

Current Topics in the Geographic Information Science & Technology Body of Knowledge

Foundational Concepts (FC)		Computing Platforms (CP)	
<u>Origins</u>	<u>Basic Measures</u>	<u>Computing Infrastructures</u>	<u>Software Systems</u>
Public & Private Sector Origins	Academic developments <i>Intro to the GIS&T BoK</i>	Graphics Processing Units (GPUs) Cyberinfrastructure Spatial Cloud Computing Mobile Devices e-Science, Evolution of Science	Spatial Database Mgmt Systems Artificial Intelligence Tools & Platforms Geospatial Technology Transfer Web GIS Enterprise GIS
<u>Cognitive</u>	<u>Interrogating Geog Info</u>	<u>Computing Approaches</u>	<u>Examples & Applications</u>
The Power of Maps and Mapping Place and Landscape <i>Foundational Ontologies</i>	Shape Areal Operations Directional Operations Distance Operations <i>First & Second Laws of Geography</i>	Origins: Computer Systems Origins: Peripheral Devices <i>High Throughput Computing and GIS</i> <i>High Performance Computing and GIS</i> <i>Science Gateways</i>	Google Earth Engine ArcGIS Online GIS&T and Computational Notebooks <i>Apache Spark</i> <i>OSGeo Live</i>
Perceptions & Cognitive Processing <i>Ontologies for Analysis</i>	Proximity and Distance Decay Adjacency and Connectivity Resolution Geometric Primitives & Algorithms Spatial Autocorrelation	<u>Social Media & Location Services</u>	
Semantic Information Elicitation	Set Theory SQL & Attribute Theories Spatial Queries	Location-based Services Social Media Analytics Social Networks <i>GIS and the Internet of Things</i> <i>GIS and Web Services</i>	
<u>Domains of Geog Info</u>	<u>Uncertainty</u>	Programming & Development (PD)	
Space Time Space-Time Relationships	Data Properties Networks Neighborhoods Events & Processes	<u>Algorithm Design & Approaches</u>	<u>Application Development</u>
Philosophical	Openness Epistemology Philosophical Perspectives	Real Time Prgrmmng & Geocomputation Natural Language Processing in GIS Machine Learning Programming for GIS Linear Programming and GIS GIS and Parallel Programming <i>Object-oriented programming</i>	Design, Develop, Test, Deploy <i>Verification & Validation of GIS Apps</i> Commercialixation of GIS Apps Licensing of GIS Apps Open Source Software Development <u>Platform-Specific Programming</u>
Knowledge Economy (KE)		<u>Languagues & Libraries</u>	<u>Development Tools</u>
<u>GIS&T Workforce</u>	<u>Coordinating Organizations</u>	Python for GIS PySal and Spatial Statistics Libraries R for Geospatial Analysis & Mapping Javascript for GIS SQL Languages for GIS GDAL/OGR and IO Libraries	Programming of Mobile GIS Apps Web GIS Programming Visual Programming for GIS Apps SpatialMPI for GIS Apps GIS APIs
GIS&T Workforce Development Competence in Knowledge Work GIS&T Positions and Qualifications GIS&T Education & Training Professional Certification	Value of Geospatial Professional Orgs. <i>Regional GIS Coordination & Collaboration</i> Multi-Organizational GIS Coordination Publications and Conferences The Geospatial Community The Geospatial Industry	GIS&T and Society (GS)	
<u>Design & Implementation</u>	<u>GIS Operations</u>	<u>Law, Regulation, and Policy</u>	<u>Governance & Agency</u>
The Process of GIS&T Design Strategic Planning for GIS Design Project Planning & Management Measuring GIS ROI Measuring GIS Costs <i>Managing Infrastructure & Operations</i>	Systems Modeling for Mngmt Organizational Models for GIS Mngmt Funding	<i>The Legal Regime</i> Location Privacy Mechanisms of Control of Geosptl Info Legal Mechanisms for Sharing GIS&T for Equity and Social Justice	<i>Public Participation GIS</i> Professional & Practical Ethics of GIS&T Codes of Ethics for GIS Professionals Aggregation & Redistricting <i>Implications of Distributed GIS&T</i>
Data Capture (DC)		<u>Critical Perspectives</u>	
<u>History & Trends</u>	<u>Remote Sensing Platforms/Sensors</u>	Epistemological Critiques GIS and Critical Ethics Feminist Critiques of GIS Balancing Data Access, Security, Privacy	GIS&T and Citizen Science GIS&T and Spatial Decision Support Maps/Spatial Justice & Marginal Societies GIS&T and Community Engagement Geospatial Participatory Modeling
Changes Over Time Part 1: Tech Dev Changes Part 2: Implications & Cases Georeferencing & Georectification	Remote Sensing Platforms Overview Nature of Multispectral Images Unmanned Aerial Systems Landsat	Domain Applications (DA)	
<u>Software & Data Coordinating Orgs.</u>	<u>Processing Remotely-Sensed Data</u>	Disaster Management <i>Earth Science Research</i> <i>Economic Development</i> <i>Ecosystem Science & Management</i>	<i>Land Administration</i> <i>Landscape Architecture</i> Landscape Ecology Libraries, Archives, and Museums Local Government Marine Science Marketing Natural Resource Management <i>Politics</i> Public Health Public Policy
Multi-Organization GIS Coordination National Organizations & Programs International Organizations & Programs	Light Detection & Ranging (LiDAR) Basics <i>Hyperspectral Imagery</i> <i>Airborne LiDAR Bathymetry</i> <i>Thermal Imagery</i> <i>Radar, Sonar, and Echolocation</i>	Education & Training <i>Energy Development</i> <i>Environmental Science & Management</i> Epidemiology <i>Facilities Management</i> Forestry Geodesign <i>Humanitarian Mapping</i> <i>Hydrology and Hydraulics</i> <i>Insurance</i>	
<u>Digital Data Sources & Methods</u>	<u>GIS and Surveying</u>	Intelligence & National Security <i>Insurance</i> International Affairs	
Historical Paper Maps Global Navigation Satellite Systems Aerial Photos: History & Georeferencing Street-Level Imagery Social Media Platforms <i>Mobile Applications</i> <i>Texts</i> Volunteered Geographic Info (VGI) Time-of-Arrival Localization	Professional Land Surveying <i>Land Records</i> <i>Ocean Surveying</i>	GIS&T Body of Knowledge 2/28/2023 bold = revised & expanded regular = original & still limited <i>italics = future or forthcoming</i> https://gistbok.ucgis.org	
<u>Field Data Collection</u>	<u>Domain Applications (DA)</u>		
Sampling: Size, Selection, Types Field Data Capture Technologies U.S. Census Data	Agriculture Archaeology Architecture Business Civil Engineering <i>Climate Studies & Atmos. Science</i> Computational Geography <i>Conservation</i> Criminal Justice / Law Enforcement Digital Humanities		

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Data Management (DM)		Analytics & Modeling (AM)	
<u>Spatial Databases</u>	<u>Query Processing</u>	<u>Methodological Context</u>	<u>Analysis of Errors & Uncertainty</u>
Spatial Database Mngmnt Systems	<i>Optimal I/O Algorithms</i>	Geospatial Analysis & Model Building	Conceptual Models of Error/Uncertainty
Relational DBMS and Extensions	Spatial Joins	Evolution of Reasoning, Analytics	Spatial Data Uncertainty
<i>Geodatabases</i>	<i>Complex Queries</i>	<u>Building Blocks</u>	Problems of Scale & Zoning
<i>Topological Relationships</i>	<u>Georeferencing Systems</u>	Overlay	Thematic Accuracy and Assessment
Database Administration	Linear Referencing	Areal Interpolation	Mathematical Models of Uncertainty
Conceptual Data Models	Earth's Shape, Sea Level, Geoid	Aggregation of Spatial Entities	Error-based Uncertainty
Logical Data Models	<i>Geographic Coordinate Systems</i>	Grid Operations & Map Algebra	Stochastic Simulation & Monte Carlo
Physical Data Models	Planar Coordinate Systems	Classification & Clustering	Fuzzy Aggregation Operators
Array Databases	<i>U.S. National Grid</i>	<i>Boundaries & Zone Membership</i>	<u>Big Data & Geospatial Analysis</u>
NoSQL databases	Vertical (Geopotential) Datums	Spatial Queries	Problems of Large Spatial Databases
Problems w/ Large Spatial Databases	Horizontal (Geometric) Datums	Buffering	Pattern Recognition and Matching
<u>Representation of Spatial Objects</u>	Map Projectoins	<u>Data Exploration & Spatial Stats</u>	Artificial Intelligence Approaches
Raster Data Models	Georeferencing & Georectification	Spatial Statistics	Intro to Spatial Data Mining
Hexagonal Models	<u>Data Manipulation</u>	Spatial Sampling for Spatial Analysis	Rule Learning for Spatial Data Mining
Triangular Irregular Network (TIN) Models	Point, Line, Area Generalization	Exploratory Spatial Data Analysis	Machine Learning Approaches
Hierarchical Data Models	Vector-to-Raster and R-to-V Conversions	Point Pattern Analysis	Cyberinfrastructure
Topological Models	Raster Resampling	Kernels & Density Estimation	<u>Surface & Field Analysis</u>
Vector Data Models	Coordinate Transformations	Spatial Interaction	Modeling Surfaces
Network Models	Transaction Management	Cartographic Modeling	<i>Gridding, Interpolation, & Contouring</i>
Entity-based Models	<u>Data Standards & Infrastructures</u>	Multi-Criteria Evaluation	<i>Inverse Distance Weighting</i>
Modeling 3-D Entities	Metadata, Quality, and Uncertainty	Landscape Metrics	<i>Radial Basis and Spline Functions</i>
Fields in Space and Time	Geospatial Content Standards	Hot-spot and Cluster Analysis	<i>Polynomial Functions</i>
Fuzzy Models	Spatial Data Warehouses	Global Measures of Spatial Association	Kriging Interpolation
Events and Processes	Spatial Data Infrastructures	Local Indicators Spatial Autocorrelation	<i>LiDAR Point Cloud Analysis</i>
Geneological Relationships, Lineage	U.S. National Spatial Data Infrastructure	Simple Regression & Trend Surfaces	Intervisibility, Line-of-Sight, Viewsheds
Geospatial Data Conflation	Ontology for Geosptl Semantic Interop.	Geographically Weighted Regression	<i>DEM and Terrain Metrics</i>
<u>Spatial Access Methods</u>	Marine Spatial Data Infrastructures	Spatially Autoregressive Models	<i>TIN-based models and Terrain Metrics</i>
Spatial Data Retrieval Strategies	<u>Map Design Techniques</u>	Spatial Filtering Models	Watersheds and Drainage
Spatial Indexing	Common Thematic Map Types	<u>Network & Location Analysis</u>	<i>3D Parametric Surfaces</i>
Space-driven Structures	Multivariate Mapping	<i>Intro to Network & Location Analysis</i>	<u>Geocomputation Methods/Models</u>
Data-driven structures	Spatio-Temporal Representation	<i>Network Route & Tour Problems</i>	Cellular Automata
Modeling Unstructured Spatial Data	Representing Uncertainty	Location & Service Area Problems	Agent-based Modeling
Modeling Semi-structured Spatial Data	Terrain Representatoin	Accessibility Modeling	Simulation Modeling
<u>Cartography & Visualization (CV)</u>	Cartograms	Location-Allocation Modeling	<i>Artificial Neural Networks</i>
<u>History & Trends</u>	Map Icon Design	The Classic Transportation Problem	Genetic Algorithms / Evolutionary Cmptng
Cartography & Science	Narrative & Storytelling	<u>Space-Time Analytics & Modeling</u>	Time Geography
Cartography & Art	Flow Maps	Capturing Spatiotemporal Dynamics	GIS-based Computational Modeling
Cartography & Power	Collaborative Cartography	Computational Movement Analysis	<i>Volumes and Space-Time Volumes</i>
<u>Data Considerations</u>	<u>Interactive Design Techniques</u>	<u>Domain Applications (DA) (continued)</u>	Real Estate
Vector Formats & Sources	User Interface & User Experience (UI/UX)	Recreation Planning & Management	Urban & Regional Planning
Raster Formats & Sources	Web Mapping	Retail Businesses	<i>Utilities</i>
<u>Map Design Fundamentals</u>	Virtual & Immersive Environments	State & Regional Government	<i>Water Resources</i>
Scale & Generalization	Big Data Visualization	Telecommunicaions	<i>Wildlife & Fisheries Science</i>
Statistical Mapping	Mobile Maps & Responsive Design		
Map Projections	Usability Engineering & Evaluation		
Map Projections	Geovisual Analytics		
Visual Hierarchy & Layout	Geovisualization		
Symbolization & Visual Variables	Map Reading		
Color Theory	Map Interpretation		
Typography	Map Analysis		
Design and Aesthetics	Lesson Design in Cartography Education		
Map Production & Management			
<u>Map Use</u>			

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