

SOCIAL DATA ANALYTICS, B.S.

Begin Campus: Any Penn State Campus

End Campus: University Park

Program Description

Social Data Analytics is an interdisciplinary major that prepares students to participate in both a research environment where “big data” is a major source of insight into social and political processes, and an economy increasingly organized around data analytics. Students completing the major will have the technical skills to handle, analyze, apply and present big data, and the disciplinary knowledge to draw valid inferences from such information to address real world problems. The program integrates coursework in the social sciences with courses in statistics, mathematics, information science and computer science to develop the unique skill set necessary to conceptualize data sources in relation to the social conditions from which they arise; to think critically about big data in relation to specific problems; and to derive and test hypotheses through application of data tools and techniques. Students will gain valuable practical experience working with data through a capstone experience and participation in faculty research.

This major is intended to produce graduates who are big picture thinkers with the knowledge to formulate good questions and leverage vast stores of unstructured data in answering them. Students will be prepared for careers in government, business, healthcare, and industry. The major also provides a strong foundation for advanced study in social science, law, business and public policy.

What is Social Data Analytics?

Social Data Analytics (SoDA) is an interdisciplinary major that teaches students to use the increasingly vast stores of information generated from social media, cell phones, “smart objects” and other technology that captures moment to moment changes in where people are, what they are doing and thinking, and with whom they are associating. This data (often called “social data” or “big data”) can help researchers and policy makers address a wide variety of political, economic and social problems. It can be used, for example, to improve government services; to identify patterns of armed conflict, human rights abuses, and disease before they escalate; to enhance the efficiency of businesses; and to create more resilient communities in the face of climate change. Students in this major learn data analysis techniques and how to apply them to develop reliable answers to questions about the social and political world.

You Might Like This Program If...

You want to develop data analytics skills to solve real-world problems in the political, social, and economic arenas. The Social Data Analytics major combines social science, computer science, statistics, and visual communication to prepare students to use “big data” – effectively and ethically – to improve how people live and work together.

Entrance to Major

Admission to the major requires a grade of C or better in MATH 140, MATH 141, and CMPSC 131 and CMPSC 132, and a grade of B or better in PLSC 309. These courses must be completed by the end of the semester during which the admission to major process is carried out.

Degree Requirements

For the Bachelor of Science degree in Social Data Analytics, a minimum of 120 credits is required:

Requirement	Credits
General Education	45
Requirements for the Major	87

12 of the 45 credits for General Education are included in the Requirements for the Major. This includes: 6 credits of GQ courses, 6 credits of GS courses.

Requirements for the Major

A grade of C or better is required for all courses in the major. To graduate, a student enrolled in the major must earn at least a C grade in each course designated by the major as a C-required course, as specified by Senate Policy 82-44 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#82-44>).

Code	Title	Credits
Prescribed Courses		
<i>Prescribed Courses: Require a grade of C or better</i>		
CMPSC 131	Programming and Computation I: Fundamentals	3
CMPSC 132	Programming and Computation II: Data Structures	3
CMPSC 221	Object Oriented Programming with Web-Based Applications	3
CMPSC 360	Discrete Mathematics for Computer Science	3
DS 220	Data Management for Data Sciences	3
DS 300	Privacy and Security for Data Sciences	3
DS 310	Machine Learning for Data Analytics	3
DS 330	Visual Analytics for Data Sciences	3
MATH 140	Calculus With Analytic Geometry I	4
MATH 141	Calculus with Analytic Geometry II	4
MATH 220	Matrices	2
PLSC 1	American Politics: Principles, Processes and Powers	3
PLSC 10	Scientific Study of Politics	3
PLSC 309	Quantitative Political Analysis	3
SODA 308	Research Design for Social Data Analytics	3
SODA 496	Special Topics	6
STAT 184	Introduction to R	2
STAT/MATH 318	Elementary Probability	3
STAT 380	Data Science Through Statistical Reasoning and Computation	3
Additional Courses		
<i>Additional Courses: Require a grade of C or better</i>		
Select 3 credits from the following:		3
PLSC 3	Comparing Politics around the Globe	
PLSC 7N	Contemporary Political Ideologies	
PLSC 14	International Relations	
PLSC 17N	Introduction to Political Theory	
Select 3 credits from the following:		3
PHIL 106	Business Ethics	
PHIL 107	Philosophy of Technology	
PHIL 233Z	Ethics and the Design of Technology	

PHIL 406		
PHIL 407	Seminar in Philosophy of Technology	
Select 12 credits of PLSC courses at the 400 level of which at least 9 credits must be data intensive courses from a department list, including but not limited to PLSC 404, PLSC 429, PLSC 447, PLSC 476.		12
Select 9 credits from the following:		9
CMPSC 431W	Database Management Systems	
CMPSC 448	Machine Learning and Algorithmic AI	
CMPSC 465	Data Structures and Algorithms	
DS 320	Data Integration	
DS 402	Emerging Trends in the Data Sciences	
DS/CMPSC 410	Programming Models for Big Data	
STAT/MATH 319	Elementary Mathematical Statistics	
STAT 440	Computational Statistics	
STAT 464	Applied Nonparametric Statistics	
	Analytics courses from a department list	

General Education

Connecting career and curiosity, the General Education curriculum provides the opportunity for students to acquire transferable skills necessary to be successful in the future and to thrive while living in interconnected contexts. General Education aids students in developing intellectual curiosity, a strengthened ability to think, and a deeper sense of aesthetic appreciation. These are requirements for all baccalaureate students and are often partially incorporated into the requirements of a program. For additional information, see the General Education Requirements (<https://bulletins.psu.edu/undergraduate/general-education/baccalaureate-degree-general-education-program/>) section of the Bulletin and consult your academic adviser.

The keystone symbol appears next to the title of any course that is designated as a General Education course. Program requirements may also satisfy General Education requirements and vary for each program.

Foundations (grade of C or better is required and Inter-Domain courses do not meet this requirement.)

- **Quantification (GQ):** 6 credits
- **Writing and Speaking (GWS):** 9 credits

Breadth in the Knowledge Domains (Inter-Domain courses do not meet this requirement.)

- **Arts (GA):** 3 credits
- **Health and Wellness (GHW):** 3 credits
- **Humanities (GH):** 3 credits
- **Social and Behavioral Sciences (GS):** 3 credits
- **Natural Sciences (GN):** 3 credits

Integrative Studies

- **Inter-Domain Courses (Inter-Domain):** 6 credits

Exploration

- **GN,** may be completed with Inter-Domain courses: 3 credits
- **GA, GH, GN, GS, Inter-Domain courses.** This may include 3 credits of World Language course work beyond the 12th credit level or the requirements for the student's degree program, whichever is higher: 6 credits

University Degree Requirements

First Year Engagement

All students enrolled in a college or the Division of Undergraduate Studies at University Park, and the World Campus are required to take 1 to 3 credits of the First-Year Seminar, as specified by their college First-Year Engagement Plan.

Other Penn State colleges and campuses may require the First-Year Seminar; colleges and campuses that do not require a First-Year Seminar provide students with a first-year engagement experience.

First-year baccalaureate students entering Penn State should consult their academic adviser for these requirements.

Cultures Requirement

6 credits are required and may satisfy other requirements

- United States Cultures: 3 credits
- International Cultures: 3 credits

Writing Across the Curriculum

3 credits required from the college of graduation and likely prescribed as part of major requirements.

Total Minimum Credits

A minimum of 120 degree credits must be earned for a baccalaureate degree. The requirements for some programs may exceed 120 credits. Students should consult with their college or department adviser for information on specific credit requirements.

Quality of Work

Candidates must complete the degree requirements for their major and earn at least a 2.00 grade-point average for all courses completed within their degree program.

Limitations on Source and Time for Credit Acquisition

The college dean or campus chancellor and program faculty may require up to 24 credits of course work in the major to be taken at the location or in the college or program where the degree is earned. Credit used toward degree programs may need to be earned from a particular source or within time constraints (see Senate Policy 83-80 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#83-80>)). For more information, check the Suggested Academic Plan for your intended program.

Program Learning Objectives

- Develop capacity for cross disciplinary communication and the ability to work in teams.
- Handle large, heterogenous data; analyze data; and create data visualizations.
- Integrate data analytics skills, social science methodology and substantive knowledge to draw inferences about social and political phenomena, assess the validity of those inferences and apply conclusions to real life problems and decisions.
- Understand data in relation to both broader social and political problems and the social context that generates that information.
- Develop substantive knowledge in a social science discipline.
- Develop proficiency in research design, experimentation, statistical processes, hypothesis testing and validation.

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

Liberal Arts Academic Advising

814-865-2545

Use the Liberal Arts Meet the Academic Advisers web page (<https://la.psu.edu/student-services/academic-advising/meet-the-academic-advisers/>) to see the contact information for the specific adviser(s) of this program

Suggested Academic Plan

The suggested academic plan(s) listed on this page are the plan(s) that are in effect during the 2023-24 academic year. To access previous years' suggested academic plans, please visit the archive (<https://bulletins.psu.edu/undergraduate/archive/>) to view the appropriate Undergraduate Bulletin edition (*Note: the archive only contains suggested academic plans beginning with the 2018-19 edition of the Undergraduate Bulletin*).

Social Data Analytics, B.S. at University Park Campus

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

First Year

Fall	Credits	Spring	Credits
MATH 140 (GQ) ^{*†‡}	4	MATH 141 (GQ) ^{*†‡}	4
CMPSC 131 [*]	3	CMPSC 132 ^{*#}	3
PLSC 10 (GS) ^{*†}	3	PLSC 309 ^{*#}	3
FYS (GH)	3	IST 210 [*]	3
ENGL 15, 30H, 137H, CAS 137H, or ESL 15 (GWS) [†]	3	CAS 100, CAS 100A, CAS 100B, CAS 100C, CAS 138T, or ENGL 138T (GWS) [†]	3
	16		16

Second Year

Fall	Credits	Spring	Credits
MATH 220 [*]	2	DS 220 [*]	3
STAT 184	2	CMPSC 360 [*]	3
CMPSC 221 [*]	3	STAT 318 [*]	3

PLSC 1 (GS) (US) ^{*†}	3	PLSC any level (WAC) [*]	3
PLSC 3, 7N, 14, or 17N [*]	3	General Education Course (IL)	3
General Education Course	3		
	16		15

Third Year

Fall	Credits	Spring	Credits
DS 300, 310, or 330 [*]	3	DS 300, 310, or 330 [*]	3
PLSC 400-level ^{*1}	3	PLSC 400-level ^{*1}	3
STAT 380 [*]	3	Advanced Analytics ^{*2}	3
SODA 308 [*]	3	ENGL 202A, 202B, 202C, or 202D (GWS) [†]	3
General Education Course	3	Ethics (GH) ^{*†3}	3
	15		15

Fourth Year

Fall	Credits	Spring	Credits
SODA 496 [*]	3	SODA 496 [*]	3
DS 300, 310, or 330 [*]	3	PLSC 400-level ^{*1}	3
PLSC 400-level ^{*1}	3	Advanced Analytics ^{*2}	3
Advanced Analytics ^{*2}	3	General Education Course [*]	3
General Education Course	3	General Education Course (GHW)	3
	15		15

Total Credits 123

- * Course requires a grade of C or better for the major
- ‡ Course requires a grade of C or better for General Education
- # Course is an Entrance to Major requirement
- † Course satisfies General Education and degree requirement

¹ Select 12 credits of PLSC 400-level courses; at least 9 credits must be data intensive from department list

² Select 9 credits of advanced analytics from department list

³ Select 3 credits of ethics from department list

University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy Cultural Diversity Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

General Education includes Foundations (GWS and GQ), Knowledge Domains (GHW, GN, GA, GH, GS) and Integrative Studies (Inter-domain) requirements. N or Q (Honors) is the suffix at the end of a course number used to help identify an Inter-domain course, but the inter-domain attribute is used to fill audit requirements. Foundations courses (GWS and GQ) require a grade of 'C' or better.

All incoming Schreyer Honors College first-year students at University Park will take ENGL 137H/CAS 137H in the fall semester and ENGL 138T/CAS 138T in the spring semester. These courses carry the GWS designation and satisfy a portion of that General Education requirement. If the student's program prescribes GWS these courses will

replace both ENGL 15/ENGL 30H and CAS 100A/CAS 100B/CAS 100C.
Each course is 3 credits.

Social Data Analytics, B.S. at Commonwealth Campuses

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

First Year

Fall	Credits Spring	Credits
MATH 140 (GQ) ^{*‡#†}	4 MATH 141 (GQ) ^{*‡#†}	4
CMPSC 131 [*]	3 CMPSC 132 ^{*#}	3
General Education Course	3 General Education Course	3
FYS (GH)	3 General Education Course (IL)	3
ENGL 15, 30H, 137H, CAS 137H, or ESL 15 (GWS) [‡]	3 CAS 100, CAS 100A, CAS 100B, CAS 100C, CAS 138T, or ENGL 138T (GWS) [‡]	3
	16	16

Second Year

Fall	Credits Spring	Credits
MATH 220 [*]	2 DS 220 [*]	3
STAT 184	2 CMPSC 360 [*]	3
CMPSC 221 [*]	3 STAT 318 [*]	3
PLSC 309 ^{*#}	3 PLSC 1 (GS)(US) ^{*†}	3
IST 210 [*]	3 PLSC 3, 7N, 14, or 17N [*]	3
PLSC 10 (GS) ^{*†}	3	
	16	15

Third Year

Fall	Credits Spring	Credits
DS 300, 310, or 330 [*]	3 DS 300, 310, or 330 [*]	3
PLSC 400-level ^{*1}	3 PLSC 400-level ^{*1}	3
STAT 380 [*]	3 Advanced Analytics ^{*2}	3
SODA 308 [*]	3 ENGL 202A, 202B, 202C, or 202D (GWS) [‡]	3
PLSC any level (WAC) [*]	3 Ethics (GH) ^{*†3}	3
	15	15

Fourth Year

Fall	Credits Spring	Credits
SODA 496 [*]	3 SODA 496 [*]	3
DS 300, 310, or 330 [*]	3 PLSC 400-level ^{*1}	3
PLSC 400-level ^{*1}	3 Advanced Analytics ^{*2}	3
Advanced Analytics ^{*2}	3 General Education Course [*]	3
General Education Course	3 General Education Course (GHW)	3
	15	15

Total Credits 123

* Course requires a grade of C or better for the major

‡ Course requires a grade of C or better for General Education

Course is an Entrance to Major requirement

† Course satisfies General Education and degree requirement

¹ Select 12 credits of PLSC 400-level courses; at least 9 credits must be data intensive from department list

² Select 9 credits of advanced analytics from department list

³ Select 3 credits of ethics from department list

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General Education includes Foundations (GWS and GQ), Knowledge Domains (GHW, GN, GA, GH, GS) and Integrative Studies (Inter-domain) requirements. N or Q (Honors) is the suffix at the end of a course number used to help identify an Inter-domain course, but the inter-domain attribute is used to fill audit requirements. Foundations courses (GWS and GQ) require a grade of 'C' or better.

All incoming Schreyer Honors College first-year students at University Park will take ENGL 137H/CAS 137H in the fall semester and ENGL 138T/CAS 138T in the spring semester. These courses carry the GWS designation and satisfy a portion of that General Education requirement. If the student's program prescribes GWS these courses will replace both ENGL 15/ENGL 30H and CAS 100A/CAS 100B/CAS 100C. Each course is 3 credits.

Career Paths

Businesses and governments increasingly need employees who know how to handle, analyze and communicate with and about large and complex bodies of information. Glass Door described being a data scientist as the "best job in America" in 2016 because these positions are abundant and they command high salaries. Employers need people who can turn data into insights about the kind of problems they are trying to solve. The Social Data Analytics major provides students with a unique interdisciplinary training that develops their ability to think about data in relation to the complex social realities from which it is generated.

Careers

Some Social Data Analytics majors will use their training with companies seeking new markets, improved work flows, more effective marketing, or better investment climates. Others may work for government agencies such as the Department of Defense, the National Institute of Health, the Department of Energy or the Department of State, forecasting political change and coordinating resources to improve human health and security. The degree also prepares students to be strategists for political campaigns or to work in law enforcement. Additionally, this degree is excellent preparation for a variety of graduate programs, including social science, public policy, urban planning, and law.

MORE INFORMATION ABOUT POTENTIAL CAREER OPTIONS FOR GRADUATES OF THE SOCIAL DATA ANALYTICS PROGRAM (<https://soda.la.psu.edu/programs/undergraduate/prospective-students/>)

MORE INFORMATION ABOUT OPPORTUNITIES FOR GRADUATE STUDIES (<https://soda.la.psu.edu/programs/graduate-program/requirements/>)

Contact

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