Cover Sheet: Request 14332

New Data Science major

Info

Process	Major|New|Ugrad/Pro|Residential
Status	Pending at PV - University Curriculum Committee (UCC)
Submitter	Michael Daniels daniels@ufl.edu
Created	10/10/2019 1:46:28 PM
Updated	12/8/2019 6:18:00 PM
Description of request	This is the submission of materials for the new data science major (that will be under the current statistics undergraduate program). We have modified the catalog as requested, added the letter from math, and included the consult from computer science, engineering, business, and CALS. We did not include additional electives from the physical and biological sciences. There are lot of opportunities here, but most, at this time, are special topics courses. From our understanding, most of these will have course #'s in the next year and we will add that elective option later.

Actions

Step	Status	Group	User	Comment	Updated
Department	Approved	CLAS - Statistics 011623000	Michael Daniels		10/11/2019
Data Science major model semester plan (002).docx					10/11/2019
College	Approved	CLAS - College of Liberal Arts and Sciences	Joseph Spillane		11/19/2019
support-math-datascienceUCC.pdf ext-consult-eng-business-cs.pdf CALS-support-DataScienceMajor-email.rtf					11/1/2019 11/1/2019 11/8/2019
AP for Undergraduate Affairs	Approved	PV - Associate Provost for Undergraduate Affairs	Casey Griffith		11/21/2019
No document changes					
University Curriculum Committee	Pending	PV - University Curriculum Committee (UCC)			11/21/2019
No document changes					
Faculty Senate Steering Committee					
No document changes					
Faculty Senate					
No document changes					
Academic Affairs					
No document changes					
Board of Trustees Notified					
No document changes					
Academic Affairs Notified					
No document changes					
Office of the Registrar					

Original file: Cover sheet.pdf

Step	Status	Group	User	Comment	Updated
No document changes					
OIPR Notified					
No document changes					
Student Academic Support System					
No document changes					
Catalog					
No document changes					
Academic Assessment Committee Notified					
No document changes					
College Notified					
No document changes					

Major|New for request 14332

Info

Request: New Data Science major
Description of request: This is the submission of materials for the new data science major (that will be under the current statistics undergraduate program). We have modified the catalog as requested, added the letter from math, and included the consult from computer science, engineering, business, and CALS. We did not include additional electives from the physical and biological sciences. There are lot of opportunities here, but most, at this time, are special topics courses. From our understanding, most of these will have course #'s in the next year and we will add that elective option later.
Submitter: Michael Daniels daniels@ufl.edu
Created: 10/10/2019 1:40:52 PM
Form version: 1

Responses

Program Level B - Bachelor's Degree
CIP Code 27.0501
Program or Department Name Statistics
Major Code, Degree & Name for Existing Majors STA, Bachelor of Arts in Statistics
STA, Bachelor of Science in Statistics
Major Code STA
Requested New Major Name Data Science
Degree of Requested Major BS
Credits 62
Tracks/Concentrations N/A
Delivery Method On Campus
Students 100
Effective Term Fall
Effective Year Earliest Available
Percentage of Credits Available Fully Online <50%
Percentage of Credits Available Off-Campus <25%
Rationale for the Proposed Major With the advent of big data in biology, engineering, the humanities, and the social sciences, there is a need for graduates trained to properly manage and draw valid scientific inferences from such data. Problems range from trying to make causal discoveries from large observational databases to predicting future neurological diseases from brain images. It is essential for these graduates to have sufficient training in mathematics, statistics, computer science, and a subject matter area (e.g., geography or political science). The University of Florida is uniquely positioned nationally and internationally through the creation of multiple statewide databases that integrate data from humans and their environment. Given the plan to put big data-oriented disciplines together in one building, we are creating the opportunity to explore the intersections of data science to many problems from different perspectives. Our undergraduate majors will benefit from their association with this research as they acquire the skills to use these innovative approaches in their careers as data scientists.

This new major will require additional mathematical foundations as well as a series of courses from computer science. The major has overlap with the current BS in Statistics. This overlap involves three mathematics courses and four statistics courses (as part of the core). However, there are four required mathematics courses, three required (new) statistics courses, four required computer science courses (as well as a philosophy course and three subject matter elective sequence) that are not part of the current BS or BA in statistics. The major has minimal overlap with other majors at the university.

Impacts on Other Programs There will be a need for additional courses from the Department of Mathematics and new required courses from the Department of Mathematics and the Department of Computer and Information Systems Engineering. The chairs of both departments are aware of the additional demand this major will require.

Critical Tracking:

Semester 1: MAC2311, STA2023

Semester 2: MAC2312, COP3502

Semester 3: MAC2313, MAD2XXX (Python), COP3503

Semester 4: MAD 3017 (or COT3100), , STA3XXX (R)

Semester 5: STA 4210, PHI 3XXX (data ethics), MAS3114

Semester 6: STA4321, COP3530, , MAS4XXX (LA for DS)

Semester 7: STA4322, STA4XXX (comp stats), CIS4301, Subject area elective

PROPOSED DATA SCIENCE MAJOR

Model Semester Plan

Students are expected to complete the writing requirement while in the process of taking the courses below. Students are also expected to complete the general education international (GE-N) and diversity (GE-D) requirements concurrently with another general education requirement (typically, GE-C, H, or S). The Subject Area Electives and Data Ethics course count towards 3000 level or above electives outside of this multidisciplinary major.

To remain on track, students must complete the appropriate critical-tracking courses, which appear in bold. These courses must be completed by the terms as listed above in the Critical Tracking criteria.

This semester plan represents an example progression through the major. Actual courses and course order may be different depending on the student's academic record and scheduling availability of courses. Prerequisites still apply.

Semester 1	Credits
IDS 1161/Quest 1 course (GE-H)	3
MAC 2311 (State Core Gen Ed Mathematics)	4
STA 2023 (Gen Ed Mathematics)	3
COP 3502	3
State Core Gen Ed Biological or Physical Science P)	3
Total	1

Semester 2	Credits
MAC 2312	4
State Core Gen Ed Social Science	3
Gen Ed Biological or Physical Science (area **not** taken in Semester 1)	3
State Core Gen Ed Composition	3
COP 3503	3
Total	1

Semester 3	Credits
MAC 2313	4
Gen Ed Physical Science	3
Gen Ed Social Science	3
MAD 2XXX Math modeling w/ Python	3
Gen Ed Composition	3
Total	1

Semester 4	Credits
MAS 3114	3

STA 3XXX Programming with data (in R)	3
MAD 3107 (or COT 3100)	3
Elective (3000-level or above, not in major)	3
Gen Ed Social Science	3
Total	1

Semester 5	Credits
STA 4321	3
STA 4210	3
COP 3530	3
Foreign Language	5
PHI 3XXX Data Ethics (GE-H)	3
Total	17

Semester 6	Credits
STA 4322	3
CIS 4301	3
MAS 4XXX Linear alg data science	3
Foreign Language	5
Total	14

Semester 7	Credits
STA 4XXX Computational Stats	3
Subject Area Elective (3000-level or higher)	3
Gen Ed Biological science	3
Science Laboratory (Gen Ed Biological or Physical Sciences)	1
State Core Gen Ed Humanities	3
Total	1

Semester 8	Credits
STA 4XXX Stat Learning	3
Subject Area Electives (3000-level or higher)	6
Elective	1
Elective (3000-level or above, not in major)	3
Total	1

Notes. CLAS curriculum requirements are met in the plan; Quest courses included as GE-H, GE-S, GE-B, GE-P.

Data Science

MAJOR

- Home
- Undergraduate Catalog
- Colleges and Schools
- Liberal Arts and Sciences, College of
- Statistics

Data science is a field of study that combines computer science (programming, databases, and algorithms) and statistical methodology, both with a strong mathematical foundation, to apply to diverse areas in ethical ways. Data scientists work in many areas, including business, economics, medicine, epidemiology, agriculture, environmental sciences, sports, and all aspects of government. With the increasing digitization and networking of society, data have become ever more ubiquitous, further expanding the demand for data scientists and their expertise in the collection, management, and analysis of data.

Section Menu
Catalog Home

- Data Science | BS

About this Program

- **College:** Liberal Arts and Sciences
- **Degrees:** Bachelor of Science
- **Credits for Degree:** 120
- **Contact:** Email
- **Additional Information**
- **Related Statistics Programs**

To graduate with this major, students must complete all university, college, and major requirements.

- Overview
- Academic Learning Compact

Data science majors draw inference from large data generated from a variety of disciplines. Core courses cover mathematical foundations of data science, programming, algorithms, and databases as well as statistical methods for data science. Majors will also learn about data science in practice within subject matter areas.

Students who wish to major in data science must consult a department advisor early in their programs.

Coursework for the Major

The College of Liberal Arts and Sciences offers the Bachelor of Science in data science.

Bachelor of Science

To enter the program, students must receive a minimum grade in the perquisites: STA 2023, B OR STA 3032, B- OR AP Statistics, 4 (out of 5). Students also must receive minimum grades of C within two attempts (including withdrawals) in every required core course and in every course counted toward the 9 credit elective requirement, with the exception of MAC 2312 and MAC 2313 where students must receive a minimum grade of B-. Students cannot retake core or statistics elective courses after earning a minimum grade of C, with the exception of MAC 2312 and MAC 2313 , in which students must receive a minimum grade of B-. A minimum GPA of 2.0 must be achieved on all attempts of core and major elective courses and 2.67 on MAC 2312 and MAC 2313 . The grades from all attempts to satisfy core requirements will be used to compute the minimum GPA. A minimum of 18 credits of major coursework must be taken at UF, including a minimum of 12 credits of core coursework.

Required Coursework

The B.S. in data science requires a minimum of 62 credits in data science and related coursework. It is important that the prerequisites of each class are met before the class is attempted.

Mathematics courses (20 credits)
MAC 2312 Calculus II

4
MAC 2313 Calculus III

4
MAD 2XXX Introduction to Computational Math 3
MAS 3114 Computational linear algebra

3
MAS 4XXX Linear Algebra for data science

3

Statistics courses (21 credits)
STA 3XXX Programming with Data in R

3
STA 4321 Probability

3
STA 4322 Inference

3
STA 4210 Regression analysis

3
STA 4XXX Statistical learning in R

3
STA 4XXX Computational statistics in R

3

Computer Science courses (12-15 credits)
COP 3502 Prog. Fund. I (MAC 2311 coreq)

3
COP 3503 Prog. Fund. II

3

MAD 3107 Discrete mathematics

3

OR

COT 3100 Applications of Discrete Structures

3

COP 3530 Data structures & algorithms

3

CIS 4301 Information & database systems I

3

Ethics (3 credits)

PHI 3XXX Ethics, Data, and Technology

3

Subject matter electives (9 credits)

Choose 3 from one of the following divisions (Humanities or Social Sciences)

Humanities

REL 2104 Environmental Ethics
REL 3082 Global Ethics
REL 3160 Religion and Science
CLA 3700 Introduction to Classical Archaeology.
WST 3610 Gender, Race and Science
WST 4704 Discrimination and Health
WST 3703 History of American Medicine: Race, Class, Gender, and Science

OR

Social Sciences

ANT 4930 Social Network Analysis
LIN 4930 Corpus Linguistics
ECO 4422 Econometrics 2
EXP 4174C Laboratory in Sensory Processes
SYD 4020 Population
SYD 4021 U.S. Population Issues
GIS 3043 Foundations of GIS
PSB 4343C Laboratory in Cognitive Neuroscience

Relevant Minors and/or Certificates

Data science majors may want to consider a minor in actuarial science, which prepares students for careers as actuaries. Required courses cover the material for the beginning examinations and VEE credits leading to an associateship in the major national actuarial societies.

Related Statistics Programs

BA in Statistics

BS in Statistics

Academic Learning Compact

The data science major enables students to achieve proficiency in the fundamentals of programming, databases, and statistical reasoning. Through coursework and projects, students will gain knowledge in problem solving, data science applications and ethics, and statistical inference. Emphasis is on developing the ability to approach real world problems and through the use of computing and statistical methods to draw valid scientific inferences.

Before Graduating Students Must

- Complete an exam on the fundamentals of data science, which will be 5% of their grade in STA 4XXX (Statistical learning).
- Complete a data analysis project, which will be 10% of their grade in STA 4XXX.

- Complete requirements for the baccalaureate degree, as determined by faculty.

Students in the Major Will Learn to

Student Learning Outcomes (SLOs)

Content

1. Identify, define and describe concepts and issues in data science, including those involved in computing and programming, databases, ethics, mathematical foundations, and statistical methods.

Critical Thinking

2. Identify sources of variability and bias in a given set of data and formulate and carefully program an appropriate statistical analysis.

Communication

3. Clearly and effectively present ideas in speech and in writing concerning issues in the proper analysis of data.

Curriculum Map

I = Introduced; R = Reinforced; A = Assessed

	Academic Learning Compact 3		
Courses	**SLO 1**	**SLO 2**	**SLO 3**
MAS3114	I		
MAS4XX	R		
STA3XX	I	I	I
STA 4321	I		
STA 4322	I		
STA 4210	R	R	R
STA 4XX (SL)	A	A	A
STA 4XX (Comp)	R	R	R
COP3502	I		
COP3503	R		
COP3530	I		
CIS4301	R		
PHI3XXX	I	R	R

Assessment Types

- Exams
- Projects
- Written and oral presentations

Data Science New courses

MAD 2XXX Introduction to Computational Mathematics 3

MAS 4XXX Linear Algebra for data science

3

STA 3XXX Programming with Data in R

3

STA 4XXX Statistical learning in R

3

STA 4XXX Computational statistics in R

3

PHI 3XXX Ethics, Data, and Technology

3

The first five are all on the agenda for the December UCC meeting. The philosophy course was approved at the November UCC meeting.

UF UNIVERSITY of FLORIDA

UCC: External Consultations

External Consultation Results (departments with potential overlap or interest in proposed course, if any)

Department	Name and Title
College of Engineering	Toshikazu Nishida , Associate Dean and Professor
Phone Number	**E-mail**
352-392-0943	nishida@ufl.edu

Comments

See attached e-mail in support of major

Department	Name and Title
College of Business	Selcuk Erenguc, Associate Dean and Professor
Phone Number	**E-mail**
(352) 392-8436	selcuk.erenguc@warrington.ufl.edu

Comments

See attached e-mail in support of major

Department	Name and Title
CISE	Juan Gilbert, Professor and Chair
Phone Number	**E-mail**
(352) 392-1527	juan@ufl.edu

Comments

See attached letter committing to offer the needed seats from computer science

From: **Mccarty,Christopher** ufchris@ufl.edu
Subject: FW: Data Science proposal
Date: November 1, 2019 at 10:18 AM
To: Daniels,Michael Joseph daniels@ufl.edu

Christopher McCarty
Associate Dean and Professor of Anthropology

From: Toshikazu Nishida <nishida@ufl.edu>
Sent: Wednesday, October 30, 2019 11:50 AM
To: Mccarty,Christopher <ufchris@ufl.edu>
Cc: Abernathy,Cammy <caber@eng.ufl.edu>; Taylor,Curtis <taylor@eng.ufl.edu>; Gilbert,Juan E <juan@ufl.edu>
Subject: Re: Data Science proposal

Hi Chris,

Thank you for sending the eight semester plan and catalog plan. We have discussed the proposal and do not see substantial overlaps with existing programs. HWCOE supports the BS in Data Science proposal.

Thanks,
Toshi

T. Nishida, Ph.D.
Associate Dean for Academic Affairs, Herbert Wertheim College of Engineering
Professor, Department of Electrical and Computer Engineering
Director, NSF Multi-functional Integrated System Technology (MIST) Center
Member, Interdisciplinary Microsystems Group
University of Florida
Gainesville, FL 32611
nishida@ufl.edu
http://www.img.ufl.edu and http://mist-center.org

From: Mccarty,Christopher
Sent: Monday, October 28, 2019 1:37 PM
To: Toshikazu Nishida
Subject: Data Science proposal

Hi Toshi,

Attached are the eight semester plan and the catalog page.

Take care,

chris

From: **Mccarty,Christopher** ufchris@ufl.edu
Subject: FW: Data Science major
Date: November 1, 2019 at 10:18 AM
To: Daniels,Michael Joseph daniels@ufl.edu

Christopher McCarty
Associate Dean and Professor of Anthropology

From: Erenguc,S. Selcuk <selcuk.erenguc@warrington.ufl.edu>
Sent: Wednesday, October 30, 2019 1:59 PM
To: Mccarty,Christopher <ufchris@ufl.edu>
Subject: RE: Data Science major

Hi Chris,

We do not see a substantial overlap between your proposed undergraduate major and our Information Systems and Operations Management major.

I hope this is helpful.

Take care,

Selcuk

—

S. Selcuk Erenguc

Senior Associate Dean
Warrington College of Business

Director
Hough Graduate School of Business

WARRINGTON COLLEGE OF BUSINESS
UNIVERSITY OF FLORIDA

352-392-8436
selcuk.erenguc@warrington.ufl.edu
Hough Hall 100

UF UNIVERSITY of FLORIDA

Herbert Wertheim College of Engineering
Computer & Information Science & Engineering

E301 CSE Building
PO Box 116120
Gainesville, FL 32611-6120
352-392.1200 Voice
352-392-1220 Fax

October 22, 2019

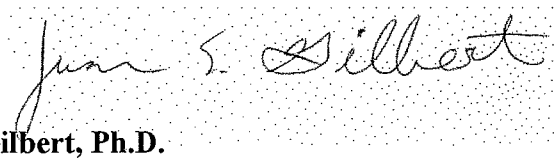
Dear Mike and Kevin:

As we discussed the department of Computer and Information Science and Engineering (CISE) agrees to provide additional instructional resources and seats in the CISE courses described in the proposed Data Science major. The following courses will likely see additional enrollment:

COP3502, COP3503, COP3530, COT3100 and CIS4301

We agree to accommodate students from the Data Science major who will need to take these courses.

Sincerely,



Juan E. Gilbert, Ph.D.
Andrew Banks Family Preeminence Endowed Professor & Chair
Computer & Information Science & Engineering Department (CISE)
Herbert Wertheim College of Engineering
University of Florida
P.O. Box 116120, Gainesville, FL 32611
352.392.1527 (V)
juan@ufl.edu

UF UNIVERSITY of FLORIDA

College of Liberal Arts and Sciences
Department of Mathematics

358 Little Hall
PO Box 118105
Gainesville, FL 32611-8105
(352) 294-2350
Fax (352) 392-8357

October 23, 2019

Dear Members of the University Curriculum Committee,

The Department of Mathematics fully supports the creation of a new data science major within the Department of Statistics. The proposed program was developed jointly by Statistics chair Mike Daniels and me, and we are confident that it will attract high quality students and equip them with the skills they need to succeed.

To this end, the Department of Mathematics commits to the following:

1. We will make available a sufficient number of seats in the required mathematics courses to meet student demand.
2. We will develop the two new mathematics courses, MAS 4XXX (Linear Algebra for Data Science) and MAD 2XXX (Computational Mathematics with Python), and have them approved by the requisite curriculum committees. The first one is already under review and both will be piloted in the Spring 2020 term.
3. We will work closely with the Statistics Department on recruiting and advising students in the program.

It is time for UF to join its peers in offering a data science program for our undergraduates. I urge you to approve this new major.

Sincerely,

Kevin P. Knudson
Professor and Chair
UF Distinguished Teaching Scholar

From: "Daniels,Michael Joseph" <daniels@ufl.edu>
Subject: Re: Data Science Major
Date: November 6, 2019 at 2:39:46 PM EST
To: "Mccarty,Christopher" <ufchris@ufl.edu>
Cc: "Knudson,Kevin P" <kknudson@ufl.edu>, "Daniels,Michael Joseph" <daniels@ufl.edu>

Hi Chris,
Happy to meet to discuss this. And find my initial thoughts below:

_____

Mike Daniels
Professor and Chair
Andrew Banks Family Endowed Chair
Department of Statistics
University of Florida
Gainesville, FL 32611

On Nov 6, 2019, at 2:19 PM, Mccarty,Christopher <ufchris@ufl.edu> wrote:
Can we discuss this? I feel like I need a clear statement from them about their support rather than including this with the external consult. That may require you to consider their suggestions.

chris

Christopher McCarty
Associate Dean and Professor of Anthropology

From: Brendemuhl,Joel H <brendj@ufl.edu>
Sent: Wednesday, November 6, 2019 1:58 PM
To: Mccarty,Christopher <ufchris@ufl.edu>
Cc: Brendemuhl,Joel H <brendj@ufl.edu>
Subject: Data Science Major

Good morning Chris,

I have shared the BS Data Science major in Statistics with CALS Undergraduate Coordinators and Department Chairs. The feedback I

have received indicates that the undergraduate major does not have substantial overlap with any CALS BS/BA degrees or majors.

I think this is, in principle, all we need from the consult.

There were a few suggestions concerning enhancing the draft proposal and I have provided those below. I would also ask that the Bioinformatics minor be listed under Relevant Minors

I would be ok with adding this.

and/or Certificates and that AEB 4126 be considered as a choice under the Subject matter electives (Social Science).

Also happy to add this one as well.

I would also hope the major would be open to adding additional courses under the subject matter electives should they arise.

Of course on this.

Comments:

1) Overall, it covers all the fundamentals I think would be important (calculus sequence, linear algebra, probability), and then adds a goodly number of stats courses. My main thought is that this degree would look a lot like a “statistics” degree, rather than emphasizing the “data science” twist (which near as I can tell is equal parts computer science and applications as it is statistics). One thing the college might consider is something like an accelerated MS in Data Science. My undergraduate alma mater has initiated such a degree to good effect: https://www.ncf.edu/academics/graduate-program/data-science-curriculum/. My sense is that industry is looking for people with real-world “street fighting” skills in data science and statistics, including collaborative problem-solving – a solid theoretical base is important for doing rigorous basic science, but might be a bit over-emphasized in this currently proposed approach.

These just seem to be his thoughts/suggestions. The consult (as far as I understand) is to avoid conflicts with existing courses/programs and not to get suggested changes having nothing to do with conflicts.

2) That is a popular major now (especially at the grad level). We don't see any problems with it, though they could add AEB 4126 Ag and Natural Resource Ethics to the selected list given some of the courses they have there.

Can do.

3) I discussed with Ethan White, who teaches our graduate Data Carpentry course. He provided the below links from UC Berkeley, which he believes may be the best extant best data science major:

* Undergraduate major: https://data.berkeley.edu/academics/undergraduate-programs/data-science-major
* Undergraduate minor: https://data.berkeley.edu/academics/undergraduate-programs/data-science-minor
* University wide undergraduate data science course: https://data.berkeley.edu/education/courses/data-8

We are aware of this major. But it was not the 'model' we were shooting for.

The domain emphasis within this major seems like a great idea, as it gives students a link from data science to an area of study (https://data.berkeley.edu/degrees/domain-emphasis).

It might be a subject to broach as a revision of the major.

The ‘domain’ emphasis is meant to be captured by the subject area electives

Best regards,

Mike D

Kind regards,
Joel

Joel H. Brendemuhl, Ph.D.
Professor and Associate Dean
College of Agricultural and Life Sciences | UF/IFAS
2010 McCarty Hall D | POB 110270 | Gainesville, FL 32611-0270
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