GEOSPATIAL DATA SCIENCE MAJOR, B.S.

The bachelor of science in Geospatial Data Science prepares students to to work in the field of Geospatial Data Science, which has emerged as a distinct and important subfield in Data Science, leveraging data tied to geographic locations on the Earth's surface. Students who complete this degree will gain knowledge, skills, and training the technical aspects of geographic inquiry, which span data science, geographic information science (GISc), and geography. The degree pairs traditional training in GISc (geovisualization, geographic information systems, and remote sensing) with cutting edge applications in big data analysis, cloud computing, Geospatial Artificial Intelligence (GeoAI), machine learning, data mining, and data engineering for automation. The curriculum aims to provide students with a strong foundation in the concepts and theories underlying modern spatial data analytics, critical thinking and reasoning skills, and applied, hands-on training in modern methods and techniques.

Student Learning Outcomes

Upon completion of the geospatial data science program, students should be able to:

- Understand physical and human geographical phenomena and their interactions (Foundations of Geography).
- Apply sound techniques and methods in GIS, remote sensing, geovisualization, and spatial data science to prepare, process, and analyze geospatial data using GeoAI and machine learning tools on both personal computers and cloud computing platforms with geo-bigdata.
- Apply sound practices in data management, problem-solving, automation, and algorithm development in the context of computer programming and geospatial data.
- Apply sound practices when using mathematical and statistical methods to analyze and interpret geospatial data.

Requirements

In addition to the program requirements, students must

- earn a minimum final cumulative GPA of 2.000
- complete a minimum of 45 academic credit hours earned from UNC–Chapel Hill courses
- take at least half of their major core requirements (courses and credit hours) at UNC–Chapel Hill
- earn a minimum cumulative GPA of 2.000 in the major core requirements. Some programs may require higher standards for major or specific courses.

For more information, please consult the degree requirements section of the catalog (https://catalog.unc.edu/undergraduate/degree-requirements/).

Code	Title	Hours
Core Requirements		
GEOG 110	The Blue Planet: An Introduction to Earth's Environmental Systems [H]	3
or GEOG 111	Weather and Climate	
Select one of the following courses:		3
GEOG 120	World Regional Geography	
GEOG 121	Geographies of Globalization	
GEOG 123	Cultural Geography	
GEOG 130	Development and Inequality: Global Perspectives [F]	
GEOG 141	Geography for Future Leaders	
GEOG 215	Introduction to Spatial Data Science	3
GEOG 370	Geographic Information Science	3
GEOG 391	Quantitative Methods in Geography	3
GEOG 392	Research Methods in Geography	3
GEOG 455	Cartography and Geovisualization	3
GEOG 477	Introduction to Remote Sensing of the Environment	3
GEOG 491	Principles of Geographic Information Systems	3
GEOG 515	Applied Spatial Data Science	3
Select two courses from the following options:		6
GEOG 419	Field Methods in Physical Geography	
GEOG 456	Geovisualizing Change	
GEOG 541	GIS in Public Health	
GEOG 544	Geographic Information Systems for Impact Evaluation and Health Studies	
GEOG 555	Cartography of the Global South	
GEOG 567	Geospatial Data Analysis with Google Earth Engine	
GEOG 570	Geographic Information Analysis	
GEOG 577	Advanced Remote Sensing	
GEOG 586	Scaling Up Geospatial Analysis	
GEOG 591	Applied Issues in Geographic Information Systems	
GEOG 592	Geographic Information Science Programming	
GEOG 594	Global Positioning Systems and Applications	
GEOG 597	Ecological Modeling	
GEOG 598	Freshwater Greenhouse Gases	
Select three elective courses from the list below		9
Select one of the following capstone or senior thesis options:		3-6
GEOG 697	Capstone Seminar in Geographic Research	
GEOG 691H & GEOG 692H	Honors and Honors	
Additional Requirements		
MATH 231	Calculus of Functions of One Variable I [H, F]	4
or MATH 210	Mathematical Tools for Data Science	
Select one of the following courses:		3-4
DATA 110	Introduction to Data Science [H]	
STOR 120	Foundations of Statistics and Data Science [H, F]	
STOR 151	Introduction to Data Analysis	

STOR 155	Introduction to Data Models and Inference [H, F]	
Total Hours		**55-59**

H Honors version available. An honors course fulfills the same requirements as the nonhonors version of that course. Enrollment and GPA restrictions may apply.

F FY-Launch class sections may be available. A FY-Launch section fulfills the same requirements as a standard section of that course, but also fulfills the FY-SEMINAR/FY-LAUNCH First-Year Foundations requirement. Students can search for FY-Launch sections in ConnectCarolina using the FY-LAUNCH attribute.

Electives

Code	Title	Hours
Elective Requirement		
Select one course from the following options:		3
DATA 120	Ethics of AI and Societal Decision Making [H]	
DATA 130	Critical Data Literacy	
DATA 150	Communication for Data Scientists	
GEOG 115	Geospatial Technologies, Maps, and Society	
GEOG 415	Communicating Important Ideas	
INLS 541	Information Visualization	
Select two courses from the following options:		6
GEOG---	Any GEOG 300, 400, or 500 course (at least three credits)	
ANTH 404	Agent-Based Modeling of Social-Ecological Systems	
ANTH 419	Anthropological Application of GIS	
COMP 210	Data Structures and Analysis	
COMP 301	Foundations of Programming	
DATA 140	Introduction to Data Structures and Management	
EMES 203	Data Analysis for Earth, Marine, and Environmental Sciences	
EMES 415	Environmental Systems Modeling	
EMES 483	GIS and Remote Sensing for Earth and Ocean Sciences	
EMES 520	Data Analysis for Earth and Marine Sciences	
ENEC 305	Data Analysis and Visualization of Social and Environmental Interactions	
ENEC 340	Environmental Applications of Drones	
ENEC 468	Temporal GIS and Space/Time Geostatistics for the Environment and Public Health	
ENEC 479	Landscape Analysis	
INLS 523	Introduction to Database Concepts and Applications	
INLS 613	Text Mining	
INLS 623	Database Systems II: Intermediate Databases	
INLS 641	Visual Analytics	
INLS 642	Data Mining	
MATH/STOR 235	Mathematics for Data Science	
MATH 347	Linear Algebra for Applications [F]	
STOR 215	Foundations of Decision Sciences	
STOR 455	Methods of Data Analysis [H]	
Total Hours		**9**

H Honors version available. An honors course fulfills the same requirements as the nonhonors version of that course. Enrollment and GPA restrictions may apply.

F FY-Launch class sections may be available. A FY-Launch section fulfills the same requirements as a standard section of that course, but also fulfills the FY-SEMINAR/FY-LAUNCH First-Year Foundations requirement. Students can search for FY-Launch sections in ConnectCarolina using the FY-LAUNCH attribute.

Special Opportunities in Geography and Environment

Honors in Geography

Qualifying students are encouraged to pursue an honors degree. To gain admission to the honors program students must have a cumulative grade point average of 3.3 or higher and a grade point average of 3.4 or higher in geography courses. Honors students take GEOG 691H and GEOG 692H (honors readings and research and theses hours) with their honors thesis chair in their senior year. Honors study involves the completion of a substantial piece of original research and the formal presentation of the results in an honors thesis and oral defense. Those who successfully complete the program are awarded their B.A. degree with either honors or highest honors in geography.

Departmental Involvement

All students are welcomed and encouraged to attend the department's seminar, held on most Friday afternoons at 3:30 p.m. in Carolina Hall 220. The department sponsors the Carolina Geography and Environment Club, which provides an avenue for student involvement with the department outside of course work (see the club's Facebook page). Students can also interact with the department through service on the faculty undergraduate committee and through independent research with faculty.

Experiential Education

The department offers several experiential education courses:

Code	Title	Hours
GEOG 53	First-Year Seminar: Battle Park: Carolina's Urban Forest	3
GEOG 419	Field Methods in Physical Geography	3
GEOG 429	Urban Political Geography: Durham, NC	3
GEOG 452	Mobile Geographies: The Political Economy of Migration	3
GEOG 493	Internship	3
GEOG 650	Technology and Democracy Research	3
GEOG 691H	Honors	3
GEOG 692H	Honors	3

Internship

Students can gain course credit by interning with an organization, agency, or business that will augment their classroom learning. The department

has an internship coordinator available to assist students in finding internships and to manage participation in the organization's activities. Internship can be taken with a geography and environment faculty member for academic credit through GEOG 493.

Independent Study

Independent study with a geography and environment faculty member can be taken for academic credit through GEOG 296. Students are responsible for arranging their independent study with a faculty member who will sponsor them for this activity. Students must fill out a learning contract and syllabus in collaboration with the sponsoring faculty member, and then be enrolled by Ms. Nell Phillips, the Student Services Manager, in the department's main office. For more information, contact the individual faculty member or the Director of Undergraduate Studies, Professor Shorna Allred.

Undergraduate Research

Research with a geography and environment faculty member can be taken for academic credit through GEOG 295. Students are responsible for arranging their research activities and responsibilities with a faculty member who will sponsor them for this activity. Students must fill out a learning contract with the sponsoring faculty member and then be enrolled by Ms. Nell Phillips, the Student Services Manager, in the department's main office.

Study Abroad

Experiences with other cultures and environments are important to a well-rounded background in geography, and the department thus encourages a study abroad experience. Many of our students study abroad in the Galapagos Islands at the Galapagos Science Center. The department also participates in a junior-year exchange program with King's College London. Many other study abroad programs combine well with a major in geography.

Undergraduate Awards

The Andrew McNally Award is given each spring to an outstanding graduating geography major, as chosen by a committee of the faculty. The department also administers the Melinda Meade Award for Excellence in Undergraduate Geographic Research, the John D. Eyre Service in Geography Award, as well as the John D. Eyre Travel Award, and the Burgess McSwain Travel America Fund, which are open to all geography undergraduates at UNC–Chapel Hill.

Department Programs

Major

- Geography and Environment Major, B.A. (https://catalog.unc.edu/undergraduate/programs-study/geography-major-ba/)
- Geospatial and Data Science Major, B.S. (p. 1)

Minor

- Climate Change Minor (https://catalog.unc.edu/undergraduate/programs-study/climate-change-minor/)
- Environmental Justice Minor (https://catalog.unc.edu/undergraduate/programs-study/environmental-justice-minor/)
- Geography Minor (https://catalog.unc.edu/undergraduate/programs-study/geography-minor/)
- Geographic Information Sciences Minor (https://catalog.unc.edu/undergraduate/programs-study/gis-minor/)

Graduate Programs

- M.A. in Geography and Environment (https://catalog.unc.edu/graduate/schools-departments/geography/)
- Ph.D. in Geography and Environment (https://catalog.unc.edu/graduate/schools-departments/geography/)

Courses

- Geography (GEOG) (https://catalog.unc.edu/courses/geog/)

Contact Information

Department of Geography and Environment
Visit Program Website (http://geography.unc.edu)
205 Carolina Hall, CB# 3220
(919) 962-8901

Program Director
Dave Parr
daveparr@unc.edu

Chair
Conghe Song
csong@email.unc.edu

Director of Undergraduate Studies
Shorna Allred
shorna@unc.edu

Department Manager
Barbara Taylor
barb@unc.edu

Undergraduate Program Administrator
Nell Phillips
nphillip@email.unc.edu