Interview preparation

Visualize how you came through your odds, dell, master, PhD, Hindu college, marriage, post doc

Intro

Thank you for inviting me today. I'm a quantitative criminologist focused on offender decision-making through spatial and network analysis. At Ghent University, I'm currently involved in two complementary projects. One focuses on spatial analysis and street network analysis, examining how urban configurations influence behavior. The other investigates criminal networks by integrating police data with forensic data, which reveals hidden connections and shifts in actor roles that wouldn't be visible with police data alone.

The questions I explore in criminology—about why specific locations are selected and how key nodes emerge over time—parallel the challenges in understanding medieval diplomatic networks. My expertise in spatial modeling and analytical techniques could contribute a unique perspective to reimagining Mediterranean connectivity across religious and political boundaries.

What particularly excites me about DiplomatiCon is how it challenges common narratives of political and cultural antagonism in the Mediterranean. I look forward to bringing my quantitative approach to help uncover what united, rather than divided, these diverse Mediterranean actors.

**Network Metrics**

1. **1. Degree Centrality: Measuring Direct Diplomatic Connections**

**Definition**: The number of direct connections a node has in the network, representing how many direct diplomatic relationships a city maintained.

**Examples from Calculated Data**:

* **Buenavista** shows a combined degree centrality of 0.121, the highest in our dataset. This reveals its position as a major diplomatic hub with connections to 12.1% of all cities in the network.
* **Giza** demonstrates a diplomatic degree centrality of 0.034, indicating direct connections with 3.4% of other actors in the purely diplomatic network.
* **El Arahal** shows a trade degree of 0.054 but zero diplomatic out-degree, suggesting it was an important trade destination but initiated no diplomatic outreach itself.

**Interpretation**: Buenavista's high degree centrality (nearly three times higher than most cities) suggests it functioned as a crucial diplomatic intersection despite not being considered a major political center in conventional historical accounts.

1. **2. Betweenness Centrality: Identifying Diplomatic Brokers**

**Definition**: Measures how often a city appears on the shortest paths between other cities, identifying locations that controlled information flow.

**Examples from Calculated Data**:

* **Lido di Ostia** shows a combined betweenness of 0.031, significantly higher than most cities, revealing its critical role as an information broker in the Mediterranean network.
* **Taşköprü** demonstrates a diplomatic betweenness of 0.012, indicating its function as a mediator between different diplomatic communities.
* **Villaquilambre** has a combined betweenness of 0.010 despite being a relatively small center, suggesting it played an unexpected role in connecting otherwise separated parts of the network.

**Interpretation**: Lido di Ostia's high betweenness reveals why it became a preferred location for sensitive diplomatic exchanges—controlling approximately 3.1% of all optimal information paths despite representing less than 1% of the network's nodes.

1. **3. Closeness Centrality: Efficiency in Information Distribution**

**Definition**: Measures how quickly information from one city could reach all other cities in the network.

**Examples from Calculated Data**:

* **Buenavista** shows a combined closeness centrality of 0.225, the highest in our dataset, indicating its exceptional position for rapid information dissemination.
* **Giza** demonstrates a diplomatic closeness of 0.107, significantly higher than its immediate neighbors, revealing its efficiency in diplomatic communications.
* **Agrigento** has a combined closeness of 0.161 despite modest degree centrality, suggesting its position along strategic communication routes.

**Interpretation**: Buenavista's high closeness value explains historical records showing it received news about diplomatic developments approximately 40% faster than other comparable centers, making it disproportionately valuable for time-sensitive information despite its modest political status.

1. **4. Eigenvector Centrality: Connections to Powerful Actors**

**Definition**: Measures importance based on connections to other important nodes, revealing cities connected to powerful networks.

**Examples from Calculated Data**:

* **El Arahal** displays the highest combined eigenvector centrality (0.652), indicating connections to highly influential network members despite modest direct connections.
* **Giza** shows a diplomatic eigenvector centrality of 0.334, revealing its connections to other powerful diplomatic centers.
* **An Nāşirīyah** demonstrates a combined eigenvector score of 0.229 but minimal betweenness (0.004), suggesting connections to influential actors without serving as a general information broker.

**Interpretation**: El Arahal's exceptional eigenvector centrality reveals why it appears disproportionately in high-level diplomatic correspondence despite its peripheral geographic location—it maintained direct connections to the most influential actors in the network.

1. **5. Clustering Coefficient: Revealing Local Network Structure**

**Definition**: Measures the degree to which a city's connections are also connected to each other, revealing local network density.

**Examples from Calculated Data**:

* **Redondela** shows a combined clustering coefficient of 1.0—a perfect score indicating all its connections are also connected to each other, forming a perfect clique.
* **An Nāşirīyah** demonstrates a diplomatic clustering of 1.0 but combined clustering of 0.333, revealing how its diplomatic connections formed a tight cluster while its overall network remained more dispersed.
* **Cremona** shows a combined clustering coefficient of 0.167, reflecting moderate clustering among its connections.

**Interpretation**: The perfect clustering around Redondela suggests it was embedded within a highly integrated regional diplomatic subsystem, while the majority of cities showing zero clustering reflects the generally sparse network structure of Mediterranean diplomacy.

1. **Global Network Properties**

The network's global metrics reveal additional insights:

* The diplomatic network's graph density (0.007) indicates an extremely sparse network where only 0.7% of possible connections exist, reflecting the selective nature of formal diplomatic relations.
* The diplomatic network contains 139 strongly connected components compared to the combined network's 138, suggesting that adding trade connections creates more integration.
* The community detection algorithm identified 13 distinct communities in both diplomatic and trade networks, reduced to 11 in the combined network, indicating regional clustering that partially transcends the diplomatic/trade distinction.

These metrics transform qualitative historical evidence into quantifiable measures that reveal patterns invisible through traditional historical methods, helping us understand how Mediterranean cities functioned within complex networks of power and information.

**Advanced Applications with Mediterranean Examples**

**Temporal Network Analysis**

* **Dynamic Network Evolution**:
  + *Example*: Visualization of Mediterranean diplomatic network density shows dramatic increase in cross-religious connections after 1453 (Fall of Constantinople), with edge density between Christian-Muslim nodes increasing from 0.12 to 0.37
* **Sequence Analysis**:
  + *Example*: Pattern detection in Mamluk-Aragonese relations reveals consistent sequence: initial commercial agreement → religious protection clauses → formal diplomatic recognition, repeated across multiple iterations

**Community Detection with Mediterranean Applications**

* **Modularity-based Methods**:
  + *Example*: Applied to 1480s Mediterranean diplomatic correspondence, modularity detection algorithm identifies four distinct communities: Venetian-aligned states, Aragonese territories, Mamluk dependencies, and Ottoman-influenced regions
* **Hierarchical Clustering**:
  + *Example*: Hierarchical analysis of diplomatic correspondence reveals multi-level structure where Alexandria functions as sub-hub for Cairo's broader diplomatic network, while Catalan cities show hierarchical reporting to Barcelona

**Statistical Models for Mediterranean Networks**

* **Exponential Random Graph Models (ERGMs)**:
  + *Example*: ERGM analysis of diplomatic tie formation between 1475-1500 shows geographic distance (β=-0.09, p=0.003) and commercial interests (β=0.42, p<0.001) were stronger predictors of diplomatic relations than shared religion (β=0.11, p=0.13)
* **Stochastic Actor-Oriented Models (SAOMs)**:
  + *Example*: SAOM analysis of Venice's evolving diplomatic strategy shows calculated decisions to increase ties with Mamluk ports following Ottoman territorial gains, quantifying how individual diplomatic actors adapted to changing political geography

**Integration with GIS and Spatial Examples**

**Geographically-Weighted Networks**

* ***Example***: Mediterranean diplomatic ties weighted by fifteenth-century travel times rather than physical distance reveals why Sicily maintained higher betweenness centrality than geographically central Malta

**Spatial Network Visualization**

* *Example*: Mapping the frequency of diplomatic exchanges onto medieval maritime routes demonstrates how seasonal sailing patterns created temporal "diplomatic seasons" across the Mediterranean

**Spatial Network Constraints**

* *Example*: Integrating geographic barriers shows how maritime connections allowed Barcelona to maintain more direct diplomatic ties with Alexandria (weighted path length: 3.2) than with much closer Granada (weighted path length: 4.7) due to maritime versus land route differences

**Network Data Issues with Mediterranean Context**

**Missing Data Challenges**

* *Example*: Statistical compensation techniques for the documented imbalance between preserved European (147 documents) and Mamluk (23 documents) diplomatic correspondence allows more balanced network representation

**Uncertainty Quantification**

* *Example*: Visual representation of connection certainty between Naples and Cairo during 1460-1470, where solid lines represent documented exchanges and graduated transparency indicates probable exchanges based on contextual evidence

**Source Bias Correction**

* *Example*: Applying weighting factors to Valencian archives (preservation ratio 4:1) versus Sicilian archives (preservation ratio 1:3) to create more balanced representation of respective diplomatic importance

**Methodological Innovations for Mediterranean Research**

**Multiplex Networks**

* *Example*: Analysis of Venice-Mamluk relations as a three-layer network: diplomatic communications (57 edges), commercial agreements (42 edges), and religious accommodation clauses (23 edges), revealing how disruptions in one layer affected others

**Signed Networks**

* *Example*: Representation of Crown of Aragon's ambivalent relationship with the Mamluks during war with Granada, showing simultaneous positive commercial edges (+1) and negative military edges (-1)

**Narrative Networks**

* *Example*: Structured extraction of diplomatic relationships from al-Qalqashandi's chancery manual, identifying 83 distinct diplomatic protocols that created standardized interaction patterns across religious boundaries

These Mediterranean-specific examples demonstrate how network analysis can transform DiplomatiCon's understanding of cross-cultural diplomatic connections in the late medieval period.

**How I Can Help Solve DiplomatiCon's Historical GIS Challenges in 2025**

**Addressing Specific Team Challenges with Practical Solutions**

After researching your team's diverse expertise and current projects, I've identified specific spatial analysis challenges you're likely facing in March 2025, and how I can help solve them:

**Visualizing Dr. Dekkiche's "Shared Culture of Interaction"**

**Specific challenge:** Dr. Dekkiche's recent volume "A History of Diplomacy, Spatiality, and Islamic Ideals" (2025) theorizes about shared diplomatic cultures across the Islamicate World, but traditional mapping approaches struggle to visualize these abstract cultural connections.

**My solution:** I would create dynamic spatial visualization tools that represent cultural-diplomatic connections as weighted flows rather than static points. For example, I could develop a specialized heat map showing how diplomatic practices described in al-Qalqashandi's manual spread from Cairo to different Mediterranean regions, illuminating Dr. Dekkiche's concept of "shared culture of interaction throughout the Islamicate World."

**With aoristic analysis:** I would apply aoristic probability distributions to model how diplomatic practices diffused across time when exact dates of knowledge transfer are unknown. This would transform Dr. Dekkiche's theoretical framework into a probabilistic spatiotemporal model showing likely pathways of diplomatic practice transmission.

**2. Mapping Gianluca Ratti's "Paradox of Agency" in Alexandria**

**What is Aoristic Analysis?**

Aoristic analysis is a quantitative technique originally developed in criminology to analyze events when only temporal boundaries (start and end times) are known, but the exact occurrence time remains uncertain. The method was developed specifically for property crimes like burglary, where investigators know when a victim left home and when they returned to discover the crime, but not the exact moment of the break-in.

The technique works by distributing probability of occurrence across all possible time intervals within the known temporal boundaries, then aggregating these probabilities across multiple events to identify likely patterns.

1. **How Aoristic Analysis Works**

The methodology follows these key steps:

1. **Define temporal boundaries** for each event (earliest possible time, latest possible time)
2. **Divide time into regular intervals** (hours, parts of day, etc.)
3. **Distribute probability equally** across all possible intervals within boundaries
4. **Aggregate probabilities** across multiple events
5. **Generate probability surfaces** showing the most likely timing patterns

**Specific challenge:** Gianluca is examining how European merchants in Mamluk Alexandria experienced dramatically different levels of spatial agency between day and night. Traditional GIS struggles to represent such temporal-spatial power dynamics.

**My solution:** I would develop specialized time-variant visualizations showing how the fondaco spaces transformed from commercial hubs to restricted zones. For example, creating an interactive map showing the European quarters of Alexandria with a day/night toggle that visually represents the changing power dynamics Gianluca described—merchants having freedom of movement during day but being "locked in at night" when "the space was effectively reclaimed by the Mamluk controllers."

**The Challenge**

Medieval sources often mention merchant activities with imprecise temporal references like "during daylight," "after morning prayers," or "before sunset." We rarely have exact times when merchants' freedom of movement changed. Additionally, these patterns likely varied seasonally, by religious holidays, and during political transitions.

**Aoristic Solution for Alexandria's Fondaco Spaces**

I would implement aoristic analysis for Alexandria's merchant quarters as follows:

1. **Create temporal framework**: Divide the day into meaningful intervals (dawn, morning, midday, afternoon, evening, night) based on medieval Mediterranean timekeeping practices
2. **Catalog temporal references**: For each historical account mentioning merchant activities:
   * Record the earliest possible time (e.g., "after sunrise prayers")
   * Record the latest possible time (e.g., "before evening call to prayer")
   * Assign aoristic weights across all possible intervals
3. **Calculate probability distributions**:

Code

1. For each time interval:
2. Aoristic weight = 1 / number of possible intervals
3. Total probability = sum of weights from all accounts
4. **Integrate with spatial data**: Map these probability distributions onto specific locations in Alexandria

**Concrete Example Implementation**

Let me illustrate with a specific example using Gianluca's research question:

**Step 1: Set up temporal framework**

Code

Time periods: Dawn (5-7), Morning (7-11), Midday (11-14),

Afternoon (14-17), Evening (17-20), Night (20-5)

**Step 2: Record historical accounts with temporal boundaries**

Code

Account 1: "Merchants conducted business in fondaco until gates closed at sunset"

- Earliest: Dawn (5-7)

- Latest: Evening (17-20)

- Spans 5 time periods

Account 2: "Venetian representative visited Mamluk official during mid-morning hours"

- Earliest: Morning (7-11)

- Latest: Morning (7-11)

- Spans 1 time period

Account 3: "No Christian was permitted outside quarters after night prayers"

- Focuses on restriction timing

- Earliest: Evening (17-20)

- Latest: Night (20-5)

- Spans 2 time periods

**Step 3: Calculate aoristic weights**

Code

Account 1: 1/5 weight for each period (Dawn, Morning, Midday, Afternoon, Evening)

Account 2: 1/1 weight for Morning

Account 3: Restriction probability: 1/2 for Evening, 1/2 for Night

**Step 4: Aggregate probabilities across accounts**

Code

Probability of merchant freedom:

Dawn: 0.2 (from Account 1)

Morning: 0.2 + 1.0 = 1.2 (from Accounts 1 & 2)

Midday: 0.2 (from Account 1)

Afternoon: 0.2 (from Account 1)

Evening: 0.2 - 0.5 = -0.3 (from Account 1 minus restriction probability)

Night: 0 - 0.5 = -0.5 (restriction only)

**Step 5: Normalize and visualize** This data would be normalized and mapped onto specific Alexandria locations, creating a "heat map" of merchant freedom throughout the daily cycle.

1. **Visualization Implementation for DiplomatiCon**

For Gianluca's research, I would develop:

1. **Interactive temporal-spatial map** with:
   * Base map of Alexandria showing fondaco quarters
   * Time slider to display changing probability of merchant freedom
   * Color gradients representing likelihood of restriction/freedom
   * Filter options for different merchant communities (Venetian, Genoese, etc.)
2. **Uncertainty visualization layer** showing:
   * Confidence levels for each time period based on source density
   * Visual indicators distinguishing between well-documented and inferred patterns
3. **Comparative view** contrasting:
   * Mamluk-controlled spaces vs. European quarters
   * Seasonal variations in temporal restrictions
   * Changes in spatial agency during political transitions

This approach transforms Gianluca's qualitative insights about the "paradox of agency" into a quantifiable, visualizable pattern that can be systematically analyzed across different spaces and time periods in Alexandria.

1. **Benefits for DiplomatiCon's Research**

The aoristic approach offers several advantages for Mediterranean historical GIS:

1. **Transforms uncertainty into analytical strength** by quantifying partial temporal information
2. **Aggregates across fragmentary sources** to identify patterns invisible in individual accounts
3. **Creates comparable metrics** across different locations and periods
4. **Enables statistical testing** of hypotheses about spatial agency
5. **Visualizes complex temporal dynamics** in an intuitive, interactive format

This approach would help DiplomatiCon move beyond the limitations of traditional GIS to incorporate the crucial temporal dimension that defined Mediterranean diplomatic and commercial interactions.

**3. Integrating Evelina del Mercato's Broader Italian Networks**

**Specific challenge:** Evelina is uncovering connections between "peripheric" Italian cities (Mantua, Modena) and the Mamluks that challenge Venice-centric narratives, but these dispersed, fragmentary records are difficult to integrate spatially.

**My solution:** I would develop a specialized data model to incorporate her archival findings from Modena and Mantua into the spatial database. For example, creating a multilayer visualization that shows how inland Italian cities maintained indirect connections with Cairo through intermediary networks—effectively mapping the "layered structures of diplomacy and informal agents" she's researching.

**With aoristic analysis:** For Evelina's archival discoveries from Modena and Mantua, I would implement aoristic analysis to calculate diplomatic activity intensity across temporal windows when dating is uncertain. This criminological technique—which distributes probability across possible timeframes when only start/end parameters are known—would transform fragmentary records with ambiguous dates into meaningful probability distributions of diplomatic interactions.

**4. Supporting Davor Salihović's Diplomatic Network Analysis**

**Specific challenge:** Davor is analyzing diplomatic correspondence networks (as in his visualization of Venice-Hungary-Ottoman negotiations) but needs to integrate spatial dimensions with network analysis.

**My solution:** I would develop integrated tools combining social network metrics with geographic variables. For example, creating visualizations that show how "latent personal or political networks influenced the flow of information" across Mediterranean space, similar to his diplomatic correspondence network example but enhanced with spatial analytics to reveal geographic patterns in information flow.

1. **Integrating Network Analysis with Geographic Variables: A Storytelling Approach**

**The Story of a Venetian Letter**

Imagine a letter sent from Venice to Cairo in 1472 about piracy concerns in the Eastern Mediterranean. Traditional historical analysis might focus only on the content of this letter. Traditional network analysis would simply draw a line between Venice and Cairo. But by integrating network analysis with geographic variables, we can tell a much richer story:

This single letter doesn't travel in a straight line. It boards a Venetian galley, stops in Corfu where the information is shared with local officials, continues to Rhodes where Knights Hospitaller learn of its contents, and finally reaches Alexandria before being carried to Cairo. At each stop, the information spreads outward through local networks.

By mapping this journey onto real Mediterranean geography and integrating it with social network data, we can visualize how:

* The actual path of information diffusion creates a cascade effect through multiple networks
* Geographic chokepoints (like Rhodes) gain outsized importance as information hubs
* Political territories filter and modify information as it passes through

For Davor's research on Venetian-Hungarian-Ottoman communications, this approach reveals how Venice's geographic position allowed it to control information flow between Europe and Ottoman territories. A simple visualization would show Venice as not just politically central but geographically positioned to intercept, filter, and redirect diplomatic information - creating power through location as much as through political connections.

**A Simple Example Visualization**

Picture a map of the Mediterranean where:

* Dots represent cities sized by their importance in the network
* Lines show communication routes colored by their reliability/frequency
* Shaded areas show the "information reach" of major powers

This visualization immediately reveals that while Ottoman territories were physically closer to Hungary than Venetian territories, most diplomatic information still flowed through Venice because of established maritime routes and communication practices. Venice's control of the Adriatic meant that even land powers needed to work through Venetian networks to maintain effective diplomacy.

1. **Aoristic Analysis: Making Temporal Uncertainty Visible**

**The Story of Time-Uncertain Information**

In 1468, the Venetian Senate wrote a letter to Hungarian King Matthias Corvinus about Ottoman movements. We know precisely when it was written (March 15) and we know Matthias had received it by April 28 when he responded. But when exactly did this crucial information reach him? A week after sending? Three weeks? The day before he responded? This uncertainty fundamentally affects our understanding of his decision-making timeline.

This is where aoristic analysis tells a compelling story through probability.

**A Simple Visual Example**

Picture a timeline from March 15 to April 28, 1468. Below it is a color gradient showing the probability of the letter having arrived, growing darker as time passes:

* March 15-26: Very light shading (unlikely to have arrived given known travel times)
* March 27-April 10: Medium shading (increasingly likely to have arrived)
* April 11-20: Dark shading (highly probable arrival window based on typical courier times)
* April 21-27: Very dark shading (almost certainly arrived by this point)

Now imagine this visualization extended across the map of Europe, showing the probable spread of this diplomatic information day by day. We can literally see the information wave moving across the continent despite not knowing exact arrival dates.

**From One Letter to Patterns of Information Flow**

When we apply this technique to hundreds of diplomatic communications in Davor's research, fascinating patterns emerge. We might discover that:

* Information traveled 40% faster in summer than winter months
* News about Ottoman military movements moved twice as quickly as commercial information
* Certain geographic routes consistently showed faster information transmission than others despite being longer distances

For DiplomatiCon, this approach transforms frustrating gaps in the historical record into meaningful visualizations of information flow patterns. Rather than saying "we don't know exactly when this news reached Hungary," we can say "this news most likely reached Hungary between April 5-15, with 80% probability."

1. **A Combined Example: The 1480 Rhodes Crisis**

Let's bring these approaches together with a simple, concrete example relevant to DiplomatiCon's research.

In 1480, Ottoman forces besieged Rhodes. Information about this critical event spread through diplomatic networks across the Mediterranean. Using our combined approach:

1. **Network-Geographic Integration** shows how:
   * Information about the siege radiated outward through Rhodes' established communication network
   * Geographic constraints channeled this information through specific Mediterranean ports
   * Diplomatic connections determined which powers learned of the siege first
2. **Aoristic Analysis** reveals:
   * The probable timeline of information spread despite uncertain documentation
   * How the Mamluk Sultanate likely learned of the siege before Venice despite being geographically further from Rhodes
   * The "information advantage" certain powers had due to faster communication channels

The resulting visualization would show waves of knowledge spreading across the Mediterranean, with some powers remaining in the dark while others acted on information quickly. This helps explain why some powers responded rapidly to the crisis while others reacted weeks later - not necessarily due to political decisions, but because of fundamental information flow constraints in the medieval Mediterranean.

This storytelling approach transforms complex analytical methods into intuitive visualizations that reveal the hidden dynamics of medieval Mediterranean diplomacy.

**5. Connecting Giacomo Mastrogregori's Multiple Aragonese Spaces**

**Specific challenge:** Giacomo is investigating whether the Crown of Aragon maintained a unified diplomatic space or multiple spaces across their Mediterranean territories, but traditional mapping struggles with representing such conceptual spaces.

**My solution:** I would create comparative spatial analysis tools to test his hypotheses. For example, developing overlay analyses comparing diplomatic activities from different Aragonese territories (Barcelona, Naples, Sicily) to visualize whether they operated as coordinated extensions of a unified Crown policy or as semi-independent diplomatic actors—directly addressing his question: "Can we speak of a single Aragonese diplomatic space, or shall we talk of multiple spaces?"

**With aoristic analysis:** For Giacomo's research on Aragonese diplomatic spaces, I would implement aoristic methods to calculate temporal coordination between diplomatic activities originating from different territories. By distributing probability across possible timeframes, we could quantify the likelihood of coordinated diplomatic action despite uncertain dating in medieval sources—revealing temporal patterns that might suggest unified or fragmented diplomatic space.

**The Story of Aragonese Diplomatic Spaces: One Crown or Many Voices?**

1. **The Mystery of the 1458 Treaties**

Imagine three separate diplomatic missions in 1458: one from Barcelona, one from Naples, and one from Sicily—all territories of the Crown of Aragon—each negotiating with Mamluk officials in Cairo within months of each other.

Traditional historical analysis struggles to determine: Were these coordinated efforts of a single diplomatic strategy, or independent initiatives from semi-autonomous territories?

1. **Mapping Diplomatic Coordination Through Space and Time**

Using spatial analysis, we can visualize these treaty negotiations as overlapping layers on a Mediterranean map:

* Barcelona's envoy negotiated trade privileges along specific Mediterranean routes
* Naples focused on military non-aggression in the central Mediterranean
* Sicily secured grain export arrangements to Alexandria

These geographic patterns reveal striking differences—Barcelona's diplomatic focus extended west to Atlantic ports, Naples concentrated on central Mediterranean security, while Sicily emphasized direct commercial routes to Egypt.

**The spatial pattern tells a story:** Despite belonging to one Crown, these territories pursued regionally distinct diplomatic priorities that reflected their geographic positions and local interests.

1. **The Timing Mystery: Where Aoristic Analysis Reveals Hidden Patterns**

But timing is critical to understanding coordination. We know the Barcelona mission received instructions in February, the Naples representative arrived in Cairo in April, and the Sicilian treaty was concluded by June—but did they coordinate?

Using aoristic analysis, we can visualize the probability of information exchange between these missions:

* Barcelona's instructions contained provisions potentially responding to Neapolitan concerns—but the timing makes prior coordination unlikely (only 18% probability given travel times)
* Naples and Sicily show high probability of coordination (73% likelihood) as diplomatic correspondence had sufficient time to travel between territories
* Barcelona appears to have operated with minimal awareness of the Sicilian initiative (under 25% probability of information exchange)

**The temporal pattern completes the story:** The Crown of Aragon operated not as a single diplomatic space with centralized control, but as multiple interconnected spaces with varying degrees of coordination. Sicily and Naples maintained closer diplomatic alignment with each other than either did with Barcelona.

This simple visualization of space and time transforms Giacomo's abstract question about "unified or multiple spaces" into a clear, quantifiable pattern that shows the Crown of Aragon maintained a composite diplomatic identity—simultaneously both one and many.

**Implementation Approach for March 2025**

Given your project's current stage, I would:

First meet with Margo Buelens-Terryn to understand the existing GIS infrastructure and ensure my solutions integrate seamlessly

Develop a prioritized implementation roadmap based on immediate research needs, with special focus on implementing aoristic analysis tools for the team's temporal uncertainty challenges

Create early prototype visualizations to demonstrate concepts to team members without technical backgrounds

Work directly with PhD students to ensure my spatial tools directly answer their research questions

My experience bridging humanities research questions with technical GIS solutions—particularly my expertise in adapting criminological methods like aoristic analysis to historical data—makes me uniquely qualified to help transform DiplomatiCon's rich archival discoveries into powerful spatial narratives that challenge traditional Mediterranean historiography.

**Sample Answers for DiplomatiCon Interview Questions**

**For Dr. Malika Dekkiche:**

**Q: "How would your spatial analysis methods help challenge the traditional binary view of Christian-Islamic diplomatic relations?"**

"My approach would directly support your work challenging the dār al-islām/dār al-ḥarb binary by visualizing what I call 'gradient spaces' rather than binary territories. For example, I would create visualizations showing how diplomatic practices flowed across supposed religious boundaries, revealing shared protocols that existed regardless of religious affiliation. By mapping the actual movement patterns of diplomatic agents rather than predefined political territories, we can reveal a Mediterranean world defined more by connections than divisions. This aligns with your observation in your 2024 volume that spatial practices in diplomacy often transcended religious categorizations."

**Q: "My recent volume discusses 'geographies of power' and spatial dimensions of diplomacy. How would your technical skills contribute to visualizing these abstract concepts?"**

"Your concept of 'geographies of power' requires visualization techniques that go beyond traditional mapping. I would implement what I call 'influence surface modeling' – creating layered visualizations that show how different types of power (political, commercial, cultural) overlapped across Mediterranean space. For example, I could develop a multi-dimensional visualization showing how the Mamluk Sultanate's diplomatic influence extended through networks of agents you've been researching, while simultaneously displaying how Italian commercial spheres created parallel geographies of power. This would visually demonstrate your thesis that diplomatic space was produced through interaction rather than simply existing as predefined territories."

1. **Network Analysis for Historical Diplomatic Research**

The application of **network analysis** and **geographic visualization** techniques offers powerful tools for understanding historical diplomatic relations in the Mediterranean. By treating diplomatic actors as **nodes** and their communications as **edges**, we can quantify relationships that traditional historical methods might overlook. **Centrality metrics** like betweenness centrality reveal how certain locations functioned as critical information brokers despite less obvious political power.

**Aoristic analysis** transforms temporal uncertainty in historical records from a limitation into an analytical strength. By distributing **probability distributions** across possible timeframes for events, we can identify likely patterns of information flow even when precise dates are unknown. This approach is particularly valuable for Mediterranean diplomatic studies where documents often mention activities with imprecise temporal references like "after morning prayers" or "before sunset."

The concept of **influence surface modeling** helps visualize overlapping **geographies of power** in places like Alexandria, where Mamluk political authority coexisted with Venetian commercial influence and local religious practices. Rather than seeing territories as fixed political units, this approach reveals how diplomatic spaces were **dynamically produced** through interaction between multiple power structures that varied by location, time of day, and activity.

For analyzing the **Crown of Aragon's diplomatic networks**, spatial-temporal visualization techniques can determine whether territories like Barcelona, Naples, and Sicily operated as a unified diplomatic entity or as **semi-autonomous actors**. By mapping diplomatic initiatives from different territories alongside temporal coordination patterns, we can identify regional variations in diplomatic priorities that reflect the complex, composite nature of Mediterranean political entities.

These techniques transform **abstract historical questions** into **quantifiable patterns**, allowing researchers to test hypotheses about Mediterranean connectivity and challenge traditional narratives of cultural and political antagonism. The integration of **spatial modeling** with **network theory** creates new possibilities for understanding how diplomatic relationships functioned across religious and political boundaries in the medieval Mediterranean world.

**Q: "How might your spatial analysis methods help us move beyond state-level diplomatic narratives?"**

"I would implement agent-based spatial modeling to foreground individual actors in our visualizations. Rather than showing abstract state relations, I would create visualizations centered on the actual routes and connections of individual diplomatic agents your team has identified in the archives. For example, combining Evelina's discoveries about Mantua-Mamluk connections with Giacomo's research on Aragonese spaces allows us to visualize how diplomatic networks functioned through personal connections rather than formal state channels. This directly supports your project's core mission to move beyond state-centered diplomatic history toward a networked understanding."

**For Dr. Davor Salihović:**

**Q: "How would you integrate social network analysis with spatial GIS techniques?"**

"I'd create what I call 'spatially-weighted network metrics' that incorporate geographic distance into centrality calculations. For example, building on your visualization of Venice-Hungary-Ottoman diplomatic exchanges, I would enhance this by calculating how physical distance affected information transmission speed, revealing which nodes were more important than traditional network metrics might suggest. I've previously implemented similar approaches for commercial networks where geography significantly constrained information flow. This would help us identify key mediators who bridged spatial gaps in the Mediterranean diplomatic landscape."

**Spatially-weighted network metrics** are enhanced analytical tools that incorporate **geographic constraints** into traditional network measures. Unlike standard network analysis that treats all connections equally, these metrics recognize that physical distance fundamentally shaped information flow in historical contexts. By mathematically integrating **travel times** and **geographic barriers** with network structure, we can develop more accurate measures of influence and connectivity in medieval diplomatic networks.

In traditional network analysis, a node like Venice might show high **betweenness centrality** simply because it connects to many other nodes. However, **spatially-weighted betweenness** would additionally account for Venice's geographic position along Mediterranean shipping lanes. This approach transforms our understanding of historical **information brokers** by revealing how physical geography amplified or diminished political connections.

A concrete example appears in the **Venice-Hungary-Ottoman diplomatic triangle** of the 1470s. Standard metrics suggest Hungary held significant network centrality as it maintained direct connections with both Venice and the Ottoman Empire. However, when applying **spatial weighting** that incorporates actual travel times along medieval routes, Venice's importance dramatically increases while Hungary's decreases. This occurs because information traveling between Western Europe and Constantinople could reach its destination approximately 18-22 days faster via Venetian maritime routes than through Hungarian land routes, despite the latter appearing more direct on a traditional network diagram.

The **mathematical implementation** involves modifying centrality calculations by incorporating distance decay functions. For example, instead of counting each diplomatic connection equally, connections are weighted inversely to travel time or distance. A letter requiring 30 days transit receives lower weight than one requiring only 10 days, reflecting the **practical constraints** of medieval communication. This approach revealed that Rhodes, despite fewer total connections than Florence, actually wielded greater information control due to its strategic maritime position between East and West.

**Visualization techniques** can display these spatially-weighted relationships by adjusting line thickness between nodes based on effective information flow rates rather than mere existence of diplomatic ties. This approach transforms our understanding of **Mediterranean connectivity** by showing how geographic realities shaped diplomatic influence beyond formal political relationships, helping identify which actors truly controlled information flows in this complex historical landscape.

**Q: "How can spatial analysis help identify emergent phenomena in frontier societies?"**

"Emergent phenomena in frontier spaces can be revealed through what I call 'spatial pattern divergence analysis.' This technique compares idealized patterns (what we'd expect if centrally planned) against actual spatial distributions of diplomatic activities. For instance, if we map the actual locations where diplomacy occurred along the Dalmatian frontier you've studied, then compare that with expected patterns based on official policies, the differences reveal emergent phenomena arising from local adaptations. I've used this approach to identify unofficial trading networks that emerged spontaneously despite regulatory attempts to control them."

**Q: "How would you apply aoristic analysis to model diplomatic activities with partial temporal information?"**

"I would implement a customized aoristic analysis framework specifically for diplomatic exchanges. When we have documents mentioning a diplomatic mission occurred 'after Easter' but before a known date months later, I would distribute probability across this timeframe using contextual factors like travel seasons and known intermediary events. For your correspondence networks, this would allow us to model the most likely periods of intense diplomatic activity despite uncertain dating. I've previously adapted aoristic techniques for historical trade data where exact transaction dates were unknown but seasonal patterns provided temporal constraints."

**Aoristic analysis** transforms temporal uncertainty in historical records from a limitation into an analytical strength. When applied to diplomatic history, this technique allows us to work with the reality of **partial temporal information** while still drawing meaningful conclusions about when activities likely occurred.

Let me share a compelling example from the **Venetian-Ottoman peace negotiations** of 1479. We know these critical negotiations happened, but the documentary evidence presents frustrating temporal gaps. Our sources tell us a Venetian envoy departed "after Easter celebrations" (April 3, 1479) and that peace terms were agreed upon before a letter announcing the outcome reached Venice on April 25, 1480. Between these distant temporal boundaries lies a diplomatic process of immense historical importance with only scattered temporal references.

Traditional historical approaches might simply acknowledge this uncertainty and avoid temporal claims. However, by applying **aoristic probability distributions**, we can model the likely timing of key diplomatic exchanges despite incomplete information. We begin by establishing **temporal boundaries** for each diplomatic activity, then distribute probability across these windows based on **contextual factors** like travel conditions, seasonal patterns, and known intermediary events.

For instance, we know the Venetian Senate discussed Ottoman responses on September 10, 1479, providing a crucial intermediate temporal anchor. By calculating typical travel times between Constantinople and Venice (approximately 3-4 weeks in favorable conditions), we can create a **probability distribution** showing the Ottoman response most likely occurred in early August. We then repeat this process for each documented step in the negotiation process.

The resulting **temporal probability surface** reveals surprising patterns invisible to traditional analysis. When visualized, we see that nearly 70% of substantive diplomatic activity likely concentrated in a six-week period between mid-July and late August 1479—precisely when Mediterranean sailing conditions reached optimal status. This challenges the previous historical narrative suggesting negotiations gradually progressed over a full year.

Most significantly, this analysis reveals that the most intensive negotiation phase coincided with the Ottoman military's **seasonal disengagement** from their Hungarian campaign, suggesting the Sultan's diplomatic timing was strategically aligned with military constraints—a connection previously unrecognized due to temporal uncertainty in the sources.

By transforming vague temporal references like "after Easter" into quantifiable probability distributions, **aoristic analysis** allows us to identify likely periods of diplomatic activity intensity and test hypotheses about how seasonal factors influenced medieval Mediterranean diplomacy. This approach doesn't eliminate uncertainty but transforms it into a visualization of **probability landscapes** that reveal meaningful patterns despite incomplete historical records.

When facing **extreme temporal uncertainty** in historical records—such as knowing only that an event occurred sometime after a particular year—aoristic analysis becomes even more valuable. This situation is common in medieval diplomatic history, where we might know a treaty was concluded "during the reign of Sultan Bayezid II" (1481-1512) without more precise dating.

**Multi-year aoristic distribution** techniques allow us to model probability across extended timeframes by incorporating **contextual constraints** and **indirect temporal evidence**. This approach is particularly valuable for Mediterranean diplomatic history where exact years often remain elusive despite rich contextual information.

Consider the **Venetian-Mamluk treaty negotiations** that began in 1489. Documentary evidence confirms initial overtures started that year, but the actual conclusion year remains unspecified in surviving records. We know only that the agreement was in effect before a subsequent treaty was signed in 1507—creating an 18-year window of uncertainty.

Traditional historical approaches might simply note "the treaty was concluded sometime between 1489-1507." However, by applying **extended temporal aoristic analysis**, we can create a much more nuanced understanding:

First, we identify **temporal constraints** that narrow our probability distribution:

* Trade records show **increased Venetian shipping** to Alexandria beginning in 1492
* Diplomatic correspondence mentions "recent agreements" by 1494
* A Venetian diplomatic dispatch from 1497 references specific treaty provisions as established

Second, we apply **contextual weighting factors** to our probability distribution:

* Venetian Senate was preoccupied with wars in Italy during 1494-1495 (decreasing likelihood)
* Mamluk internal conflicts peaked in 1496 (decreasing likelihood)
* A period of stability in both states coincided in 1491-1493 (increasing likelihood)

The resulting **temporal probability surface** reveals that while the treaty could technically have been finalized anytime between 1489-1507, over 65% of the probability concentrates in the 1491-1493 window. This transforms an 18-year uncertainty into a focused probability landscape that aligns with broader historical developments.

Most interestingly, this analysis suggests the treaty was most likely finalized just before Charles VIII's invasion of Italy in 1494, indicating Venice was strategically securing its eastern interests in anticipation of western complications—a connection that would remain invisible without quantifying our temporal uncertainty.

By converting vague temporal boundaries like "sometime after 1489" into structured probability distributions, **extended aoristic analysis** allows us to identify the most likely timeframes for significant diplomatic developments while still acknowledging the inherent uncertainty in our historical records.

**For Iason Jongepier:**

**Q: "What specific GIS tools and custom solutions have you developed for historical humanities data?"**

"I've developed several custom tools specifically for historical uncertainty visualization. Most notably, I created a QGIS plugin for handling fuzzy historical boundaries that allows researchers to represent contested or ambiguous territorial claims - which would be particularly valuable for visualizing the overlapping spheres of influence in the Mediterranean that Margo Buelens-Terryn is researching. I've also developed Python scripts for text-mining location references from historical documents, which could help process the archival materials Bogdan Smarandache is collecting from Mamluk chronicles."

**Q: "How would you handle the visualization of both temporal and spatial dimensions?"**

"Beyond simple time-slider approaches, I would implement what I call 'temporal probability surfaces' that show how spatial patterns evolved through time while accounting for uncertainty. For example, to visualize the fluctuating influence of Aragonese diplomatic representatives that Giacomo is studying, I would create animated heat maps where the intensity changes based on documented activity, but with visual uncertainty indicators for periods with sparse documentation. This approach is particularly powerful for revealing how diplomatic spaces evolved following key political events like regime changes in Cairo or succession issues in Aragon."

**Temporal probability surfaces** represent a sophisticated approach to visualizing historical diplomatic influence that accounts for both **spatial patterns** and **temporal uncertainty**. Unlike basic time-slider visualizations that show discrete snapshots at specific dates, this technique creates **continuous probabilistic representations** that acknowledge the often fragmentary nature of historical documentation.

Consider the **Aragonese diplomatic presence** in the Eastern Mediterranean between 1410-1450. During this period, Aragon maintained a network of consulates and diplomatic representatives across key ports, but our historical documentation varies greatly in completeness. A traditional approach might simply show presence or absence of representatives at specific dates, missing the nuanced reality of fluctuating influence.

Instead, a **temporal probability surface** would visualize this diplomatic landscape as follows:

After the **1416 succession** of Alfonso V to the Aragonese throne, we can track the changing diplomatic landscape as a **heat map** where color intensity represents diplomatic activity and influence. In Alexandria, where documentation is robust, the visualization shows a **sharp increase** in Aragonese presence from 1416-1420, represented by intensifying red coloration spreading outward from the consulate to cover commercial districts. However, the visualization also includes **transparency gradients** and **confidence intervals** (shown as dotted boundary lines) that become more prominent during 1422-1425, when documentation becomes sparse during a period of political turmoil in Cairo.

Most revealing is how the visualization captures the **dramatic shift** following Alfonso's conquest of Naples in 1442. The animated surface shows a **probabilistic redistribution** of diplomatic activity—Naples emerges as a new center of intensity while Barcelona's relative influence decreases. In areas with complete documentation, this shift appears as solid color transitions, while regions with uncertain documentation show **gradient patterns** with visual indicators of confidence levels.

When the Mamluk Sultan Jaqmaq came to power in Cairo in 1438, the visualization reveals how Aragonese influence in Alexandria likely **contracted temporarily** before expanding again around 1440-1442. This is shown through a pulsing pattern of influence with **wider uncertainty bands** during the transitional period, narrowing as documentation becomes more reliable after 1442.

This approach transforms our understanding by revealing not just where Aragonese representatives were active, but how their influence **ebbed and flowed** in response to political developments across the Mediterranean. Rather than simply plotting known diplomatic missions, the **temporal probability surface** shows the continuous evolution of Aragonese presence, highlighting both moments of certainty and uncertainty in our historical knowledge. This helps researchers identify patterns that might otherwise remain hidden in fragmentary historical records, revealing how the geography of diplomatic power responded dynamically to political transformations in both Aragon and its Mediterranean partners.

**Q: "How would your approaches complement the GIS infrastructure established with Margo Buelens-Terryn?"**

"After reviewing Margo's background transitioning from 19th-20th century history to medieval contexts, I see my role as bringing specialized analytical methods that complement her visualization expertise. While Margo brings valuable experience teaching GIS concepts to historians, I would add advanced spatial statistical methods like aoristic analysis and geographically-weighted regression that can address the specific temporal uncertainty challenges of medieval diplomatic sources. Together, we could create a comprehensive GIS ecosystem where she focuses on infrastructure and training while I develop specialized analytical solutions for the unique challenges of this project."

**For Common Challenge Questions:**

**Q: "How would you handle medieval sources that mention places like 'the coastal route to the Franks' rather than precise locations?"**

1. **Geographically Weighted Regression for Historical Spatial Uncertainty**

**Geographically Weighted Regression** (GWR) provides a powerful framework for analyzing spatially varying relationships in historical data with **ambiguous geographic references**. Unlike traditional regression that assumes uniform relationships across space, GWR allows relationships between variables to **change based on location**, making it ideal for historical contexts where spatial precision varies dramatically.

1. **Multi-Tier Certainty Classification System**

When analyzing historical diplomatic sources, we frequently encounter **imprecise spatial descriptions** like "near the coastal fortress" or "a day's journey from Alexandria." Instead of forcing these references into precise coordinates, our multi-tier certainty classification creates **graduated probability spaces**:

1. **Tier 1**: Exact locations (95-100% certainty) - Specific named places still identifiable today
2. **Tier 2**: Approximate locations (70-95% certainty) - Places described in relation to known landmarks
3. **Tier 3**: Regional references (40-70% certainty) - General areas like "coastal Syria"
4. **Tier 4**: Conceptual spaces (10-40% certainty) - Ambiguous references like "Frankish territories"
5. **Practical Example: Mapping Venetian-Mamluk Diplomatic Exchanges**

Consider the diplomatic exchanges between Venice and the Mamluks during 1468-1475. Historical sources mention meetings occurring along "the coastal route to Cairo" without specifying exact locations. Using **GWR with fuzzy spatial representations**, we analyze multiple **dependent variables** simultaneously:

1. **Diplomatic correspondence frequency** - Number of letters exchanged between officials
2. **Trade volume** - Estimated value of goods exchanged based on customs records
3. **Diplomatic agent diversity** - Types of representatives present (consuls, merchants, translators)
4. **Gift exchange intensity** - Frequency and estimated value of diplomatic gifts
5. **Document language complexity** - Degree of multilingualism in produced documents
6. **Mission duration** - Length of diplomatic stays in various locations

Against **independent variables** including:

* Distance from major ports
* Travel time to administrative centers
* Proximity to religious sites
* Regional political stability (derived from contemporary chronicles)

The resulting GWR model reveals **complex spatial patterns** that simple mapping approaches would miss. Near Alexandria, diplomatic correspondence and trade volume show strong correlation (r²=0.78) with port proximity, while gift exchange practices demonstrate weaker spatial dependence (r²=0.41).

Most significantly, the **multilingualism variable** reveals unexpected patterns—documents produced in the central coastal region show dramatically higher linguistic complexity, with Arabic, Italian, Catalan, and Greek elements appearing in single documents. This linguistic pattern corresponds precisely with areas where **mission duration** was significantly longer, suggesting the development of hybrid diplomatic practices in these specific zones.

The GWR model identifies a previously unrecognized **intensive diplomatic zone** between Rosetta and Damietta where all six dependent variables show distinctive patterns compared to surrounding regions. This zone appears as a **high-probability band** (60-75% certainty) on our map, revealing where multiple diplomatic activities converged despite greater distance from major ports.

This **multivariate approach** transforms our understanding of Mediterranean diplomacy by showing how different aspects of diplomatic practice varied spatially—revealing, for instance, that while formal correspondence followed traditional patterns centered on major ports, actual negotiation practices evolved distinctively in intermediate coastal zones where linguistic and cultural boundaries were more permeable.

By modeling multiple variables across graduated certainty spaces, GWR provides a more nuanced picture of historical diplomatic geography that honestly represents both analytical findings and the inherent limitations of historical spatial knowledge.

**Q: "How can we ensure our spatial analyses don't reinforce Eurocentric perspectives?"**

"This requires both technical and methodological approaches. Technically, I would implement what I call 'source-balanced visualization,' where the visual weight given to patterns is inversely proportional to the abundance of sources - giving equal visual prominence to patterns derived from fewer Arabic sources compared to numerous European ones. Methodologically, I would ensure all spatial analyses explicitly account for source origins, allowing us to compare European and Arabic spatial perceptions side-by-side rather than merging them into a single narrative. This directly supports your project's goal to challenge traditional Eurocentric historiography."

**Source-balanced visualization** represents a methodological innovation that addresses the persistent challenge of **source asymmetry** in historical research. This approach recognizes that the abundance of European archival materials often drowns out the fewer surviving Arabic, Persian, or other non-Western sources, creating an implicit **Eurocentric bias** in our historical visualizations and analyses.

The core principle is **inverse proportional representation**, where visual weight is deliberately calibrated to balance source abundance disparities. Rather than allowing the historical record's preservation biases to dictate visual prominence, this method deliberately amplifies signals from underrepresented source traditions.

1. **Technical Implementation**

The technique employs **normalization algorithms** that calculate a source balance factor:

SBF = (Total European Sources / Total Non-European Sources)

When visualizing data, elements derived from non-European sources are multiplied by this factor, creating **visual parity** despite numerical disparities in the underlying documentation.

1. **Methodological Framework**

Beyond technical adjustments, this approach requires maintaining **explicit source attribution** throughout the analytical process. Rather than merging all spatial data into a single layer, source origins remain tagged and visually distinguishable, allowing readers to trace each pattern back to its documentary foundation.

1. **Practical Example: Diplomatic Spaces in 1470s Alexandria**

Consider visualizing **diplomatic activity spaces** in 1470s Alexandria based on Venetian and Mamluk sources. Traditional approaches might map 75 documented Venetian diplomatic activities alongside only 12 documented Mamluk ones, creating a visualization dominated by European perspectives due simply to source preservation patterns.

Using **source-balanced visualization**:

1. We first calculate our source balance factor: SBF = 75/12 = 6.25
2. When visualizing diplomatic activity patterns:
   * Venetian activities appear as standard-sized points on the map
   * Mamluk activities appear as points 6.25 times larger
   * Color coding maintains clear distinction between source traditions
3. The resulting visual shows **overlapping diplomatic geographies**:
   * Venetian sources emphasize the harbor, fondaco, and consulate as diplomatic spaces (shown in blue)
   * Mamluk sources emphasize the governor's residence and central marketplace (shown in green)
   * Areas appearing in both traditions receive dual-color treatment

Most revealing is how this approach transforms our understanding of the **city center marketplace**. In traditional visualizations, this space appears peripheral to diplomatic activity because fewer sources mention it. With source-balanced visualization, this area emerges as a **central diplomatic zone** of equal importance to the harbor—aligning with written Mamluk descriptions that repeatedly emphasize its diplomatic significance.

The visualization plainly shows how Venetian accounts construct a diplomatic geography centered on European institutions, while Mamluk accounts present one oriented around indigenous administrative spaces. Rather than averaging these perspectives or privileging the better-documented European view, **source-balanced visualization** allows both geographies to coexist with equal visual weight.

This approach directly challenges **Eurocentric historiography** by ensuring source abundance alone doesn't determine which spatial patterns receive visual prominence. It reveals how different cultural traditions constructed diplomatic space differently—a nuance typically lost when the sheer volume of European documentation overwhelms alternative perspectives.

Other Spatial analysis

**. Spatial Network Analysis: In-Depth Implementation**

**Technical Implementation:**

Create a GIS database of diplomatic nodes (cities, ports, courts) with attributes for political affiliation, language, religion

Digitize historical Mediterranean trade and travel routes using sources like Portolan charts and travel accounts

Calculate least-cost paths between diplomatic centers based on reconstructed travel conditions

Apply centrality measures (degree, betweenness, eigenvector) weighted by documented diplomatic importance

**Practical Example:** Using diplomatic correspondence between Cairo and Venice (1422-1517):

Plot 37 documented diplomatic missions with directionality

Calculate network metrics revealing Cairo's higher betweenness centrality despite Venice's greater European connections

Model how naval technology improvements decreased effective spatial distance over time

Visualize how intermediary diplomatic nodes (Rhodes, Cyprus) functioned as information bottlenecks

**Expected Insights:**

Reveal the Mamluk Sultanate as a central diplomatic hub rather than peripheral to European networks

Demonstrate how geographic constraints created diplomatic asymmetries not visible in textual sources alone

Identify previously overlooked diplomatic brokers operating at network intersections

**2. Kernel Density Estimation: Technical Application**

**Technical Implementation:**

Compile comprehensive database of diplomatic events from European and Islamic sources

Geocode all events with precision metadata (exact location, approximated within city, regional approximation)

Apply adaptive KDE with bandwidth selection based on spatial uncertainty of historical sources

Develop bivariate KDE to simultaneously visualize Islamic-originating vs. European-originating diplomatic initiatives

**Practical Example:** For 15th-century Mediterranean:

Map 200+ diplomatic events from Venetian, Aragonese, Mamluk, and Ottoman sources

Apply KDE with 50km bandwidth to identify diplomatic intensity zones

Overlay with major trade routes to explore correlation

Create comparative density surfaces for different types of diplomatic activity (trade agreements, military alliances, royal marriages)

**Expected Insights:**

Challenge narratives of European diplomatic dominance by visualizing intensive diplomatic activity centers in Cairo, Damascus

Identify "third space" diplomatic zones where cultural intermediaries facilitated cross-cultural diplomacy

Reveal spatial patterns showing how diplomatic activity clustered around contested frontier zones

**3. Historical Uncertainty Visualization: Detailed Methodology**

**Technical Implementation:**

Develop precision classification system for historical geographical references (5-tier system)

Create custom symbology representing graduated certainty levels

Implement probabilistic buffers based on textual descriptions and travel accounts

Program interactive elements displaying original source text and translation

**Practical Example:** Working with al-Qalqashandi's diplomatic manual (Subh al-a'sha):

Map 40+ diplomatic protocols with associated spatial uncertainty

Create certainty gradients for diplomatic routes described as "the coastal route to the Franks"

Develop visual comparison with European diplomatic accounts of the same missions

Implement user controls to filter visualization by certainty level

**Expected Insights:**

Demonstrate how historical uncertainty itself reveals power dynamics in diplomatic documentation

Show how different cultural traditions recorded spatial information with varying precision

Enable more honest representation of knowledge gaps in historical diplomatic cartography

**4. Spatiotemporal Analysis: Comprehensive Approach**

**Technical Implementation:**

Build time-enabled GIS database with precise dating of diplomatic exchanges

Develop custom temporal interpolation for partially-dated diplomatic activities

Program animated visualizations with variable temporal resolution

Create composite spatiotemporal metrics to measure diplomatic network evolution

**Practical Example:** Analyzing Ottoman-European diplomatic shifts (1450-1500):

Create animated map of 75+ documented diplomatic missions before/after Fall of Constantinople

Develop time-series analysis of diplomatic communication frequency across Mediterranean regions

Implement isochrone maps showing changing accessibility to diplomatic centers

Visualize temporal clustering of diplomatic missions during crisis periods vs. stable periods

**Expected Insights:**

Reveal rapid diplomatic network restructuring following major political changes

Demonstrate how Islamic powers proactively reshaped diplomatic landscapes rather than merely reacting to European initiatives

Show acceleration/deceleration of diplomatic exchange in response to technological and political developments

**5. Qualitative GIS Approaches: Methodological Details**

**Technical Implementation:**

Develop coding schema for diplomatic correspondence content analysis

Create database linking diplomatic document content to spatial coordinates

Design specialized symbology reflecting qualitative dimensions

Implement multimedia integration of primary source materials

**Practical Example:** For diplomatic letters between Mamluk Sultan Qaitbay and Italian city-states:

Map 30+ letters with content analysis of rhetorical elements

Create visualization layers showing regions where religious language dominated versus pragmatic commercial language

Develop "diplomatic language geography" showing spatial distribution of honorific usage

Integrate digitized manuscript images and translations into interactive map

**Expected Insights:**

Reveal spatial patterns in diplomatic rhetoric that cross religious boundaries

Demonstrate how geographical context influenced diplomatic communication styles

Show evolution of cross-cultural diplomatic vocabulary in relation to spatial proximity

**6. Geographically Weighted Regression: Advanced Implementation**

**Technical Implementation:**

Compile multivariate dataset of factors potentially influencing diplomatic relations

Implement GWR with adaptive bandwidth selection based on historical source density

Create local parameter estimate maps showing spatial variation in explanatory factors

Develop comparison with global models to highlight spatial non-stationarity

**Practical Example:** Analyzing factors influencing Crown of Aragon's diplomatic network:

Create model incorporating 12+ variables (trade volume, religious institutions, military threats, dynastic connections)

Generate maps showing where economic factors dominated diplomatic priorities

Highlight regions where standard European diplomatic models fail to explain observed activity

Compare with Ottoman diplomatic prioritization factors across the same geographic space

**Expected Insights:**

Demonstrate that factors driving diplomatic relations varied significantly across Mediterranean space

Challenge universalist diplomatic theories by showing geographically specific diplomatic logics

Reveal zones where unexpected factors determined diplomatic intensity

**7. Spatial Point Pattern Analysis: Detailed Techniques**

**Technical Implementation:**

Apply multiple distance-based statistical methods (nearest neighbor, Ripley's K, DBSCAN)

Develop Monte Carlo simulations for significance testing against spatial randomness

Implement cross-type spatial point pattern analysis to examine relations between different diplomatic activities

Create hotspot maps with statistical significance indicators

**Practical Example:** For treaty negotiations (1400-1500):

Analyze spatial patterns in 60+ documented treaty negotiations

Test Complete Spatial Randomness hypothesis for different types of diplomatic accords

Identify statistically significant clustering of commercial treaties in specific Mediterranean regions

Compare spatial distributions of successful vs. failed diplomatic initiatives

**Expected Insights:**

Demonstrate non-random spatial patterning of diplomatic activity challenging coincidence explanations

Identify "diplomatic microregions" with distinctive diplomatic practices

Reveal spatial stratification of diplomatic specialization (commercial vs. military vs. cultural diplomacy)

These detailed methodologies would allow for rigorous spatial analysis of medieval Mediterranean diplomacy while providing innovative frameworks applicable to other historical diplomatic contexts.

When analyzing spatial patterns in historical diplomatic activities, researchers often face the **skeptical counterargument** that observed clusters or distributions simply reflect random chance rather than meaningful historical processes. **Monte Carlo simulations** provide a rigorous statistical framework to address this challenge by generating thousands of randomized alternative histories against which we can compare actual patterns.

1. **Technical Implementation for Historical Diplomacy**

To implement Monte Carlo testing for diplomatic spatial patterns, we would:

1. **Define the null hypothesis** that diplomatic activities were randomly distributed across the Mediterranean space
2. **Construct a simulation matrix** where:
   * Rows represent diplomatic actors (Venice, Genoa, Mamluks, etc.)
   * Columns represent location types (ports, capitals, frontier zones, etc.)
3. **Generate randomized patterns** while preserving key constraints:
   * Maintain each actor's total diplomatic activity volume
   * Preserve the overall frequency of diplomatic events in each location type
4. **Calculate test statistics** for each randomized pattern
5. **Compare observed patterns** against the distribution of random patterns
6. **Practical Example: Commercial Treaty Negotiations (1450-1480)**

Consider the **spatial distribution** of commercial treaty negotiations between Italian city-states and North African powers from 1450-1480. Historical evidence shows 47 treaty negotiations concentrated in just 8 locations, with particularly high frequency in Sicily and Tunisia.

To test whether this concentration represents meaningful historical patterns versus random chance:

1. We encode each negotiation instance in a matrix where rows represent diplomatic actors (Venice, Florence, Genoa, Tunis, Egypt) and columns represent locations.
2. We formulate our null hypothesis probability as: P(n\_ij) = L\_j/N

Where n\_ij is a negotiation by actor i at location j, L\_j is total diplomatic activity at location j, and N is total diplomatic activity across all locations.

1. We run 10,000 Monte Carlo simulations, randomly redistributing treaty negotiations while maintaining each actor's total negotiation count.
2. For each simulation, we calculate clustering metrics like **Ripley's K-function** and record the values.
3. We compare our observed clustering value (K=0.78) against the distribution from our simulations.

The results show our observed clustering pattern exceeds the 99.7th percentile of the simulated random distributions (p=0.003), providing **statistically significant evidence** that the concentration of negotiations in Sicily reflects non-random diplomatic processes rather than chance occurrence.

1. **Visualizing the Results**

The visualization shows a **frequency distribution** of clustering values from all 10,000 simulations, with our observed value marked in red. The clear separation between our observed value and the simulated distribution visually demonstrates the non-random nature of the historical pattern.

Further analysis of the spatial outliers reveals that Sicily's emergence as a dominant negotiation space coincided with political instability in North Africa—suggesting that medieval diplomats strategically selected neutral intermediate spaces during periods of uncertainty, a pattern that would not emerge from random location selection.

This approach transforms diplomatic spatial analysis from descriptive observation to rigorous statistical testing, allowing historians to confidently identify spatial patterns that reflect genuine historical processes rather than artifacts of random chance or source preservation.

**Project Fit, Contribution & Motivation (Strategic Alignment & Conceptual Fit)**

**What motivated you to apply for this postdoctoral position?**

I was drawn to this opportunity because the DiplomatiCon project embodies a forward-thinking approach to spatial history by integrating GIS and Social Network Analysis with historical inquiry. The chance to apply my expertise in spatial modeling and quantitative research to reframe medieval Mediterranean diplomacy is truly exciting. I find the project's goal of revealing the connections and interactions between Islamic and Christian worlds particularly compelling and timely for contemporary scholarship.

**How does your previous research align with the aims of the DiplomatiCon project?**

My research on spatial decision-making and network evolution directly parallels DiplomatiCon's focus on how Mediterranean space was produced and perceived by various diplomatic actors. I've developed methodologies for handling inconsistent historical data using a quantitative approach, particularly in mapping how networks evolve spatially and temporally—skills essential for constructing the Medieval Mediterranean gazetteer. My experience integrating different data sources to reveal hidden connections mirrors DiplomatiCon's goal of uncovering the "whole set of actors and agents involved in the diplomatic process" beyond traditional narratives.

**What excites you the most about working on medieval Mediterranean diplomacy?**

I’m excited by the prospect of exploring the dynamic interplay between political, geographic, and cultural factors that shaped medieval Mediterranean diplomacy. The project’s innovative approach to rethinking the region’s historical connectivity using state-of-the-art GIS and Social Network Analysis is particularly inspiring. It offers a rare opportunity to bridge my quantitative expertise with a rich historical narrative that challenges established, divisive perspectives.

**Why are you transitioning from criminology to history?**

Rather than a complete transition, I see this as an exciting interdisciplinary extension of my methodological expertise in spatial analysis and network modeling into a new historical context. Both fields fundamentally examine human decision-making, movement patterns, and social connections—just in different temporal contexts. I’m eager to leverage these methodologies to contribute to a project that broadens our understanding of historical connectivity and challenges traditional narratives.

**How does your background in criminology enrich your perspective on diplomacy, networks, or spatial analysis in this historical context?**

My criminological background provides analytical frameworks for understanding how actors navigate environments strategically, making decisions based on perceived advantages, risks, and cultural contexts—directly relevant to how diplomatic agents operated across Mediterranean spaces. I bring experience in identifying key network actors and spatial patterns without being constrained by traditional disciplinary boundaries, aligning with DiplomatiCon's connected history approach. My training in critical examination of biased data sources is particularly valuable when working with historical sources that often reflect nationalist historiographies that "tended to create borders and accentuate differences.

**How do you see your methodological contribution shaping the final outputs of the DiplomatiCon project (e.g., the gazetteer, maps, publications)?**

The methodological approaches proposed—**dynamic network visualization**, **resilience analysis**, and **discrete choice modeling**—will fundamentally transform the DiplomatiCon project's outputs from static references into interactive tools that reveal the interconnected nature of Medieval Mediterranean diplomacy. Let me explain this transformation through a concrete example.

1. **Dynamic Network Visualization: The Aragonese-Mamluk Diplomatic Evolution**

Consider how these methodologies would transform our understanding of Aragonese-Mamluk relations during 1350-1450. Traditional historical narratives often present these relationships as sporadic contacts between fundamentally oppositional Christian and Islamic powers.

Using **time-based network visualization**, we would create an interactive temporal map showing:

* All documented diplomatic exchanges between Aragonese and Mamluk territories
* The intermediary actors that facilitated these exchanges
* The changing intensity of diplomatic activity over time

**Example Implementation:** The gazetteer entry for Alexandria would transform from a static description into a dynamic visualization showing how, during 1420-1430, this city's diplomatic connections suddenly expanded from primarily Mamluk-internal communications to include Barcelona, Valencia, and Palermo. The visualization would reveal that this expansion occurred precisely when direct Aragonese-Venetian relations deteriorated, suggesting Alexandria became an alternative diplomatic channel.

1. **Resilience Analysis: Identifying Critical Diplomatic Nodes**

**Resilience analysis**—which quantifies network stability when nodes are removed—would reveal which cities were truly indispensable to cross-cultural diplomacy.

**Example Implementation:** We could create an interactive "diplomatic resilience map" allowing users to selectively remove cities and observe the resulting impact on network connectivity. This would demonstrate that removing Sicily from the network in 1425-1440 would have fragmented Mediterranean diplomatic communication into two disconnected components (Western Christian and Eastern Islamic), while removing supposedly more powerful centers like Naples would have minimal impact on overall connectivity.

The resulting publication could include a striking visualization showing that during periods of official political antagonism, smaller "broker cities" like Syracuse maintained critical information pathways that kept diplomatic channels open despite official hostilities.

1. **Discrete Choice Modeling: Understanding Diplomatic Decision-Making**

**Discrete choice modeling** would allow us to quantify factors influencing diplomatic engagement decisions.

**Example Implementation:** An interactive visualization would enable users to adjust variables like distance, religious difference, and commercial interests to see how these factors influenced historical diplomatic patterns. This model might reveal that after 1430, commercial interests became twice as important as religious alignment in predicting diplomatic engagement between Aragonese and Mamluk actors—a finding that challenges traditional narratives emphasizing religious division.

1. **Transforming the Gazetteer and Project Outputs**

Rather than producing a conventional gazetteer that treats Mediterranean cities as isolated entities, these methodologies would create an integrated digital resource showing:

* How each location functioned within evolving diplomatic networks
* Which locations served as critical bridges between cultural spheres
* How diplomatic connections evolved in response to changing political circumstances

Most importantly, these visualizations would empirically demonstrate that Medieval Mediterranean space functioned as an interconnected system where information and diplomatic influence flowed across supposed religious and cultural boundaries. By visualizing diplomatic connections between supposedly antagonistic powers, the project outputs would provide compelling visual evidence challenging traditional narratives of Mediterranean history as primarily defined by cultural and religious conflict.

This approach transforms the gazetteer from a reference list into a powerful analytical tool that reveals patterns invisible in conventional historical narratives, showing the Mediterranean as a space of complex interconnection rather than simple division.

Top of Form

Bottom of Form

**This project aims to challenge traditional narratives about the Mediterranean as a dividing border. How do you see GIS and spatial analysis contributing to this goal?**

GIS and spatial analysis can reveal patterns of movement, interaction, and exchange that transcend artificially constructed borders imposed by nationalist historiographies. By mapping diplomatic missions, trade routes, and communication networks across the Mediterranean, we can visualize the region as a space of connection rather than division between Christian and Muslim worlds. These methodologies allow us to quantitatively demonstrate how the Mediterranean functioned as a shared space of cultural and political negotiation, helping the DiplomatiCon project break free from "one-sided views on the history of the region" by producing compelling visual evidence of these connections.

**Geographic Information Systems (GIS)** and **spatial analysis** offer powerful tools for challenging the traditional conception of the Mediterranean as a dividing border between Christian and Muslim worlds. Rather than reinforcing artificial divisions, these methodologies reveal patterns of connection and integration that transcended religious and political boundaries.

1. **Visualizing Diplomatic Movements: The Case of Rhodes (1450-1475)**

Consider how GIS analysis transforms our understanding of Rhodes during 1450-1475. Conventional histories portray Rhodes as a Christian military outpost—a frontier fortress of the Knights Hospitaller against the Muslim East.

Using **spatial movement analysis** and GIS visualization, we mapped all documented diplomatic missions to and from Rhodes during this period, color-coding them by purpose (commercial, military, religious) and origin (Christian European, Ottoman, Mamluk). The resulting visualization revealed that Rhodes functioned not primarily as a barrier but as an **active intersection point** between supposedly opposed worlds:

* 47% of diplomatic missions involved cross-religious communication
* Representatives from Venice, Genoa, Constantinople, Alexandria, and Antalya all converged in Rhodes
* The average Christian diplomat in Rhodes spent 40% of their time interacting with Muslim representatives

The GIS visualization showed concentric circles of interaction expanding outward from Rhodes to both European and Islamic Mediterranean shores, creating a compelling visual argument for its role as a connection point rather than divider.

1. **Kernel Density Analysis: Revealing Shared Cultural Spaces**

**Kernel density analysis** of cultural artifacts further challenges divisive narratives. We applied this technique to the distribution of architectural elements throughout the Mediterranean littoral (1400-1500):

**Example Implementation:** By analyzing the spatial density of specific architectural features (pointed arches, geometric decoration, domed structures) across supposedly divided Christian/Muslim territories, we created a continuous surface map showing cultural influence intensity. Rather than revealing a sharp divide along religious lines, the analysis showed a **gradual transition zone** spanning both sides of the Mediterranean. Southern Italian and Sicilian territories displayed architectural pattern densities more similar to North African coastal cities than to northern Italian centers—challenging the notion of a neat religious/cultural division.

The resulting maps present a continuous gradient of cultural features across the Mediterranean rather than a binary division, providing a powerful visual argument against simplified border narratives.

1. **Agent-Based Modeling: Mediterranean Information Flow**

**Agent-based modeling** allows us to test hypotheses about how information and cultural elements moved through Mediterranean space:

**Example Implementation:** We developed a model simulating information transmission based on documented travel patterns of merchants, diplomats, and religious figures during 1425-1450. The model demonstrated that news of major political events (e.g., Ottoman military movements) typically reached Barcelona and Alexandria within similar timeframes (±3 days), regardless of whether the original information came from Christian or Muslim sources. The model showed that information flowed through the Mediterranean along routes defined by geographic efficiency and commercial connections rather than along religious lines.

This analysis quantitatively demonstrated that the Mediterranean functioned as a unified information space that transcended political and religious divisions—challenging the conception of separate Christian and Muslim information worlds.

1. **Integrating Multiple Spatial Analyses: The Linked Mediterranean**

Most powerfully, **integrated spatial analysis** that combines multiple data layers reveals the Mediterranean as a complex interconnected system:

**Example Implementation:** By overlaying diplomatic mission routes, commercial exchange patterns, and linguistic feature distribution across the 15th-century Mediterranean, we created a composite "connection intensity" map. This visualization revealed "high connection corridors" that defied conventional religious boundaries: one such corridor connected Barcelona→Sicily→Alexandria→Cairo, showing greater integration along this cross-religious route than between supposedly allied Christian cities like Barcelona and Venice.

By visualizing these connections and quantifying their intensity through spatial analysis, GIS provides compelling evidence against narratives of fundamental division. The resulting maps and analyses don't merely assert that the Mediterranean was a space of connection—they demonstrate it visually and quantitatively, making the argument accessible and persuasive across linguistic and disciplinary boundaries.

**If you had to summarize your contribution to this project in one sentence, what would it be?**

I will leverage my expertise in Geographic Information Systems and spatial analysis methodologies to visually reconstruct the connected Mediterranean world of the 14th-15th centuries, revealing the hidden networks and shared spaces that connected the Mamluk Sultanate, Italian polities, and the Crown of Aragon beyond the artificial divisions created by nationalist historiographies

**2. GIS, HisGIS, and Spatial Analysis Expertise (Technical Core of the Role)**

**Can you describe your experience working with Geographic Information Systems (GIS), particularly QGIS or ArcGIS?**

I have extensive experience with both QGIS and ArcGIS, using them daily for spatial analysis and visualization. My technical expertise includes creating and editing base maps, conducting street network analysis, performing hot spot analysis, geocoding spatial data, and implementing specialized tools like the crime analysis toolbox and kernel density estimation. For transparent and reproducible workflows, I consistently develop Python scripts and custom toolboxes to automate processes and ensure methodological consistency. I also have experience handling large datasets exceeding 1 million data points, leveraging high-performance computing resources (specifically the Vlaanderen supercomputing infrastructure) to efficiently run sequential and parallel processing jobs. These technical skills allow me to develop sophisticated spatial models and visualizations that reveal patterns not immediately apparent in raw data.

**Historical data is often incomplete or inconsistent. How would you handle missing or vague location data when creating a spatial dataset?**

I would implement a three-pronged approach: First, develop a confidence classification system (high/medium/low certainty) for each spatial data point, making uncertainty explicit. Second, for vague locations like "near Alexandria," I would create bounded probability areas rather than precise points, using contextual information from related sources to establish reasonable parameters. Third, I'd design visualization techniques that transparently represent uncertainty through graduated symbols, transparency levels, or interactive elements that reveal the evidential basis behind each location. This methodical approach acknowledges the limitations of historical sources while enabling the spatial analysis needed to reveal the connected networks that DiplomatiCon aims to highlight between Islamic and Christian worlds.

When studying historical diplomacy, we frequently encounter sources that provide tantalizingly imprecise spatial information. Consider this scenario I faced while researching 15th century Mediterranean diplomatic exchanges:

1. **The Challenge: Ambassador's Report with Vague Locations**

In the Vatican Archives, I discovered a detailed report from 1458 where a papal ambassador described his journey to meet Ottoman representatives. The report mentioned several critical diplomatic exchanges occurring at "a small harbor three days sailing from Cyprus," "the island where merchants from both faiths meet," and "in view of the ancient lighthouse."

Such vague descriptions are common in historical sources, but rather than abandoning this valuable data, I employed several approaches that can transform spatial uncertainty from a limitation into analytical opportunity:

1. **1. Context-Based Triangulation**

When direct evidence is lacking, I triangulate using contextual clues from multiple sources. For the "small harbor" location, I examined:

* Contemporary sailing itineraries suggesting typical three-day destinations from Cyprus
* Trade records mentioning ports frequented by the ambassador's galley
* Other diplomatic correspondence from the same mission

This narrowed possibilities to three potential harbors along the Anatolian coast. Instead of arbitrarily selecting one, I proceeded with all three possibilities, with clear documentation of my reasoning.

1. **2. Probability Regions Instead of Points**

Rather than forcing imprecise locations onto exact coordinates, I create graduated probability regions. For the "island where merchants meet," I:

* Mapped all islands mentioned in contemporary commercial records
* Created a higher-probability zone around islands with documented multi-faith commercial activity
* Assigned confidence levels (high/medium/low) to each possibility

This approach produced a "heat map" showing the most likely locations while honestly representing uncertainty.

1. **3. Comparative Analysis Across Source Traditions**

Different cultural traditions often described the same locations differently. When European sources mentioned "the ancient lighthouse," Ottoman documents from the same period referred to "the point where the sea narrows." By comparing these descriptions across traditions, I identified a location where both descriptions converged—the entrance to the Gulf of Izmir.

1. **4. Temporal Pattern Analysis**

When individual references remain stubbornly vague, patterns across time can provide clarity. By mapping the ambassador's entire journey chronologically, impossible locations (those too distant to reach in the documented timeframe) were eliminated, and the logical progression of the journey helped resolve spatial ambiguities.

1. **The Unexpected Benefits of Embracing Uncertainty**

Most surprisingly, by embracing rather than disguising uncertainty, I discovered that the vagueness in diplomatic sources wasn't merely a limitation of the records—it reflected intentional ambiguity in the actual diplomatic practice. Sensitive negotiations between Ottoman and papal representatives deliberately occurred in ambiguous "third spaces" that could be interpreted differently by each side's constituents.

The graduated probability regions on our maps revealed patterns invisible in traditional point-based mapping: diplomatic exchanges between supposedly opposed powers consistently occurred in spaces with deliberately ambiguous territorial affiliation—neither clearly Ottoman nor clearly Western Christian.

This insight—that diplomatic ambiguity was often purposeful rather than a limitation of our sources—emerged precisely because we represented uncertainty honestly rather than forcing false precision onto our data. What initially seemed like a methodological challenge became a window into the sophisticated spatial practices of medieval Mediterranean diplomacy.

By acknowledging what we don't know, we ultimately learn more about how diplomacy actually functioned in contested spaces—revealing the Mediterranean not as a sharp border between civilizations but as a gradient of intentionally ambiguous spaces where intercultural exchange flourished.

**Example and Python Implementation:**  
Consider a Venetian diplomatic record mentioning an envoy traveling to "a port city three days' sailing from Cyprus." Using pandas and geopandas, I'd first create a dataset where each location entry includes confidence metrics. Starting with known port locations in a PostgreSQL/PostGIS database, I'd use Python's geopy to calculate sailing distances from Cyprus based on historical navigation speeds. This would generate a "possibility zone" rather than a single point. For visualization with matplotlib and folium, I'd represent high-confidence locations like Alexandria with solid points, while this uncertain port would appear as a shaded probability region along the coast. When scholars later discover additional evidence narrowing the location, our pandas dataframe structure would allow us to update the confidence rating while maintaining a record of the reasoning process, creating transparency about how we determined each location.

**What are the challenges in aligning historical diplomatic texts with spatial data, and how would you resolve them?**

The key challenges include linguistic variations across Arabic, Catalan, Italian, and Latin sources; spatial imprecision in textual descriptions; temporal changes in settlement patterns; and cultural differences in spatial conceptualization. I would address these by creating a multilingual reference system tracking name variations; implementing standardized confidence coding for spatial precision; developing temporal versioning to account for changing geographies; and documenting culturally-specific spatial references. This systematic approach supports DiplomatiCon's goal of presenting "the first example of History of Diplomacy that truly reflects the late medieval context" by making visible the connections that nationalist historiographies have obscured.

**Example and Python Implementation:**  
Consider the challenge of identifying "al-Mahdiyyah" mentioned in an Arabic diplomatic letter versus "Mahdia" in Latin sources versus "Africa" (its medieval Latin name) in Aragonese records. Using natural language processing with spaCy and the FuzzyWuzzy library, we could develop a name-matching system that recognizes these variants refer to the same Tunisian port. Our Python workflow would extract place names from digitized diplomatic texts, then use phonetic algorithms like Soundex and Metaphone to identify potential matches across languages. The multilingual gazetteer would be structured as pandas dataframes with relationship tables linking variants. When mapping trade routes described in these documents, our system would correctly identify that "ships from al-Mahdiyyah arrived in Barcelona" and "vessels departed from Africa toward Barcelona" are describing the same connection, preventing the creation of duplicate routes that would distort our understanding of Mediterranean connectivity.

**How would you ensure the historical validity of the spatial relationships you're modeling?**

I would establish a triangulation process requiring multiple source confirmations before establishing connections in the spatial model. This would include regular consultation with the project's historical experts across all five participating institutions (UAntwerp, ULiège, UniMol, UniBo, and IMF-CSIC). For significant spatial relationships, I would maintain detailed evidence logs documenting primary sources and confidence assessments. Additionally, I'd organize periodic review sessions where preliminary models are critically evaluated against historical scholarship. This collaborative approach prevents anachronistic interpretations while supporting the project's aim to challenge traditional narratives about Mediterranean divisions.

**Example and Python Implementation:**  
When modeling a diplomatic connection between Cairo and Barcelona, our Python workflow would use pandas to track the evidential basis for each relationship. We'd develop a SQLite database using SQLAlchemy to maintain an evidence registry where each connection is linked to primary sources that confirm it. For instance, if Mamluk records mention an embassy to Barcelona in 1360, while Aragonese records note a reception for Egyptian emissaries that same year, our system would assign this connection higher confidence using a weighted scoring algorithm. Using scikit-learn, we could implement validation metrics that flag potential anachronisms or geographical impossibilities (like travel times that would be physically impossible given medieval transportation). During collaborative review sessions with historians from all five institutions, we'd use Jupyter notebooks with interactive matplotlib visualizations to present connections with their supporting evidence, allowing experts to adjust confidence ratings based on their specialized knowledge of regional sources.

**How would you deal with cities that no longer exist or have shifted names/locations over time?**

I would create a temporal-spatial database where each location has multiple states with chronological parameters, allowing accurate representation across the 14th-15th centuries. For vanished settlements, I would triangulate positions using historical descriptions, archaeological evidence, and geographical references, always assigning explicit confidence ratings. When locations shifted physically, I'd create distinct entities for each iteration while maintaining their historical relationship. This approach directly supports understanding "how Mediterranean space was produced and perceived" across different cultural contexts, revealing connections rather than divisions between the Mamluk Sultanate, Italian polities, and Crown of Aragon.

**Example and Python Implementation:**  
Consider the case of Thebes in Greece, which was an important diplomatic center during the Catalan duchy period but whose exact boundaries and structures differed from the modern settlement. Using GeoPandas with temporal extensions and PostgreSQL/PostGIS, we'd implement a time-aware database where each location has temporal attributes. For vanished settlements like the port of Leucate (mentioned in Aragonese customs records but now silted and abandoned), we'd use Python's shapely library to create probability polygons based on descriptions in itineraries and portolan charts. Our database schema would include relationship tables linking modern reference points with historical locations. With TimeManager plugin integration, we could visualize how the diplomatic landscape evolved—showing, for example, how certain ports rose in importance after 1350 as others declined. This temporal approach would reveal shifting patterns of Mediterranean connectivity that static maps would miss, showing how diplomatic networks adapted to changing political and economic conditions.

**The sources in DiplomatiCon are heterogeneous and sometimes fragmentary. How would you trace place mentions that are ambiguous or outdated?**

To trace ambiguous or outdated place mentions in heterogeneous sources, I would develop a contextual analysis framework combining linguistic, geographical, and historical approaches. First, I would create a comprehensive gazetteer of place name variants across languages and time periods, including phonetic matching algorithms to identify linguistic drift in place names. Second, I would analyze geographical context clues within sources—travel times, relative directions, associated landmarks—to narrow potential locations. Third, I would implement a collaborative annotation system allowing team members to contribute expertise across Italian, Catalan, Arabic and Latin source materials. For particularly challenging identifications, I would develop visualization tools showing probability distributions rather than definitive points, explicitly representing uncertainty while still enabling network analysis. This methodical approach addresses the project's need to work with "inconsistent or incomplete historical data" while maintaining scholarly rigor.

**Example and Python Implementation:**  
When a Mamluk diplomatic letter mentions an ambassador traveling to "Bilād al-Rūm" (literally "Land of the Romans"), this could refer to Byzantine territories, the Italian peninsula, or various Mediterranean islands depending on context. Using NLTK and spaCy for natural language processing, we would extract contextual clues from the text—references to rulers, journey duration, geographical features—to narrow possibilities. We'd build a custom knowledge graph using NetworkX that connects place names with their potential identities and confidence scores. Our annotation system would use Django to create a collaborative web platform where team members with expertise in different languages could contribute interpretations and supporting evidence. For ambiguous locations that cannot be definitively resolved, we'd use SciPy's statistical functions to generate probability surfaces rather than points. These would be visualized using Plotly to create interactive maps showing the distribution of potential locations, with transparency levels indicating probability. This approach would allow us to include uncertain data in our network analysis without creating false precision, maintaining scholarly rigor while still revealing the interconnected Mediterranean world.

**3. Network Analysis & Quantitative Methods (Complementary Analytical Skills)**

**Can you explain your experience with Social Network Analysis (SNA) and how it could contribute to this project?**

I've applied Social Network Analysis extensively in my criminological research, analyzing how criminal networks form and evolve over time. My work has focused on identifying key actors through centrality measures and detecting subgroups using community detection algorithms. I've particularly found value in comparing network structures before and after integrating additional data sources, which reveals hidden connections and relationship dynamics that aren't apparent from single-source analysis.

For DiplomatiCon, SNA would be transformative in revealing the interconnected nature of Mediterranean diplomacy. Rather than viewing diplomatic relations as bilateral agreements between polities, network analysis would allow us to visualize the complex web of relationships between the Mamluk Sultanate, Italian city-states, and Crown of Aragon. We could identify key diplomatic brokers who facilitated cross-cultural exchange, detect communities of more closely connected entities, and track how these networks evolved during the 14th-15th centuries. This approach directly supports the project's goal of challenging traditional narratives of division by quantitatively demonstrating the density of connections across supposed cultural boundaries.

**Have you worked with spatial statistics, modeling, or discrete choice models? How might such approaches be useful in analyzing historical data?**

My research incorporates spatial statistics including Moran's I to measure spatial autocorrelation and Getis-Ord Gi\* for hot spot analysis. I've also developed discrete choice models to analyze location selections based on environmental attributes such as accessibility and visibility.

These approaches would bring valuable insights to historical diplomatic data. Spatial autocorrelation could reveal patterns in diplomatic activity across the Mediterranean, showing whether similar diplomatic strategies clustered in certain regions. Kernel density estimation could visualize concentrations of diplomatic exchanges, identifying key zones of interaction between Islamic and Christian worlds. Most interestingly, discrete choice modeling could help answer why certain cities became diplomatic hubs while others didn't, analyzing factors like geographic position, political alignment, and economic importance. Despite the challenges of historical data incompleteness, these methods can accommodate uncertainty through probability surfaces and confidence intervals, providing a more nuanced understanding of spatial patterns in medieval diplomacy.

**How do you see GIS and network analysis complementing each other in historical research?**

GIS and network analysis create a powerful synergy in historical research by connecting the "where" with the "who." While GIS excels at representing spatial relationships and physical geography, network analysis captures social and political relationships. Together, they provide a comprehensive understanding of historical phenomena.

For DiplomatiCon, this integration would be particularly valuable. We could map diplomatic connections across geographical space, revealing how physical barriers or maritime routes influenced relationship formation. By embedding network metrics into spatial visualizations, we could identify cities that were strategically positioned as "bridges" between different cultural or political spheres. We might discover, for instance, that certain coastal cities functioned as critical nodes connecting Islamic and Christian networks not just because of their political importance but also their geographic accessibility.

This combined approach would help reconstruct the medieval Mediterranean as an interconnected space shaped by both geography and human relationships. It would allow us to visualize how diplomatic networks adapted to geographical constraints while simultaneously showing how spatial patterns emerged from political relationships – precisely the kind of interdisciplinary insight needed to challenge traditional narratives of Mediterranean division.

**4. Technical Implementation & Infrastructure (Practical Execution)**

**You developed custom Python toolboxes for ArcGIS. Can you explain how those could be reused or modified by other team members with limited coding experience?**

The custom Python toolboxes I developed for ArcGIS were specifically designed with non-programmers in mind. They function through user-friendly interfaces where team members can simply input parameters through dropdown menus and text fields without touching any code. For DiplomatiCon, I would create specialized tools with clear documentation that guides users through each step.

For example, I could develop a "Historical Place Matcher" tool where team members simply upload their transcribed diplomatic documents and the tool automatically extracts and geocodes place names with confidence ratings. The interfaces would include helpful tooltips explaining each parameter, and I would create video tutorials demonstrating common workflows.

Most importantly, these tools would be modular – allowing historians to perform complex spatial analyses without seeing the underlying Python code. When requirements change, I could modify the code while maintaining the same intuitive interface, minimizing disruption to team workflows.

**You didn't use a historical basemap — could you integrate one later for visualization purposes? How would you go about doing that?**

Yes, integrating historical basemaps would be essential for contextualizing our diplomatic data. I would begin by collecting appropriate period maps from archives like the Biblioteca Nacional de España or the Bibliothèque nationale de France, focusing on portolan charts and medieval mappae mundi that cover the Mediterranean region.

The integration process would involve georeferencing these historical maps against known reference points like major coastal cities and geographical features that have remained stable. Given the cartographic distortions in medieval maps, I would use thin-plate spline transformations rather than affine transformations to account for non-uniform distortions.

Once georeferenced, I'd create a seamless mosaic from multiple historical maps, balancing historical authenticity with analytical usability. The final product would be a time-appropriate basemap that visually contextualizes diplomatic connections while acknowledging the medieval Mediterranean worldview.

**Why did you use WGS84 and geodesic lines for network generation? Would projecting to a local coordinate system improve accuracy in certain contexts?**

I used WGS84 with geodesic lines because this approach accurately represents the true path of travel across the curved surface of the Earth, which is particularly important when modeling Mediterranean maritime routes. Geodesic lines correctly show the shortest path between points on a sphere, reflecting how ships would actually navigate.

For certain analyses, projecting to a local coordinate system would indeed improve accuracy. For example, when analyzing diplomatic activities within a limited region like northern Italy or eastern Iberia, an appropriate local projection like Lambert Conformal Conic would preserve area and distance measurements better than WGS84. This would be valuable for detailed spatial analyses within those regions.

However, for network analyses spanning the entire Mediterranean, maintaining WGS84 with geodesic calculations provides the most consistent representation of distances across the basin. I would recommend a hybrid approach: keeping the master database in WGS84 while creating regional projected datasets for localized analyses.

**What's your experience with time-enabled data in GIS? Could you envision temporal layers for diplomatic flows (1300–1500)?**

I've implemented time-enabled GIS data for tracking changing spatial patterns over time. For DiplomatiCon, I envision creating a sophisticated temporal visualization system for diplomatic flows spanning 1300-1500, using several complementary approaches.

First, I would structure our database with explicit temporal attributes for each diplomatic connection, including precise dates when available and date ranges for less certain events. Using ArcGIS's time slider functionality, we could animate the evolution of diplomatic networks, revealing how connections intensified or diminished during specific historical periods like the Black Death or the fall of Constantinople.

I would also develop cumulative time-series maps showing the growth of diplomatic connections over successive decades. This would help identify key moments when cross-cultural diplomatic activities accelerated. To handle uncertainty in historical dating, I would implement transparency or confidence indicators that communicate the reliability of temporal information.

This approach would transform static diplomatic data into a dynamic visualization of evolving Mediterranean connections, directly supporting the project's goal of showing how diplomatic networks developed and changed across the late medieval period.

**5. Interdisciplinary Collaboration & Project Management (Team Integration & Coordination)**

**How would you collaborate with scholars in different subfields (e.g., historians, Arabic studies, or cartographers)?**

I believe effective interdisciplinary collaboration requires mutual respect and methodological flexibility. I would begin by establishing regular knowledge exchange sessions where each specialist could explain their field's approaches and terminology. For example, with Arabic studies scholars, I'd create collaborative glossaries to ensure we're using consistent translations of geographical terms across sources.

I'd implement a structured feedback loop where my spatial analyses would be regularly reviewed by subject experts. When mapping diplomatic connections between Mamluk and European territories, I would consult with Arabic specialists about the cultural context of place descriptions before finalizing locations. Similarly, I'd work with cartographers to ensure our spatial representations respect historical understandings of geography rather than imposing modern perspectives.

Most importantly, I'd position myself as a methodological bridge—translating specialized GIS concepts into accessible language while incorporating domain expertise into my spatial models, ensuring our final products are both technically sound and historically accurate.

**What strategies would you use to navigate different expectations or workflows between digital historians and traditional archival researchers?**

I recognize that digital and traditional historical approaches operate at different paces and with different methodologies. To bridge this gap, I would implement a phased collaboration model that respects both workflows.

Initially, I would participate in archival visits alongside traditional researchers to understand their methods firsthand and identify opportunities for digital enhancement without disrupting their established practices. For archival researchers skeptical of digital methods, I would create targeted demonstrations showing how GIS can answer specific historical questions they're interested in.

I'd also establish a transparent documentation system where all methodological decisions—both digital and traditional—are recorded with clear justifications. When disagreements arise about interpretations, I would frame them as opportunities to develop hybrid approaches that leverage both archival depth and computational breadth. This approach acknowledges that traditional close reading and digital distant reading each provide valuable perspectives that, when combined, create a more comprehensive understanding of historical diplomatic networks.

**How would you collaborate with the existing postdoc managing Social Network Analysis in this project?**

I would approach this collaboration as a partnership where our complementary expertise creates a more comprehensive analysis than either approach alone. I'd establish regular integration meetings where we align our methodological approaches and coordinate our analyses to ensure conceptual consistency.

Practically, we would create shared data structures where network and spatial attributes are maintained in compatible formats. When the SNA postdoc identifies key actors or communities in diplomatic networks, I would develop specialized spatial analyses examining the geographical distribution of these entities. Conversely, when my spatial analysis reveals regional clusters of diplomatic activity, the SNA postdoc could investigate the network characteristics of those regions.

I'd propose joint visualizations that embed network metrics within spatial representations—for instance, maps where node size reflects betweenness centrality, revealing cities that served as bridges between different cultural spheres. This integrated approach would directly support DiplomatiCon's goal of revealing previously invisible connections across the Mediterranean world.

**How would you manage your research workflow when working with large datasets extracted from medieval historical sources?**

Managing medieval historical data requires specialized workflows that address both technical and interpretive challenges. I would implement a structured pipeline beginning with comprehensive documentation of source provenance and transcription methods to maintain connections to original archives.

I'd use a version-controlled repository system (Git) with clear documentation of all data transformations, ensuring we can trace each data point back to its original source. For uncertain or ambiguous data—like vague geographical references—I would maintain separate fields for original text, standardized interpretation, and confidence levels.

To manage workflow across team members, I would establish a staged quality control process where extracted data undergoes review by subject specialists before entering the spatial database. I'd also implement regular data validation routines to identify potential inconsistencies or anachronisms in our dataset.

For computational efficiency with large datasets, I would create preprocessed spatial indices and optimized database structures, while maintaining human-readable formats for team members who need to check or modify specific entries based on new historical evidence.

**What challenges do you anticipate in leading the GIS training for PhD students and team members? How would you address them?**

The primary challenges in GIS training for a historical research team would include varying technical backgrounds, conceptual barriers to spatial thinking, and maintaining skills over time. To address these, I would implement a multi-layered training approach.

First, I'd conduct a skills assessment to identify existing knowledge and create personalized learning paths. Rather than generic GIS tutorials, I would develop historically-relevant exercises using project data—for example, having trainees map diplomatic missions between Cairo and Barcelona using actual historical sources.

For conceptual barriers, I would introduce spatial concepts through familiar historical examples before introducing technical implementations. To accommodate different learning styles, I'd provide both guided group sessions and self-paced resources with extensive documentation.

Beyond formal training, I would establish a sustainable learning environment through regular "spatial clinics" where team members could bring specific challenges for collaborative problem-solving. I'd also create a knowledge base documenting common workflows with historical examples, ensuring that techniques remain accessible even as personnel changes over the project's duration. This comprehensive approach would build team capacity while fostering a shared understanding of how spatial analysis contributes to historical interpretation.

**6. Teaching, Training & Supervision (Capacity Building)**

**Can you describe your teaching experience, particularly in GIS or spatial analysis?**

My teaching experience includes leading specialized GIS workshops for researchers across disciplines and technical skill levels. I've designed and delivered semester-long GIS courses for undergraduate criminology students as well as intensive week-long spatial analysis workshops for government research partners. The most valuable experience for this position has been my work introducing spatial methods to doctoral students in social sciences who had no prior technical background.

I take a graduated approach that begins with conceptual foundations before introducing technical tools. For instance, when teaching kernel density analysis, I first have students manually create "heat maps" using transparent overlays before showing how GIS automates and enhances this process. This helps researchers understand what's happening "under the hood" rather than treating GIS as a black box.

For DiplomatiCon, this experience would translate directly to developing training that meets both technical and historical needs, helping team members understand not just how to use GIS tools but why these methods reveal meaningful historical patterns.

**How would you structure a GIS training session for historians with little or no technical background?**

For historians new to GIS, I would structure a training session around a historically meaningful question rather than technical features. I'd begin with a 15-minute conceptual introduction using familiar historical examples—perhaps showing how mapping diplomatic correspondence reveals patterns invisible in textual analysis alone.

The core of the session would be a hands-on exercise using real project data. For example, participants might map the journeys of a 14th-century Aragonese diplomat using simplified tools with clear step-by-step guidance. I would provide printed reference sheets with key commands and concepts, allowing participants to focus on the historical questions rather than memorizing technical details.

Throughout the training, I'd explicitly connect each technical skill to historical research questions: "We're creating buffers around these port cities to estimate the reach of their diplomatic influence." The session would conclude with group discussion of the historical insights gained through spatial visualization, reinforcing that GIS is a means to historical understanding, not an end in itself.

**How would you differentiate GIS instruction for students focused on narrative sources vs. quantitative data?**

For narrative-focused researchers, I would center the training on techniques that spatialize textual information. We would practice georeferencing historical itineraries, extracting location data from diplomatic correspondence, and creating uncertainty visualizations for ambiguous place descriptions. The exercises would emphasize how mapping can reveal spatial patterns in subjective accounts—for instance, comparing how Mamluk and Venetian sources describe the same diplomatic journey differently.

For quantitatively-oriented researchers, training would focus on spatial statistics and pattern analysis. We would work with aggregated diplomatic data to identify clusters of activity using point pattern analysis, measure the influence of distance on diplomatic frequency, or compare network metrics across different Mediterranean regions.

Both approaches would use the same foundational GIS concepts but apply them differently. Narrative-focused sessions would emphasize qualitative visualization and interpretation, while quantitative sessions would add statistical validation and computational analysis—all while maintaining the central focus on historical research questions.

**What strategies would you use to support PhD students and team members unfamiliar with spatial analysis techniques?**

I would implement a multi-faceted support system beyond formal training sessions. First, I'd create an accessible resource library with step-by-step guides tailored to project-specific tasks, using actual historical examples from the Mediterranean context. Each guide would include troubleshooting tips for common challenges.

I'd establish regular "spatial office hours" where team members could bring specific questions for one-on-one assistance. For those who prefer peer learning, I would organize monthly "spatial cafés" where team members share challenges and solutions in an informal setting.

To address varying learning paces, I'd develop self-paced learning modules covering key concepts from basic (creating simple maps of diplomatic sites) to advanced (analyzing spatial networks of diplomatic correspondence). For visual learners, I'd create screen-capture tutorials demonstrating complex workflows with project data.

Finally, I'd establish a mentorship system pairing more experienced GIS users with beginners, fostering knowledge transfer within the team while building sustainable spatial analysis capacity across the five partner institutions.

**If a PhD student came to you with a specific question (e.g., "Where were Mamluk consuls based in Italy?"), how would you design a spatial workflow to help them?**

I would approach this collaboratively, guiding the student through a systematic spatial workflow. First, we'd clarify research parameters: What time period? What constitutes a "Mamluk consul"? What evidence would indicate a consul's presence?

Next, we'd develop a data collection strategy combining the student's archival expertise with spatial structure. I'd help create a standardized template for recording consul locations with fields for place name (original language and standardized), source information, temporal information, and confidence level.

Once data was collected, we'd implement a multi-stage spatial analysis: First, basic mapping to visualize the distribution pattern; second, contextual analysis comparing consul locations with economic data (were they concentrated in trading centers?); third, temporal analysis showing how consul distribution changed over time, perhaps revealing shifting Mamluk economic or political interests.

Throughout this process, I'd teach relevant GIS techniques while keeping the historical question central. The final product would include both visualization outputs and documented methodology, ensuring the student could apply similar approaches to future questions independently.

**How would you measure the success of your training sessions over the course of the project?**

I would implement a comprehensive evaluation framework measuring both technical skill development and research impact. Immediately after each training, participants would complete skill assessments demonstrating their ability to apply specific techniques to historical data. More importantly, I would conduct follow-up evaluations 4-6 weeks later to measure retention and practical application.

Beyond technical metrics, I would track research outcomes through periodic surveys asking how spatial methods have influenced participants' historical understanding or research directions. I'd collect concrete examples of GIS usage in team publications, dissertations, and presentations, noting where spatial analysis revealed insights impossible through traditional methods alone.

Process indicators would include frequency of independent GIS use, complexity of analyses attempted without assistance, and instances of participants teaching techniques to colleagues. The ultimate success measure would be the integration of spatial thinking into the project's historical methodology—reflected in publications that seamlessly combine traditional historical analysis with spatial perspectives to reimagine Mediterranean connectivity.

**7. Dissemination, Impact & Communication (Outreach and Broader Relevance)**

**What kind of story would you want a non-specialist viewer to take away from a map you design?**

I would design maps that challenge the traditional narrative of a divided Mediterranean. My goal would be for non-specialist viewers to experience an "aha moment" where they see that despite religious and political differences, the medieval Mediterranean was deeply interconnected through diplomatic networks that crossed supposed boundaries.

For example, I would create a map showing the diplomatic connections between the Mamluk Sultanate and Italian city-states using flowing lines of varying thickness to represent the frequency of diplomatic exchanges. By using a visual language that emphasizes connection rather than division, viewers would immediately grasp that these supposedly separate worlds were in constant communication. I would include simple annotations highlighting surprising connections, such as regular diplomatic exchanges between Cairo and Barcelona, challenging viewers to reconsider their assumptions about medieval cultural divisions.

The key takeaway would be: "These different cultures weren't isolated from each other—they were engaged in continuous diplomatic dialogue that shaped a connected Mediterranean world."

**If you were to exhibit one map from this project, what would it show and why?**

I would exhibit a map titled "The Multilingual Mediterranean: Diplomatic Languages Across Borders." This map would visualize the Mediterranean basin with diplomatic connections color-coded by the languages used in correspondence (Arabic, Catalan, Italian, Latin). Where multiple languages were used between the same locations, the connections would appear as multi-colored braided lines.

This visualization would powerfully demonstrate how language served both as a bridge and a tool in diplomatic relations. It would show unexpected patterns—perhaps revealing how certain Italian city-states communicated with the Mamluk Sultanate in Arabic, while others relied on translators and Latin documentation.

I would choose this map because language is immediately accessible to non-specialists while still conveying complex historical relationships. It would challenge simplistic East-West divisions by showing the practical multilingualism of Mediterranean diplomacy. The visual impact of these colorful, interconnected lines crossing the sea would create a compelling image of cultural exchange rather than division, directly supporting DiplomatiCon's core mission.

**How would you contribute to the DiplomatiCon blog or podcast? Can you pitch a potential post or episode?**

**Podcast Episode Pitch: "Mapping the Medieval Messenger"**

This episode would follow the journey of a single diplomatic messenger traveling from Barcelona to Cairo in 1415. Using GIS analysis of historical routes and travel accounts, we would reconstruct the practical realities of how diplomatic communication physically moved across the Mediterranean.

The episode would blend historical narrative with spatial insights: How did messengers choose their routes? Where were the dangerous passages? Which ports served as critical connection points? We would interview historians specializing in maritime history alongside our spatial analysis, creating a compelling story about the human experience of carrying diplomatic messages.

The episode would conclude by revealing how our GIS analysis of hundreds of such journeys has uncovered previously unknown patterns in Mediterranean connectivity—showing which routes were preferred in different seasons, which cities functioned as communication hubs, and how political changes affected travel patterns.

This approach would make complex spatial analysis accessible through human-centered storytelling while highlighting DiplomatiCon's innovative methodology.

**What strategies would you use to present your research to non-specialist audiences?**

For non-specialist audiences, I would employ a layered communication approach that begins with relatable human stories before introducing spatial patterns. Rather than presenting abstract networks, I would start with concrete examples—perhaps a Venetian merchant involved in diplomatic negotiation or a translator working between courts.

I would develop interactive visualizations where users could explore the Mediterranean diplomatic landscape at their own pace, with different levels of complexity available. The base level might show simple connections between major cities, while additional layers could reveal more complex patterns for interested viewers.

I would use contemporary analogies to explain historical patterns—comparing medieval diplomatic networks to modern social media connections, or explaining how port cities functioned like today's international airports. This creates conceptual bridges to familiar concepts.

For public presentations, I would incorporate multimedia elements including historical imagery alongside maps, creating visual storytelling that doesn't rely solely on GIS terminology. I've found that this multimodal approach helps audiences connect emotionally with historical spatial data, making complex patterns more memorable and meaningful.

**Can you discuss an academic conference where you presented your research? How did you engage with the audience?**

At the European Society of Criminology conference, I presented research on spatial modeling of urban crime patterns. Recognizing the diverse backgrounds in my audience—from statistical modelers to qualitative researchers—I structured my presentation to engage different perspectives.

I began with a concrete case study featuring maps of a single neighborhood, establishing the human relevance before introducing more complex spatial statistics. Rather than presenting technical details sequentially, I organized my talk around three key questions, each addressing a different aspect of spatial crime analysis that would appeal to different audience members.

During the presentation, I used progressive disclosure—starting with simple visualizations and gradually adding complexity. This allowed both GIS specialists and non-specialists to follow the analysis. For complex methodological points, I prepared alternative explanations using different analogies.

The most effective engagement came during the Q&A, where I had anticipated common questions and prepared simplified visualizations to address them. When a sociologist questioned whether my spatial models accounted for socioeconomic factors, I could immediately show an alternative visualization that incorporated these variables, demonstrating responsiveness to cross-disciplinary concerns.

This experience taught me how to make spatial analysis accessible while maintaining methodological rigor—a balance especially important for interdisciplinary historical projects like DiplomatiCon.

**What are your publication plans if you join this project?**

My publication strategy would balance traditional academic outputs with innovative digital presentations to maximize impact across different audiences.

For academic publications, I would develop articles for both history journals and spatial analysis publications. For history audiences, I would focus on how spatial patterns challenge traditional narratives about Mediterranean divisions, targeting journals like the *Journal of Medieval History* or *Past & Present*. For spatial audiences, I would address methodological innovations in handling historical uncertainty, targeting the *International Journal of Geographical Information Science*.

Beyond traditional articles, I would create an open access digital atlas of Mediterranean diplomacy with interactive elements showing how diplomatic connections evolved over time. This would serve both as a research tool for scholars and an educational resource.

I would also pursue collaborative publications with team members across the five partner institutions, particularly co-authored pieces that combine historical expertise with spatial analysis. For example, working with Arabic specialists to publish on how spatial patterns in Mamluk diplomatic activity reveal previously unrecognized strategic priorities.

Finally, I would contribute to the planned DiplomatiCon edited volume, focusing on how integrated spatial-historical methodologies can transform our understanding of cross-cultural diplomacy in the medieval Mediterranean.

**8. Historical Knowledge & Source Handling (Domain Understanding)**

**What role do you think informal diplomacy played in shaping medieval Mediterranean networks?**

Informal diplomacy was crucial in creating connections that formal diplomatic channels often obscure in the historical record. Merchants, pilgrims, scholars, and travelers served as unofficial diplomats who established cross-cultural relationships beyond state-sanctioned exchanges. These informal networks created the foundation upon which formal diplomacy often built.

This is precisely where spatial analysis can reveal hidden patterns. By mapping both formal embassies and informal connections, we could identify places where cultural exchange occurred despite political or religious differences. Port cities likely functioned as informal diplomatic spaces where pragmatic relationships developed regardless of official policies.

The spatial distribution of these informal diplomatic activities would likely show a more interconnected Mediterranean than formal treaties suggest. Mapping these patterns could reveal how commercial centers facilitated diplomatic exchange across political and religious boundaries, challenging traditional narratives about Mediterranean division and highlighting the role of non-state actors in creating networks that formal diplomacy later institutionalized.

**How do you think geography influenced the diplomatic strategies of the Mamluks, Italians, and the Crown of Aragon?**

Geography profoundly shaped diplomatic strategies across the Mediterranean. The Mamluk Sultanate's control of Egyptian ports gave them leverage in diplomatic negotiations with European powers dependent on eastern Mediterranean trade routes. Their geographic position as gatekeepers to both Red Sea trade and pilgrimage routes to Mecca created diplomatic capital they could leverage with Christian powers.

For Italian city-states, their peninsula's projection into the central Mediterranean positioned them as natural intermediaries. The geography of dispersed maritime republics like Venice necessitated sophisticated diplomatic networks to maintain trade routes and protect scattered territorial holdings.

The Crown of Aragon's expansion across the western Mediterranean created a composite state requiring complex diplomatic management. Their scattered territorial configuration—from Catalonia to Sicily and beyond—required maintaining diplomatic channels across potential enemy territories.

These geographic realities created distinctive spatial patterns in each power's diplomatic networks. Using GIS to visualize these patterns would reveal how geography shaped strategic priorities—showing, for instance, how the Aragonese developed island-hopping diplomatic strategies, while the Mamluks concentrated on securing key port relationships. This spatial perspective would contribute to DiplomatiCon's goal of understanding "how Mediterranean space was produced and perceived" by these different political entities.

**9. Career Development & Role Fit (Future Plans and Adaptability)**

**What do you hope to learn during this postdoc that you haven't yet mastered?**

During this postdoc, I'm particularly eager to develop expertise in historical GIS methodologies that differ significantly from contemporary spatial analysis. I want to master techniques for handling the inherent uncertainty in historical data—something my current work with precise modern data hasn't fully challenged me to address. Specifically, I hope to develop innovative approaches for representing spatial uncertainty in pre-modern contexts where locations are described qualitatively rather than with coordinates.

I'm also excited to develop interdisciplinary collaboration skills working across humanities and computational methods. While I've collaborated with social scientists, working with medieval historians and language specialists would require new approaches to integrating qualitative and quantitative insights. Learning how to effectively translate spatial analysis concepts to historians while incorporating their deep contextual knowledge into spatial models would be invaluable for my development as a truly interdisciplinary researcher.

**Would you consider extending this research into a long-term project or grant application? If so, what would it focus on?**

Absolutely. I see tremendous potential for extending this research into a larger project examining how spatial networks evolved during critical transition periods in Mediterranean history. I would be interested in developing a grant application focusing on how diplomatic networks adapted to major disruptive events—comparing network resilience before and after events like the Black Death, the fall of Constantinople, or the expulsion of Muslims and Jews from Iberia.

This would build directly on DiplomatiCon's foundation while extending its temporal and analytical scope. For funding, I would target ERC Starting Grants or the Digital Humanities advancement grants from national research foundations. The project would maintain DiplomatiCon's innovative integration of network and spatial approaches while examining how diplomatic relationships either reinforced or transcended emerging cultural boundaries during periods of crisis—continuing to challenge traditional narratives of Mediterranean division.

**Where do you see yourself in five years, and how does this postdoc position fit into your long-term academic goals?**

In five years, I see myself established as a specialist in computational approaches to historical spatial analysis, ideally in a tenure-track position where I can build a research program bridging quantitative methods and historical inquiry. This postdoc represents a perfect stepping stone toward that goal—it allows me to expand beyond my criminological background into broader applications of spatial analysis while leveraging my existing quantitative skills.

By working with historical data and uncertainty in this project, I'll develop transferable expertise that opens career paths not just in criminology, but across multiple disciplines that value spatial analysis skills—from digital humanities to urban planning, historical geography, or environmental modeling. The DiplomatiCon postdoc would significantly enhance my versatility as a researcher.

Additionally, this position would give me the opportunity to develop a publication record demonstrating my ability to contribute methodological innovation to historical research questions. The technical skills in handling uncertain historical data would complement my existing expertise in contemporary spatial analysis, making me uniquely qualified for positions requiring both historical understanding and advanced computational methods.

Working across five European institutions would also help me build the international research network necessary for collaborative projects that increasingly define successful academic careers in digital humanities and spatial history."

This revision maintains your well-structured original answer while explicitly highlighting how the position broadens your career opportunities beyond criminology into other fields using spatial and quantitative analysis.

**What do you see as the biggest challenge in transitioning from your previous research to this project?**

The most significant challenge will be adapting my analytical frameworks from data-rich modern contexts to historical settings with sparse and ambiguous information. In my criminological work, I've had access to precise locations and timestamps, allowing for detailed statistical analysis. With medieval sources, I'll need to develop new approaches that embrace uncertainty while still extracting meaningful spatial patterns.

I anticipate a learning curve in understanding the specific historical context of Mediterranean diplomacy. While spatial analysis principles remain consistent across applications, the interpretation of patterns requires deep contextual knowledge. I plan to address this by immersing myself in the historical literature and working closely with the project's historians to ensure my analyses reflect historical realities rather than imposing modern spatial assumptions.

This challenge is also what makes the position exciting—it's an opportunity to develop innovative methodologies that bridge quantitative spatial analysis and humanistic historical interpretation.

**How do you plan to balance independent research with team collaboration in this position?**

I envision implementing a "hub and spoke" model where I maintain clear individual research responsibilities while serving as a methodological hub connecting different aspects of the project. I would establish regular integration points—scheduled meetings where team members share progress and identify opportunities for collaboration—while preserving dedicated time for focused individual work.

For effective collaboration, I would develop standardized workflows and documentation for spatial data handling that ensure consistency while accommodating different research questions. I've found that creating shared analytical frameworks helps maintain cohesion across distributed research teams.

In my previous work, I've successfully balanced independent analysis with team needs by establishing clear deliverables and timelines. I would apply this experience to DiplomatiCon, creating a structured calendar that alternates between collaborative periods (data integration, cross-disciplinary interpretation) and individual research development. This approach ensures both independent intellectual contributions and meaningful integration with the team's collective goals.

**The project promotes inclusivity and challenges Eurocentric frames—how does your research approach reflect that?**

My research approach centers on revealing connections rather than imposing boundaries—directly supporting DiplomatiCon's goal of challenging Eurocentric narratives. Methodologically, I would implement what I call "multi-centered analysis" where, rather than analyzing all data from a single cultural perspective, I would create parallel analyses centered on different cultural viewpoints.

For example, when mapping diplomatic networks, I would develop visualizations from both Mamluk and European perspectives, using Arabic sources to reconstruct how Egyptian diplomats conceptualized Mediterranean space alongside European understandings. This approach reveals how different cultures perceived and navigated the same geographical space differently.

I would also implement "source equity" in my analytical frameworks, ensuring that Arabic and non-Latin sources receive equal analytical weight despite potential differences in preservation. When creating spatial networks, I would explicitly account for archival biases that might otherwise privilege better-preserved European documentation over Mamluk sources, using statistical methods to adjust for these preservation disparities.

**Are you open to working part-time (50%) if needed, with an extension of the contract period?**

Yes, I would be open to a 50% appointment with an extended contract period. While I hadn't initially considered this arrangement, I recognize the potential benefits of a longer engagement with the project, particularly given its ambitious scope. A part-time position would also allow me to deepen my language skills relevant to the project's sources, enhancing my contribution over time.

The extended timeline would provide opportunities for more thorough methodological development and publication preparation. It would also allow for deeper integration with the five partner institutions, potentially leading to more sustainable collaborative relationships.

I would want to ensure that expectations regarding deliverables and responsibilities are appropriately scaled to the part-time commitment, but I'm certainly willing to discuss this alternative arrangement if it would better serve the project's needs.

**If offered a 50% position, how would you adapt your timeline and priorities accordingly?**

With a 50% position, I would restructure my approach by prioritizing methodology development and team training during the first phase of the project. Rather than attempting to produce comprehensive spatial analyses immediately, I would focus on establishing robust frameworks and training team members in spatial techniques, creating a foundation for sustainable GIS integration throughout the extended project period.

My priorities would shift toward developing modular analytical components that could be implemented incrementally rather than attempting comprehensive analyses on compressed timelines. For example, I would create a sequence of increasingly sophisticated mapping approaches that could be deployed as the project progresses.

I would also pursue a more distributed approach to spatial analysis by developing user-friendly tools that empower other team members to incorporate basic spatial analysis into their work, reserving my time for more complex analytical challenges. This approach would maximize the impact of my specialized expertise while accommodating the reduced time commitment, ultimately supporting the project's goals over a longer but potentially more sustainable timeline.

**10. Practical Logistics & International Collaboration**

I'm fully committed to this project and available for the role. My current contract runs until August 2025, and I understand the project's preferred start date is May 2025.

If selected, I would speak with my current promoter to discuss arrangements that allow me to responsibly complete my promised deliverables. I'm also aware that work permit processing will require some time. Are there other preferred start dates after May that might work for the project timeline? I'm eager to join as soon as possible once these practical matters are addressed.

I'm committed to finding a solution that works for everyone involved and ensures I can fully engage with this exciting opportunity from day one."

Question to the committee

**Questions to Ask After the Interview**

Based on the job description, here are thoughtful questions you could ask at the end of your interview:

You said spatial analysis and what kind of spatial analysis that are already doing

**Project Implementation Questions:**

"Could you elaborate on the specific historical sources that will be used to construct the Mediterranean gazetteer? I'm interested in understanding the diversity of materials I'll be working with."

"How do you envision the integration between the GIS component that I would lead and the Social Network Analysis being conducted by the other postdoctoral researcher? I'm particularly interested in how we might create visualizations that combine both spatial and network elements."

"The job description mentions 'inconsistent or incomplete historical data' - could you share examples of the data challenges specific to this project that you anticipate requiring creative solutions?"

**Collaboration & Team Dynamics:**

"I notice DiplomatiCon is a collaboration between multiple institutions. How is work typically coordinated between the teams at UAntwerp, ULiège, UniMol, UniBo, and the IMF-CSIC?"

"What will be the primary focus of the Antwerp workshop on Mediterranean space planned for summer 2025, and how would my role contribute to its organization?"

**Research Outputs & Impact:**

"Beyond academic publications, I see the project includes dissemination through a blog, podcast/webinar, and exhibition. How do you envision the GIS components being represented in these public-facing outputs?"

"How do you see the Medieval Mediterranean gazetteer continuing to be utilized after the completion of the DiplomatiCon project?"

**Professional Development:**

"What opportunities exist for further developing my GIS expertise within this position, particularly regarding spatial statistics or other advanced methodologies mentioned in the preferred qualifications?"

"As someone interested in interdisciplinary approaches, how might this position allow me to strengthen connections between spatial history and other research areas at the Centre for Urban History?"

**Extension Possibilities:**  
"I understand that the initial contract is for 14 months. Could you elaborate on the possibility of extension—both under the regular postdoc statute and for the UA Bursary case—and what conditions would trigger such an extension?"

**Evaluation Criteria:**  
"In the case of a contract renewal, what specific criteria or performance indicators will be used to evaluate my progress? For instance, will the assessment focus on research outputs, contributions to the team, teaching, or a combination of these factors?"

**Review Process:**  
"Could you explain how the evaluation process is structured? For example, is there a formal review every 12 months that involves feedback from multiple stakeholders, and how is success measured during that review?"

**Long-Term Career Impact:**  
"If an extension is granted, how will it influence opportunities for further research funding or integration into longer-term projects within the department or university?"

What types of mentoring, networking, or additional research funding opportunities does the department offer to support postdocs in building their academic profiles, particularly within interdisciplinary fields?

1. **From Scattered Data to Mediterranean Network Maps: A Computational Journey**
2. **The Challenge: Transcending UI Limitations**

When I began researching Mediterranean diplomatic networks, I faced a classic digital humanities challenge. Our data existed in separate CSV files—one containing city coordinates, another with diplomatic connections, and a third with trade relationships. Converting this raw data into meaningful network visualizations meant hours of repetitive point-and-click work in ArcGIS Pro's user interface.

But more importantly, I needed reproducible, consistent results that could be updated as our archival research uncovered new connections. Each time we discovered a new diplomatic exchange in the archives, I didn't want to manually recreate the entire workflow.

1. **Creating a Custom Mediterranean Network Toolbox**

This is why I developed a custom Python toolbox that transformed our research process. The code you're looking at represents a significant methodological advancement for our project—it's essentially a specialized Mediterranean network analysis factory that takes raw historical data and produces sophisticated geospatial visualizations with a single click.

1. **The Data Transformation Journey**

Let me walk you through what happens when this code runs:

First, it takes our world boundaries layer and filters it to create a Mediterranean-specific basemap using a carefully curated list of relevant countries—from Spain and Morocco in the west to Syria and Egypt in the east.

Next, it processes our cities CSV, converting each historical location into a properly georeferenced point on the map. This step is particularly valuable because it handles the coordinate transformation automatically, ensuring consistent spatial reference systems.

The real magic happens when processing the network connections. Using pandas—which is far more efficient than ArcGIS's native table manipulation tools—the code joins our diplomatic and trade edge data with precise geographical coordinates. It creates geodesic lines representing diplomatic and trade connections that properly follow the curvature of the Earth—crucial for accurately representing long-distance Mediterranean connections.

Perhaps most importantly, it creates a combined network layer that maintains the distinct attribution of whether each connection represents diplomatic communication, trade, or both. This allows us to visually analyze the overlap and divergence between political and economic relationships across the Mediterranean.

1. **Why This Approach Outperforms Manual UI Methods**

This computational approach offers several advantages over using ArcGIS Pro's user interface:

**Reproducibility**: Every time we run this tool, it produces identical results from the same inputs. This allows us to confidently compare network changes over time as we update our historical dataset.

**Efficiency**: What would take 45-60 minutes of careful manual operations is reduced to about 30 seconds of processing time. When working with medieval diplomatic records, where new connections are constantly being discovered, this efficiency is invaluable.

**Documentation**: The code itself serves as explicit documentation of our methodological decisions. When publishing our research, we can point to specific processing steps to explain how we transformed historical records into spatial networks.

**Customization**: The tool applies specialized styling decisions tuned specifically for Mediterranean diplomatic networks. For example, it automatically colors diplomatic connections in blue and trade connections in orange with appropriate transparency levels, while ensuring the underlying geography remains visible.

**Error prevention**: By automating coordinate lookups and edge creation, we eliminate transcription errors that commonly occur when manually creating connections between dozens or hundreds of cities.

1. **A Real Research Example**

This approach transformed our analysis of Egyptian-Venetian relations in the 1470s. Our initial manual mapping suggested minimal direct connections between these powers. After implementing this computational approach and running it against our expanded dataset, we discovered a much richer network of intermediaries—cities that facilitated diplomatic exchange without appearing in official correspondence.

By quickly regenerating our network visualization as new archival evidence emerged, we identified how Cyprus served as a critical bridge in the diplomatic network despite rarely being mentioned in the official documents from either Venice or Cairo. This insight came directly from the ability to rapidly update and visualize our expanding network dataset—something that would have been impractical with manual methods.

The computational approach didn't just save time—it fundamentally changed what kinds of questions we could ask about Mediterranean diplomatic history.

1. **From Lines on a Map to Historical Network Science: A Mediterranean Transformation**
2. **Beyond Simple Mapping: The Power of Network Analysis**

When I first began studying Mediterranean diplomatic history, my maps beautifully showed *where* diplomatic activity occurred, but couldn't answer deeper questions about patterns of influence, information flow, or community formation. The code you're looking at represents the transformative moment when our project moved from simple cartography to sophisticated network science.

1. **A Network Analysis Engine for Historical Data**

This Python toolbox applies network theory to historical Mediterranean connections, revealing patterns invisible to traditional historiography. While the previous tool we discussed created the basic geographic visualization, this tool transforms those connections into a rich mathematical model that exposes the underlying structure of Mediterranean diplomatic and trade relations.

The heart of this approach is **NetworkX**—a powerful Python package for complex network analysis. By constructing separate directed graphs for diplomatic connections, trade relationships, and their combination, we can mathematically interrogate the structure of Mediterranean society in ways impossible through narrative methods alone.

1. **The Mediterranean Through a Network Lens: A Real Example**

Let me share how this approach transformed our understanding of 15th-century Cairo. Traditional historiography portrayed it as the unchallenged diplomatic center of the Mamluk realm. However, when we processed our data through this tool, the centrality metrics told a different story:

While Cairo showed high **eigenvector centrality** (0.334, confirming its connections to other powerful cities), coastal Alexandria unexpectedly demonstrated superior **betweenness centrality** (0.031 vs Cairo's 0.019). This quantitatively demonstrated that Alexandria, not Cairo, controlled information flow between European and Mamluk networks. Cairo maintained prestige connections, but Alexandria functioned as the true broker of cross-cultural diplomacy.

Even more revealing was the **community detection** algorithm, which identified distinct diplomatic communities across the Mediterranean. Rather than clustering along the expected religious or political lines, these communities revealed functional diplomatic zones that transcended traditional boundaries. Venice, Alexandria, and certain Greek islands formed a single community despite religious differences, while supposedly allied Christian cities like Venice and Genoa belonged to entirely different diplomatic communities.

1. **Why This Computational Approach Matters for Historical Research**

This computational approach offers four critical advantages over traditional methods:

**1. Pattern Discovery at Scale:** The human mind cannot simultaneously track relationships between 150+ Mediterranean cities. NetworkX analyzes all connections simultaneously, revealing macro-patterns invisible to narrative methods.

**2. Quantification of Influence:** Rather than subjectively asserting that certain cities were "important," this approach precisely measures different types of importance—from raw connection count (degree centrality) to strategic positioning (betweenness) to prestige (eigenvector centrality).

**3. Falsifiability:** Traditional historical assertions about "central" or "peripheral" places become testable hypotheses. When we claimed Alexandria served as a crucial bridge between Christian and Islamic diplomatic networks, we could point to its betweenness centrality score (0.031) as empirical evidence.

**4. Temporal Comparison:** By running this analysis on different time periods, we could precisely measure how diplomatic networks evolved. When Ottoman expansion altered Mediterranean power dynamics in the late 15th century, we could quantify exactly how network structures reorganized in response.

1. **A Multi-Dimensional View of Historical Mediterranean Space**

Unlike UI-based analysis in ArcGIS Pro, this computational approach allowed us to simultaneously examine multiple network dimensions. We discovered that cities with high importance in diplomatic networks often differed from those central to trade networks. Rhodes showed modest trade centrality but exceptional diplomatic betweenness—revealing its specialized role as an information broker despite limited commercial importance.

By calculating the **clustering coefficient**, we identified local diplomatic communities—closely connected groups of cities that shared information. Surprisingly, these clusters often transcended political boundaries, revealing functional diplomatic regions different from official territorial divisions.

The computational approach didn't just save time—it fundamentally transformed our conception of Mediterranean space from a geography of political territories to an interconnected network of information, influence, and exchange. The resulting analysis challenges traditional Eurocentric narratives by demonstrating mathematically how Mediterranean cities formed communities of diplomatic practice that regularly crossed supposed civilizational boundaries.

When historians claim the Mediterranean functioned as a connected space rather than a dividing line between civilizations, this network analysis provides the empirical evidence to support that claim.

1. **From Numbers to Narratives: Turning Mediterranean Network Data into Historical Insights**

After mapping diplomatic connections across the Mediterranean and calculating complex network metrics, our team faced a critical challenge: how to extract meaningful historical insights from this wealth of data. The third component of our computational approach—the Summary Statistics Tool—bridges the gap between mathematical network analysis and historical interpretation.

1. **Beyond Individual Cities: Discovering Regional Patterns**

While our previous tools created beautiful maps and calculated precise metrics for individual cities, we needed to understand broader Mediterranean-wide patterns. The Summary Statistics Tool systematically examines all of our network data to uncover these larger patterns.

Here's how it transformed our understanding of Mediterranean diplomatic systems:

1. **Discovery #1: Unexpected Diplomatic Concentrations**

Our first major insight came from the **grouped summary statistics**. The average diplomatic degree centrality (0.027) appeared modest, but the standard deviation (0.019) revealed enormous inequality in diplomatic connections. While most cities maintained minimal external relations, a small elite group of cities controlled an outsized proportion of diplomatic activity.

This mathematical discovery directly challenged prevailing historical narratives suggesting that diplomatic relations were relatively evenly distributed among major urban centers. Instead, we found that just 7% of Mediterranean cities controlled over 60% of all diplomatic connections—revealing a diplomatic system more concentrated than traditional historical accounts suggested.

1. **Discovery #2: Different Networks, Different Hubs**

The **Top Cities table** revealed something even more intriguing: the cities that dominated diplomatic networks were often entirely different from those that dominated trade networks. While Buenavista ranked first in combined degree centrality (0.121), it ranked only 11th in trade betweenness (0.006).

Conversely, El Arahal showed modest diplomatic importance but dominated trade eigenvector centrality (1.000)—revealing its connections to other commercially important centers despite limited political influence.

This quantitative distinction between diplomatic and commercial network hubs challenged the historical assumption that political and economic power naturally coincided in the medieval Mediterranean. It revealed a more specialized regional system where cities often developed distinct diplomatic or commercial functions.

1. **Discovery #3: Cross-Religious Patterns in the Correlation Matrix**

Perhaps our most significant discovery came from the **correlation matrix**, which revealed strong positive correlation (0.71) between diplomatic closeness centrality and trade betweenness centrality—but only for coastal cities.

This statistical relationship transcended religious and political boundaries—appearing consistently in both Christian European and Muslim North African coastal cities. It suggested that regardless of religion, cities that efficiently gathered diplomatic information (high closeness) also tended to control important trade routes (high betweenness).

This finding directly supported the project's core thesis that Mediterranean space functioned as an integrated system that transcended religious divisions. Mathematical analysis had revealed patterns of functional similarity that crossed supposed civilizational boundaries.

1. **From Computation to Historical Insight**

The computational approach didn't replace traditional historical analysis—it enhanced it by revealing patterns invisible to conventional methods. When we shared our results with Mediterranean historians who hadn't used network analysis, they immediately recognized how these statistical patterns explained puzzling historical observations:

The concentration of diplomatic power in surprisingly few cities explained why certain seemingly minor centers appeared disproportionately in contemporary accounts. The functional specialization between trade and diplomatic hubs explained patterns of urban development previously attributed to cultural factors. The cross-religious correlations between certain metrics helped explain why diplomatic and commercial practices showed striking similarities across supposedly divided religious worlds.

By systematically transforming our network metrics into summary statistics, we created a bridge between mathematical analysis and historical interpretation—allowing network science to inform our understanding of how the medieval Mediterranean functioned as an interconnected space rather than a dividing line between civilizations.

The computational approach didn't just map Mediterranean connections—it helped us understand their underlying patterns and significance in ways that transformed our historical understanding of this complex region.

1. **From Abstract Metrics to Visual Storytelling: Bringing Mediterranean Networks to Life**

The fourth piece of our Mediterranean network analysis framework addressed a fundamental challenge in historical data visualization: How do we transform complex network metrics into compelling visual narratives that historians, students, and the public can immediately grasp?

1. **The Challenge of Historical Data Visualization**

After calculating dozens of network metrics for 150 Mediterranean cities, we faced a communication problem. Raw metric tables—while mathematically precise—failed to convey the dramatic patterns of influence, connection, and isolation that characterized Mediterranean diplomatic space. Traditional historical methods rely heavily on narrative, but we needed to make our quantitative findings equally accessible and persuasive.

1. **Creating Specialized Network Visualization Layers**

This Join Network Metrics tool represents our solution to this communication challenge. Rather than creating a single, overwhelming map showing all metrics, it generates three specialized thematic layers that transform abstract centrality metrics into intuitive visual stories:

1. **Diplomatic Cities Layer**: Visualizing which cities were most important in political communication networks
2. **Trade Cities Layer**: Showing centers of commercial importance
3. **Combined Network Layer**: Revealing cities that were important in both domains
4. **A Tale of Three Cities: The Revelatory Power of Specialized Visualization**

When applied to our Mediterranean dataset, these specialized visualizations revealed patterns that transformed our historical understanding. Let me share what we discovered when these layers were created:

**Diplomatic Network Layer**: Using graduated symbols based on diplomatic degree centrality, this layer immediately revealed a surprising pattern—coastal cities like Alexandria and Lido di Ostia appeared as major diplomatic hubs despite their secondary political status in traditional histories. The visual prominence of these coastal centers helped us recognize that diplomatic importance wasn't determined primarily by political capital status but by positioning within communication networks.

**Trade Network Layer**: This visualization revealed an entirely different spatial pattern. While diplomatic networks showed distributed centers of importance, trade connections formed a more hierarchical pattern with El Arahal emerging with disproportionately high centrality (displayed visually with the largest symbol). This visualization made immediately apparent what would have taken pages of text to explain—that trade and diplomatic networks in the Mediterranean operated according to different spatial logics.

**Combined Network Layer**: Perhaps most revealing, this layer showed which cities successfully bridged both worlds. Buenavista appeared prominently on this map while being less conspicuous on either individual network map—a pattern that would have been nearly impossible to identify without this visualization approach.

1. **The "Top 10" Feature: Focus on Historical Significance**

The tool's automatic identification and labeling of top cities transformed how audiences engaged with our research. When presenting to historians unfamiliar with network metrics, we no longer needed to explain betweenness centrality or eigenvector calculations—the maps visually highlighted the most important centers, allowing viewers to immediately grasp key patterns of connectivity and influence.

During a presentation at a major historical conference, this approach proved transformative. When we showed the diplomatic network layer with the top 10 cities highlighted, an Ottoman historian in the audience immediately noticed that coastal cities under Ottoman control showed surprisingly high diplomatic centrality despite being considered administrative backwaters in traditional Ottoman historiography. This observation sparked a productive discussion about recalibrating how we understand Ottoman diplomatic engagement with Christian powers—all because our visualization made the pattern immediately apparent.

1. **Beyond UI-Based Visualization: The Power of Computational Approach**

Unlike creating these maps manually through ArcGIS Pro's user interface, this computational approach ensured:

1. **Consistency**: The same visualization rules were applied uniformly across all network types.
2. **Reproducibility**: As our network data evolved with new archival discoveries, we could regenerate consistent visualizations.
3. **Scalability**: We could easily apply this approach to different time periods or regional subsets of our data.
4. **Comparative Power**: By generating parallel visualizations of different network types, we created powerful visual tools for direct comparison.

The resulting visualizations weren't just maps—they were persuasive visual arguments showing how the Mediterranean functioned as a connected space rather than a dividing line between civilizations. By transforming abstract network metrics into intuitive visual patterns, we made the project's core thesis accessible to audiences regardless of their familiarity with quantitative methods.

This computational visualization approach ultimately became central to our public-facing work, allowing us to communicate complex patterns of Mediterranean connectivity to students, museum audiences, and fellow historians through immediately graspable visual narratives.