

Exploring the Earth

An Introduction to Geospatial Analysis

Lloyd Seo

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_____ for _____

Exploring the Earth: Intro to Geospa...

maps

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members.acmucsd.com

Icebreaker

Introduce yourself to the people around you!

Q1. If you could live anywhere in the world for a year, where would you choose and why?

Q2. What's the most memorable place you've visited?

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Agenda

1 What is Geospatial Analysis?
GIS and Applications

2 GIS Programming
Programming languages, libraries, software

3 San Diego Analysis
Let's analyze San Diego's geospatial data!

4 Open Workshop
Tinker with GIS yourself!

5 Future of GIS
Innovations and Developments

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What is Geospatial Analysis?

Process of collecting, processing,
and visualizing geospatial data

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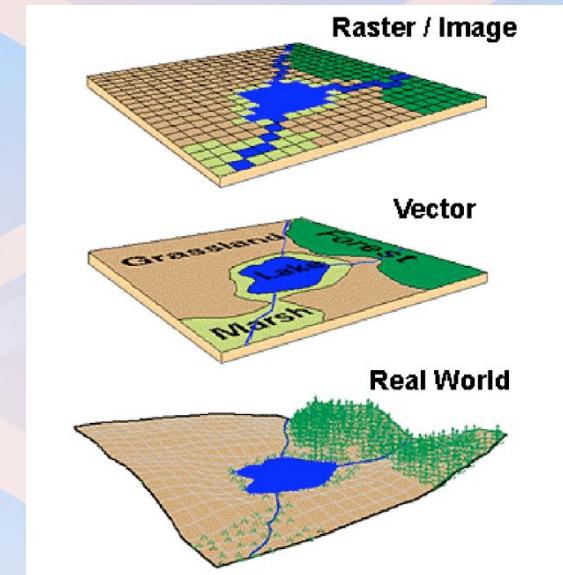
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Types of Geospatial Data

Vector data: Geographic features represented through points, lines, and polygons

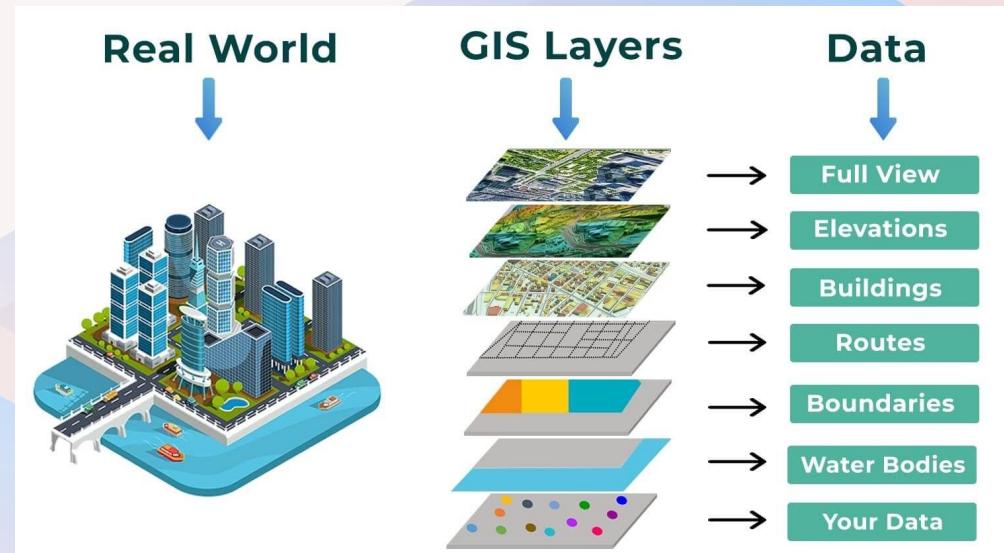
Raster data: Pixelated or gridded cells identified according to row and column

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Geographic Information System (GIS)

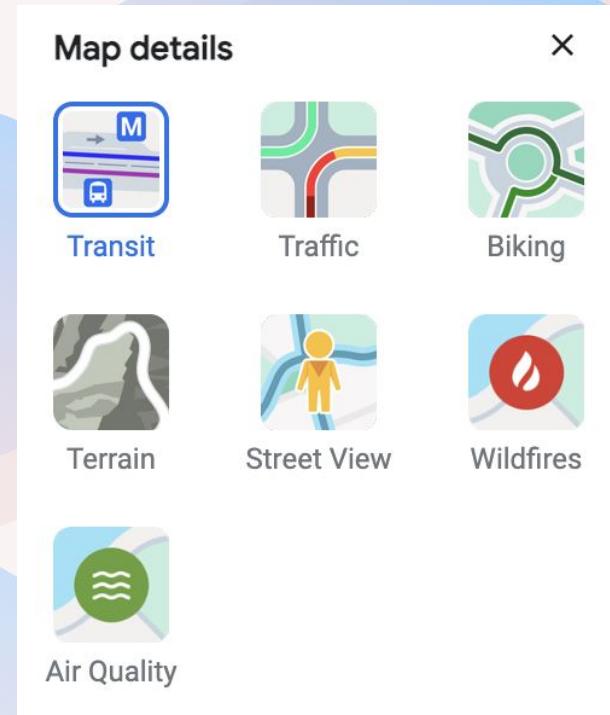
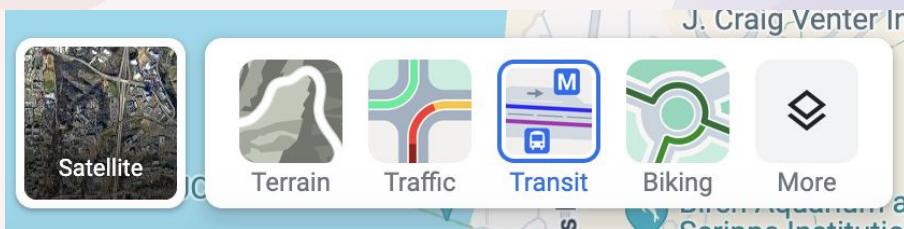


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Google Maps



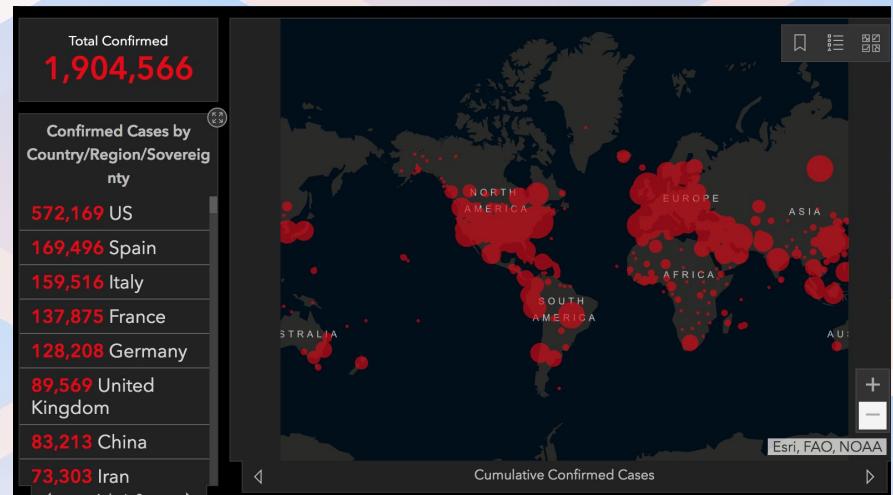
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Applications of GIS

- Healthcare
- Agriculture
- Urban Planning
- Utility Management



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Applications of GIS

- Healthcare
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Applications of GIS

- Healthcare
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Applications of GIS

- Healthcare
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- **Utility Management**



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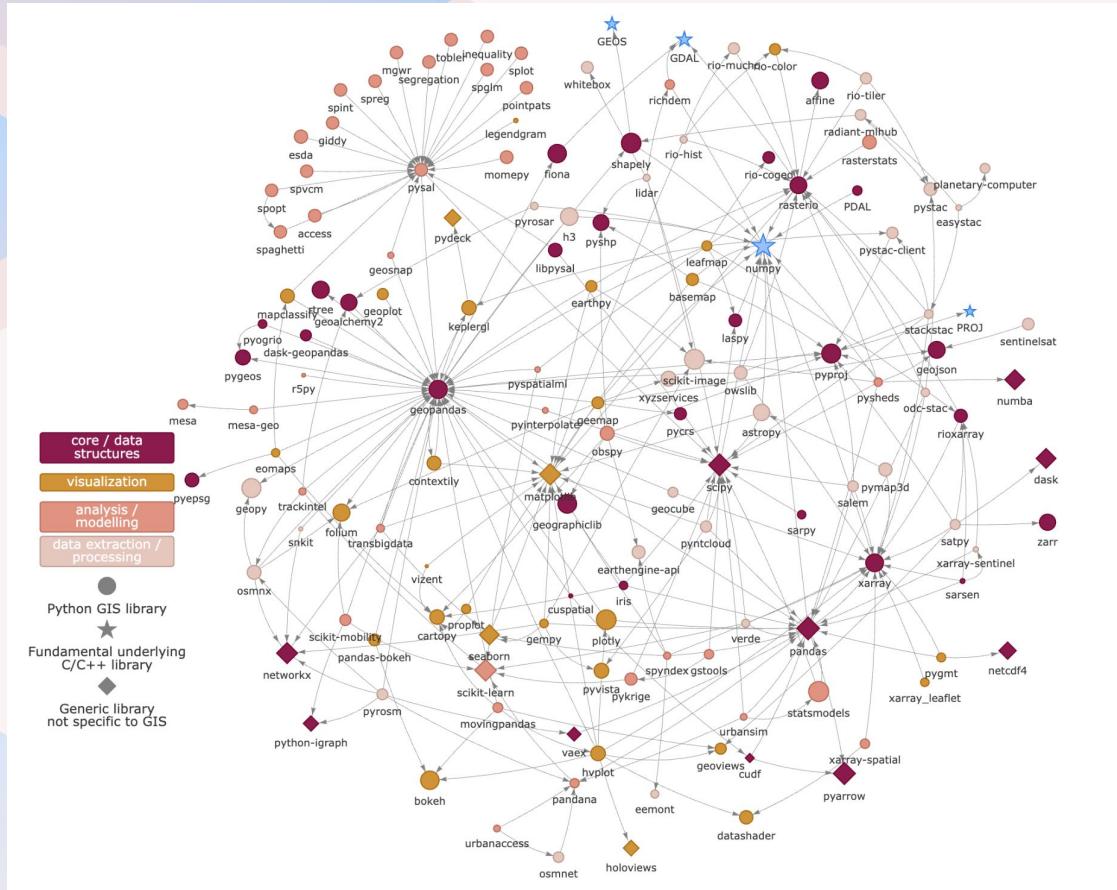
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GIS Technologies

- Languages: Python, C++, Java
 - GIS libraries: Shapely, GeoPandas/GeoPy, OSMnx, NetworkX
- Data files: Shapefile, GeoPackage, CRS
- Software: ArcGIS, QGIS, Google Maps/Earth

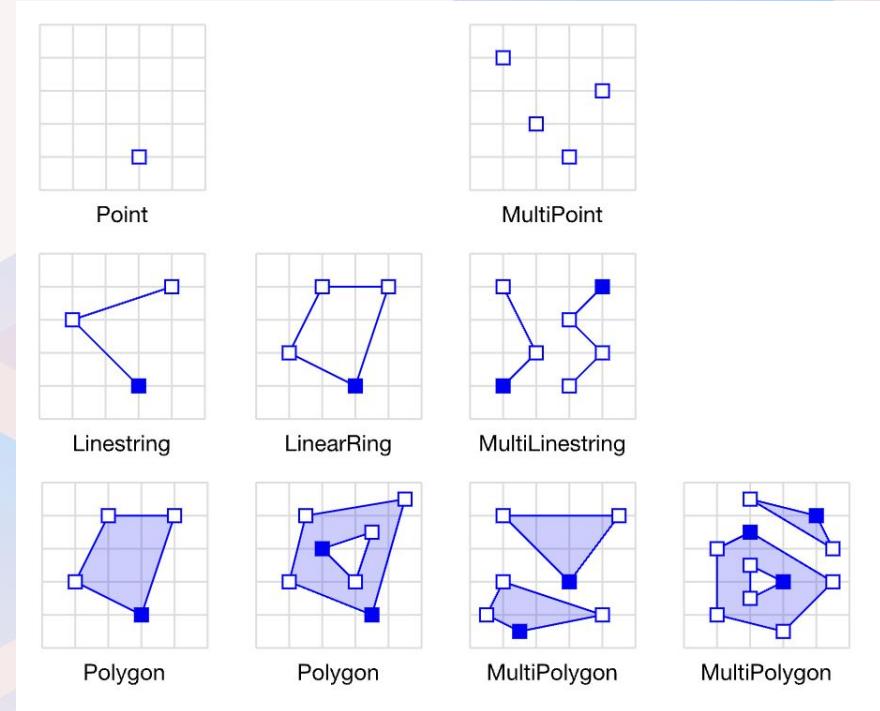
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Shapely

Geometric object manipulation



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GeoPandas

Geospatial data
analysis

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GeoPy

Geocoder for
GeoPandas

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Reading data through OSMnx



Via place names

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Via coordinates



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GIS Treasure Hunt!

1. Make a donut-shaped polygon (shapely)
2. Find the number of playgrounds in Balboa Park (dtsd)
3. Graph the shortest path by bike from Sixth College to Warren College (ucsd)
4. 32.6915199, -117.1766947, where is this? (Nominatim)

Drive: acmurl.com/gis-drive

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AR/VR Applications

Visualizing
underground
infrastructure
through AR



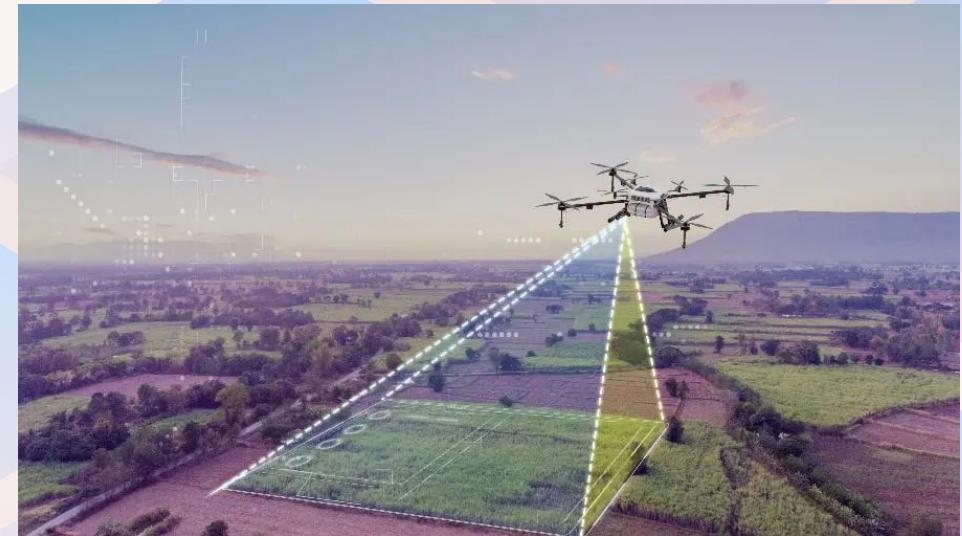
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Drone-based GIS

GIS mapping using
drones



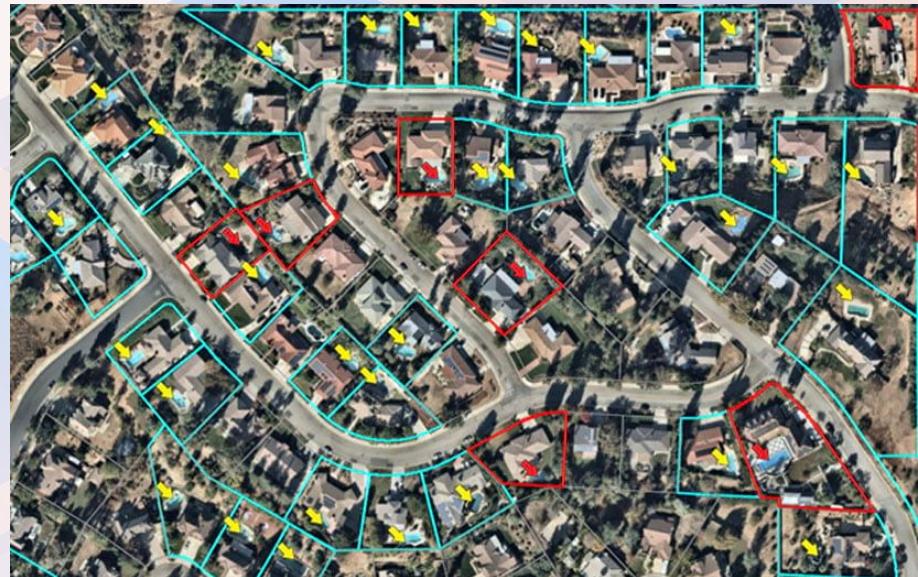
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Machine Learning in GIS

Geospatial object
detection using
computer vision



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Documentations

Shapely: shapely.readthedocs.io

GeoPandas: geopandas.org

GeoPy: geopy.readthedocs.io

OSMnx: osmnx.readthedocs.io

NetworkX: networkx.org/documentation

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GIS Datasets

Google Earth:

developers.google.com/earth-engine/datasets

United States:

catalog.data.gov/dataset/?metadata_type=geospatial

California: gis.data.ca.gov/

San Diego: sangis.org/

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Google Maps

SDKs & APIs

SDKs and APIs

Explore, learn, and build with comprehensive documentation, sample code, example apps, and more.



Maps

Maps SDKs
Bring the real world to your users with dynamic maps for the web and mobile.

[JS](#) [Android](#) [iOS](#) [HTML](#)
[Web Components](#) [Flutter](#)



Routes

Routes
Performance optimized version of the Directions API and Distance Matrix API, with additional features.

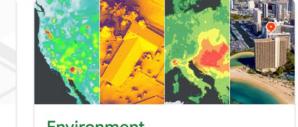
[API](#)



Places

Places API & SDKs
Integrate Google's Place details, search, and autocomplete into your apps.

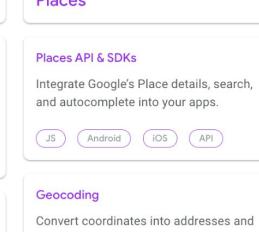
[JS](#) [Android](#) [iOS](#) [API](#)



Environment

Solar
Look up the rooftop solar energy potential for specific buildings.

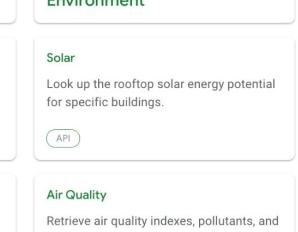
[API](#)



Geocoding

Geocoding
Convert coordinates into addresses and addresses into coordinates.

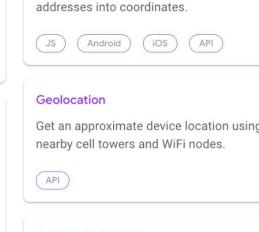
[JS](#) [Android](#) [iOS](#) [API](#)



Air Quality

Air Quality
Retrieve air quality indexes, pollutants, and health recommendations for specific locations.

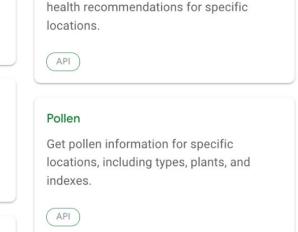
[API](#)



Pollen

Pollen
Get pollen information for specific locations, including types, plants, and indexes.

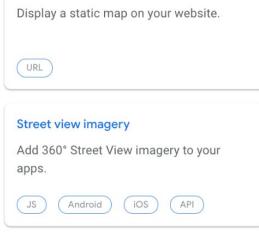
[API](#)



Address Validation

Address Validation
Validate an address and its components.

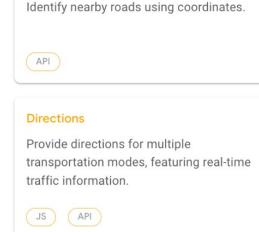
[API](#)



Elevation

Elevation
Get the elevation of one or a series of locations.

[JS](#) [Android](#) [iOS](#) [API](#)



Distance Matrix

Distance Matrix
Calculate travel times and distances for multiple origins and destinations.

[JS](#) [API](#)

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Library Resources

Data & GIS Lab

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The Data & GIS Lab maintains Libguides containing data science & GIS resources to help you with your research.

GIS & GEOSPATIAL TECHNOLOGIES

This guide provides GIS tutorials, data, books, course-specific GIS guides, and other geospatial-related information.

USP Senior Sequence Guide
Need help with your senior research project? Specific guides are able to assist you in research for the Urban Studies & Planning Senior Sequence, including GIS training and spatial analysis. Explore the QR code for Librarian Kelly Smith's USP 186 and USP 187 guide!

ArcGIS Training **GIS Libguide**
Are you interested in learning more about using GIS software? Learn how to get started with ArcGIS or build a successful StoryMap using tutorials available in the GIS Libguide. Explore ArcGIS training and the GIS Libguide at the QR codes above.

FINDING DATA & STATISTICS

This guide contains access to frequently used data repositories, databases, and datasets. You can also browse data by topic, as well as a list of APIs and bulk download mechanisms for obtaining data.

Frequently Used Data
Looking for commonly used data archives and collections to browse? The Library collects frequently accessed data sources and datasets for your project needs. Browse a variety of repositories at the QR code!

Find Data by Topic
Browse data sources over 30 categories, from Art & Culture and Crime to Linguistics and Sports! Explore even more categories through the QR code above.

Explore the Libguide resources at the QR codes above, or visit the Data & GIS Lab to learn more!

The Library has access to a variety of resources to help aid your data analysis & GIS projects.

ONLINE RESOURCES


SimplyAnalytics
SimplyAnalytics is a user-friendly, web-based mapping application that lets users create maps and reports using U.S. city and county-level demographic, business, and marketing data. Data can be exported as .csv and .shp files.


SageData
Sage Data provides easy access to statistical data including stock market, financial, and real estate sources in shapefile, Excel and .csv formats.


Social Explorer
Social Explorer combines data from the U.S. Census of Population and Housing & the American Community Survey (ACS). U.S. demography data from 1790–present and recent crime and health data are included.


POLICYMAP
DIG DEEPER
Policy Map provides access to over 50,000 geographic indicators down to the zip code or neighborhood level in the United States, an easy-to-use mapping application, and data visualization and analytics.


nearmap
We have access to high-resolution Nearmap imagery for the United States, dating back to 2014. Image availability varies across the country, with 2.2" to 3" resolution.


Explore more lab resources at the QR code, or visit the Data & GIS Lab to learn more!



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UCSD GIS-related Courses

USP 4. Introduction to Geographic Information Systems (4)

This course provides an entry-level introduction to Geographic Information Systems (GIS) and using GIS to make decisions: acquiring data and organizing data in useful formats, demographic mapping, and geocoding.

USP 191A. Intermediate GIS for Urban and Community Planning (4)

Intermediate geographic information systems (GIS) as applied to urban studies builds upon the introductory course and teaches students how to use the GIS software, collect and analyze data, and produce maps and products relating to demographics, transportation, health, public safety, and other current issues.

Prerequisites: USP 4 and upper-division standing.

USP 191B. Advanced GIS for Urban and Community Planning (4)

Advanced geographic information systems (GIS) as applied to urban studies. Learn to use the GIS software with a focus on data management, online GIS, elements of spatial statistics, technologies, and models for spatial data integration to support urban research and decision-making. **Prerequisites:** USP 191A and upper-division standing.

DSC 170. Spatial Data Science and Applications (4)

Spatial data science is a set of concepts and methods that deal with accessing, managing, visualizing, analyzing, and reasoning about spatial data in applications where location, shape and size of objects, and their mutual arrangement are important. This upper-division course explores advanced data science concepts for spatial data, introducing students to principles and techniques of spatial data analysis, including geographic information systems, spatial big data management, and geostatistics. **Prerequisites:** DSC 80. Restricted to students with upper-division standing.

SIO 110. Introduction to GIS and GPS for Scientists (4)

A hands-on introduction to science applications of geographic information systems and global positioning system. Students acquire data through GPS field surveys, design and construct GIS using ESRI's ArcGIS software, analyze spatial data, and present the results in a web-based environment. **Prerequisites:** upper-division standing or consent of instructor.

Thank You

Do you have any questions?



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