DATA SCIENCE (CASNR)

Description

The data science major prepares students with skills and competency in data analysis and interpretation, algorithm design and implementation, and helps them develop aptitudes for interdisciplinary problem-solving. The interdisciplinary program enables students to take advantage of career and employment opportunities across diverse fields involving data-rich, data-driven systems and applications. Ultimately, this will help address the increasing societal and economic need for a qualified workforce in our digital age.

Students can select a major in data science through one of three colleges: Arts and Sciences (Department of Mathematics), Engineering (School of Computing), or Agricultural Science and Natural Resources (Department of Statistics). The data science program offers flexibility for students to earn a dual degree in data science and their chosen discipline's degree program. In addition, students may choose to add a minor that both complements and enhances the data science major.

College Requirements

College Admission

Requirements for admission into the College of Agricultural Sciences and Natural Resources (CASNR) are consistent with general University admission requirements (one unit equals one high school year): 4 units of English, 4 units of mathematics, 3 units of natural sciences, 3 units of social sciences, and 2 units of world language. Students must also meet performance requirements: a 3.0 cumulative high school grade point average OR an ACT composite of 20 or higher, writing portion not required OR a score of 1040 or higher on the SAT Critical Reading and Math sections OR rank in the top one-half of graduating class; transfer students must have a 2.0 (on a 4.0 scale) cumulative grade point average and 2.0 on the most recent term of attendance.

Admission Deficiencies/Removal of Deficiencies

Students who are admitted to CASNR with core course deficiencies must remove these deficiencies within the first 30 credit hours at the University of Nebraska–Lincoln, or within the first calendar year at Nebraska, whichever takes longer. College-level coursework taken to remove deficiencies may be used to meet degree requirements in CASNR.

Deficiencies in the required entrance subjects can be removed by the completion of specified courses in the University or by correspondence.

The Office of Admissions, Alexander Building (south entrance), City Campus, provides information to new students on how deficiencies can be removed.

College Degree Requirements

Curriculum Requirements

The curriculum requirements of the College consist of three areas: ACE (Achievement-Centered Education), College of Agricultural Sciences and Natural Resources Core, and Degree Program requirements and electives. All three areas of the College Curriculum Requirements are incorporated within the description of the Major/Degree Program sections of the catalog. The individual major/degree program listings of classes ensure that a student will meet the minimum curriculum requirements of the College.

World Languages/Language Requirement

Two units of a world language are required. This requirement is usually met with two years of high school language.

Experiential Learning

All undergraduates in the College of Agricultural Sciences and Natural Resources must take an Experiential Learning (EL) designated course. This may include 0-credit courses designed to document co-curricular activities recognized as Experiential Learning.

Minimum Hours Required for Graduation

The College grants the bachelors degree in programs associated with agricultural sciences, natural resources, and related programs. Students working toward a degree must earn at least 120 semester hours of credit. A minimum cumulative grade point average of C (2.0 on a 4.0 scale) must be maintained throughout the course of studies and is required for graduation. Some degree programs have a higher cumulative grade point average required for graduation. Please check the degree program on its graduation cumulative grade point average.

Grade Rules

Removal of C-, D, and F Grades

Only the most recent letter grade received in a given course will be used in computing a student's cumulative grade point average if the student has completed the course more than once and previously received a grade or grades below C in that course.

The previous grade (or grades) will not be used in the computation of the cumulative grade point average, but it will remain a part of the academic record and will appear on any transcript.

A student can remove from their cumulative average a course grade of C-, D+, D, D-, or F if the student repeats the same course at the University of Nebraska and receives a grade other than P (pass), I (incomplete), N (no pass), W (withdrew), or NR (no report). If a course is no longer being offered, it is not eligible for the revised grade point average computation process.

For complete procedures and regulations, see the Office of the University Registrar website at http://www.unl.edu/regrec/course-repeats (http://www.unl.edu/regrec/course-repeats/).

Pass/No Pass

Students in CASNR may take any course offered on a Pass/No Pass basis within the 24-hour limitation established by the Faculty Senate. However, a department may specify that the Pass/No Pass status of its courses be limited to non-majors or may choose to offer some courses for letter grades only.

GPA Requirements

A minimum cumulative grade point average of C (2.0 on a 4.0 scale) must be maintained throughout the course of studies and is required for graduation. Some degree programs have a higher cumulative grade point average required for graduation. Please check the degree program on its graduation cumulative grade point average.

Transfer Credit Rules

To be considered for admission a transfer student, Nebraska resident or nonresident, must have an accumulated average of C (2.0 on a 4.0 scale) and a minimum C average in the last semester of attendance at another college. Transfer students who have completed less than 12 credit hours of college study must submit either ACT or SAT scores.

Ordinarily, credits earned at an accredited college are accepted by the University. The College, however, will evaluate all hours submitted on an application for transfer and reserves the right to accept or reject any of them. Sixty (60) is the maximum number of hours the University will accept on transfer from a two-year college. Ninety (90) is the maximum number of hours the University will accept from a four-year college. Transfer credit in the degree program must be approved by the degree program advisor on a Request for Substitution Form to meet specific course requirements, group requirements, or course level requirements in the major. At least 9 hours in the major field, including the capstone course, must be completed at the University of Nebraska–Lincoln regardless of the number of hours transferred.

The College will accept no more than 10 semester hours of C-, D+, D, and D- grades from other schools. The C-, D+, D, and D- grades can only be applied to free electives. This policy does not apply to the transfer of grades from UNO or UNK to the University of Nebraska–Lincoln.

Joint Academic Transfer Programs

The College of Agricultural Sciences and Natural Resources has agreements with many institutions to support joint academic programs. The transfer programs include dual degree programs and cooperative degree programs. Dual degree programs offer students the opportunity to receive a degree from a participating institution and also to complete the requirements for a bachelor of science degree in CASNR. Cooperative programs result in a single degree from either the University of Nebraska–Lincoln or the cooperating institution.

Dual Degree Programs

A to B Programs

The A to B Program, a joint academic program offered by the CASNR and participating community colleges, allows students to complete the first two years of a degree program at the participating community college and continue their education and study in a degree program leading toward a bachelor of science degree.

The A to B Program provides a basic knowledge plus specialized coursework. Students transfer into CASNR with junior standing.

Depending on the community college, students enrolled in the A to B Program may complete the requirements for an associate of science at the community college, transfer to the University of Nebraska–Lincoln, and work toward a bachelor of science degree.

Participating community colleges include:

- Central Community College
- Metropolitan Community College
- Mid-Plains Community College
- Nebraska College of Technical Agriculture
- Nebraska Indian Community College
- Northeast Community College
- Southeast Community College
- Western Nebraska Community College

3+2 Programs

Two specialized degree programs in **animal science** and **veterinary science** are offered jointly with an accredited college or school of veterinary medicine. These two programs permit CASNR animal science or veterinary science students to receive a bachelor of science degree from the University of Nebraska–Lincoln with a degree in animal science or veterinary science after successfully completing two years of the professional curriculum in veterinary medicine at an accredited veterinary school. Students who successfully complete the 3+2 Program, must provide transcripts and complete the Application for Degree form via MyRED. Students without MyRED access may apply for graduation in person at Husker Hub in the Canfield Administration Building, or by mail. Students should discuss these degree programs with their academic advisor.

Cooperative Degree Programs

Academic credit from the University and a cooperating institution are applied towards a four-year degree from either the University of Nebraska–Lincoln (University degree-granting program) or the cooperating institution (non-University degree-granting program). All have approved programs of study.

UNL Degree-Granting Programs

A University of Nebraska–Lincoln degree-granting program is designed to provide students the opportunity to complete a two-year program of study at one of the four-year institutions listed below, transfer to CASNR, and complete the requirements for a bachelor of science degree.

Chadron State College. Chadron State College offers a 2+2 program leading to a grassland ecology and management degree program and a transfer program leading to a bachelor of science in agricultural education in the teaching option.

Wayne State College. Wayne State College offers a 3+1 program leading to a bachelor of science in plant biology in the ecology and management option and a 3+1 program leading to a bachelor of science in Applied Science.

University of Nebraska at Kearney. Transfer programs are available for students pursuing degree programs leading to a bachelor of science degree.

University of Nebraska at Omaha. Transfer programs are available for students pursuing degree programs leading to a bachelor of science degree.

Non University of Nebraska–Lincoln Degree-Granting Programs

CASNR cooperates with other institutions to provide coursework that is applied towards a degree at the cooperating institution. Pre-professional programs offered by CASNR allow students to complete the first two or three years of a degree program at the University prior to transferring and completing a degree at the cooperating institution.

Chadron State College–Range Science. The 3+1 Program in range science allows Chadron State College students to pursue a range science degree through Chadron State College. Students complete three years of coursework at Chadron State College and one year of specialized range science coursework (32 credit hours) at CASNR.

Residency

Students must complete at least 30 of the total hours for their degree using University of Nebraska–Lincoln credits. At least 18 of the 30 credit hours must be in courses offered through CASNR[1] (>299) including the appropriate ACE 10 degree requirement or an approved ACE 10 substitution offered through another Nebraska college and excluding independent study regardless of the number of hours transferred. Credit earned during education abroad may be used toward the residency requirement if students register through the University of Nebraska–Lincoln and participate in prior-approved education abroad programs.

The University of Nebraska–Lincoln open enrollment and summer independent study courses count toward residence.

[1] *Includes courses taught by CASNR faculty through interdisciplinary prefixes (e.g., LIFE, MBIO, ENVR, SCIL, EAEP, ENSC) and CASNR crosslisted courses taught by non-CASNR faculty.*

Online and Distance Education

There are many opportunities to earn college credit online through the University of Nebraska–Lincoln. Some of these credits may be applicable not only as elective credits but also toward the fulfillment of the College's education requirements. Credits earned online may count toward residency. However, certain offerings may not be counted toward scholarship requirements or academic recognition criteria.

For further information, contact:

Office of Online and Distance Education
University of Nebraska–Lincoln
305 Brace Labs
Lincoln, NE 68588-0109
402-472-4681
http://online.unl.edu/

Independent Study Rules

Students wishing to take part in independent studies must obtain permission; complete and sign a contract form; and furnish copies of the contract to the instructor, advisor, departmental office, and the Dean's Office. The contract should be completed before registration. Forms are available in 103 Agricultural Hall or online at the CASNR website.

Independent study projects include research, literature review or extension of coursework under the supervision and evaluation of a departmental faculty member.

Students may only count 12 hours of independent study toward their degrees and no more than 6 hours can be counted during their last 36 hours earned, excluding senior thesis, internships, and courses taught under an independent study number.

Other College Degree Requirements

Capstone Course Requirement

A capstone course is required for each CASNR degree program. A capstone course is defined as a course in which students are required to integrate diverse bodies of knowledge to solve a problem or formulate a policy of societal importance.

ACE Requirements

All students must fulfill the Achievement Centered Education (ACE) requirements. Information about the ACE program may be viewed at ace.unl.edu (https://ace.unl.edu/).

The minimum requirements of CASNR reflect the common core of courses that apply to students pursuing degrees in the college. Students should work with an advisor to satisfy ACE outcomes 1, 2, 3, 4, 6, and 10 with the college requirements.

Catalog Rule

Students must fulfill the requirements stated in the catalog for the academic year in which they are first admitted to the University of Nebraska–Lincoln or when they were first admitted to a Joint Academic Transfer Program. Students transferring from a community college, but without admission to a Joint Academic Transfer Program, may be eligible to fulfill the requirements as stated in the catalog for an academic year in which they were enrolled at the community college prior to attending the University of Nebraska-Lincoln. This decision should be made in consultation with academic advisors, provided the student a) was enrolled in a community college during the catalog year they are utilizing, b) maintained continuous enrollment at the previous institution for 1 academic year or more, and c) continued enrollment at the University of Nebraska-Lincoln within 1 calendar year from their last term at the previous institution. In consultation with advisors, a student may choose to follow a subsequent catalog for any academic year in which they are admitted to and enrolled as a degree-seeking student at the University of Nebraska–Lincoln in the College of Agricultural Sciences and Natural Resources. Students must complete all degree requirements from a single catalog year. The catalog which a student follows for degree requirements may not be more than 10 years old at the time of graduation.

Learning Outcomes

The primary student learning outcomes of the interdisciplinary data science major are:

1. Foundational knowledge and expertise in the analysis of large-scale data sources from the interdisciplinary perspectives of applied computer science, data modeling, mathematics, and statistics.
2. Foundational knowledge and expertise in the application of computing, informatics, and modeling to solve multidisciplinary problems.
3. Abilities and professional skills to solve multidisciplinary data science problems as a member of an interdisciplinary team.
4. Familiarity with ethical challenges in data science, including ethical collection of data, responsible use of data and algorithmic bias.

Major Requirements

The interdisciplinary data science major includes a set of core requirements, professional experience, and selection of fifteen (15) hours from two focus areas of interest.

College Integrative Course (ACE 8)		
SCIL 101	Science and Decision-Making for a Complex World	3
Credit Hours Subtotal:		3
Communications		
Written Communication (ACE 1)		
Select one of the following:		3
ENGL 150	Writing and Inquiry	
ENGL 151	Writing for Change	
ENGL 254	Writing and Communities	
JGEN 120	Basic Business Communication	
JGEN 200	Technical Communication I	
JGEN 300	Technical Communication II	
Oral Communication (ACE 2)		
Select one of the following:		3
ALEC 102	Interpersonal Skills for Leadership	
COMM 101	Communication in the 21st Century	
COMM 209	Public Speaking	
COMM 210	Communicating in Small Groups	

COMM 215	Visual Communication	
COMM 283	Interpersonal Communication	
COMM 286	Business and Professional Communication	
JGEN 300	Technical Communication II	
NRES 301	Environmental Communication Skills	
TMFD 121	Visual Communication with Animation	
Credit Hours Subtotal:		6
Natural Sciences (ACE 4)		
Select one each from two of the following areas:		8
Select from CASNR Approved Life Sciences:		
PLAS 131 & PLAS 132	Plant Science and Agronomic Plant Science Laboratory	
BIOS 101 & 101L	General Biology and General Biology Laboratory	
ENTO 115 / BIOS 115 & ENTO 116 / BIOS 116	Insect Biology and Insect Identification	
LIFE 120 & 120L	Fundamentals of Biology I and Fundamentals of Biology I laboratory	
LIFE 121 & 121L	Fundamentals of Biology II and Fundamentals of Biology II Laboratory	
Select from the following:		
CHEM 105A & CHEM 105L	Chemistry in Context I and Chemistry in Context I Laboratory	
CHEM 109A & CHEM 109L	General Chemistry I and General Chemistry I Laboratory	
Select from the following:		
AGST 109	Physical Principles in Agriculture and Life Sciences	
PHYS 141	Physics for Life Sciences I	
PHYS 151	Elements of Physics	
PHYS 211	General Physics I	
Credit Hours Subtotal:		8
Economics (ACE 6)		
Select one of the following:		3
ECON 211	Principles of Macroeconomics	
ECON 212	Principles of Microeconomics	
AECN 141	Introduction to the Economics of Agriculture	
Credit Hours Subtotal:		3
ACE Requirement		
Select one course each from ACE outcomes 5, 7, and 9		9
Credit Hours Subtotal:		9
CASNR Minor		
Select any CASNR minor in consultation with an academic advisor		12-18
Credit Hours Subtotal:		12-18
Total Credit Hours		**41-47**

Core Requirements

Computer Science		
CSCE 155T	Computer Science I: Informatics Focus	3
or CSCE 155E	Computer Science I: Systems Engineering Focus	
or CSCE 155N	Computer Science I: Engineering and Science Focus	
or CSCE 155H	Honors: Computer Science I	
or CSCE 155A	Computer Science I	
or RAIK 183H	Honors: Computer Problem Solving Essentials	
CSCE 311	Data Structures and Algorithms for Informatics	3
or CSCE 310	Data Structures and Algorithms	
or RAIK 283H	Honors: Software Engineering III	
CSCE 320	Data Analysis	3
or RAIK 370H / CSCE 370H	Honors: Data and Models II: Data Science Fundamentals	
Credit Hours Subtotal:		9
Mathematics		
MATH 104	Applied Calculus (ACE 3)	3-5
or MATH 106	Calculus I	
MATH 203	Contemporary Mathematics	3-4
or MATH 107	Calculus II	
MATH 315	Linear Algebra for Data Science	3
or MATH 314	Linear Algebra	
Credit Hours Subtotal:		9-12
Statistics		
Select on of the following options:		
Option 1:		
STAT 101	Introduction to Data	3
STAT 102	Principles of Statistical Analysis	3
Option 2:		
STAT 218	Introduction to Statistics	3
or STAT 380 / RAIK 270H	Statistics and Applications	
STAT 318	Introduction to Statistics II	3
Credit Hours Subtotal:		12
Total Credit Hours		**30-33**

Specific Major Requirements

Professional Experience (ACE 10)		
STAT 425	Statistical Collaboration II	3
or STAT 451	Development of Statistical Software	
or STAT 471	Analysis of Messy Data	
Credit Hours Subtotal:		3
Additional Courses		
STAT 212	Principles of Study Design	4
STAT 325	Statistical Collaboration I	3
STAT 349	Technical Skills for Statisticians	3
Credit Hours Subtotal:		10
Focus Area Courses		
Select at least 15 hours from two of the following focus areas, with 9 credit hours in one focus area and 6 credit hours in another focus area.		15
Artificial Intelligence		
CSCE 421	Foundations of Constraint Processing	
CSCE 472	Digital Image Processing	
CSCE 473	Computer Vision	

CSCE 474	Introduction to Data Mining
CSCE 475	Multiagent Systems
CSCE 476	Introduction to Artificial Intelligence
CSCE 478	Introduction to Machine Learning
CSCE 479	Introduction to Deep Learning
Software Development	
CSCE 361	Software Engineering
or RAIK 284H	Software Engineering IV
CSCE 378	Human-Computer Interaction
CSCE 412	Data Visualization
CSCE 453H / RAIK 453H	Honors: User Interfaces
CSCE 460	Software Engineering for Robotics
CSCE 461	Advanced Topics in Software Engineering
CSCE 464	Internet Systems and Programming
CSCE 466	Software Design and Architecture
CSCE 467	Testing, Verification and Analysis
CSCE 468	Requirements Elicitation, Modeling and Analysis
RAIK 403H	Honors: RAIK Design Studio III
RAIK 404H	Honors: RAIK Design Studio IV
RAIK 405H	Honors: RAIK Research Studio I
RAIK 406H	Honors: RAIK Research Studio II
Data Pipeline	
STAT 251	Statistical Computing I: Data Wrangling
STAT 351	Statistical Computing II: Data Management and Visualization
CSCE 411	Data Modeling for Systems Development
CSCE 413	Database Systems
CSCE 436	Advanced Embedded Systems
CSCE 438	Internet of Things
CSCE 458	Molecular and Nanoscale Communication
CSCE 463	Data and Network Security
CSCE 465	Wireless Communication Networks
Mathematical Modeling	
MATH 208	Calculus III
MATH 221	Differential Equations
MATH 415	Theory of Linear Transformations
MATH 424	Introduction to Partial Differential Equations
MATH 428	Principles of Operations Research
MATH 433	Nonlinear Optimization
MATH 440	Numerical Analysis I
MATH 447	Numerical Methods for Applied Math
MATH 450	Combinatorics
MATH 452	Graph Theory
MATH 471	Introduction to Topology
MATH 487	Probability Theory
MATH 489	Stochastic Processes
Statistical Modeling	
STAT 212	Principles of Study Design
STAT 301	Mathematical Statistics and Modeling I
STAT 302	Mathematical Statistics and Modeling II
STAT 325	Statistical Collaboration I
STAT 412	Advanced Statistical Design
STAT 414	Introduction to Survey Sampling
STAT 432	Introduction to Spatial Statistics
STAT 443	Statistical Analysis of Genomics Data
STAT 450	Introduction to Regression Analysis
STAT 462	Introduction to Mathematical Statistics I: Distribution Theory
STAT 463	Introduction to Mathematical Statistics II: Statistical Inference
STAT 464	Model Selection and Prediction
STAT 474	Introduction to Nonparametric Statistics
STAT 475	Introduction to Categorical Data Analysis
STAT 478	Introduction to Time Series Analysis
STAT 486	Introduction to Bayesian Analysis
PLAS 420	Bioinformatics Applications in Agriculture
SOCI 465	Survey Design and Analysis
Applied Computing: Journalism and Humanities	
ADPR 358	UX/UI Design
HIST 461	Geospatial Approaches in Digital Humanities and Social Sciences
HIST 470	Digital History
JOUR 307	Data Journalism
JOUR 407	Data Visualization
SPMC 350	Sports Data Visualization and Analytics
Applied Computing: Sociology	
SOCI 333	Applied Research in Public Opinion
SOCI 362	Ethics and the Responsible Conduct of Research
SOCI 407	Strategies of Social Research: Qualitative Methods
SOCI 430	Advanced Social Network Analysis
SOCI 465	Survey Design and Analysis
Applied Computing: Natural Resources	
AECN 401	Advanced Farm Management and Linear Programming
AECN 436	Commodity Price Forecasting
AGST 433	Equipment and Tractor Testing
NRES 218	Introduction to Geospatial Technologies
NRES 415	GIS for Agriculture and Natural Resources
NRES 418 / GEOG 418	Introduction to Remote Sensing
PLAS 420	Bioinformatics Applications in Agriculture
PLAS 431 / AGEN 431 / AGST 431	Site-specific Crop Management
Credit Hours Subtotal:	15

Additional Major Requirements

Grade Rules

C- and D Grades

A grade of C or above is required for all courses in the major.

Pass/No Pass

No course taken Pass/No Pass will be counted toward the major unless the course is offered exclusively with a grade option of Pass/No Pass.