

SPATIAL DATA SCIENCE

Graduate Program Head	Anthony C. Robinson
Program Code	SDS
Campus(es)	World Campus (M.S.)
Degrees Conferred	Master of Science (M.S.)
The Graduate Faculty	View (https://secure.gradsch.psu.edu/gpms/?searchType=fac&prog=SDS)

The Master of Science in Spatial Data Science (SDS) degree is awarded to students who demonstrate mastery of the scientific, technical, and leadership competencies required to research, design, and evaluate spatial data science methods and technologies in a wide range of decision-making contexts.

Admission Requirements

Applicants apply for admission to the program via the Graduate School application for admission (<https://gradschool.psu.edu/graduate-admissions/how-to-apply/>). Requirements listed here are in addition to Graduate Council policies listed under GCAC-300 Admissions Policies (<https://gradschool.psu.edu/graduate-education-policies/>).

The language of instruction at Penn State is English. English proficiency test scores (TOEFL/IELTS) may be required for international applicants. See GCAC-305 Admission Requirements for International Students (<https://gradschool.psu.edu/graduate-education-policies/gcac/gcac-300/gcac-305-admission-requirements-international-students/>) for more information.

Additional requirements imposed by the Department of Geography include:

- Statement of professional experience and goals. A résumé should be attached as a supplement, but the statement itself should be an essay (two to three pages) that demonstrates the applicant's written communication skills and clarifies the applicant's objectives in completing the degree program;
- Two letters of recommendation that attest to the applicant's readiness for graduate study;
- Official transcripts from all post-secondary institutions attended (<http://www.gradschool.psu.edu/prospective-students/how-to-apply/new-applicants/requirements-for-graduate-admission/>), including the institution that conferred the applicant's baccalaureate degree (and any graduate degrees, if applicable);
- Test of English as a Foreign Language (TOEFL) or International English Language Testing System (IELTS) score, if applicable;
- Nonrefundable application fee.

Applications will be evaluated by the SDS Admissions Committee based on the applicants' technical qualifications for the program relative to their previous educational experience, academic interests, and English Language proficiency. In general, successful applicants are expected to have earned an undergraduate grade-point average of at least 3.0 on a 4.0 scale. Applicants with a marginal record are encouraged to first complete a related Graduate Certificate before applying for admission to the SDS program. Exemplary performance in the Graduate Certificate will be taken into consideration for possible admission into the SDS program,

but completion of a certificate does not imply or guarantee admission into a degree program.

Credits earned at other institutions but not used to earn a degree may be applied toward the requirements for a graduate degree, subject to restrictions outlined in GCAC-309 Transfer Credit (<https://gradschool.psu.edu/graduate-education-policies/gcac/gcac-300/gcac-309-transfer-credit/>).

Degree Requirements

Master of Science (M.S.)

Requirements listed here are in addition to Graduate Council policies listed under GCAC-600 Research Degree Policies. (<https://gradschool.psu.edu/graduate-education-policies/>)

A minimum of 33 credits at the 400, 500, 600, or 800 level is required. At least 18 credits must be in 500- or 600-level courses. Students choosing to complete a thesis must complete a minimum of 36 credits, with at least 6 credits in thesis research (GEOG 600 or GEOG 610). Students choosing to complete a capstone course must complete at least 18 credits in 500-level courses, including 3 credits in GEOG 570 Capstone in Spatial Data Science.

Code	Title	Credits
Required Courses		
Complete the following 5 required courses that total 15 credits with a grade point average of 3.00 or higher:		
GEOG 485	GIS Programming and Software Development	3
GEOG 486	Cartography and Visualization	3
GEOG 580	GEOVISUAL ANALYTICS	3
GEOG 583	Geospatial System Analysis and Design	3
GEOG 586	Geographical Information Analysis	3
Electives		
Complete a minimum of 9 credits of Spatial Data Science Methods		9
electives in 400-, 500-, or 800-level courses. The courses that will satisfy this requirement can be chosen from a list of approved courses maintained by the graduate program office.		
Complete a minimum of 6 credits of Spatial Data Science		6
Applications electives in 400-, 500-, or 800-level courses. The courses that will satisfy this requirement can be chosen from a list of approved courses maintained by the graduate program office.		
Culminating Experience		
A capstone course or thesis must be completed to meet the specific requirement of the culminating experience. The capstone course will demonstrate analytical thinking and synthesis of knowledge in the field of spatial data science. The thesis will demonstrate original research in the field of spatial data science to their adviser, a second reader, and the director of the SDS graduate program.		
Choose one of the following depending on whether a capstone course or thesis is completed:		
GEOG 570	Capstone in Spatial Data Science (Capstone Course)	3
GEOG 600	Thesis Research (Thesis)	6
or GEOG 610	Thesis Research Off Campus	
Total Credits		33-36

Candidates may choose a capstone course or thesis option to fulfill their culminating experience requirement and demonstrate integration of knowledge and research experience acquired during their time in the

spatial data science degree program. Students who choose the capstone course option must complete a work product advised by a Graduate Faculty member that demonstrates analytical thinking and synthesis of knowledge in the field of spatial data science. Students choosing the capstone course option will register for 3 credits of GEOG 570 Capstone in Spatial Data Science. Students will be encouraged to utilize an industry internship or current employer to identify a relevant or practical problem of importance that spatial data science methods could address, and to advance the state of the art in order to solve that problem. Students will be required to produce a paper and to present their results. The quality of the required paper is such that it must be suitable for publication in a professional journal or proceedings at a national or international conference.

Candidates who choose the thesis option must write and defend, at an oral examination, a thesis based upon original research in the field of spatial data science. The thesis will demonstrate depth of knowledge to their adviser, a second reader, and the director of the SDS graduate program. Candidates must submit a thesis following the procedures specified by the Graduate School and register for 6 credits of GEOG 600/GEOG 610. The thesis must be accepted by the adviser and committee members, the head of the graduate program, and the Graduate School, and the student must pass the thesis defense. Students who choose the thesis option for their culminating experience are expected to take two years to complete the degree.

Complementary Electives

Students in the SDS program may take individual courses outside of Geography as electives if approved by the SDS program director.

Minor

A graduate minor is available in any approved graduate major or dual-title program. The default requirements for a graduate minor are stated in Graduate Council policies listed under GCAC-600 Research Degree Policies (<https://gradschool.psu.edu/graduate-education-policies/>) and GCAC-700 Professional Degree Policies (<https://gradschool.psu.edu/graduate-education-policies/>), depending on the type of degree the student is pursuing:

- GCAC-611 Minor - Research Doctorate (<https://gradschool.psu.edu/graduate-education-policies/gcac/gcac-600/gcac-611-minor-research-doctorate/>)
- GCAC-641 Minor - Research Master's (<https://gradschool.psu.edu/graduate-education-policies/gcac/gcac-600/gcac-641-minor-research-masters/>)
- GCAC-709 Minor - Professional Doctorate (<https://gradschool.psu.edu/graduate-education-policies/gcac/gcac-700/gcac-709-professional-doctoral-minor/>)
- GCAC-741 Minor - Professional Master's (<https://gradschool.psu.edu/graduate-education-policies/gcac/gcac-700/gcac-741-masters-minor-professional/>)

Student Aid

World Campus students in graduate degree programs may be eligible for financial aid. Refer to the Tuition and Financial Aid section (<https://www.worldcampus.psu.edu/tuition-and-financial-aid/>) of the World Campus website for more information.

Courses

Graduate courses carry numbers from 500 to 699 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may

be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

Geography (GEOG) Course List (<https://bulletins.psu.edu/university-course-descriptions/graduate/geog/>)

Learning Outcomes

Master of Science (M.S.)

Explain and communicate the distinguishing characteristics of spatial data, including how spatial data are created, sensed, stored, manipulated, and represented distinctly compared to other data types.

Practice the science of spatial analysis and modeling, leveraging advances in geocomputation, geovisual analytics, open geospatial data, and spatial thinking to develop ethically responsible and reproducible workflows across the lifecycle of spatial data science problems.

Architect, implement, and deploy solutions that advance the state of the art in spatial data science to solve problems by leveraging and integrating contemporary computational, spatial data, and spatial visualization frameworks, including open source options.

Research, critique, and visually communicate spatial data quality and map spatial analysis results in support of analytical reasoning and ethical decision making in a variety of data intensive spatial data science contexts.

Contact

Campus	World Campus
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