

1. Overview

A. Description

Provide a brief description of the proposed minor.

A minor in Data Science provides students with a background in statistics, probability, and coding in the context of large data sets. Students in this minor will be able to become useful consumers and producers of data. They will be able to understand and manipulate data sets to make conclusions and recommendations that can have an impact in real world settings.

B. Why should this be a minor rather than a concentration?

This is a subset of an already existing degree. It is fewer credit hours and is meant to supplement an already existing program of study.

C. Affiliation

If the minor is affiliated with a degree program, include a brief statement of how it will complement the program. If it is not affiliated with a degree program, incorporate a statement as to how it will provide an opportunity for a student to gain knowledge or skills not already available at ASU.

The Data Science major already includes several tracks. However, not every conceivable sequence of courses is included and possible as a track. Should a student wish to combine Data Science skills with a content area that is not a track, this minor will provide an avenue for doing so. This minor will allow a student to gain critical skills that can tie to a variety of fields based on the student's choosing.

D. Demand

Explain the need for the new minor (e.g., market, student demand, interdisciplinary considerations).

An estimated shortage of up to 190,000 data analysts in the U.S. is creating high demand for data scientists with the know-how to use data to make effective decisions. From predicting consumer behavior to extracting information from medical images, you will graduate ready for a dynamic career that inspires global change.

E. Projected enrollment

What are enrollment projections for the first three years?

	1st Year	2nd Year (Yr. 1 continuing + new entering)	3rd Year (Yr. 1 & 2 continuing + new entering)
Number of Students (Headcount)	20	50	75

2. Collaboration and Impact

A. Faculty governance

Attach a supporting letter from the chair of the academic unit verifying that the proposed minor has received faculty approval through appropriate governance procedures in the unit and that the unit has the resources to support the minor as presented in the proposal, without impacting core program resources.

See attached letter from Al Boguess, Director, School of Mathematical and Statistical Sciences.

B. Collaboration and impact statements

- i. Identify related ASU programs and outline how the new certificate will complement these existing ASU programs.

New College offers a certificate in Data Science. See attached letter of support from Dean Todd Sandrin.

- ii. Attach a letter of collaboration and impact from each Dean, or Dean's designee at the Assist or Associate Dean level, from impacted programs. Refer to the Provost's Office Curriculum Development website (<https://provost.asu.edu/node/3227>) for guidelines on collaboration and impact statements.

3. Academic Curriculum and Requirements

A. Knowledge, competencies, and skills

List the knowledge, competencies, and skills (learning outcomes) students should have when they complete this proposed minor. Examples of program learning outcomes can be found at (<http://www.asu.edu/oue/assessment.html>).

Outcome 1: Graduates of the minor will be able to critically engage with real world data problems.

Measure 1.1: In DAT 250 , Data Science and Society, students will identify a real world problem in their chosen emphasis area and create a presentation to show how methods in Data Science can influence the outcomes in positive and negative fashions. The presentations will be evaluated on mathematical reasoning, critical thinking, and problem solving.

Performance Criterion 1.1: The presentations will be evaluated on mathematical reasoning, critical thinking, and problem solving. 70% of students will attain a minimum rating of meets expectations on all rubric items.

Measure 1.2: In DAT 402, Statistical Learning, students will complete an embedded assignment to create a computer program that is able to discover and identify patterns in a data set related to their chosen emphasis area. The results will be used to make predictions and recommendations for a real world problem. The assignment will be assessed on a faculty developed rubric that covers validity of the created model program, effective communication, and mathematical reasoning.

Performance Criterion 1.2: The assignment will be assessed on a faculty developed rubric that covers validity of the created model program, level of potential impact, effective communication, and mathematical reasoning. 70% of students will attain a minimum rating of meets expectations on all rubric items.

Measure 1.3:

Performance Criterion 1.3:

Outcome 2: Graduates of the minor will be able to develop team oriented skills while utilizing diverse programming languages and statistical processes to interpret results of their own data collection.

Measure 2.1: In DAT 301, Exploring Data in R and Python, students will complete a series of embedded assignments that utilize real world data sets in a team setting to interpret, evaluate, and present findings.

Performance Criterion 2.1: Work will be graded against a faculty developed rubric that focuses on problem solving, effective communication, and statistical reasoning. On an average of all assignments, 70% of students will attain a minimum rating of meets expectations on all rubric items.

Measure 2.2: In DAT 401, Statistical Modeling and Inference for Data Science, students will complete an embedded assignment that requires them to work in groups and think critically to create statistical models and utilize proper testing methodologies to provide insight into real world problems.

Performance Criterion 2.2: Student work will be assessed by a faculty developed rubric that focuses on mathematical reasoning, collaboration, and problem solving. 70% of students will attain a minimum rating of meets expectations on all rubric items.

B. Program Map

Attach a copy of the "proposed" map for this minor program. Instructions on how to create a "proposed minor map" in [BAMM](#) can be found in the [Build a Major Map Training Guide](#).

C. Curricular structure

Attach a PDF copy of the program requirements from BAMM to the proposal submission. The PDF should outline all core/required courses and program specific electives.

To retrieve the PDF in BAMM:

1. Select the "Preview in Degree Search" button page.
2. Select PDF icon in the upper-right corner of the page.
3. Save as PDF.

2021 - 2022 MINOR Map

Data Science (Proposed)

Program Requirements

The minor in data science consists of a minimum of 25 credit hours. A grade of "C" (2.00 on a 4.00 scale) or better is required for courses used in the minor.

Required Courses -- 25 credit hours

[DAT 250: Data Science and Society](#) (3)

[DAT 300: Mathematical Tools for Data Science](#) (3)

[DAT 301: Exploring Data in R and Python](#) (4)

[DAT 401: Statistical Modeling and Inference for Data Science](#) (3)

[DAT 402: Statistical Learning](#) (3)

[MAT 265: Calculus for Engineers I \(MA\)](#) or [MAT 270: Calculus with Analytic Geometry I \(MA\)](#) (3-4)

[MAT 266: Calculus for Engineers II \(MA\)](#) or [MAT 271: Calculus with Analytic Geometry II \(MA\)](#)
(3-4)

[MAT 343: Applied Linear Algebra](#) (3)

Depending on a student's undergraduate program of study, prerequisite courses may be needed in order to complete the requirements of this minor.

D. Minimum residency requirement
 How many hours of the minor must be ASU credit?
 Six hours must be ASU Credit.

E. New courses
 Provide a brief course description for each new course.
 None

Note: All new required courses should be submitted in Curriculum Changemaker and ready for Provost’s Office approval before this certificate is put on Curriculum and Academic Programs Committee (CAPC) agenda.

4. Administration and Resources

A. Enrollment criteria
 Describe the procedures and any qualifications for enrollment in the minor.

Standard ASU procedures will be used for enrolling in the minor.

B. Administration
 How will the proposed minor be administered (including enrollment, student advisement, retention, minor completion verification, etc.)?

The School of Mathematical and Statistical Sciences advisors will administer the program in terms of the student experience. The faculty leadership for the Data Science major will adjust the curriculum as needed.

C. Resources
 What are the resource implications for the proposed minor, including any projected budget needs? Will new books, library holdings, equipment, laboratory space and/or personnel be required now or in the future? If multiple units/programs will collaborate in offering this minor, please discuss the resource contribution of each participating program. Letters of support must be included from all academic units that will commit resources to this minor.

Personnel to staff the courses. These courses are also used in the major. However, this minor may cause the need for additional sections of the DAT courses.

D. Primary faculty
 List the primary faculty participants regarding this proposed certificate. For interdisciplinary certificates, please include the relevant names of faculty members from across the University.

Name	Title	Area(s) of Specialization as they relate to proposed certificate
Marko Samara	Clinical Assistant Professor	Program Coordinator, Statistics
Shiwei Lan	Assistant Professor	Statistics, Data Sciences

5. Additional Materials

A. Appendix
 Complete and attach the Appendix document.

- B. Program of study
Provide one or more model programs of study (if appropriate).
- C. Attach other information that will be useful to the review committees and the Office of the Provost.

PROVOST OFFICE APPROVAL(S)

This proposal has been approved by all necessary Provost office levels of review. I recommend implementation of the proposed organizational change.

Office of the University Provost

Signature _____ **Date:** / /20

Note: An electronic signature, email, or a PDF of the signed signature page is acceptable.

**APPENDIX
OPERATIONAL INFORMATION FOR MINORS**

(This information is used to populate the Degree Search/catalog website.
Please consider the student audience in creating your text.)

1. Proposed Minor Name: Data Science

2. Marketing Description

Optional. 50 words maximum. The marketing description should not repeat content found in the program description.

See your current field of study through a new lens. By becoming a skilled producer, user and manipulator of data, you can make informed decisions about the world around you.

3. Program Description (150 words maximum)

A minor in data science provides students with a skills in statistics, probability and coding in the context of large data sets. Students in this minor become useful consumers and producers of data. They understand and manipulate data sets to make conclusions and recommendations that can have an impact in real world settings.

4. Contact and Support Information

Building code and room number: (Search ASU map)	WXMLR 211
Program office telephone number: (<i>i.e.</i> 480/965-2100)	480/965-7195
Program Email Address:	Math@asu.edu
Program Website Address:	https://math.asu.edu

5. Program Requirements

Remember to attach a copy of the “proposed” map for this minor program. Instructions on how to create a “proposed minor map” in [BAMM](#) can be found in the [Build a Major Map Training Guide](#).

6. Enrollment Requirements

If applicable, list any special enrollment requirements applicable to this minor in addition to the standard text. Enrollment requirements for all minors include the following text.

GPA Requirement: N/A

Majors Ineligible to Add This Minor: All majors in the School of Mathematical and Statistical Science

Other Enrollment Requirements: N/A

Current ASU undergraduate students may pursue a minor and have it recognized on their ASU transcript at graduation. A student should consult their academic advisor to declare the minor and to ensure that an appropriate set of courses is taken. Minor requirements appear on the degree audit once the minor is added. Certain major and minor combinations may be deemed inappropriate by the college or department of either the major program or the minor. Courses taken for the minor may not count toward both the major and minor. Students should contact their academic advisor for more information.

7. Delivery/Campus Information Options:

Both, On-Campus and ASU Online

Note: Once students elect a campus or online option, students will not be able to move between the on-campus and the ASU Online options. Approval from the Office of the University Provost and Philip Regier (Executive Vice Provost and Dean) is required to offer programs through ASU Online. Please contact Ed Plus [then](#) complete the ASU Online Offering form in Curriculum ChangeMaker to begin this request.

8. Campus/Locations indicate all locations where this program will be offered.

Downtown Phoenix Polytechnic Tempe Thunderbird West Other: _____

9. Career Opportunities

Please add career opportunities text. The template is below.

A minor can help students enhance the marketable skills they acquire in their major program and help them develop new skills apart from it, though most career areas do require more training than a minor alone can provide. A minor in data science can help students with [insert skills here] skills as they pursue careers in [career areas].

September 1, 2020

To: Dr. Paul LePore, Associate Dean, CLAS (and Ms. Jenny Smith, Assistant)
From: Al Boggess, Director, School of Mathematical and Statistical Sciences
Re: Proposed degree in Data Science



This is a strong letter of support for the proposed minor in Data Science. This minor field of study will add value to the university community through its unique interdisciplinary approach that involves coursework in mathematics, statistics, and computer science. Students who complete this minor will have useful data science tools to enhance their major field of study.

The minor is currently being developed. In fall 2021, we look forward to offering both an online and immersion minor in Data Science.

This minor field of study has the support of our undergraduate program committee, which is charged with overseeing the undergraduate programs and course offerings within SOMSS as consistent with our bylaws.

Attached is the major map and assessment plans. Please let me know if you have any questions or concerns about this proposed minor field of study.

Cc: Don Jones, Associate Professor

From: Todd Sandrin (DEAN)
Sent: Friday, November 6, 2020 1:56 PM
To: Paul LePore
Cc: Nancy Gonzales (Dean); Jenny Smith; Patricia Friedrich
Subject: Re: Proposal to Establish a Minor in Data Science

Follow Up Flag: Follow up
Flag Status: Flagged

Dear Paul,

How wonderful it is to hear from you! I hope this email finds you well and thriving in these challenging times.

New College is happy to support the minor in Data Science, and we very much look forward to working with you and your colleagues in The College as explore building out New College degree programs in distinctive areas of study that integrate and rely upon the evermore relevant and ubiquitous toolsets within data science.

Best regards,
Todd

Todd R. Sandrin, Ph.D.
Dean, [New College of Interdisciplinary Arts and Sciences](#)
Vice Provost, [West campus](#)
Professor, [School of Mathematical and Natural Sciences](#)
Senior Sustainability Scientist - [Julie Ann Wrigley Global Institute of Sustainability](#)

 **New College**
of Interdisciplinary Arts and Sciences
Arizona State University

[Instagram](#) | [Twitter](#)

From: Paul LePore <Paul.Lepore@asu.edu>
Sent: Friday, November 6, 2020 8:42 AM
To: Todd Sandrin (DEAN) <Todd.Sandrin@asu.edu>
Cc: Nancy Gonzales (Dean) <nancy.gonzales@asu.edu>; Paul LePore <Paul.Lepore@asu.edu>; Jenny Smith <jenny.smith@asu.edu>
Subject: Proposal to Establish a Minor in Data Science

Dear Vice Provost and Dean Sandrin,

Would you be so kind and review and perhaps provide a letter of support for a new Data Sciences minor (to go along with our recently approved Data Sciences BS degree)?

Thanks for your consideration – copies of the proposal and a minor map are attached.

Happy Friday!

Paul

PAUL C. LEPORE, Ph.D.

Associate Dean

The College of Liberal Arts and Sciences

Armstrong Hall, Suite 152-H

1100 South McAllister Avenue

Arizona State University | P.O. Box 872601 | Tempe, Arizona 85287-2601

480.965.6506 | Fax: 480.965.2110 | e-mail: paul.lepore@asu.edu

The College of Liberal Arts and Sciences — *First Year Forward*