New Program Proposal

MS in Data Science

General Information

Give a brief (1-2 paragraphs) overview of the proposed credential, including its disciplinary foundations and connections, its focus and learning objectives for students, and the specific degree (e.g. bachelors, masters, doctorate) and/or credentials (e.g. major, certificate, minor, concentrations) to be offered.
This Master of Science program in Data Science is designed to enable students coming from all backgrounds to achieve masters level mastery of data science techniques and their application to real data. A set of foundational classes are provided to enable students lacking mathematical, statistical, and/or computational knowledge to prepare for the core courses in the MS degree.

Each student completes 6 core courses (data management, statistics, machine learning I and II, data mining, and data ethics). Each student also completes three application domain courses. The remaining credits needed to obtain the MS degree are either research or internship credits. Learning objectives of the degree include the ability to work with a diversity of applied science data sets, formulation and implementation of appropriate models and analyses, grasp of statistical and computer programming "toolboxes," ability to communicate complex analyses intuitively to action-seeking stakeholders, appreciation for social and ethical dimensions of data-based decision making, and effective team-based science.

For students entering the program with a data science undergraduate degree, they should be able to complete the degree in 12 months; for those requiring a path facilitated by the foundational courses, they should be able to complete the degree in 15 months. A more in-depth and less intense 21-month option is also available.

Primary Proposer
Peter Ralph

Home department for this program
Data Science

College
Arts & Sciences, College of

Additional Department Affiliations

Level
Graduate

Program Type
Master's degree

Degree Type
Master of Science

Primary Location
UO main campus

Program Delivery Format
Traditional classroom/lab

Does the program represent a collaboration of two or more university academic units?
No

What's your desired effective term?
Fall 2026
Fall term is the default term unless an alternative is specifically requested and approved.

Relationship to Institutional Mission and Statewide Goals

How is the program connected with the UO's mission, signature strengths and strategic priorities?
The University of Oregon is a comprehensive public research university committed to exceptional teaching, discovery, and service. Data science is increasingly critical to an expanding set of research fields. The collaborative nature of this degree builds upon recent UO strengths in accessibility, applied programs and the discovery-driven mission of the SCDS. Data science jobs are growing rapidly across local, regional, and national landscapes.

How will the proposal contribute to meeting UO and statewide goals for student access and diversity, quality learning, research, knowledge creation and innovation, and economic and cultural support of Oregon and its communities?
Accessibility, equity and inclusion are fundamental to the data science program. By nature, data science involves and impacts all members of society. Correspondingly, an essential measure of success for the program is the recruitment and sustained support of a richly diverse student cohort, particularly for students traditionally underrepresented in STEM fields. We intentionally include advising and activities to attract and support such a diverse community of students and scholars.

Specific efforts with respect to education and quality learning involve adopting a pedagogical approach that embraces students who may not otherwise be exposed to STEM fields or who may be intimidated by quantitative STEM programs. The curriculum explicitly includes foundational courses to enable students from non STEM undergraduate disciplines to catch up.

Further initiatives will emulate the successful practices employed by the Data Science undergraduate program, including active recruitment of women and minorities into the

program and summer internship placements with companies partnering with the data science program. It is expected that these measures will ensure successful employment of data science students, including those traditionally underrepresented, as has been the case for the Data Science undergraduate program.

How will the proposal meet regional or statewide needs and enhance the state' capacity to:
• improve educational attainment in the region;
• respond effectively to social, economic and environmental challenges and opportunities; and
• address civic and cultural demands of citizenship?

Experienced data scientists are a growing economic need. The January 2019 report from Indeed, one of the top job websites, showed a 29% increase in demand for data scientists year over year, and a 344% increase since 2013. Data from the technology job website Dice showed a 32% increase in data science job postings year over year. Dice also noted that the job postings are from companies in a wide variety of industries, not just technology – e.g., healthcare, energy, and manufacturing. Indeed currently lists 121 open data science jobs in Oregon, 3,805 in California, 838 in Washington, and 20,281 in the United States.

We expect graduates of this program to find quality jobs immediately after graduation, both in the local area and throughout Oregon and the rest of the US, and in a diversity of domains including biotech, manufacturing, the public sector, etc.

In alignment with the deep history of UO as a liberal arts research university, a goal of the program is to not only help students utilize data science but to think critically about the impacts of data science on society, including awareness of the benefits and costs. With respect to the civic and cultural demands of citizenship, this program will prepare students to be keenly aware of the common and more subtle misuses of big data, and to securely and ethically use data in their future professions and leadership roles.

The program is responsive and robust to changes in the employment landscape due to rapid progress in AI. Informed and skillful use of cutting-edge tools including AI are incorporated at many points in the curriculum. Furthermore, the program focuses on contextualization and critical thinking paired with deep fundamental understanding; these are the skills that are increasingly in demand as the landscape shifts due to adoption of AI (especially, LLM) tools.

Program Description

Is there a core set of required courses?
Yes

What is the core set of required courses and what is the rationale for giving these courses this prominent role? What are the central concepts and/or skills you expect students to take from the core?
The core set of required courses that all students, regardless of domain focus, are required to take are listed below. The courses were selected as part of the core curriculum based on the program's learning objectives, a survey of leading data science programs across the nation, and a market assessment from Hanover Research.

* DSCI 531 Data Access and Management - data management using structured and unstructured databases
* DSCI 632 Statistics for Data Science - practical understanding of and experience with core concepts and methods in modern data analysis
* DSCI 633 Machine Learning I - applied concepts and methods in machine learning
* DSCI 634 Machine Learning II - advanced methods in machine learning
* DSCI 535 Data Mining, Exploration, and Visualization - summarize data with summary statistics and ordination techniques, as well as visualize data using a range of transformations and graphic approaches
* PHIL 623 Data Ethics - advanced exploration of central ethical challenges in data science and related fields of computational analysis

Armed with the knowledge from the courses above, a student will possess mastery of data science techniques that can be applied to multiple domains.

The above courses assume the equivalent of CS 212, MATH 252 and 342, and DSCI 311 in the undergraduate program. For students from non-STEM backgrounds, the following foundational courses are provided to enable such students to fill in the missing background before launching into the program core:

* DSCI 625 Foundational Mathematics for Data Science - an introduction to key mathematical principles for application to data science models, algorithms, and processes.
* DSCI 626 Foundational Statistics - an introduction to data management, data visualization, and statistical inference
* DSCI 627 Introduction to Programming for Data Science

These courses (DSCI 625, 626, and 627) are intended to fill in for prior training, and so their credits do not count towards the degree. Courses are offered in a way that allows graduation in one year (if no foundational courses are taken), four quarters (if some are required), or two years (if more in-depth study or a less full schedule is desired).

Are there tracks or concentrations within the credential? If so, do these start from a common core or are they differentiated from the beginning?
No. The 3-course elective portion of the MS degree enables a student to apply these techniques to one or more emphasis domains. At least 20 suitable, regularized elective courses exist to meet these emphasis domain requirements.

Furthermore, any remaining credit requirements (after having fulfilled the core and elective portions of the degree) will be fulfilled via one or more of four experiential mechanisms: 1. Research credits; 2. Internship credits; 3. The Synthetic Capstone course (DSCI 636); 4. Thesis credits.

Course of Study

Data Science Major Requirements

Courses used to fulfill the major requirements must be taken for a letter grade and passed with a grade of B- or better. Students may petition to replace a required course with another course (with the same number of units) if they can demonstrate equivalent prior work (for instance, by taking the course at UO).

Course List

Code	Title	Credits
Core courses - take all 6		
DSCI 531	Data Access and Management	4
DSCI 535	Data Mining, Exploration, and Visualization	4
DSCI 632	Statistics for Data Science	4
DSCI 633	Machine Learning I	4
DSCI 634	Machine Learning II	4
PHIL 623	Data Ethics	4
Elective courses - take any 3; the following is a list of pre-approved courses, but others can be substituted with approval of the Graduate Advisor:		12
ACTG 580	Accounting Data Analytics I	
ACTG 681	Accounting Data and Analytics II	
BI 561	Systems Neuroscience	
CH 547	Computational Chemistry	
CS 571	Introduction to Artificial Intelligence	
CS 573	Probabilistic Methods for Artificial Intelligence	
EC 522	Economic Forecasting	
EC 523	Econometrics	

Course List		
Code	**Title**	**Credits**
EC 527	Games and Decisions	
ERTH 518	Earth and Environmental Data Analysis	
GEOG 581	GIScience I	
GEOG 582	GIScience II	
GEOG 585	Remote Sensing I	
GEOG 586	Remote Sensing II	
GEOG 591	Advanced Geographic Information Systems	
GEOG 594	Spatial Analysis	
GEOG 595	Geographic Data Analysis	
JCOM 642	Quantitative Research Methods	
MKTG 515	Marketing Analytics	
PSY 512	Applied Data Analysis	
PSY 558	Decision-Making	
Research/Internship - minimum of 9 credits selected from one or more of the following courses:		9
DSCI 601	Research: [Topic]	
DSCI 604	Internship: [Topic]	
DSCI 636	Synthetic Project Capstone	
Total Credits		45

Expected Learning Outcomes for Students and Means of Assessment

Only one learning outcome should be listed per row. Additional fields are added once a row has been filled.

Principle Learning Outcome (Concept or Skill)	Part of curriculum where this learning outcome introduced	Part of curriculum where this learning outcome developed	How student learning for this outcome will be assessed
Be capable of working with a diverse range of data structures, formats, and sizes; able	.	DSCI 531, DSCI 535	Final projects in these courses

Principle Learning Outcome (Concept or Skill)	Part of curriculum where this learning outcome introduced	Part of curriculum where this learning outcome developed	How student learning for this outcome will be assessed
to implement clear, reproduceable workflows for data cleaning and manipulation			
Have a comprehensive toolbox of computational proficiencies, and a readiness to learn new skills as necessary	.	DSCI 531, DSCI 535	Final projects in these courses
Have a strong foundational and applied knowledge of statistical concepts and understand how these concepts motivate varying approaches to data exploration and visualization, prediction, and inference	.	DSCI 632, DSCI 535, DSCI 636	Final projects in these courses
Based on data at hand, be able to ask tractable questions and formulate appropriate analyses by leveraging a wide range of modeling and optimization frameworks, with emphasis on predictive modeling and machine learning.	.	DSCI 633, DSCI 634, DSCI 636	Final projects in these courses
Given a chosen modeling framework, demonstrate mastery of the process of model fitting. Be able to diagnose and apply	.	DSCI 632, DSCI 634	Final projects in these courses

Principle Learning Outcome (Concept or Skill)	Part of curriculum where this learning outcome introduced	Part of curriculum where this learning outcome developed	How student learning for this outcome will be assessed
methods for improving fit, and select the best performing model via comparison.			
Be able to present otherwise complex analysis results in an intuitive, easily comprehensible manner, with actionable recommendations for diverse stakeholders.	.	DSCI 535, DSCI 636	Final projects in these courses
Appreciate and effectively assess the social, ethical, and legal dimensions of data use and its consequences, including privacy, bias, and transparency in algorithmic decision-making and statistical inference.	.	PHIL 623, DSCI 636	Final projects in these courses

Only one learning outcome should be listed per row. Click the green plus sign to add a row.

Expected Learning Outcomes (Will Appear in Catalog)

	Learning Outcomes
1	Be capable of working with a diverse range of data structures, formats, and sizes, and be able to implement clear, reproducible workflows for data cleaning and manipulation with appropriate tools, including AI-assisted and automated systems.
2	Have a comprehensive toolbox of computational proficiencies, and a readiness to learn new skills as necessary and leverage rapidly developing AI technologies as necessary.
3	Have a strong foundational and applied knowledge of statistical concepts, and understand how these concepts motivate varying approaches to data exploration and visualization, prediction, and inference.

	Learning Outcomes
4	Based on data at hand, be able to ask tractable questions and formulate appropriate analyses by leveraging a wide range of modeling and optimization frameworks, with emphasis on predictive modeling and machine learning.
5	Be able to skillfully carry out chosen analyses and rigorously assess outcomes. Have the ability to confidently evaluate analyses for appropriateness and accuracy, including existing and AI-generated pipelines.
6	Be able to present otherwise complex analysis results in an intuitive, easily comprehensible manner, with actionable recommendations for diverse stakeholders.
7	Appreciate and effectively assess the social, ethical, and legal dimensions of data and algorithm use. Be familiar with methods to maintain privacy, enhance transparency, and avoid bias in algorithmic decision-making, statistical inference, and use of generative AI.

Accreditation

Is or will the program be accredited?
No

Please explain why accreditation is not being sought:
No formal accreditation body currently exists. We are tracking developments.

Need for this Credential

What is the anticipated fall term headcount over each of the next five years?

Fall Term Headcount = number of students enrolled in the program as of Fall term.

Year 1	Year 2	Year 3	Year 4	Year 5
10	15	30	45	80

What are the expected degrees/certificates over the next five years.

Number of Degrees:

Year 1	Year 2	Year 3	Year 4	Year 5
10	15	30	45	80

How did you arrive at the above estimates? Please provide evidence. (e.g. surveys, focus groups, documented requests, occupational/ employment statistics and forecasts, etc.)

These estimates are based on internal UO data: growth of the undergraduate program in Data Science (which launched in 2020).

The estimates are also based on anticipated increasing demand for data science professionals in the job market. The January 2019 report from Indeed showed a 29% increase in demand for data scientists year over year, and a 344% increase since 2013. The U. S. Bureau of Labor Statistics reported a 35% yearly increase in Data Scientist jobs for 2022 to 2023.

What are the characteristics of students you expect this program to attract (e.g., resident/out-of-state/international; traditional/nontraditional; full-time/part-time)? Will it appeal to students from particular backgrounds or with specific careers in mind?
This program will attract students with diverse characteristics. Resident, out-of-state, international, traditional, and non-traditional students with a wide variety of educational and lived experiences will be attracted to the program. Given the relatively intensive (~12-15 month) flight path for the program, we mostly anticipate full-time students, although part-time students are possible depending on the circumstances.

The program is specifically designed to welcome and appeal to students from all backgrounds, STEM-centered or not. Our optional foundational component of the curriculum will serve students without STEM training. Students wanting applied data science careers in domains with which they are already experienced, for example, should be especially attracted to the program. Likewise, students with strong backgrounds in computer science, statistics, etc., may seek more general data science careers but will also be prepared to work within specific domains.

What are possible career paths for students who earn this credential? Describe and provide evidence (e.g. surveys, focus groups, documented requests, occupational/employment statistics and forecasts, etc.) for the prospects for success of graduates in terms of employment, graduate work, licensure, or other professional attainments, as appropriate.
Data science is a growing field with numerous applications in the natural sciences and increasing employment demands. Graduates of the program will be competitive for data scientist positions in industry and public domains, including data analyst, quantitative analyst, data engineer, or artificial intelligence/machine learning engineer. Companies seeking to fill these positions include those from biotechnology, healthcare, manufacturing, and energy spaces. The demand for these positions has grown substantially in all sectors with the increasing availability of business and customer data. The workforce analysis company Glassdoor estimates starting salaries between $81k-$149k for entry-level data scientists.

Describe the steps that have been taken to ensure that the proposed program(s) does not overlap other existing UO program(s) or compete for the same population of students. [Provide documentation that relevant departments or areas have been informed of the proposal and have voiced no objections.]

Throughout design and planning of this program (initiated in 2020 by the UO Presidential Data Science Initiative), numerous UO stakeholders and academic units were solicited for feedback. As expected, the program is so unique that no other unit objected to the proposal on grounds related to overlap, competition, etc.

The following units were contacted for feedback, as they have the greatest potential for shared academic interests:

• Mathematics – This department does not have a graduate degree or area of emphasis specifically focused in data science. The department leadership has been informed of the proposed program.
• Computer Science – This department is an affiliate in the delivery of some proposed coursework and is heavily invested and involved in the undergraduate degree in data science. As such, and as CS is also housed within the new SCDS, CS supports the program.
• Biology – This department is an affiliate in the delivery of some proposed coursework and is supportive of the program. Several of its faculty and staff are on the DSI Graduate Program visioning committee that produced this document.
• KCASI (KCGIP) – The KC Graduate Internship Program's Bioinformatics and Genomics Track (BGMP) currently does not have an area of emphasis specifically focused broadly in data science. Several of its current or former faculty and staff were on the DSI Graduate Program visioning committee that produced this proposal.

List any existing program(s) that are complemented or enhanced by the new major.

Program(s)
KCASI Bioengineering Graduate Program
KCASI Graduate Internship Program
Biology Graduate Program
Computer Science Graduate Program
Data Science Undergraduate Program
Chemistry and Biochemistry Graduate Program
Earth Sciences Graduate Program

Program Integration And Collaboration

Are there closely-related programs in other Oregon public or private universities?
Yes

List similar prorgrams and indicate how the proposal complements them. Identify the potential for new collaboration.
Other MS in Data Science degrees in Oregon:

Oregon State University
Link: https://ecampus.oregonstate.edu/online-degrees/graduate/data-

analytics/curriculum.htm
This degree in Data Analytics is offered online (OSU's eCampus) by the Statistics department. The proposed UO degree is more heavily focused on Machine Learning and Data Mining, as well as Ethics and Visualization. Our graduates will be have more experience with framing, communication, and translation.

Portland State University
Link: https://www.pdx.edu/academics/programs/graduate/applied-data-science-business
This online degree is targeted at applied data science for business applications. The proposed UO degree is targeted at multiple emphasis domains, including business.

If applicable, explain why collaborating with institutions with existing similar programs would not take place.
The opportunity for collaboration among institutions is likely minimal, but there is a standing relationship with Oregon State University in areas of computational genomics and biological data science. In the future, collaboration with respect to education in this particular domain (biological data science) is possible.

Describe the potential for impact on other institution's programs.
The potential impact on the other institutions' programs should be minimal, as our program will draw from a much broader pool of potential students.

Resources Required to Offer the Program

List any faculty who will have a role in this this program, indicating those who have leadership and/or coordinating roles. For each individual, indicate status with respect to tenure track (TT or NTT), rank, and full-time or part-time.

Faculty Name	Faculty Classification and Rank	FTE	Role
Peter Ralph (TT)	Associate Professor		Director
Rori Rohlfs (TT)	Associate Professor		Faculty
Andrew Muehleisen (NTT)	Lecturer		Faculty
Jake Searcy (TT)	Assistant Professor		Faculty
Ashley Cordes (TT)	Assistant Professor		Faculty
Roshni Patel (TT)	Assistant Professor		Faculty
Charlotte Chang (TT)	Assistant Professor		Faculty

Please describe the adequacy and quality of the faculty delivering the program, including how the mix of tenure-track, career and pro tem faculty are strategically used to ensure effective delivery of the curriculum.
Faculty within the new Data Science Department, and within the new School of Computer and Data Sciences, are leaders in Data Science research and education. Collectively, the faculty currently have the expertise and excellence required to deliver the program, and the quality of the program will grow with the Department and School. The Department has

grown to 5.5 TTF and 1.0 NTTF, and are searching for an additional position in AY25/26; these faculty have broad experience in research and pedagogy across domains in Data Science, and are sufficient to cover the proposed curriculum. Additional hires have been projected in the upcoming years, which will cover sabbaticals and buyouts, and to broaden the pool of elective courses.

Over the past several years faculty lines have been approved both within Data Science as well as more broadly affiliated with SCDS across campus, and the majority have been successful. These faculty members are teaching courses that will contribute to the core offerings (e.g., Data Ethics is offered via faculty hired into philosophy in CAS) and domain offerings at the upper division (e.g., hires in Data Science, Computer Science, biology, math, physics, etc.).

To fulfill the pedagogical needs of training in core applied data science principles, program courses will be developed through two primary mechanisms. First, working under the guidance of TTF members of the Internal Advisory Board (IAB), NTTF in the SCDS - including new hires as necessary - will work to build the courses and begin delivering content. These individuals are highly trained in data science and have been developing and teaching courses in a variety of data science areas at UO. Second, key interested TTF faculty housed in other units (e.g. CS, Math, Biology, KCASI) will be recruited to participate in the development and delivery of these courses via course buyouts to home departments.

The Data Science department has been awarded two IHP tenure lines to fill during the 23-24 recruiting season. We anticipate additional lines over time to grow the department.

What is the nature and level of research and/or scholarly work expected of program faculty that will be indicators of success in those areas?
Program faculty, including TT and NTT, are and will continue to be leaders in Data Science (and Data Science-heavy domains) research and education. For example, faculty are expected to publish impactful research in leading journals for their respective fields, acquire competitive funding for Data Science research, and train/graduate both undergraduate and graduate students who launch into careers as analysts, machine learning and AI experts, data science educators and advisors, etc.

Describe how students will be advised in the new program.
The Data Science Master's Program faculty and staff will provide the majority of advising to data science students. In addition, as with other programs such as the GIP in KCASI, FTE will be built into the budget through staff and peer mentors to provide additional, data science-specific advising support for students once revenue from the program is available. These resources will be appropriately scaled as the program grows. We anticipate that at full scale, a 1.0 FTE graduate education advisor will be among the faculty/staff.

Describe the staff support for the proposed program, including existing staff and any additional staff support that will be needed.

The program will grow organically over time, with the goal of reaching full capacity five years after launch. As such, in addition to core and associated faculty for teaching, we will require proportional growth of staff and personnel for office and graduate degree management, advising.

Are special facilities, equipment, or other resources required as a result of this proposal (e.g., unusual library resources, digital media support,
Due to the UO's commitment to increasing IT infrastructure over the previous 5 years (particularly investments through Transform IT and the creation of Talapas and RACS) the overall computing infrastructure is largely in place to support our degree. We will require specialized local equipment, such as a laptop pool, an educational condo on Talapas, and support for the Jupyter collaborative coding environment.

In addition to equipment, we will require classroom space for lectures and spaces for interactive computer education. Within the Data Science Department we have PAC 204, a flexible space suitable for medium-sized workshops and lectures (~20-30 people). Additional education/advising space (such as the collaborative rooms in the Price Science Library, B042 and B044, or in the KCASI) would allow better classroom structure if available, but are not required.

We anticipate no unusual library needs or other extended infrastructure resources at this time.

What is the targeted student/faculty ratio? (student FTE divided by faculty FTE)
The student/teacher ratio is estimated to be around 10 student FTE per faculty FTE.

What are the resources to be devoted to student recruitment?
AY26/27 will be a "soft launch" relying mostly on word-of-mouth recruiting through faculty contacts and existing UO students. In subsequent years, we will maintain and leverage contacts among alumni (including from the undergraduate degree and domain area partners, in part using our planned administrative FTE); streamline paths from our undergraduate degree directly to the Master's program; expand into an international market that has already expressed keen interest; and experiment with direct advertising, such as media campaigns and advertisements (FTE allowing).

Other Program Characteristics

Must courses be taken for a letter grade and/or passed with a minimum grade to count toward the proposed program? If so, please list the courses and the requirements of each. Note: Although there is variation in detail, UO undergraduate majors typically require that most of the courses be taken for a letter grade (not "pass/no pass") and that the grade be C- or better.

All courses counted towards completion of the Masters in Data Science must be taken for a letter grade and passed with a grade of B- or better.
Master's programs require at least 24 credits to be taken for a letter grade, but individual programs may require a higher number. There are no specific graded credit policies for doctoral and certificate programs; each program should determine what is appropriate within their discipline.

How much course overlap will be allowed to count toward both this programs and some other credential a student might be earning (a minor, certificate, or another program)? If there are specific credentials with overlap limits, please list those and the limits. For Accelerated Master's Program proposals, include in this section the proposed credit allocation structure for graduate credits taken as an undergraduate, i.e., how many graduate credits may count only toward the master's degree and how many may be used to clear requirements for both the bachelor's and the master's.
As this is a Masters Degree, we do not anticipate students wishing to use credits for our courses for other postgraduate credentials. Our future plans include an Accelerated Master's Program and a PhD program, and plans for credit allocation will be included in those proposals.

We are certainly willing to support inclusion of our core courses into the curricula for more domain-focused MS and PhD programs.

Does your proposal call for new courses, or conversion of experimental courses into permanent courses? If so, please list courses in the text box below and indicate when they will be submitted to UOCC for approval:
All courses are approved.

Will admission to the program be limited?
No

Will students be required to apply for entry to this program?
Yes

What are the conditions for admission?
Students must have an undergraduate (e.g. Bachelor's) degree from an accredited institution.