

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

GIS&T Body of Knowledge
10/1/2021

bold = revised, expanded
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<https://gistbok.ucgis.org>

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

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