

Contents

<i>Preface</i>	xv	Research design examples	26
<i>Acknowledgments</i>	xxi	Research funding source examples	29
Chapter 1: Democratizing spatial thinking across higher education	1	Research funding mechanism examples	33
U-Spatial	2	Research location examples	36
A week in the life of U-Spatial	3	Chapter 3: Teaching	45
The early years (2011–2015)	4	Introduction	45
Joining Research Computing (2015–2019)	6	The GIS professional curriculum	45
Rapid expansion (2019–2026)	8	The GIS-assisted curriculum	47
What services does a geospatial support center provide?	9	Rubric	49
Help desk	10	Assignments for a one- to two-week project	49
Training workshops	10	Assignments for a four- to six-week project	50
Support for instructors and learners	11	Assignments for a full-term, 15-week project	50
Access to tools, software, and computing infrastructure	12	Grading	52
Access to data	12	Group assignments	52
Community building and outreach	13	Arts examples	53
Consulting	13	History examples	58
Conclusion	14	Politics and government examples	62
Chapter 2: Research	15	Public health examples	64
Introduction	15	Science and technology examples	67
Research types	15	Chapter 4: Campus facilities	80
Research methods	16	Introduction	80
Research designs	17	Campus access	80
Research funding sources	18	Campus assets	81
Research funding mechanisms	19	Campus quality of life	82
Research locations	20		
Research type examples	21		
Research method examples	24		

Campus planning	82	Architecture, engineering, and construction examples	140
Campus access examples	83	Business examples	142
Campus asset examples	88	Conservation examples	143
Campus quality of life examples	93	Defense and intelligence examples	145
Campus planning examples	98	Education example	147
Chapter 5: Community engagement	107	Energy utilities example	147
Introduction	107	Health and human services examples	148
Global communities	108	National government examples	149
National communities	108	Natural resource examples	151
Regional communities	109	Nonprofit and NGO examples	153
Local communities	109	Petroleum example	155
Global community examples	110	Public safety examples	156
National community examples	114	Science example	157
Regional community examples	118	State and local government example	158
Local community examples	125	Sustainable development example	159
Chapter 6: GIS careers	136	Telecommunications examples	160
Introduction	136	Transportation examples	162
The GIS workplace	137	Water examples	163
Architecture, engineering, and construction	137	Chapter 7: Building a geospatial support center	167
Business	137	GIS support center models	167
Conservation	137	Libraries	168
Defense and intelligence	137	Information technology	168
Education	137	Dedicated GIS centers	169
Energy utilities	138	Departments or individuals	169
Health and human services	138	Community efforts	169
National government	138	Advice for GIS support center adoption	170
Natural resources	138	Advice for license administrators	172
Nonprofits and NGOs	138	Resources	173
Petroleum	138	Organizations	173
Public safety	138	Additional information	174
Science	139		
State and local government	139		
Sustainable development	139		
Telecommunications	139		
Transportation	139		
Water	139		

CONTENTS BY Discipline

The contents of this book are divided into four categories of interest: contents by discipline, by industry, by organization, and by location. These categories should help you locate the topic or topics that best meet your field of interest.

Arts and Literature

Mapping Dante's <i>Inferno</i>	53
Mapping James Joyce's <i>Ulysses</i>	54
Mapping temporary memorials	55
Painting with GIS	56
Geolocating Atlanta's rap	57
Public art	96
Architecture	140
Landscape architecture	141

Business

Consumer behavior	142
Real estate	142
Economics	149

Campus Operations

Indoor wayfinding	84
Accessibility	85
Inclusivity	85
Navigation	86
Wayfinding	87
Parking	87
Digital twins	88
Asset mapping	88
Space use	91
Space efficiency	92
Space management	93
Theft	95
Trash	97
Dashboards	98
Shared facilities	98
Frameworks	100
Expansions	101
Living systems	101
Connections	104

History

Nomadic tribes	25
Historical maps	29
Racial segregation	30
Indigenous environmentalism	33
Migrating farmworkers	35
Mine maps	37

Indigenous knowledge	39
American jazz clubs	54
Preserving Native American sites	58
Enslaved peoples' migration	59
Mortality in medieval Europe	59
Nightlife in old Shanghai	60
Spanish silver trade	61
Recognizing Indigenous communities	118
Recovering the Indigenous landscape	121
Revealing redlining	127

Politics and Government

Legal deserts	22
Territorial justice	24
Urban diversity	26
Climate change preparation	26
Electric commuting	29
Port positioning	31
Ownership of Indigenous land	62
The culture-nature divide	63
Femicide in Türkiye	63
Shared feelings about places	64
African American golfing	65
Emergency management	91
Visions	99
Mixed-use neighborhoods	102
Regional systems	103
Mapping the news	110
Providing election information in the United States	114
Redistricting statewide elections	118
Uncovering university-driven displacement	126
Planning for recognition justice	128
Greening vacant urban land	130
Defense	145
Intelligence	146
Equity	147
United Nations Sustainable Development Goals	159
Water utility	163

Public Health		Saving seagrass	72
Equity priorities	25	Global prevalence of languages	73
The impact of COVID-19	31	Coastal mangroves	74
Open space	32	Saving sea turtles	75
Hurricane preparation	36	Protecting crustaceans	76
Brain trauma	38	Reducing soil erosion	77
Air quality	40	Water	89
Mapping hunger	40	Utilities	90
Nature's diversity	41	Tree canopy	94
Mapping vaccinations	42	Food	95
Pediatric malaria in Nigeria	65	Mapping world ecosystems	111
Mapping medicine's consolidation	66	Protecting ocean biodiversity	112
Mapping mental health	67	Identifying planners	113
Bike access in New York City	68	Going from global to national	114
Access to health care	69	Locating citizen scientists in Europe	115
Mental health	83	Planning for climate change in England	116
Health	93	Highlighting water scarcity in South Africa	117
Anticipating COVID-19 risks	120	Finding GIS programs in the United States	117
Tracking opioid use	123	Reducing climate impacts	119
Planning for tsunami evacuation	125	Decarbonizing Sardinia	122
Achieving the 20-minute city	130	Predicting regional water demand	123
Monitoring air quality	131	Transforming Puerto Rico	124
Dentistry	148	Showing landscape change	125
Public health	149	Mapping urban plant life	129
Digital equity	154	Coordinating economic and ecological development	132
Physical safety	157	Relinking city and landscape	133
Noise	162	Biodiversity	143
Congestion	163	Ecology	144
Science and Technology		Electric grid	147
Human-elephant conflicts	21	Demographics	150
The Sundarbans	23	Agriculture	151
Boundary markers	27	Agronomy	152
Dam removal	28	Climate change	153
River dolphins	33	Pipelines	155
River ecosystems	34	Criminology	156
Nutrient diversity	36	Seismology	157
Research centers	39	Geography	158
Disappearing farmland in the West Bank	69	Cables	160
Tracking bird strikes	70	Satellites	161
Water quality in farm fields	71	Oceanography	164

CONTENTS BY Industry

Architecture, Engineering, and Construction

Open space	32
Architecture	140
Physical safety	157

Aviation

Intelligence	146
--------------	-----

Business

Port positioning	31
Mapping the news	110
Consumer behavior	142
Real estate	142

Conservation

Human-elephant conflicts	21
Territorial justice	24
River dolphins	33
River ecosystems	34
Tracking bird strikes	70
Saving seagrass	72
Coastal mangroves	74
Saving sea turtles	75
Protecting crustaceans	76
Reducing soil erosion	77
Biodiversity	143

Defense

Defense	145
---------	-----

Education

Historical maps	29
Racial segregation	30
Migrating farmworkers	35
Mapping Dante's <i>Inferno</i>	53
Mapping James Joyce's <i>Ulysses</i>	54
American jazz clubs	54
Mapping temporary memorials	55
Painting with GIS	56
Geolocating Atlanta's rap	57
Preserving Native American sites	58
Enslaved peoples' migration	59
Mortality in medieval Europe	59
Nightlife in old Shanghai	60
Spanish silver trade	61
Disappearing farmland in the West Bank	69
Global prevalence of languages	73
Tree canopy	94

Food	95
Trash	97
Dashboards	98
Identifying planners	113
Locating citizen scientists in Europe	115
Finding GIS programs in the United States	117
Recognizing Indigenous communities	118
Mapping urban plant life	129
Equity	147
Demographics	150
Digital equity	154
Criminology	156

Emergency Management

Planning for tsunami evacuation	125
---------------------------------	-----

Energy Utilities

Electric grid	147
---------------	-----

Facilities

Mental health	83
Indoor wayfinding	84
Accessibility	85
Inclusivity	85
Navigation	86
Wayfinding	87
Parking	87
Digital twins	88
Asset mapping	88
Utilities	90
Emergency management	91
Space use	91
Space efficiency	92
Space management	93
Shared facilities	98
Visions	99
Frameworks	100
Expansions	101
Living systems	101
Mixed-use neighborhoods	102
Connections	104

Geospatial

Research centers	39
------------------	----

Health and Human Services

Brain trauma	38
Air quality	40
Pediatric malaria in Nigeria	65

Mapping medicine's consolidation	66	Science	
Mapping mental health	67	Hurricane preparation	36
Access to health care	69	Protecting ocean biodiversity	112
Health	93	Seismology	157
Anticipating COVID-19 risks	120	Geography	158
Tracking opioid use	123	Satellites	161
Monitoring air quality	131	Oceanography	164
Dentistry	148		
Public health	149	Sustainable Development	
Land Development		Nomadic tribes	25
Ecology	144	The impact of COVID-19	31
Landscape Architecture		Mapping hunger	40
Landscape architecture	141	Mapping vaccinations	42
Local Government		Mapping world ecosystems	111
Legal deserts	22	Going from global to national	114
Equity priorities	25	Planning for climate change in England	116
Urban diversity	26	Reducing climate impacts	119
Climate change preparation	26	Recovering the Indigenous landscape	121
Boundary markers	27	Decarbonizing Sardinia	122
Indigenous environmentalism	33	Predicting regional water demand	123
Indigenous knowledge	39	Showing landscape change	125
Ownership of Indigenous land	62	Greening vacant urban land	130
The culture-nature divide	63	Coordinating economic and ecological development	132
Femicide in Türkiye	63	Relinking city and landscape	133
Shared feelings about places	64	Climate change	153
African American golfing	65	United Nations Sustainable Development Goals	159
Regional systems	103		
Redistricting statewide elections	118	Telecommunications	
Museums		Cables	160
Public art	96	Transportation	
National Government		Electric commuting	29
Providing election information in the United States	114	Mine maps	37
Highlighting water scarcity in South Africa	117	Bike access in New York City	68
Natural Resources		Achieving the 20-minute city	130
The Sundarbans	23	Noise	162
Nutrient diversity	36	Congestion	163
Nature's diversity	41	Urban Design	
Agriculture	151	Transforming Puerto Rico	124
Agronomy	152	Uncovering university-driven displacement	126
NGOs		Revealing redlining	127
Economics	149	Planning for recognition justice	128
Petroleum		Water	
Pipelines	155	Dam removal	28
Public Safety		Water quality in farm fields	71
Theft	95	Water	89
		Water utility	163

CONTENTS BY Organization

Academic		Recognizing Indigenous communities	118
The Sundarbans	23	Reducing climate impacts	119
Historical maps	29	Anticipating COVID-19 risks	120
Racial segregation	30	Recovering the Indigenous landscape	121
Nutrient diversity	36	Decarbonizing Sardinia	122
Mine maps	37	Predicting regional water demand	123
Brain trauma	38	Tracking opioid use	123
American jazz clubs	54	Transforming Puerto Rico	124
Mapping temporary memorials	55	Showing landscape change	125
Enslaved peoples' migration	59	Uncovering university-driven displacement	126
Nightlife in old Shanghai	60	Revealing redlining	127
Spanish silver trade	61	Planning for recognition justice	128
Disappearing farmland in the West Bank	69	Greening vacant urban land	130
Global prevalence of languages	73	Achieving the 20-minute city	130
Mental health	83	Monitoring air quality	131
Indoor wayfinding	84	Coordinating economic and ecological development	132
Accessibility	85	Relinking city and landscape	133
Inclusivity	85	Digital equity	154
Navigation	86	United Nations Sustainable Development Goals	159
Wayfinding	87	Advocacy	
Parking	87	Legal deserts	22
Digital twins	88	Open space	32
Asset mapping	88	Local Government	
Utilities	90	Equity priorities	25
Emergency management	91	Urban diversity	26
Space use	91	Climate change preparation	26
Space efficiency	92	Boundary markers	27
Space management	93	Dam removal	28
Health	93	Electric commuting	29
Tree canopy	94	Equity	147
Food	95	Electric grid	147
Public art	96	Dentistry	148
Trash	97	Water utility	163
Dashboards	98	National Government	
Shared facilities	98	Hurricane preparation	36
Expansions	101	Nature's diversity	41
Mixed-use neighborhoods	102	Planning for tsunami evacuation	125
Connections	104	Agriculture	151
Mapping the news	110	Noise	162
Mapping world ecosystems	111	NGOs	
Identifying planners	113	Human-elephant conflicts	21
Going from global to national	114		
Providing election information in the United States	114		
Planning for climate change in England	116		
Highlighting water scarcity in South Africa	117		
Finding GIS programs in the United States	117		

Territorial justice	24	Intelligence	146
Nomadic tribes	25	Demographics	150
The impact of COVID-19	31	Pipelines	155
River dolphins	33	Criminology	156
Migrating farmworkers	35	Physical safety	157
Indigenous knowledge	39	Geography	158
Air quality	40	Cables	160
Mapping hunger	40	Satellites	161
Mapping vaccinations	42	Congestion	163
Water	89		
Visions	99	Student	
Frameworks	100	Mapping Dante's <i>Inferno</i>	53
Living systems	101	Mapping James Joyce's <i>Ulysses</i>	54
Regional systems	103	Painting with GIS	56
Protecting ocean biodiversity	112	Geolocating Atlanta's rap	57
Locating citizen scientists in Europe	115	Preserving Native American sites	58
Redistricting statewide elections	118	Mortality in medieval Europe	59
Mapping urban plant life	129	Ownership of Indigenous land	62
Public health	149	The culture-nature divide	63
Economics	149	Femicide in Türkiye	63
Agronomy	152	Shared feelings about places	64
Climate change	153	African American golfing	65
Oceanography	164	Pediatric malaria in Nigeria	65
Private		Mapping medicine's consolidation	66
Port positioning	31	Access to health care	69
River ecosystems	34	Bike access in New York City	68
Research centers	39	Tracking bird strikes	70
Mapping mental health	67	Water quality in farm fields	71
Theft	95	Saving seagrass	72
Architecture	140	Coastal mangroves	74
Landscape architecture	141	Saving sea turtles	75
Consumer behavior	142	Protecting crustaceans	76
Real estate	142	Reducing soil erosion	77
Biodiversity	143	Seismology	157
Ecology	144		
Defense	145	Tribal Nation	
		Indigenous environmentalism	33

CONTENTS BY Location

(region of interest)

Africa		Mapping world ecosystems	111
Human-elephant conflicts	21	Protecting ocean biodiversity	112
The impact of COVID-19	31	Identifying planners	113
River ecosystems	34	Consumer behavior	142
Mapping hunger	40	Defense	145
Mapping vaccinations	42	Intelligence	146
Pediatric malaria in Nigeria	65	Public health	149
Highlighting water scarcity in South Africa	117	Economics	149
Relinking city and landscape	133	Agronomy	152
Architecture	140	Seismology	157
Criminology	156	Cables	160
		Oceanography	164
Asia		Middle East	
The Sundarbans	23	Nomadic tribes	25
Nightlife in old Shanghai	60	Port positioning	31
Femicide in Türkiye	63	Disappearing farmland in the West Bank	69
Mixed-use neighborhoods	102		
Coordinating economic and ecological development	132	North America	
Caribbean		Legal deserts	22
Expansions	101	Equity priorities	25
Transforming Puerto Rico	124	Boundary markers	27
		Dam removal	28
Europe		Electric commuting	29
Urban diversity	26	Historical maps	29
Mapping James Joyce's <i>Ulysses</i>	54	Racial segregation	30
Mortality in medieval Europe	59	Open space	32
Saving sea turtles	75	Indigenous environmentalism	33
Reducing soil erosion	77	Migrating farmworkers	35
Indoor wayfinding	84	Hurricane preparation	36
Going from global to national	114	Mine maps	37
Locating citizen scientists in Europe	115	Brain trauma	38
Planning for climate change in England	116	Indigenous knowledge	39
Decarbonizing Sardinia	122	Air quality	40
Planning for recognition justice	128	Nature's diversity	41
Mapping urban plant life	129	American jazz clubs	54
Monitoring air quality	131	Mapping temporary memorials	55
Landscape architecture	141	Geolocating Atlanta's rap	57
		Preserving Native American sites	58
Global		Enslaved peoples' migration	59
Nutrient diversity	36	Ownership of Indigenous land	62
Research centers	39	The culture-nature divide	63
Mapping Dante's <i>Inferno</i>	53	Shared feelings about places	64
Painting with GIS	56	African American golfing	65
Global prevalence of languages	73	Mapping medicine's consolidation	66
Mapping the news	110	Mapping mental health	67

Bike access in New York City	68	Anticipating COVID-19 risks	120
Access to health care	69	Recovering the Indigenous landscape	121
Tracking bird strikes	70	Predicting regional water demand	123
Water quality in farm fields	71	Tracking opioid use	123
Saving seagrass	72	Showing landscape change	125
Coastal mangroves	74	Planning for tsunami evacuation	125
Protecting crustaceans	76	Uncovering university-driven displacement	126
Mental health	83	Revealing redlining	127
Accessibility	85	Greening vacant urban land	130
Inclusivity	85	Achieving the 20-minute city	130
Navigation	86	Real estate	142
Wayfinding	87	Biodiversity	143
Parking	87	Ecology	144
Digital twins	88	Equity	147
Asset mapping	88	Electric grid	147
Water	89	Dentistry	148
Utilities	90	Demographics	150
Emergency management	91	Agriculture	151
Space use	91	Climate change	153
Space efficiency	92	Digital equity	154
Space management	93	Pipelines	155
Health	93	Physical safety	157
Tree canopy	94	Geography	158
Theft	95	United Nations Sustainable Development Goals	159
Food	95	Noise	162
Public art	96	Congestion	163
Trash	97	Water utility	163
Dashboards	98		
Shared facilities	98	Oceania	
Visions	99	Climate change preparation	26
Frameworks	100		
Living systems	101	South America	
Regional systems	103	Territorial justice	24
Connections	104	River dolphins	33
Providing election information in the United States	114	Spanish silver trade	61
Finding GIS programs in the United States	117		
Redistricting statewide elections	118	Space	
Recognizing Indigenous communities	118	Satellites	161
Reducing climate impacts	119		