Academic Senate
Received 3/3/22

A Proposal for a

MINOR IN DATA SCIENCE

College of Natural and Agricultural Sciences
Marlan and Rosemary Bourns College of Engineering
University of California – Riverside
Riverside, CA 92521

Minor in Data Science Approvals

Approvals	Dates
Approved by the faculty of the Program in Data Science:	2/16/2022
Approved by the Statistics Department:	2/8/2022
Approved by the Computer Science and Engineering Department:	12/8/2021
Approved by the Executive Committee of the College of Engineering:	3/3/22
Approved by the Executive Committee of the College of Natural and Agricultural Sciences:	
Approved by the Committee on Educational Policy:	

Contact Information

For any questions, please contact:

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UC RIVERSIDE
Marlan and Rosemary Bourns College of Engineering

BCOE EXECUTIVE COMMITTEE

March 3, 2022

TO: Jason Stajich, Chair
Riverside Division of the Academic Senate

FROM: Victor G. J. Rodgers, Chair
BCOE Executive Committee

RE: Minor in Data Science Proposal

The BCOE Executive Committee voted unanimously in favor of the proposal.

1. Name of the academic program and the department(s) or unit(s) that will administer the program.

Name: Data Science Minor

Department(s): Computer Science and Engineering (CSE)
Statistics (STAT)

2. A thorough justification, including the motivation for the creation of the program in terms of student interest and professional or academic importance.

This section outlines a proposal for an interdisciplinary Minor in Data Science (DS), which will be jointly managed by two departments: Statistics (STAT) and Computer Science and Engineering (CSE).

Motivation

Data has become ubiquitous in everyday life, impacting every profession, including business, health care, public safety, public policy, transportation, and many more. Data also permeates all aspects of natural and social sciences and other academic disciplines. As a result, the field of Data Science has emerged as a new academic discipline: the study of data itself. Data Science deals with obtaining insight and information from the analysis of large collections of data.

UCR recently launched a Bachelors in Data Science, but there has been much interest in new courses introduced by the major and in utilizing data science methods on problems in different fields. The proposed minor will allow students to be exposed to introductory statistics and computer science to equip them with the skills needed to understand the potential of data science and apply knowledge and tools learned to various problems.

The new program will rely on existing faculty and existing courses across the two departments and leverage upon existing facilities in the two departments.

Program Objectives

The objective of the Minor in Data Science program is to provide training in various aspects of the data lifecycle. Students will gain exposure to data collection, data cleaning, data integration, data management, and data visualization, as well as the techniques necessary for data analysis and machine learning.

The program aims to attract students from various majors and backgrounds. We believe our program will empower students across the wide array of campus disciplines and provide them with a working knowledge of statistics, probability, and computation that will allow students to carry out rigorous computational and inferential analysis for their field of interest.

We expect this minor will be attractive to students pursuing degrees in Biology, Math, Geoscience, Physics, Neuroscience, Business, Public Policy, Psychology, Environmental Engineering, and Electrical Engineering, among others. Many of these majors already require a subset of the lower-division courses required for the Data Science minor. For example, Biology students are required to take STAT 10, and can opt to take courses from the CS 9/10 series and additional STAT courses to fulfill either major or General Education requirements.

The importance of Data Science is evident through various related UC-wide initiatives. In addition to creating degree programs in Data Science, many UCs have also created a minor in Data Science. For example, UCLA offers a minor in Social Data Science[1] which provides social science students a solid background in tools and platforms required to manage and analyze data. UCLA is also proposing a new Data Science Engineering Minor that is expected to launch soon. UC Berkeley[2] and UC San Diego[3] have a minor in Data Science open to all students who are interested in gaining practical knowledge of methods and techniques of data analysis.

3. Relationship of the new program to existing programs.

UCR recently launched the B.S. in Data Science and this minor includes a subset of courses required by that program. The minor will allow students to gain experience in data science and complement their major / field of interest. We have the support of the two departments that collaborated in offering the B.S. in Data Science program (see letters).

4. The proposed curriculum. Great care should be given in this area, correct rubrics should be listed for courses, all cross listings should be listed, unit total considerations should be taken into account and totals should be verified by program staff, faculty, and appropriate Executive Committee personnel. A copy of the proposed program change should be provided for inclusion in the Catalog.

Minor Objectives

The Data Science minor is designed to provide students with practical knowledge of the concepts and techniques used in data analysis, including statistical methodology, data-oriented computing, and data ethics. The minor will empower students across a wide array of majors (including Biology, Math, Geoscience, Physics, Neuroscience, Business, Public Policy, etc.) with the foundational skills to design, implement, and think critically about inferential analysis within their respective disciplines.

Students with majors in Computer Science, Computer Science with Business Applications,

[1] https://catalog.registrar.ucla.edu/minor/2021/SocialDataScienceMinor
[2] https://data.berkeley.edu/academics/data-science-undergraduate-studies/data-science-minor
[3] https://datascience.ucsd.edu/academics/undergraduate/minor-requirements/

Computer Engineering, Data Science, and Statistics are not eligible for the Data Science minor.

Students who complete the minor program will be able to:

1) use basic programming concepts and techniques in Python or R to clean, wrangle, and organize data;
2) perform exploratory data analysis and visualization of datasets;
3) connect real-world objectives in data analysis to formal mathematical tools;
4) understand issues related to bias, fairness, and privacy with respect to data science applications and ML algorithms;
5) apply data science techniques to problems from various disciplines and communicate results to stakeholders.

Curricular Structure

The Minor in Data Science is an interdisciplinary minor offered by the Bourns College of Engineering (BCOE) and the College of Natural and Agricultural Sciences (CNAS). When students declare the minor, they choose from which college they wish to have their degree awarded. Students whose degrees are awarded by the BCOE are advised in and have their records maintained by the BCOE Office of Student Academic Affairs; students whose degrees are awarded by the CNAS are advised in and have their records maintained by the CNAS Undergraduate Academic Advising Center.

A copy of the proposed program change is provided for inclusion in the Catalog in Appendix A.

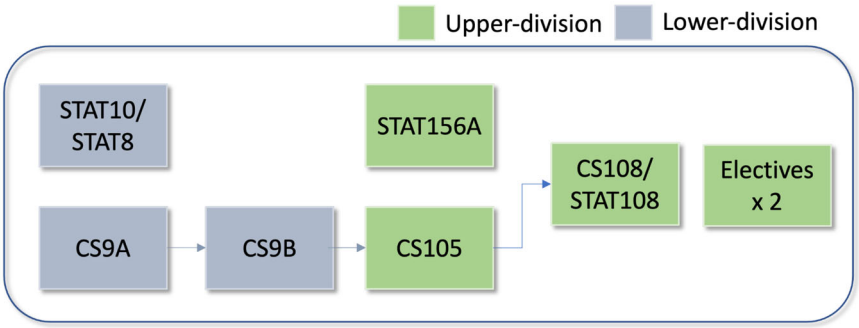
The proposed Data Science Minor requires a total of eight courses (33 units) of which three are lower division courses (13 units) and five are upper division courses (20 units). The lower division courses will provide foundational computing and statistical knowledge, as well as satisfy the prerequisite requirements, necessary for the upper division courses.

The following are the requirements for the Data Science minor.

1. Lower-division requirements (13 units):

   CS 009A; CS 009B; STAT 008 or STAT 010

2. Upper-division requirements (20 units):
   a) CS 105
   b) STAT 156A
   c) CS 108 / STAT 108
   d) Eight (8) units of the upper-division courses selected from the list below:
   CS 100, CS 166, CS 167, CS 170, CS 171, CS 172, STAT 107, STAT 130, STAT 140, STAT 146, STAT 156B, STAT 167



No more than 4 units may be in courses numbered 190 through 199 can be used as electives. Completion of CS 009A and CS 009B with a C- or better and completion of the minor requirements with at least 2.700 GPA is required.

Lower-Division Courses (13 units)

(one of STAT 010 or STAT 008)

STAT 008 Statistics for Business *5 Units, Lecture, 3 hours; discussion, 1 hour; laboratory, 3 hours. Prerequisite(s): CS 008; MATH 004 or MATH 005 or MATH 006B or MATH 007A or MATH 009A or MATH 09HA; or equivalent.* An introduction to statistics using business applications. Topics include descriptive statistics; probability; discrete and continuous distributions; Bayes' theorem; random variables; estimation and confidence intervals; hypothesis testing; and simple linear regression. Credit is awarded for one of the following STAT 008 or STAT 010.

STAT 010 Introduction to Statistics *5 Lecture, 3 hours; discussion, 1 hour; laboratory, 3 hours. Prerequisite(s): MATH 005 or MATH 006B or MATH 009A or MATH 09HA or MATH 007A.* A general introduction to descriptive and inferential statistics. Topics include histograms; descriptive statistics; probability; normal and binomial distributions; sampling distributions; hypothesis testing; and confidence intervals. Credit is awarded for one of the following STAT 010 or STAT 008.

CS 009A - Data-oriented Introduction to Computing I *4 Lecture, 3 hours; Laboratory, 2 hours, 1hr Individual Study. Prerequisite(s): A college mathematics course (may be taken concurrently) or credit for MATH 009A from the Advanced Placement Examination or the Mathematics Advisory Examination. Credit is awarded for one of the following: CS 010A or CS009A.* Covers computational thinking, problem-solving, and data analysis through application-based data manipulation tasks from science, engineering, business, and the humanities. Concepts covered includes variables, expressions, branches, loops, functions, parameters, lists, strings, file I/O, and exception handling. Also covers software design, testing, and debugging.

CS 009B - Data-oriented Introduction to Computing II *4 Lecture, 3 hours; Laboratory, 2 hour, 1hr Individual Study. Prerequisite(s): CS009A. Credit is awarded for one of the following: CS 010B or CS009A.* Covers advanced programming concepts and algorithms. Emphasizes good programming principles in the design and development of substantial programs. Topics include abstract data types, objects and classes, recursion, and basic software engineering principles. Credit is awarded for only the following: CS 010B or CS 009B.

Upper-Division Courses (12 units)

CS 105 Data Analysis Methods *4 Lecture, 3 hours; laboratory, 2 hours; individual study, 1 hour. Prerequisite(s): CS 009B or CS 010B* An introduction to fundamental concepts and methods in data analysis and visualization essential to a variety of data science tasks. Designed to provide preparation for the data science major and for advanced courses in data analysis and applications of data science

CS 108 / STAT 108 *Data Ethics* *4 Lecture, 3 hours; outside research, 3 hours. Prerequisite(s): CS 105 or STAT 107 or CS171; or equivalents; or consent of instructor.* Covers ethics specifically related to data science. Topics include data privacy; data curation and storage; discrimination and bias arising in the machine learning process; statistical topics such as generalization, causality, curse of dimensionality, and sampling bias; data communication; and strategies for conceptualizing, measuring, and mitigating problems in data-driven decision-making.

STAT 156A Mathematical Statistics With Applications For Data Science I *4 Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): MATH 009C with a grade of C- or better or MATH 09HC.* Introduction to frequentist probability concepts, random variables, and their distributions. Discusses key theorems and inequalities in probability theory. Introduces to frequentist methods of point and interval estimation.

Electives (8 units)

STAT 107 Introduction to Statistical Computing With R *4 Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): STAT 010; or equivalent.* Introduction to R. Topics include data management, basic statistical analysis and graphics, use of functions and packages, simple programming, and reproducible work.

STAT 130 Sampling Surveys *4 Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): STAT 011 or STAT 107; or equivalent.* Covers simple random sampling, stratified sampling, cluster sampling, and ratio and regression estimates. Also explores random response, capture recapture, and jack-knife techniques.

STAT 140 Nonparametric Techniques *4 Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): STAT 011 or STAT 107; or equivalent.* Covers randomization tests, rank tests, methods of association, and distribution-free tests.

STAT 146 Statistical Forecasting Techniques *4 Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): STAT 160A or equivalent.* Topics include exponential smoothing, simple and multiple regression analysis, time series, trend analysis, and seasonal analysis.

STAT 156B Mathematical Statistics With Applications For Data Science II *4 Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): STAT 156A with a grade of C- or better.* Topics include illustrative applications of Frequentist theory to linear regression; logistic regression and ANOVA; introduction to Bayes' rule, Bayesian probability concepts, and credible intervals; analysis of contingency tables; applications of sequential statistics; and methods for observational studies and missing data.

STAT 167 Introduction to Data Science *4 Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): STAT 107 with a grade of C- or better; CS 010A with a grade of C- or better.* Introduction to data science using the R programming language. Topics include big data management, visualization and analytical skills, unsupervised and supervised statistical learning methods, and real-world data science application examples.

CS 100 Software Construction *4 Lecture, 3 hours; laboratory, 2 hours; individual study, 1 hour. Prerequisite(s): CS 010C with a grade of C- or better.* Emphasizes development of software systems. Topics include design and implementation strategies and selection and mastery of programming languages, environment tools, and development processes. Develops skill in programming, testing, debugging, performance evaluation, component integration, maintenance, and documentation. Covers professional and ethical responsibilities and the need to stay current with technology.

CS 166 Database Management System*s* *4 Lecture, 3 hours; laboratory, 2 hours; individual study, 1 hour. Prerequisite(s): CS 100; CS 111*. Covers basic concepts of databases and database management systems. Topics include entity-relationship modeling for design, relational data model, relational algebra, Structured Query Language (SQL), secondary storage, indexing and hashing, query evaluation and optimization, and overview of transactions.

CS 167 Introduction to Big-Data Management *4 Lecture, 3 hours; laboratory, 2 hours; individual study, 1 hour. Prerequisite(s): CS 100, CS 111; CS 167 online section: enrollment in the online Master-of-Science in Engineering program.* Introduces the architecture of big-data systems and their applications in data management and processing. Describes the common functionality in big-data processing such as distributed storage, resource management, query processing, fault-tolerance, and programming APIs. Covers the popular big data technologies such as distributed shared nothing systems, NoSQL processing model, and semi-structured data management.

CS 170 Introduction to Artificial Intelligence 4 Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): CS 100 with a grade of "C-" or better, CS 111. An introduction to the field of artificial intelligence. Focuses on discrete-valued problems. Covers heuristic search, problem representation, and classical planning. Also covers constraint satisfaction and logical inference.

CS 171 Introduction to Machine Learning and Data Mining *4 Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): MATH 010A, MATH 031 or EE 020B; STAT 155 or EE 114; CS 100 or CS 120B or EE 120B.* Introduces formalisms and methods in data mining and machine learning. Topics include data representation, supervised learning, and classification. Covers regression and clustering. Also covers rule learning, function approximation, and margin based methods. Cross-listed with EE 142.

CS 172 Introduction to Information Retrieval *4 Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): CS 100; CS 111; EE 114 or STAT 155.* Introduces information retrieval (IR) principles and techniques for indexing and searching document collections. Topics include Web search, text processing, ranking algorithms, search in social networks, and search evaluation. Also studies scalability issues in search engines. Satisfactory (S) or No Credit (NC) grading is not available.

CS 173 Introduction to Information Retrieval *4 Lecture, 3 hours; discussion, 1 hour. Prerequisite(s): CS 150*, may be taken concurrently. An overview of modern approaches for natural language processing. Focuses on major algorithms used in NLP for various applications such as part-of-speech tagging, parsing, named entity recognition, coreference resolution, sentiment analysis, and machine translation.

5. A list of faculty who will be involved in the program, including those teaching, advising, and administering.

Supporting Faculty for Data Science Minor

Faculty Member	Department	Position	Expertise
Xinping Cui	STAT	Professor	Statistical genetics, Genomics and Bioinformatics, Multiple testing, High dimensional variable selection, Post-selection inference, System biology
Ahmed Eldawy	CSE	Assistant Professor	Spatial data management, Big data management, Databases, Data mining, Artificial intelligence,
James Flegal	STAT	Associate Professor, Vice Chair	Statistical computing, Markov chain Monte Carlo methodology, Bayesian statistical methods, Monte Carlo standard errors, Perfect sampling

Faculty Member	Department	Position	Expertise
Analisa Flores	STAT	Assistant Professor of Teaching	Effective pedagogy, Statistics education for undergraduate students, Experimental design
Yingzhuo Fu	STAT	Assistant Professor of Teaching, Data Science UG Advisor (STAT)	Effective pedagogy, Anomaly detection, Sequential process control
Subir Ghosh	STAT	Professor	Statistical design and analysis of experiments, Model identification and discrimination
Vagelis Hristidis	CSE	Professor	Systems and networks, Databases, Data mining, Artificial intelligence
Daniel Jeske	STAT	Professor, Vice Provost	Statistical classification and prediction methodologies, Statistical process control methodologies, Biostatistics applications, Reliability modeling
Eamonn Keogh	CSE	Distinguished Professor	Databases, Data mining, Artificial intelligence
Esra Kurum	STAT	Assistant Professor	Change-point models, opula-based modeling, Longitudinal and survival data analysis, Nonparametric and semiparametric modeling
Paea LePendu	CSE	Assistant Professor of Teaching	Biomedical informatics, Natural language processing, Databases, Data mining, Artificial intelligence
Jun Li	STAT	Professor	Multivariate nonparametric statistics, Statistical process control
Yehua Li	STAT	Professor, Chair	Functional/ longitudinal data analysis, Semiparametric models, Spatial statistics, Measurement error, Mixture models
Stefano Lonardi	CSE	Professor, Vice Chair	Algorithms and bioinformatics, Computational molecular biology, Data mining

Faculty Member	Department	Position	Expertise
Shujie Ma	STAT	Professor	Precision medicine, Machine learning, Large scale data
Wenxiu Ma	STAT	Associate Professor	Computational biology, Bioinformatics, Genomics, Machine learning
Amr Magdy	CSE	Assistant Professor	Database systems, Spatial data management, Big data management, Large-scale data analytics, Indexing, Main-memory management
Evangelos Papalexakis	CSE	Associate Professor	Databases, Data mining, Artificial intelligence
Ravi Ravishankar	CSE	Professor	Cybersecurity, Databases, Data mining, Artificial intelligence
Mariam Salloum	CSE	Assistant Professor of Teaching, Data Science UG Advisor (CSE)	Data integration, Big data visualization, Machine learning, Database management, Computer Science Education
Christian Shelton	CSE	Professor	Databases, Data mining, Artificial intelligence, Machine learning
Vassilis Tsotras	CSE	Professor	Databases, Data mining, Artificial intelligence
Weixin Yao	STAT	Professor	Mixture models, Semiparametric modeling, Robust data analysis
Shuheng Zhou	STAT	Associate Professor	Statistical and machine learning methods, Theory for analyzing large, complex and high dimensional data
Reem Ali Kris Miller Niloofar Montazeri Elena Strzheletska	CSE	Lecturers	Effective pedagogy

Course Instructors for Data Science Minor

Course	Course Title	Instructor(s)
CS 009A	Data-oriented Introduction to Computing I	Dr. Mariam Salloum, Kris Miller
CS 009B	Data-oriented Introduction to Computing II	Dr. Paea LePendu
CS 105	Data Analysis Methods	Dr. Mariam Salloum, Dr. Elena Strzheletska
CS 108 / STAT 108	Data Ethics	Dr. Analisa Flores, Dr. Mariam Salloum
CS 100	Software Construction	Dr. Reem Ali
CS 166	Database Management Systems	Dr. Vassilis Tsotras
CS 167	Introduction to Big-Data Management	Dr. Ahmed Eldawy
CS 170	Introduction to Artificial Intelligence	Dr. Eamonn Keogh, Dr. Niloofar Montazeri
CS 171	Introduction to Machine Learning and Data Mining	Dr. Evangelos Papalexakis, Dr. Salman Asif, Dr. Christian Shelton
CS 172	Introduction to Information Retrieval	Dr. Mariam Salloum
CS 173	Introduction to Natural Language Processing	Dr. Paea LePendu
STAT 008	Statistics for Business	Dr. Analisa Flores
STAT 010	Introduction to Statistics	Dr. James Flegal, Dr. Yingzhuo Fu, Dr. Jun Li
STAT 107	Intro to Statistical Computing With R	Dr. Analisa Flores, incoming assistant professor (TBD)
STAT 130	Sampling Surveys	Dr. Subir Ghosh
STAT 140	Nonparametric Techniques	Dr. Jun Li, Dr. Weixin Yao
STAT 146	Statistical Forecasting Techniques	Dr. Xinping Cui, Dr. Yehua Li, Dr. Weixin Yao

Course	Course Title	Instructor(s)
STAT 156A	Mathematical Statistics With Applications For Data Science I	Dr. Jun Li, Dr. Analisa Flores, incoming assistant professor (TBD)
STAT 156B	Mathematical Statistics With Applications For Data Science II	Dr. Jun Li, Dr. Analisa Flores, incoming assistant professor (TBD)
STAT 167	Introduction to Data Science	Dr. Wenxiu Ma

6. For interdisciplinary programs, the degree of participation and the role of each department must be explicitly described. The chairs of all participating departments must provide written approval for the creation of the program and indicate their commitment to provide necessary resources including faculty release.

The program will be administered through a joint steering committee. The steering committee will consist of three faculty from the Department of Computer Science and Engineering and three faculty from the Department of Statistics. The co-directors of the minor will be from different departments. The co-directors are the coordinators of the program within their respective departments and colleges, and will work together to coordinate and/or resolve campus-level issues. Normal term for the co-Directors is 5 years. If a co-Director is unable to complete their 5-year term, a faculty from the same department will be chosen to assume the duties until the end of that 5-year term.

Joint Steering Committee for Data Science Minor

Faculty Member	Department	Position
Analisa Flores	STAT	Co-Director
Yingzhuo Fu	STAT	Member
Jun Li	STAT	Member
Mariam Salloum	CSE	Co-Director
Christian Shelton	CSE	Member
Vassilis Tsotras	CSE	Member

Proposed changes to the program will need to be approved by the majority of the steering committee (including co-Directors). The proposed program change will then be reviewed by each college executive committee and then the committee on education policy. If these committees consider the change to be noncontroversial, the proposed change is placed on the Consent Calendar for a meeting of the Division of the Academic Senate.

We do not anticipate the need for any additional resources at this time. Approvals have been obtained from the two department chairs (see attached letters in Appendix B):

- Dr. Walid Najjar, Professor & Chair, Computer Science & Engineering
- Dr. Yehua Li, Professor and Chair, Statistics

7. Projected enrollment in the program.

Year	Projected Enrollment
2022 - 2023	5
2023 - 2024	8
2024 - 2025	10
2025 - 2026	15
2026 - 2027	25

8. Name of degree, if applicable, and the anticipated number of degrees to be granted when the program reaches steady state.

It is anticipated that approximately 25 students will graduate with a Data Science Minor when the program reaches a steady state. This projection is derived based on the current number of students pursuing a minor in Statistics or minor in Computer Science.

9. Potential impact of the new program on existing programs. If the proposed program includes required courses from a department other than the administering department, the proposal must include a statement from the department indicating that it has been consulted and that it will provide access to the required courses.

We don’t expect an impact on existing programs. All required courses are offered by the two departments (Statistics and Computer Science and Engineering). Both departments have provided letters of support for this minor.

10. A full listing of resources required for start-up and for operations. In cases where no additional resources will be needed, this must be explicitly stated. This listing may include: personnel (faculty FTE or temporary positions, Teaching Assistants or Readers, administrative staff, technical support); support services including computer facilities and library resources; space requirements. A plan indicating how the resources will be obtained would also be helpful to the committee in reviewing the proposal. A letter of support from the College Dean and/or Executive Vice Chancellor-Provost indicating endorsement as well as a promise of support for the proposal also would be extremely helpful.

No additional resources are required for this program.

11. Both internal and external letters of support should be provided with the proposal. Internal letters of support are often from UCR department chairs and faculty of related programs. The external letters should be from other UC campuses or other peer institutions. Letters from off-campus help to establish the quality of the program and its fit within the context of related programs at other universities. Upon consultation with the CEP the demand for external letters may be waived.

Letters of support are attached (see Appendix B) from the following:

- Computer Science Department Chair
- Statistics Department Chair
- BCOE Dean
- CNAS Divisional Dean (Physical Sciences and Mathematics)
- Data Science Director

12. Approvals from program faculty, College faculty (if the new proposal affects a college regulation), and the appropriate Executive Committee should be obtained before forwarding the new program to the attention of the Senate Analyst for CEP.

Changes in Senate regulations: No changes in Senate regulations are required.

13. All proposals for new programs should be submitted to the Senate Chair no later than March 1 of the academic year prior to the fall quarter in which the proposed program is anticipated to go into effect. This schedule should provide sufficient time for Senate review of the proposal to meet the deadline for final consideration of approval at the May Division Meeting.

Approved by the faculty of the Program in Data Science:	2/16/2022
Approved by the faculty of the Department of Statistics:	2/8/2022
Approved by the faculty of the Department of Computer Science:	12/8/2021
Approved by the Executive Committee of the College of Engineering:	TBD
Approved by the Executive Committee of the College of Natural and Agricultural Sciences:	TBD
Approved by the Committee on Educational Policy:	TBD

APPENDIX A: Proposed Program Change

EXECUTIVE COMMITTEE
COLLEGE OF NATURAL AND AGRICULTURAL SCIENCES AND
THE MARLAN AND ROSEMARY BOURNS COLLEGE OF ENGINEERING
REPORT TO THE RIVERSIDE DIVISION

To be adopted:

Proposed New Data Science Minor

PRESENT:

PROPOSED:

Minor

The Data Science minor is designed to provide students with practical knowledge of the concepts and techniques used in data analysis, including statistical methodology, data-oriented computing, and data ethics. The minor will provide students from a wide array of majors with the foundational skills to design, implement, and think critically about inferential analysis within their respective disciplines. Students with majors in Computer Science, Computer Science with Business Applications, Computer Engineering, Data Science, and Statistics are not eligible.

The following are the requirements for the Data Science minor.

1. Lower-division requirements (13 units):
CS 009A; CS 009B; STAT 008 or STAT 010

2. Upper-division requirements (20 units):
a) CS 105
b) STAT 156A
c) CS 108 / STAT 108
d) Eight (8) units of the upper-division courses selected from the list below:
CS 100, CS 166, CS 167, CS 170, CS 171, CS 172, STAT 107, STAT 130, STAT 140, STAT 146, STAT 156B, STAT 167

No more than 4 units may be in courses numbered 190 through 199.

Completion of CS 009A and CS 009B with a C- or better and completion of the minor requirements with at least 2.700 GPA.

APPENDIX B: LETTERS OF SUPPORT

- Computer Science Department Chair
- Statistics Department Chair
- BCOE Dean
- CNAS Divisional Dean (Physical Sciences and Mathematics)
- Data Science Director and co-Director

Computer Science and Engineering

Walid A. Najjar
Professor and Chair
Department of Computer Science and Engineering
351 Winston Chung Hall Riverside, CA 92521
Tel 951.827.5639 Fax 951.827.4643
najjar@cs.ucr.edu www.cs.ucr.edu/~najjar

February 7, 2022

To Whom It May Concern:

This letter is in strong support for the proposed minor in Data Science program.

Data has become ubiquitous in everyday life revolutionizing science and industries alike. Data Science has grown out of the need to study the data itself and in particular, how to manage, process and interpret data. Tools originating from data science are now becoming indispensable in today's science, technology, and business, fueling the demand for data scientists. Recognizing this need, our department has taken the initiative to develop research and educational programs related to Data Science at UCR.

I approve the inclusion of Computer Science courses in this curriculum as either required (CS 009A, CS 009B, and CS 105), plus a number of electives courses (CS 100, CS 166, CS167, CS 170, CS171, CS 172, CS173).

This program will address critical and documented shortage of highly trained college graduates in Data Science, in industry, government, and academia. The CSE Department enthusiastically supports the creation of the minor in Data Science program and is fully committed to providing necessary resources within its capabilities for the instruction and advising of its students.

Walid A. Najjar

Professor and Chair
Department of Computer Science and Engineering
Bourns College of Engineering
University of California Riverside

UC RIVERSIDE UNIVERSITY OF CALIFORNIA

COLLEGE OF NATURAL AND AGRICULTURAL SCIENCES
DEPARTMENT OF STATISTICS
900 UNIVERSITY AVENUE
RIVERSIDE, CALIFORNIA 92521

January 14, 2022

To Whom It May Concern,

As Chair of the Department of Statistics, I write to offer my support for the proposed minor program in Data Science. The proposed program is designed to meet the increasing need of data science knowledge from domain fields, including Mathematics, Science, Business, and Engineering. The proposed curricula aim to train students to solve domain field problems using Data Science principles and techniques.

I approve the inclusion of existing statistics courses as either required or electives in the proposed Data Science minor program, including STAT156A STAT 107, STAT 130, STAT 140, STAT 146, STAT 156B, STAT 167. We will provide additional seats in these classes to accommodate the DS minor students. We also commit to provide teaching resources for the newly proposed CS/STAT 108, which will alternate between Computer Science and Statistics.

Please let me know if you need any additional information.

Sincerely yours.

Yehua Li

Yehua Li
Professor & Chair of Statistics,
University of California, Riverside
yehuali@ucr.edu
https://sites.google.com/a/ucr.edu/yehuali/

UC RIVERSIDE
Marlan and Rosemary Bourns
College of Engineering

Office of the Dean
900 University Avenue
446 Winston Chung Hall
Riverside, CA 92521

February 16, 2022

To whom it may concern:

I am writing this letter in enthusiastic support for the enclosed proposal to establish a minor in Data Science. This program will be jointly administered between Bourns College of Engineering (BCOE) and College of Agricultural and Natural Sciences (CNAS) faculty. Students will select a college when declaring the minor and will be advised by academic advisors from the chosen college.

The two departments, Computer Science and Engineering and Statistics, have outlined the academic program and administrative structure of the minor and we have agreement from both departments and colleges. This program will help address the critical and documented shortage of college graduates trained in Data Science tools and techniques. We expect students attracted to this program to come from a variety of backgrounds, increasing the diversity of students in STEM.

The BCOE looks forward to partnering with the CNAS to offer this minor to UCR students. This partnership will build upon the success of the B.S. in Data Science program including leveraging existing courses developed for this program. Sincerely,

Prof. Christopher S. Lynch
William R. Johnson Jr. Family Chair
Dean, Bourns College of Engineering
University of California, Riverside

UNIVERSITY OF CALIFORNIA
UC RIVERSIDE

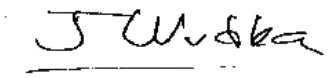
College of Natural and Agricultural Sciences
Office of the Dean
900 University Avenue
2258 Geology Building
Riverside CA 92521-0127

February 17, 2022

Dear Colleagues,

In my capacity as Divisional Dean, I write to express my full support for the proposed minor in Data Science. This program will open a new and important learning opportunity for our students, it will provide introductory instruction in a rapidly developing and exciting field with applications in a very large number of research areas. UCR has the necessary expertise, and the existing resources suffice to implement it.

Respectfully,



José Wudka

Professor, Department of Physics and Astronomy
Divisional Dean, College of Natural and Agricultural Sciences

UC RIVERSIDE

February 16, 2022

To Whom It May Concern:

We are writing this letter in strong support for the proposed interdisciplinary minor in Data Science. In Fall 2020 UCR launched the B.S. in Data Science (a collaboration between the Departments of Statistics and the Computer Science & Engineering) which grew quickly and currently has 90 students enrolled in the program. Since then, there has been a growing interest amongst UCR students in creating a minor in Data Science.

Data Science is strategically and technically a very important area that studies how to obtain insight and information from the analysis of large collections of data. As data has become ubiquitous in everyday life, it impacts every profession, including manufacturing, logistics, health care, public safety, and the military. We believe that minoring in Data Science will open the field and thus offer many career opportunities to UCR students majoring in other STEM fields. The proposed minor aims to provide students with practical knowledge of the methods and techniques required for data analysis. It will thus empower students across a wide array of disciplines on campus with a working knowledge of statistics and computation to participate in data science projects related to their discipline. The Data Science minor includes a subset of courses required by the B.S. in Data Science hence no new courses will need to be created.

The Data Science committee which oversees the B.S. in Data Science program has voted enthusiastically in favor to approve this new minor.

Vassilis J. Tsotras

Director, Data Science Major
Professor of Computer Science and Engineering

Jun Li

co-Director, Data Science Major
Professor, Department of Statistics