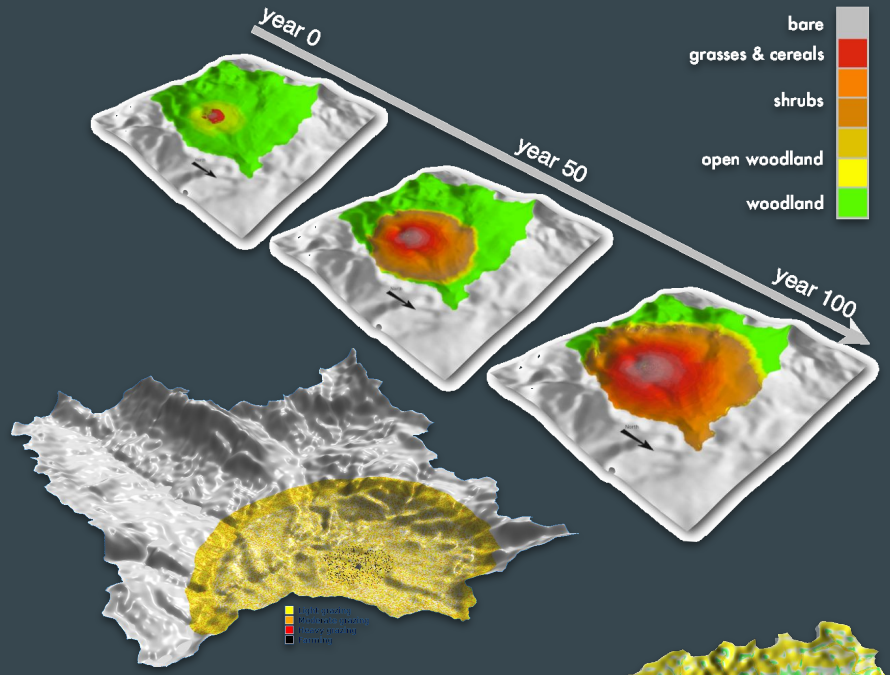


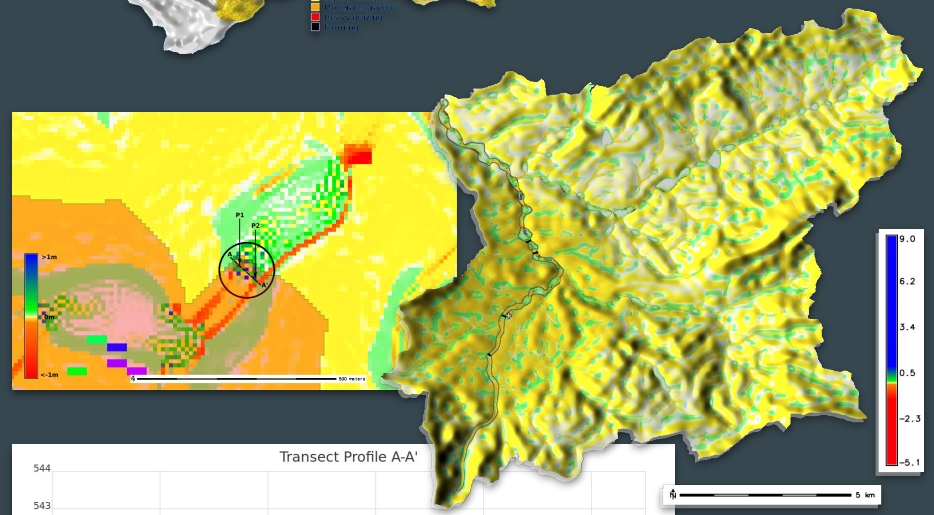
Data and Synthesis Hub

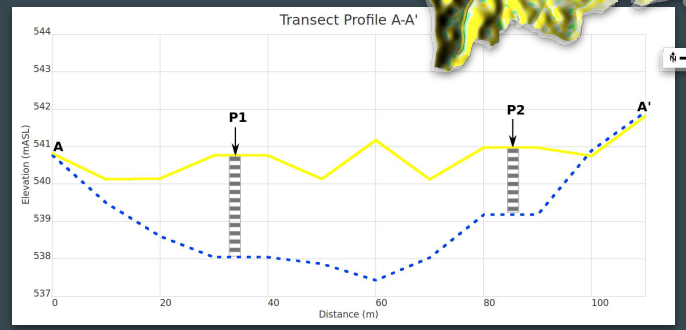
GIS harmonizes archaeological and environmental data: raster, vector, temporal, legacy, social, political, etc.

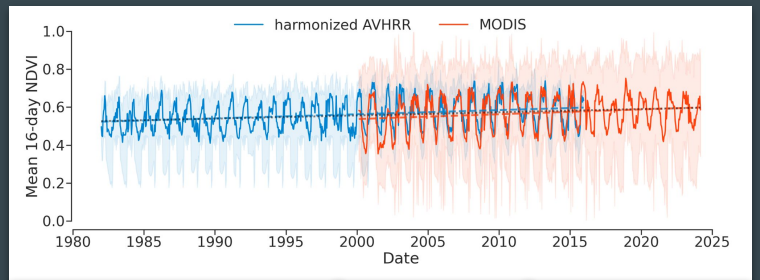
It enables geospatial simulation in detailed and realistic digital landscapes created from real places.

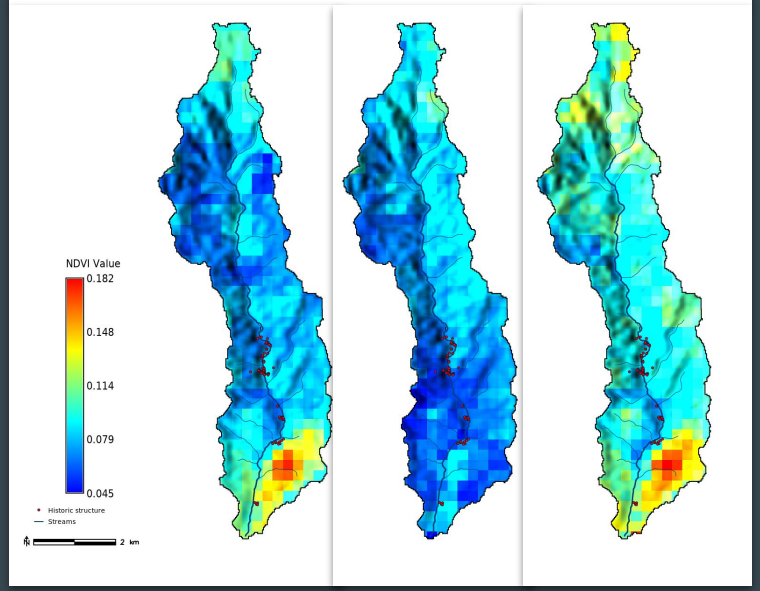
It anchors conceptual frames of reference about landscapes, landuse, and environmental perception to be encoded through formal models.

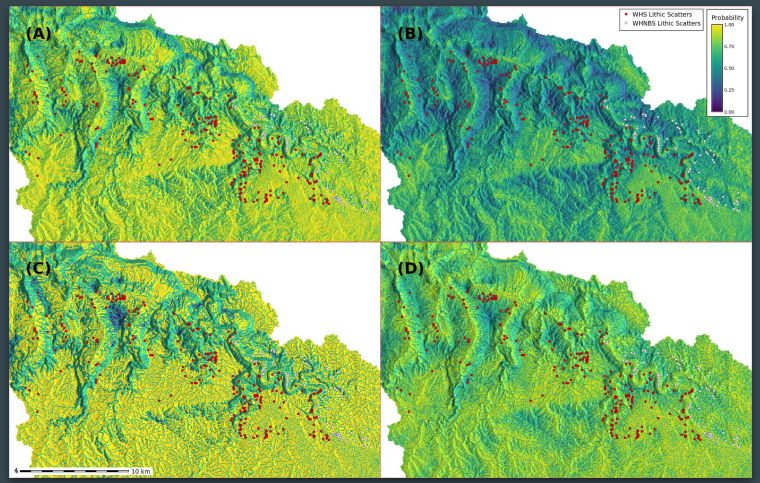












Theoretical and Epistemological Hub

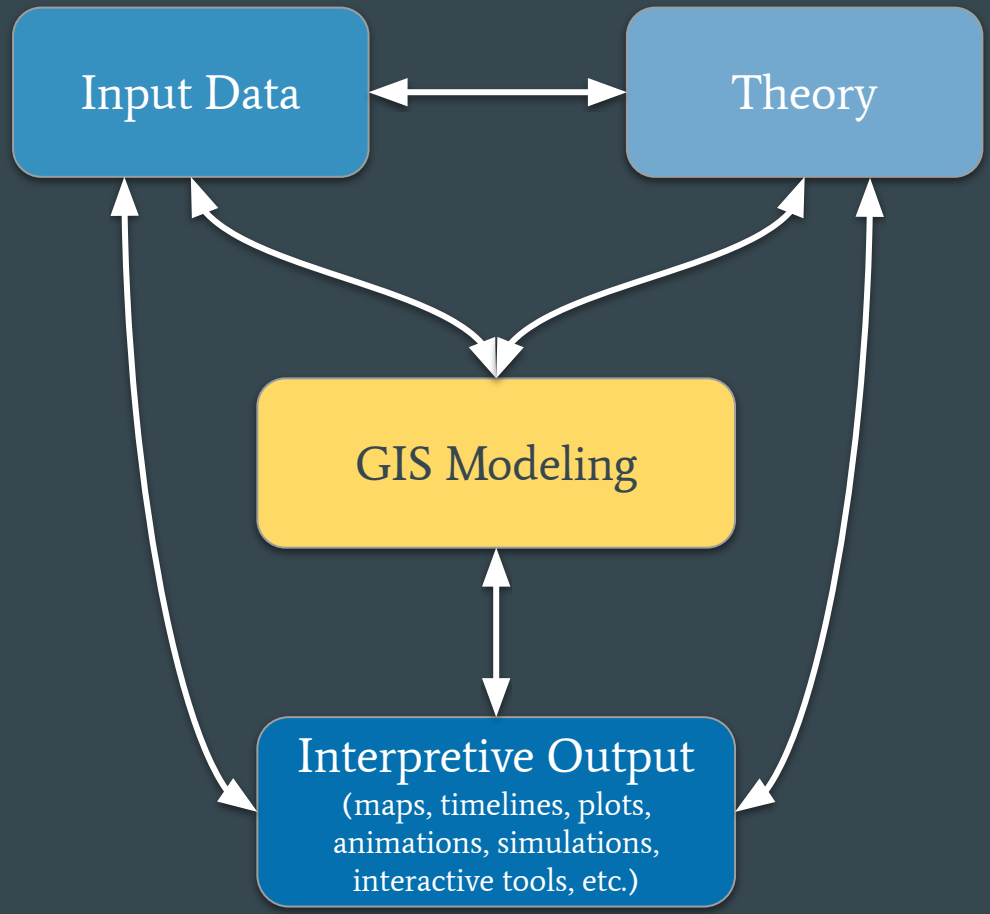
GIS embeds theory in spatial workflows (e.g., visibility = perception), but it can often be instead used as a "black box."

It allows operationalization of concepts such as landscape affordances, movement modeling, subsistence modeling, and territoriality.

Reflexivity emerges when model assumptions are made explicit, however, and integrative GIS praxis encourages treating workflows as interpretive acts.

"Black Box" GIS

Integrative GIS



"GIS [itself] is not the answer, but part of the process of asking better spatial questions."

Lock & Pouncett, 2017, Spatial thinking in archaeology: Is GIS the answer? JAS

Cognitive and Pedagogical Hub

GIS trains spatial reasoning, reflexivity, and modeling literacy. It encourages thinking through space, not just mapping it. It can and should be a pivotal hub in the way we teach archaeology.

However, GIS education is often outsourced to Geography departments, and there is little connection made between “learning GIS” and the actual archaeological problems that we want students to think through. When an archaeological GIS class is offered, it frequently comes late in an undergraduate curriculum, or perhaps not until graduate school.

An Integrative Approach to GIS Pedagogy in Archaeology

	Intro. to Arch.	Field Arch.	Arch. Lab.	Adv. Methods	Capstone
Exposure	✓	✓			
Engagement		✓	✓	✓	
Application			✓	✓	✓
Interpretation & Critique				✓	✓

How to move an integrative GIS of landscape archaeology forward?

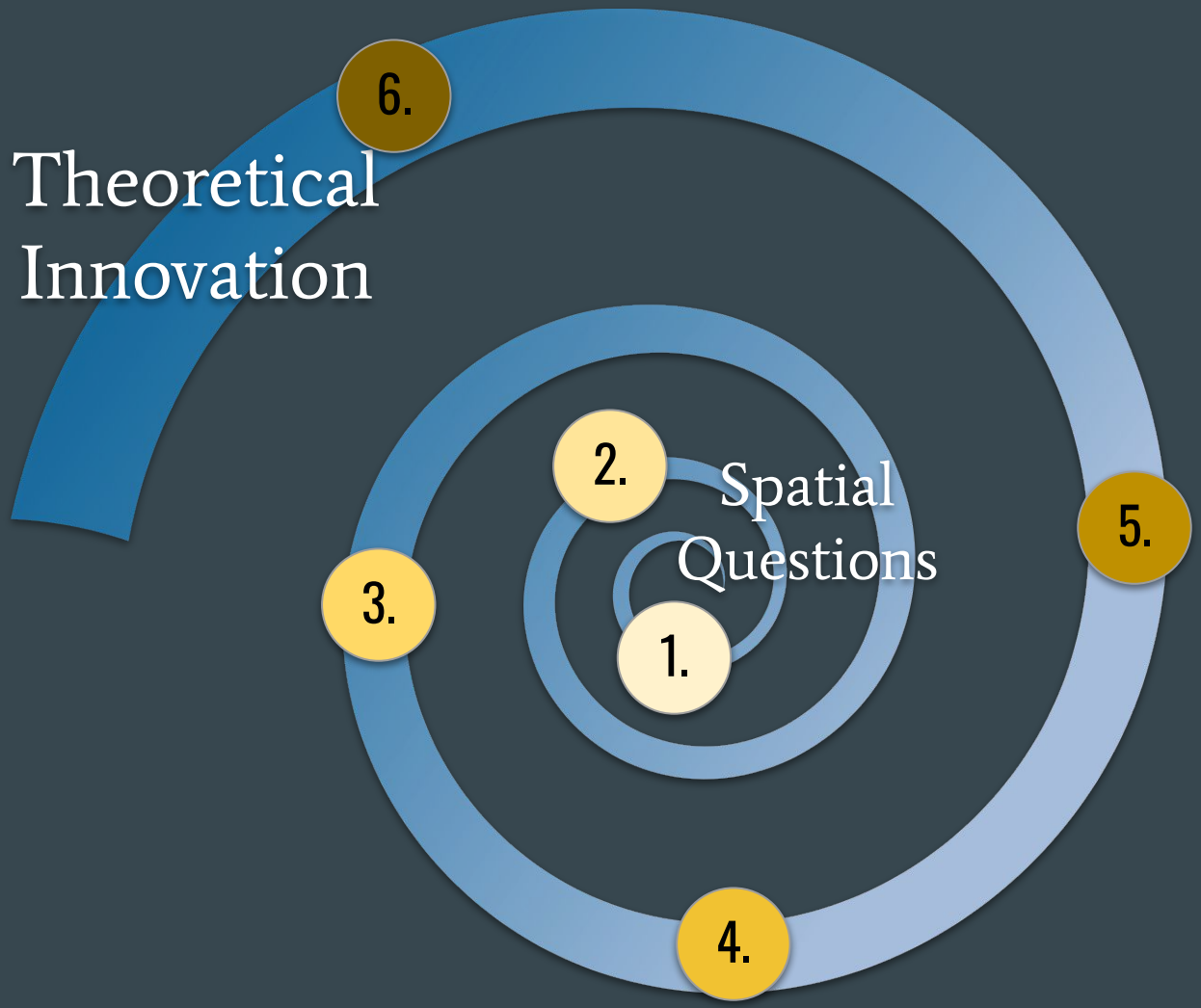
Archaeological research remains fragmented across methods, data practices, theoretical frameworks, and pedagogical approaches.

But GIS already spans these domains—our task is to use it reflexively and integratively.

This symposium models a future where landscape interpretation, spatial modeling, and theory-building can converge.

We don’t need to be experts in every method. But we do need to understand the connections and build research questions that move across them.

From Mapping to Meaning



1. Recognizing → Mapping patterns, encoding data points, etc.
2. Organizing → Classifying, buffering, bounding, joining, filtering, etc.
3. Analyzing → Cost surfaces, viewsheds, catchments, territories, etc.
4. Synthesizing → Predictive models, ABMs, regressions, analytics, etc.
5. Evaluating → Interrogating assumptions, scales, definitions, etc.
6. Creating → New spatial theories (affordance, resilience, complexity)

"GIS should be leveraged as a theory-building paradigm, one that actively shapes archaeological interpretations rather than merely reflecting previously established theories or passively visualizing results. Moving GIS from a tool to a conceptual framework can foster richer, more integrative understandings of past landscapes."

– Howey & Brouwer Burg, 2017. *Assessing the state of archaeological GIS research: Unbinding analyses of past landscapes.* JAS.

Call to Action:
5 things you can start doing right away.

1. Incorporate spatial modeling and interpretation into every stage of your workflow, from fieldwork design to publication.
2. Make GIS a recurring element in your curriculum, not just a single course, but a scaffolded framework for spatial reasoning.
3. Use open, flexible tools that allow students and collaborators to interrogate and adapt your methods.
4. Document your modeling assumptions, data choices, and workflows as integral parts of archaeological argumentation.
5. Start building a shared language of spatial practice with your students, your colleagues, and your collaborators.

Thank you!

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