

# GEOSPATIAL BIG DATA ANALYTICS, CERTIFICATE

Requirements for an undergraduate certificate may be completed at any campus location offering the specified courses for the certificate.

## Program Description

Geospatial data are central to the challenges and opportunities for science and society that big data provide. Geospatial data derive from a rapidly expanding array of sources that include sensors (from satellites, to cameras and other sensing devices carried by UAVs, to distributed sensors monitoring energy consumption, pollution, traffic, and more with smart cities), GPS enabled devices (in vehicles, smart phones, cameras, human wearable devices, and even ones small enough to mount on migrating songbirds), citizen science efforts producing volunteered geospatial data, address-linked public health and many other records, retail transactions, and location-linked social media posts. As geospatial data become more ubiquitous, big digital geospatial data has become an essential part of geographic analysis. The 12-credit Geospatial Big Data Analytics certificate is aimed at students who are seeking advanced data collection, processing, analysis, and communication knowledge and skills related to leveraging the growing array of geographically linked big data. Courses for this certificate have prerequisites that are not included in requirements for the certificate; such prerequisites may be completed through the undergraduate Geographic Information Science certificate.

Learning objectives: demonstrate an understanding of the breadth of methods and techniques available for handling large volumes of heterogeneous, rapidly-changing data; use multiple methods and techniques to conduct spatial analyses of big data and apply resulting analyses to problems within the student's own discipline.

## What is Geospatial Big Data Analytics?

No matter how sophisticated information technology gets, there is nothing that can replicate the combination of two unique pieces of data: time and place. Geospatial data come from a variety of sources, including sensors, GPS-enabled devices, volunteered geospatial data, and location-linked records and social media posts. Geographic information scientists and other geographers collect and use big data to analyze social and natural phenomena about our world. As geospatial data become more ubiquitous, big digital geospatial data has become an essential part of geographic analysis. Students enrolled in this certificate can learn how to collect, process, analyze, and communicate a wide range of geospatial big data.

## You Might Like This Program If...

- You are interested in the use of big data to analyze spatial, social, and natural phenomena about our world.
- You want to learn how spatial big data models aid in understanding logistics, finance, shipping, advertising, entertainment, and journalism.
- You are curious about how big data can deliver much-needed context to decision making in many areas.
- You want to know where and when people and things exist in the real world.

## Program Requirements

To earn an undergraduate certificate in Geospatial Big Data Analytics, a minimum of 12 credits is required.

Code	Title	Credits
<b>Required Courses</b>		
GEOG 365	Introduction to GIS Programming	3
Select 9 additional credits, including at least 3 credits in Analytics and 3 credits in Big Data.		9
<i>Analytics:</i>		
GEOG 461W	Dynamic Cartographic Representation	
GEOG 464	Advanced Spatial Analysis	
GEOG 465	Advanced Geographic Information Systems Modeling	
GEOG 485	GIS Programming and Software Development	
<i>Big Data:</i>		
GEOG 462	Advanced Observation of Earth and Its Environment	
GEOG 463	Geospatial Information Management	
GEOG 481	Topographic Mapping with Lidar	

### Non-Course Requirements

Per University policy, all credit courses for a certificate require a grade of 'C' or higher, and at least two-thirds (2/3) of the credits used to complete a certificate must be earned at Penn State. If student is completing multiple certificates in Geography, no more than one (1) course may double-count for each.

### Prerequisites not included in Geospatial Big Data Certificate:

GEOG 260: prerequisite for GEOG 361, GEOG 362, GEOG 363, GEOG 365  
 GEOG 361: prerequisite for GEOG 461W  
 GEOG 362: prerequisite for GEOG 462, GEOG 481  
 GEOG 363: prerequisite for GEOG 463, GEOG 465  
 GEOG 364 or 300/400 level statistics course: prerequisite for GEOG 464

## Academic Advising

The objectives of the university's academic advising program are to help advisees identify and achieve their academic goals, to promote their intellectual discovery, and to encourage students to take advantage of both in-and out-of class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary academic adviser, the information needed to plan the chosen program of study, and referrals to other specialized resources.

READ SENATE POLICY 32-00: ADVISING POLICY (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy/>)

## University Park

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## Career Paths

There are many potential careers for big data geospatial scientists. Students earning the Geospatial Big Data Analytics certificate learn a wide range of technological, research, and analytical skills that are highly valued by employers. Big data geography undergraduates find jobs in all levels of government, nonprofit organizations, and industry. This is one of several geography-related certificates that students can use to tailor their educational experience in preparation for the job market. The Department of Geography also offers certificates in Environment and Society Geography; Geographic Information Science; Human Geography; Justice, Ethics and Diversity in Space; Landscape Ecology and Physical Geography.

## Careers

Students earning the certificate in Geospatial Big Data Analytics are well positioned to find employment with diverse organizations spanning business, government, and nonprofit sectors. Such organizations may include (but are not limited to): American Red Cross; Amnesty International; BAE Systems; Boeing; Esri; Federal Emergency Management Agency; NASA; National Geographic; National Park Service; United Nations; U.S. Army Corps of Engineers; U.S. Census Bureau; U.S. Environmental Protection Agency; local, regional, and state planning agencies; environmental and engineering consulting firms; State Department; and humanitarian organizations.

MORE INFORMATION ABOUT POTENTIAL CAREER OPTIONS FOR GRADUATES WITH A CERTIFICATE IN GEOSPATIAL BIG DATA ANALYTICS (<https://www.geog.psu.edu>)

## Opportunities for Graduate Studies

A certificate in Geospatial Big Data Analytics is useful for students who are interested in pursuing graduate degrees in the computational, environmental, and social sciences. Alumni enter graduate and professional studies in a variety of programs, including (but not limited to) geography, planning, international development, urban studies, sustainability, environmental sciences, ecology, geographic information sciences, information technology, environmental informatics, geodesign, business administration, supply chain management, emergency management, law, and education. They sometimes begin graduate or professional programs directly after finishing undergraduate studies, but often get several years' work experience before returning to school, either full or part-time.

MORE INFORMATION ABOUT OPPORTUNITIES FOR GRADUATE STUDIES (<https://www.geog.psu.edu>)

## Professional Resources

- American Association of Geographers (AAG) (<https://www.aag.org>)
- North American Cartographic Information Society (NACIS) (<https://nacis.org>)
- ASPRS: The Imaging & Geospatial Information Society (<https://www.asprs.org>)
- Urban and Regional Information Systems Association (URISA) (<https://www.urisa.org/>)
- International Cartographic Association (ICA) (<https://icaci.org/>)

## Contact

### University Park

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