ARIZONA STATE UNIVERSITY

PROPOSAL TO ESTABLISH A NEW DOCTORAL DEGREE PROGRAM

This template is to be used only by programs that have received specific written approval from the Provost's office to proceed with internal proposal development and review. The proposal template should be completed in full and submitted to the University Provost's Office [mailto: curriculumplanning@asu.edu]. It must undergo all internal university review and approval steps including those at the unit, college, and university levels. A program **may not** be implemented until the Provost's Office notifies the academic unit that the program may be offered.

DOCTORAL DEGREE PROGRAM

College/School: Ira A. Fulton Schools of Engineering

Note: Program ownership is coded at the College/School level first and may not be a center, department or division apart from it.

Department/Division/School: School of Computing, Informatics, and Decision Systems Engineering

Proposing faculty group (if applicable)**:** Computer Science and Engineering Program (CCOMPENG)

Name of proposed degree program: Doctor of Philosophy (PhD) in Data Science, Analytics and Engineering

Doctoral degree type: PHD - Doctor of Philosophy

If Degree Type is "Other", provide degree type and proposed abbreviation:

Is a program fee required? No, a program fee is not required.

Note: for more information about program fee requests, visit https://provost.asu.edu/curriculum-development/changemaker/form-instructions#fees

Is the unit willing and able to implement the program if the fee is denied? N/A

Requested effective term and year: Spring 2021

(The first semester and year for which students may begin applying to the program)

Delivery method and campus or location options: *select all locations that apply*

☐ Downtown Phoenix   ☐ Polytechnic   ☒ Tempe   ☐ Thunderbird   ☐ West   ☐ Other: _____

☐ **Both** on-campus **and** ☐ ASU Online* **-** (check applicable campus(es) from options listed above)

☐ ASU Online only (all courses online and managed by 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 complete the ASU Online Offering form in Curriculum ChangeMaker to begin this request. Prior to completing the online Curriculum ChangeMaker form, please contact EdPlus at asuonline@asu.edu who can provide you with additional information regarding the online request process.

Do Not Fill in this information: <u>Office Use Only</u>	
Plan Code:	**CIP Code:**

PROPOSAL CONTACT			
Name:	Ronald Askin, Chitta Baral	**Title:**	Professor
Phone number:	5-2567, 7-6047	**Email:**	ron.askin@asu.edu or chitta.baral@asu.edu

DEAN APPROVAL(S)

This proposal has been approved by all necessary unit and college/school levels of review, and the college/school(s) has the resources to offer this degree program. I recommend the implementation of the proposed degree program.

Note: An electronic signature, an email from the dean or dean's designee, or a PDF of the signed signature page is acceptable.

College/School/Division Dean name: James S. Collofello

Signature: *[signature]*   Date: 2/26/20

Please note: Proposals for new degrees also require the review and recommendation of approval from the University Graduate Council, Curriculum and Academic Programs Committee (CAPC), the Academic Senate (2 readings), and the Office of the Provost before they can be put into operation.

The final approval notification will come from the Office of the Provost.

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1. **PURPOSE AND NATURE OF PROGRAM**

    A. **Provide a brief program description:**

    The proposed PhD in Data Science, Analytics and Engineering program is designed to produce data scientists, analysts, and engineers that can meet the rapidly evolving needs and opportunities for highly proficient professionals that can manage data and convert that data into relevant information for making decisions. This degree program will accept students that have a background in quantitative modeling and computational skills and provide them with advanced knowledge in data analysis and engineering. As a PhD program, the goal is to create a cadre of data scientists and engineers that can develop new systems and algorithms for collecting, cleaning, storing, valuing, aggregating, fusing, summarizing, managing and drawing inferences from high dimension, high volume, heterogenous data streams for knowledge discovery. This degree program is a collaboration between the School of Computing, Informatics, and Decision Systems Engineering (CIDSE) and the School of Mathematical and Statistical Sciences (SoMSS) in The College of Liberal Arts and Sciences. The number of required courses in the program will be kept deliberately small in order to allow students to pursue advanced coursework and a dissertation topic in either school.

    B. **Will concentrations be established under this degree program?** ☐ Yes   ☒ No
    (Please provide additional concentration information in the curricular structure section – number 7.)

2. **PROGRAM NEED**

    Explain why the university should offer this program (include data and discussion of the target audience and market).

    The field of data science is rapidly developing as a key driver of business competitiveness and scientific discovery. Glassdoor has selected "data scientist" as the best job in the U.S. for the past four years based on earning potential, the number of job openings and job satisfaction. Harvard Business Review (2012) notes that Data Scientists have rare qualities that are much in demand for the 21st century job market. The U.S. Department of Labor Occupational Outlook Handbook (https://www.bls.gov/ooh/fastest-growing.htm) lists Statisticians, Mathematicians, Software Developer (Applications) and Operations Research Analysts all among their top 20 fastest growing occupations for 2016-2026. The article, "The Quant Crunch: How the demand for Data Science Skills is Disrupting the Job Market," (Burning glass technologies, 2017) mentions the significant growth of data-center skills in 2016 (Data Science: +40%, Data Engineering: +28%) and goes on to say that, "advertised data scientist jobs pay an average of $105K and advertised data engineering jobs pay an average of $117K."

    Although there exist several PhD programs in Data Science nationally, only a limited number are offered by ASU peers or aspirational universities; most notably are recently created programs at NYU, Yale, Washington and Washington University in St. Louis. However, these programs have a more limited focus than our proposed program due to their lack of expertise breadth and disciplinary structure. If the proposed program, as envisioned, is offered at ASU, it will be unique in being backed by a strong and large faculty of Computer Scientists, Computer Engineers, Industrial Engineers and Statisticians and will produce graduates with job prospects much beyond "data analysis" and include integrated mastery of data management, computing and engineering, optimization, and decision-making skills. With its programs in Computer Science, Computer Systems Engineering, Industrial Engineering and Software Engineering that cover data management, statistical modeling, optimization, and artificial intelligence/machine learning, the ASU School of Computing, Informatics, and Decision Systems Engineering is in a unique position to administer a graduate degree program that spans the spectrum from data acquisition to decision making with a focus on data science, analytics, and engineering. Participation from the School of Mathematical and Statistical

Sciences further enhances the quantitative capabilities of the program faculty. Together, we have the faculty base that can propel this effort into a top 10 national program for this emerging area within a short time. We propose a program targeted towards Data Scientists and Engineers that will have analytical and computational depth and go beyond the Business/Data Analytics often offered through business schools to address issues related to managing and using data for discovery and prescriptive decision making as well as descriptive and predictive purposes. Modern discovery and innovation require the ability to fuse large amounts of data from multiple sources. This program will accept students with quantitative and computational skills and interests from multiple domains, and provide them with the capability to advance their field on their own or through support of more traditional researchers with high levels of domain knowledge. We envision creating a cadre of methodology innovators that will advance the state of the art in using data to make decisions. Finally, note that this program will addresses the ASU design aspirations of enabling student success and fusing intellectual disciplines.

3. IMPACT ON OTHER PROGRAMS

Attach any letters of collaboration or support from impacted programs (see checklist). Please submit as a separate document.

This degree program will not negatively impact any other programs, however, it will provide an avenue for students earning a Master's degree in Computer Science, Engineering, Mathematics, Statistics, Business Analytics or Natural Sciences to purse advanced Ph.D study.

Statements of Collaboration and Impact are included from the following units:

The College of Liberal Arts and Sciences, including School of Mathematical and Statistical Sciences

New College of Interdisciplinary Arts and Sciences

Mary Lou Fulton Teachers College

Watts College of Public Service and Community Solutions

W. P. Carey School of Business

Thunderbird School of Global Management

College of Health Solutions

College of Integrative Sciences and Arts

School for the Future of Innovation in Society (pending)

School of Sustainability

Walter Cronkite School of Journalism and Mass Communication (pending)

4. PROJECTED ENROLLMENT

How many new students do you anticipate enrolling in this program each year for the next five years?

Note: The Arizona Board of Regents (ABOR) requires that six doctoral degrees be awarded every three years. Thus, the projected enrollment numbers must account for this ABOR requirement.

5-YEAR PROJECTED ANNUAL ENROLLMENT					
Please utilize the following tabular format	1st Year	2nd Year (Yr. 1 continuing + new entering)	3rd Year (Yr. 1 & 2 continuing + new entering)	4th Year (Yrs. 1, 2, 3 continuing + new entering)	5th Year (Yrs. 1, 2, 3, 4 continuing + new entering)
Number of Students Majoring (Headcount)	15	30	45	60	75

5. **ACCREDITATION OR LICENSING REQUIREMENTS (if applicable)**
   Provide the names of the external agencies for accreditation, professional licensing, etc. that guide your curriculum for this program, if any. Describe any requirements for accreditation or licensing.

   N/A

6. **STUDENT LEARNING OUTCOMES AND ASSESSMENT**
   Attach a PDF copy of the assessment plan printed from the University Office of Evaluation and Educational Effectiveness assessment portal demonstrating UOEEE's approval of your assessment plan for this program. Visit the assessment portal at https://uoeee.asu.edu/assessment-portal or contact uoeee@asu.edu with any questions.

   See Appendix II

7. **CURRICULAR STRUCTURE**

   A. Curriculum Listing

Required Core Courses for the Degree			
Prefix and Number	**Course Title**	**New Course?**	**Credit Hours**
IEE 520 or CSE 572	Statistical Learning for Data Mining Data Mining	No	3
IEE 670 or STP 502	Mathematical Statistics Theory of Statistics II: Inference	No	3
CSE 510	Database Management System Implementation	No	3
CSE 543	Information Assurance and Security	No	3
		Section sub-total:	12
Electives Courses *(as deemed necessary by supervisory committee)*			
Prefix and Number	**Course Title**	**New Course?**	**Credit Hours**
CSE 511	Data Processing at Scale	No	3
CSE 512	Distributed Data Systems	No	3
CSE 515	Multimedia and Web Databases	No	3
CSE 546	Cloud Computing	No	3
CSE 548	Advanced Computer Network Security	No	3
CSE 550	Combinatorial Algorithms and Intractability	No	3
CSE 551	Foundations of Algorithms	No	3
CSE 552	Randomized and Approximation Algorithms	No	3
CSE 555	Theory of Computation	No	3
CSE 556	Game Theory with Applications to Networks	No	3
CSE 561	Modeling and Simulation Theory and Application	No	3
CSE 565	Software Verification, Validation and Testing	No	3
CSE 569	Fundamentals of Statistical Learning and Pattern Recognition	No	3
CSE 571	Artificial Intelligence	No	3
CSE 573	Semantic Web Mining	No	3
CSE 574	Planning and Learning Methods in AI	No	3
CSE 575	Statistical Machine Learning	No	3
CSE 576	Topics in Natural Language Processing	No	3
CSE 578	Data Visualization	No	3
CSE 579	Knowledge Representation and Reasoning	No	3
CSE 598	Algorithms in Computational Biology	No	3
IEE 506	Web-Enabled Decision Support Systems	No	3

IEE 511	Analysis of Decision Processes	No	3
IEE 512	Introduction to Financial Engineering	No	3
IEE 521	Urban Operations Research	No	3
IEE 526	Operations Research in Healthcare	No	3
IEE 545	Advanced Simulating Stochastic Systems	No	3
IEE 570	Advanced Quality Control	No	3
IEE 572	Design Engineering Experiments	No	3
IEE 573	Reliability Engineering	No	3
IEE 574	Applied Deterministic Operations Research	No	3
IEE 575	Applied Stochastic Operations Research Models	No	3
IEE 577	Data Science for Systems Informatics	No	3
IEE 578	Regression Analysis	No	3
IEE 579	Time Series Analysis/Forecasting	No	3
IEE 582	Response Surfaces/Process Optimization	No	3
IEE 605	Foundations of Information Systems Engineering	No	3
IEE 620	Optimization I	No	3
IEE 622	Optimization II	No	3
IEE 640	Probability and Stochastic Processes	No	3
IEE 672	Adv Topics-Experimental Design	No	3
STP 505	Bayesian Statistics	No	3
STP 526	Theory of Statistical Linear Models	No	3
STP 530	Applied Regression Analysis	No	3
STP 532	Applied Nonparametric Statistics	No	3
STP 533	Applied Multivariate Analysis	No	3
STP 540	Computational Statistics	No	3
STP 598	Topic: Causal Inference	No	3
STP 598	Topic: Machine Learning / Statistical Learning	No	3
STP 598	Topic: Time Series	No	3
STP 598	Topic: Advanced Design of Experiment	No	3
APM 505	Applied Linear Algebra	No	3
APM 523	Optimization	No	3
APM 525	High-Performance Computing	No	3
APM 598	Topic: Fourier Analysis and Wavelets	No	3
EEE 551	Information Theory	No	3
EEE 558	Wireless Communications	No	3
EEE 581	Filtering of Stochastic Processes	No	3
EEE 585	Security and Privacy in Networked Systems	No	3
EEE 591	Topic: Machine Learning and Data Science: Theory to Practice	No	3
EEE 598	Topic: Statistical Machine Learning from Foundations to Algorithm	No	3
EEE 598	Topic: Special Topics in Machine Learning	No	3
EEE 598	Topic: Distributed and Large Scale Optimization	No	3
EEE 598	Topic: Remote Sensing and Adaptive Radar	Np	3
EEE 598	Topic: Introduction to Complex Networks and Machine Learning	No	3
EEE 598	Topic: Speech and Audio Processing and Perception	No	3
EEE 598	Topic: Machine Learning for Smart Grid	No	3
EEE 598	Topic: Neuromorphic Hardware Design	No	3
		Section sub-total:	39
Research			**Credit Hours**
DSE 792 Research			12

Section sub-total:	12
Culminating Experience ***E.g.*** *– Capstone course, applied project, dissertation with oral defense (12 credit hours)*	**Credit Hours**
DSE 799 Dissertation	12
Section sub-total:	12
Other Requirements **Students must select coursework from either the Data Engineering Requirement or the Data Analytics Requirement. Students cannot take a Data Engineering or Data Analytics course and have it meet an elective requirement at the same time. Students will need to take a different elective course to reach the total number of credit hours required for the program. Other coursework may be used with approval of the academic unit to fulfill these requirements. All students must take the qualifying exams.** ***E.g.*** *– internships, clinical requirements, field studies, foreign language exam as applicable*	**Credit Hours**

Data Engineering requirements:
    CSE 512 Distributed Database Systems (3),
    CSE 515 Multimedia and Web Databases (3), and
    CSE 546 Cloud Computing (3)
 	
                or
Data Analytics requirements:
    CSE 575 Statistical Machine Learning (3) or ECE 598 Topic: Statistical Machine Learning (3),
    CSE 578 Data Visualization (3),
    and one of IEE 578 Regression Analysis (3), IEE 620 Optimization I (3), APM 523 Optimization (3)
    or EEE 598 Topic: Convex Optimization (3).
 	
               and
Passing the Qualifying Exam covering the required core courses within one year of matriculation into the program.
	9

Section sub-total:	9
For doctoral programs – *When approved by the student's supervisory committee, will this program allow up to 30 credit hours from a previously awarded master's degree to be used for this program? If applicable, please indicate the 30 credit hour allowance that will be used for this degree program.* **If students are admitted with only a bachelor's degree, will the remaining coursework be made up of research and elective coursework?** ☒ Yes ☐ No **If no, please list here what coursework these students must take to complete the 30 credit hours:** Elective courses	
Total required credit hours	84

1. List all required core courses and total credit hours for the core (required courses other than internships, dissertation, capstone course, etc.)**.**
2. Omnibus numbered courses cannot be used as core courses.
3. Permanent numbers must be requested by submitting a course proposal to Curriculum ChangeMaker for approval.

B. Will concentrations be established under this degree program? ☐ Yes ☒ No

8. COURSES

A. Course Prefix(es): Provide the following information for the proposed graduate program.

   i. Will a new course prefix(es) be required for this degree program?

       Yes ☒ No ☐

   If yes, complete the **Course Prefixes / Subjects Form** for each new prefix and submit it as part of this proposal submission. Form is located under the courses tab.

B. New Courses Required for Proposed Degree Program: Provide course prefix, number, title, credit hours and description for any new courses required for this degree program.

DSE 790 Reading and Conference (1-12): Independent study in which a student meets regularly with a faculty member to discuss assignments. Course may include such assignments as intensive reading in a specialized area, writing a synthesis of literature on a specific topic, or writing a literature review of a topic.

DSE 792 Research (1-12): Independent study in which a student, under the supervision of a faculty member, conducts research that is expected to lead to the dissertation. Assignments might include data collection, experimental work, data analysis and preparation of a manuscript.

DSE 795 Continuing Registration (1): Used in situations where registration is necessary but where credit is not needed. Replaces arbitrary enrollment in reading and conference, research, thesis, dissertation, etc. Used by students when taking comprehensive examinations, defending theses or dissertations or fulfilling the continuous enrollment requirement in doctoral programs. Credit is not awarded and no grade is assigned.

DSE 799 Dissertation (1-12): Supervised research focused on preparation of dissertation, including literature review, research, data collection and analysis, and writing.

9. FACULTY, STAFF, AND RESOURCE REQUIREMENTS

A. Faculty

i. Current Faculty - Complete the table below for all current faculty members who will teach in the program. If listing faculty from an academic unit outside of the one proposing the degree, please provide a support statement from that unit.

Name	Rank	Highest Degree	Area of Specialization/Expertise	Estimated Level of Involvement
Ahmed Alkhateeb	Asst. Prof.	PhD	Machine Learning for Wireless Communications, Edge Computing, Computer Vision	High
David Allee	Professor	PhD	Machine Learning Applications	Minor
Ronald Askin	Professor	PhD	Applied Optimization and Statistics	Moderate
Chitta Baral	Professor	PhD	Artificial Intelligence	Moderate
Rida Bazzi	Assoc. Professor	PhD	Machine Learning, Privacy and Security	Moderate
Visar Berisha	Assoc. Professor	PhD	Audio processing for health	Moderate
Dimitri Bertsekas	Professor	PhD	Foundations of Machine Learning	Moderate
Daniel Bliss	Assoc. Professor	PhD	Battlefield Signal Processing	Moderate
K. Selcuk Candan	Professor	PhD	Data Management	High
Chris Bryan	Asst. Prof.	PhD	Visualization and HCI	High
Yu (Kevin) Cao	Professor	PhD	Machine Learning Hardware; Neural Inspired Computing	High
Chaitali Chakrabarti	Professor	PhD	Hardware for Machine Learning	Minor
Charles Colbourn	Professor	PhD	Combinatorial Design Theory &Network Algorithms	Moderate
Gautam Dasarathy	Asst. Prof.	PhD	Interative ML, High Dimensional Statistics, Data Science on Graphs, Information Theory	High
Adolfo Escobedo	Asst. Prof.	PhD	Optimization	Moderate

Malena Espanol	Asst. Prof.	PhD	Numerical Linear Algebra and Image processing	Moderate
Georgios Fainekos	Assoc. Prof.	PhD	Cyber Physical Systems	Moderate
Deliang Fan	Asst. Prof.	PhD	ML Hardware; Security of AI Systems	Moderate
Stephanie Forrest	Professor	PhD	Adaptive Systems; biology and computation	Moderate
John Fricks	Assoc. Prof.	PhD	Stochastic Modeling, Statistical Inference	Moderate
Kevin Gary	Assoc. Prof.	PhD	Software Engineering Analytics	Moderate
Esma Gel	Assoc. Prof.	PhD	Operations Research	High
Mojdeh Hedman	Asst. Prof.	PhD	Machine Learning for Power Systems	Moderate
Sharon Hsiao	Asst. Prof.	PhD	Learning Analytics and Data Visualization	High
Suren Jayasuriya	Asst. Prof.	PhD	Visual Scene Recognition	Moderate
Feng Ju	Asst. Prof.	PhD	Applied Optimization and Statistical Modeling	Moderate
Ming-Hung Kao	Assoc. Prof.	PhD	Optimal Experimental Design; Functional MRI analysis	Moderate
Oliver Kosut	Assoc. Prof.	PhD	Information Theory	Moderate
Yin-Cheng Lai	Professor	PhD	Machine Learning, Nonlinear Dynamics; Complex Networks, Data Analysis	High
Shiwei Lan	Asst. Prof.	PhD	Statistical Computing, Bayesian Modeling	Moderate
Heewook Lee	Asst. Prof.	PhD	Computational Bioulgy and Algorithms	Moderate
Baoxin Li	Professor	PhD	Visual computing and Machine Learning	High
Jing Li	Assoc. Prof.	PhD	Statistical Modeling	High
Robert LiKamWa	Asst. Prof.	PhD	Machine Learning	Moderate
Ross Maciejewski	Assoc. Prof.	PhD.	Visualization and Data Science	Moderate
Robert McCulloch	Professor	PhD	Machine Learning & Statistical Computing	High
Katina Michael	Professor	PhD	Socioethical implications of Big Data; Implantable technologies	Moderate
Pitu Mirchandani	Professor	PhD	Optimization	High
Hans Mittelmann	Professor	PhD	Optimization and Software	Moderate
Douglas Montgomery	Regents Professor	PhD	Statistical Modeling and DOE	High
Sebastien Motsch	Assoc. Prof.	PhD	Machine Learning and Applied Math	High
Angelia Nedich	Professor	PhD	Large Scale Optimization	High
Umit Ogras	Assoc. Prof.	PhD	Machine Learning for Embedded Systems; Edge Computing	Moderate
Theodore Pavlic	Asst. Prof.	PhD	Modeling and Nonlinear Optimization	High
Rong Pan	Assoc. Prof.	PhD	Statistical Modeling	High
Antonia Papandreou-Suppappola	Professor	PhD	Bayesian Nonparametric Learning Signal Processing for Data Science	Minor
Giulia Pedrielli	Asst. Prof.	PhD	Simulation Optimization	Moderate
Rodrigo Platte	Assoc. Prof.	PhD	Function Approximation and Inverse Problems	Moderate
Rosemary Renaut	Professor	PhD	Numerical Linear Algebra	Moderate
Mark Reiser	Assoc. Prof.	PhD	Multivariate analysis, mixed models	Moderate

Fengbo Ren	Asst. Prof.	PhD	Parallel Computing/Embedded Systems	Minor
Andrea Richa	Professor	PhD	Complex Systems, Networks and Biomimicry	Minor
Christ Richmond	Assoc. Prof.	PhD	Information Theory; Signal Processing	Moderate
George Runger	Professor	PhD	Statistical Modeling	High
Lalitha Sankar	Assoc. Professor	PhD	Machine Learning, Cyber Security and Big Data	High
Anna Scaglione	Professor	PhD	Internet of Things	High
Jorge Sefair	Asst. Prof.	PhD	Optimization	High
Jaesun Seo	Asst. Prof.	PhD	Hardware for Machine Learning	Moderate
Aviral Shrivastava	Assoc. Prof.	PhD	Embedded and Multicore Systems	Moderate
Jennie Si	Professor	PhD	Reinforcement Learning, Approx. DP	Moderate
Siddharth Srivastava	Asst. Prof.	PhD	Sequential Decision Making	Minor
Andreas Spanias	Professor	PhD	Information Signal Processing	Moderate
Siddharth Srivastava	Asst. Prof.	PhD	Sequential Decision making and robotics	Minor
Violet Syrotiuk	Assoc. Prof.	PhD	Dynamic Network Optimization	Moderate
Cihan Tepedelenlioglu	Assoc. Prof.	PhD	Optimization, Signal Processing, Information Theory	Minor
Yalin Wang	Assoc. Prof.	PhD	Geometric Modeling and Topology	Moderate
Bruno Welfert	Assoc. Prof.	PhD	Scientific Computing, HPC	Moderate
Yang Weng	Asst. Prof.	PhD	Power System Optimization	Moderate
Teresa Wu	Professor	PhD	Health Info System Design & Analytics	Moderate
Guoliang Xue	Professor	PhD	Optimization; Big Data enabled networking; Truth discovery, Auto ML	Moderate
Hao Yan	Asst. Prof.	PhD	Data Analytics	High
Nong Ye	Professor	PhD	Information Systems	Moderate
Yezhou Yang	Asst. Prof.	PhD	Cognitive Robotics	Moderate
Junshan Zhang	Professor	PhD	Edge Computing, Distributed & Reinforcement Learning; Privacy; Info Theory	High
Yanchao Zhang	Professor	PhD	Social Networks and Data Mining	Minor
Yi Zheng	Professor	PhD	Applied Regression Analysis	Minor
Ming Zhao	Assoc. Prof.	PhD	Data-driven systems	Moderate
Jia Zou	Asst. Prof.	PhD	Data Science	High

ii.   New Faculty - Describe the new faculty hiring needed during the next three years to sustain the program. List the anticipated hiring schedule and financial sources for supporting the addition of these faculty members.

No additional faculty hiring is needed beyond current plans.

iii.   Administration of the program - Explain how the program will be administered for the purposes of admissions, advising, course offerings, etc. Discuss the available staff support.

The program will be administered through the School of Computing, Informatics, and Decision Systems Engineering (CIDSE). The existing CIDSE staff will handle advising and related administrative activities. A Graduate Program Committee (GPC) will propose academic requirements and policies for approval by majority vote of the Graduate Faculty. The GPC will initially consist of five members including a Chair

appointed by the Director of the School of Computing, Informatics and Decision Systems Engineering. Other members will be elected by the Graduate Faculty with the requirement that at least one member will be from each of the Computer Science and Engineering Faculty, Industrial Engineering Faculty and SoMSS Faculty. The GPC will be responsible for drafting program bylaws which shall become effective upon approval by a majority of the graduate faculty and the Dean of Engineering. After year one, the GPC Chair will be elected annually in the Spring by the members of the GPC.

B. Resource requirements needed to launch and sustain the program: Describe any new resources required for this program's success such as new staff, new facilities, new library resources, new technology resources, etc.

No new resources are required for this program.

APPENDIX I
OPERATIONAL INFORMATION FOR GRADUATE PROGRAMS
(This information is used to populate the Graduate Programs Search/catalog website.)

1. **Proposed title of major:** Data Science, Analytics and Engineering

2. **Marketing description** *(Optional - 50 words maximum. The marketing description should not repeat content found in the program description.)*

The program is designed to instill the capability of building and deploying state-of-the-art data analysis and engineering tools to meet the societal need for data-driven discovery of new knowledge and decision making that enhances business and government performance and scientific investigation.

3. **Provide a brief program description** *(Catalog type (i.e. will appear in Degree Search) – no more than 150 words. Do not include any admission or curriculum information)*

The PhD in Data Science, Analytics and Engineering program engages students in fundamental and applied research as preparation for careers in academia, government or industry. The program's educational objective is to develop each student's ability to perform original research in the development and execution of data-driven methods for solving major societal problems. This includes the ability to identify research needs, adapt existing methods and create new methods as needed for data analytics and engineering.

The doctoral program provides a rigorous education with research and educational experiences that allows students to pursue careers in advanced research, teaching or state-of-the-art practice. The graduate will demonstrate proficiency with existing methodology and significant accomplishment at advancing the state of the art in their chosen area of data science, analytics and engineering.

4. **Delivery/Campus Information Options:**   **On-campus only (ground courses and iCourses)**

5. **Campus(es) where program will be offered:**
ASU Online curriculum consists of courses that have no face-to-face content. iCourses are online courses for students in on-campus programs. iCourses may be included in a program, but may not comprise the entirety of a program. On-campus programs must have some face-to-face content.
Note: Office of the Provost approval is needed for ASU Online delivery option.

☐ ASU Online only (all courses online and managed by ASU Online)

All other campus or location options (please select all that apply):

☐ Downtown Phoenix   ☐ Polytechnic   ☒ Tempe   ☐ West   ☐ Other: _____

☐ **Both** on-campus **and** ☐ ASU Online* **-** (check applicable campus(es) from options listed above)

*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 complete the ASU Online Offering form in Curriculum ChangeMaker *to begin this request. Prior to completing the online Curriculum ChangeMaker form, please contact EdPlus at* asuonline@asu.edu *who can provide you with additional information regarding the online request process.*

6. **Admission Requirements:**

Applicants must fulfill the requirements of both the Graduate College and the Ira A. Fulton Schools of Engineering.

Applicants are eligible to apply to the program if they have earned a bachelor's or master's degree in engineering, computer science, mathematics, statistics or related field, from a regionally accredited institution.

Applicants must have a minimum cumulative GPA of 3.00 (scale is 4.00 = "A") in the last 60 hours of their first bachelor's degree program, or applicants must have a minimum cumulative GPA of 3.00 (scale is 4.00 = "A") in an applicable master's degree program.

Applicants are required to submit:
1. graduate admission application and application fee
2. official transcripts
3. two letters of recommendation
4. letter of intent/written statement
5. GRE scores
6. proof of English proficiency

Additional Application Information

An applicant whose native language is not English must provide proof of English proficiency regardless of current residency.

Official TOEFL score, taken within the last two years (only required for those who did not graduate with a baccalaureate degree from an accredited U.S. institution). The TOEFL score must be valid on the first day of class for the term the student is applying for. CIDSE required that TOEFL scores must be above 575 (paper), or 90 (iBT). We also accept IELTS with a minimum overall band score of 7.0 or the Pearson Test of English (PTE) with a minimum score of 65 or higher.

If the student is assigned any deficiency coursework upon admission, those classes must be completed with a grade of "B" (scale is 4.00 = "A") or higher within two semesters of admission to the program. Deficiency courses do not apply to the total credit hours required to complete the degree program.

Deficiency courses are:

CSE 205 Object-Oriented Programming and Data Structures (3)

MAT 242 Elementary Linear Algebra (2) OR MAT 342 Linear Algebra (3) OR MAT 343 Applied Linear Algebra (3)

MAT 267 Calculus for Engineers III (3)

IEE 380 Probability and Statistics for Engineering Problem Solving (3)

7. **Application Review Terms (if applicable session):**

Indicate the first term and year in which applications will be opened for admission. Applications will be accepted on a rolling basis after that time.
Note: It is the academic unit's responsibility to display program deadline dates on their website.

Terms	Years	University Late Fee Deadline
☒ Fall (regular)	(year): 2021	July 1st
☐ Session B	(year):	October 1st
☒ Spring (regular)	(year): 2021	December 1st
☐ Session B	(year):	February 8th
☐ Summer (regular)	(year):	May 14th
☐ Summer B	(year):	May 14th
Note: Session B is only available for approved online programs.		

Program admission deadlines website address: https://cidse.engineering.asu.edu/graduate-admissions/

8. **Curricular Requirements:**

Curricular Structure Breakdown for the Academic Catalog:
(To be completed by the Graduate College)

84 credit hours, a written comprehensive exam, an oral comprehensive exam, a prospectus and a dissertation

Required Core (12 credit hours)
CSE 510 Database Management System Implementation (3)
CSE 543 Information Assurance and Security (3)
CSE 572 Data Mining (3) or IEE 520 Statistical Learning for Data Mining (3)
IEE 670 Mathematical Statistics (3) or STP 502 Theory of Statistics II: Inference (3)

Electives (39 credit hours)

Research (12 credit hours)
DSE 792 Research (12)

Other Requirements (9 credit hours)
Data Engineering Coursework, or
Data Analytics Coursework

Culminating Experience (12 credit hours)
DSE 799 Dissertation (12)

Additional Curriculum Information
All students must take qualifying exams covering the required core courses within one year of matriculation into the program.

The dissertation prospectus should be submitted and its oral defense completed no later than one year following completion of the 60th credit hour and also no later than the fourth year in the program.

Students must select coursework from either the data engineering or the data analytics requirements. Students should see the academic unit for the approved course list.

Students cannot take a data engineering or data analytics course and have it meet an elective requirement at the same time. Students will need to take a different elective course to reach the total number of credit hours required for the program. Other coursework may be used with approval of the academic unit to fulfil these requirements.

When approved by the student's supervisory committee and the Graduate College, this program allows 30 credit hours from a previously awarded master's degree to be used for this degree. If students do not have a previously awarded master's degree, the 30 hours of coursework will be made up of electives to reach the required 84 credit hours.

9. **Comprehensive Exams:**

   Doctoral Comprehensive Exam (required), please select from the appropriate box.

   A written comprehensive exam is required for all doctoral programs.

   An oral comprehensive exam is also required.

10. **For Doctoral Degrees that require a dissertation, submission of a written dissertation prospectus and its oral defense are required.** (Please include any required timelines for defense of the prospectus.) **It is expected that the submission of a written dissertation prospectus and its oral defense will take place no later than the end of the fourth year.**

The dissertation prospectus should be submitted and its oral defense completed no later than one year following completion of the 60th credit hour and also no later than the fourth year in the program.

11. Allow 400-level courses: ☒ **Yes** ☐ **No**

Note: No more than 6 credit hours of 400-level coursework may be included on a graduate student plan of study.

12. Committee:

Required number of dissertation committee members (must be at least 3 including chair or co-chairs): 4

13. Keywords: List all keywords that could be used to search for this program. Keywords should be specific to the proposed program – limit 10 keywords.

Data Science, Analytics, Data Engineering, Big Data

14. Area(s) of Interest

A. Select **one (1)** primary area of interest from the list below that applies to this program.

☐ Architecture & Construction   ☐ Interdisciplinary Studies
☐ Arts   ☐ Law & Justice
☐ Business   ☐ Mathematics
☐ Communication & Media   ☐ Psychology
☐ Education & Teaching   ☐ STEM
☒ Engineering & Technology   ☐ Science
☐ Entrepreneurship   ☐ Social and Behavioral Sciences
☐ Health & Wellness   ☐ Sustainability
☐ Humanities

B. Select **one (1)** secondary area of interest from the list below that applies to this program.

☐ Architecture & Construction   ☐ Interdisciplinary Studies
☐ Arts   ☐ Law & Justice
☐ Business   ☒ Mathematics
☐ Communications & Media   ☐ Psychology
☐ Education & Teaching   ☐ STEM
☐ Engineering & Technology   ☐ Science
☐ Entrepreneurship   ☐ Social and Behavioral Sciences
☐ Health & Wellness   ☐ Sustainability
☐ Humanities

15. Contact and Support Information:

Office Location - Building Code & Room: *(Search ASU map)*	Centerpoint 105
Campus Telephone Number: (may not be an individual's number)	480-965-3199
Program Email Address: (may not be an individual's email)	cidse.advising@asu.edu
Program Website Address: (if one is not yet created, use unit website until one can be established)	https://cidse.engineering.asu.edu
Program Director (Name):	Sandeep Gupta
Program Director (ASURITE):	skgupta
Program Support Staff (Name):	Allison Curran & Araxi Hovhannessian
Program Support Staff	alfarina, ahovh

(ASURITE):	
Admissions Contact (Name):	Araxi Hovhannessian
Admissions Contact (ASURITE):	Ahovh

16. **Application and iPOS Recommendations:** List the Faculty and Staff who will input admission/POS recommendations to Gportal **and** indicate their approval for Admissions and/or POS:

NAME	ASURITE	ADMSN	POS
Araxi Hovhannessian	ahovh	X	X
Arzuhan Kavak	akavak	X	X
Jaya Krishnamurthy	jkrishn6		X
Burcu Kaftanoglu	bkaftano	X	X

APPENDIX II

ASSESSMENT PLAN

University Office of Evaluation and Educational Effectiveness Academic Program Assessment Plan			09-17-2018

PhD in Data Science, Analytics, and Engineering

Status: UOEEE Provisional Approval

Comments: UOEEE Approved

Element	Outcome	Measure	Description
Outcome	1		Graduates will be able to identify open challenges, adapt, develop, and apply methods and tools from industrial statistics, operations research, machine learning, computer science, and computer engineering for problem description, system development, and prescriptive decision analysis.
Plan_2Concepts	1		Program goals focus on enabling the graduate to recognize opportunities, diagnose distinguishing characteristics of those challenges and then build, implement, maintain, and apply models and tools that can leverage existing data, create new knowledge, and make decisions for solving problems of societal interest.
Plan_3Competencies	1		• Ability to develop, implement and apply algorithms for various data science tasks such as: prediction, classification, recommendations, pattern detection and grouping, anomaly detection, recognition, scoring and ranking, segmentation, and forecasting. • Ability to apply optimization and stochastic modeling techniques for abstraction of decision problems into quantitative models, validation of those models, solution of those models and sensitivity analysis for interpreting accuracy and implications of results; Understanding of the value of data and design of data systems; • Ability to develop original models and algorithms for data-driven decision making that address problem specific objectives and constraints.
Measure	1	1	Student performance on the data analysis questions of their Ph.D. comprehensive exam.
PC	1	1	Satisfactory performance is indicated when at least 80% of students taking the Comprehensive Exam pass based on demonstration of technical expertise for data modeling and discovery.
Measure	1	2	Student performance on the decision modeling and algorthmic section of the comprehensive exam.
PC	1	2	Satisfactory performance is indicated when at least 80% of students taking the Comprehensive Exam pass the portion of the exam requiring demonstrated ability to develop and solve a quantitative model.

Element	Outcome	Measure	Description
Outcome	**2**		**Graduates will be able to utilize and manage large, heterogeneous data sets for discovery.**
Plan_2Concepts	2		The student is expected to be proficient at the acquisition, management and use of data for descriptive, predictive and prescriptive analytical studies. This includes understanding the issues of economics, privacy, security and computational feasibility.
Plan_3Competencies	2		•Ability to create and evaluate models using large, heterogeneous data sets; •Understanding the value of data and information and the risks/ethics involved in acquiring, managing and using that data; •Understanding of big data systems, such as Hadoop ,for data management and processing and ability to apply existing software tools for data management and analysis.
Measure	2	1	Student performance in developing a data management plan for executing research.
PC	2	1	Satisfactory performance is met when 80% of students submit an accepted Data Management Plan for their research or accepted grant proposal.

Element	Outcome	Measure	Description
Outcome	**3**		**Graduates will be able to develop original research ideas and effectively convey research results to a technical audience.**
Plan_2Concepts	3		The graduate will be prepared for a successful career as a data researcher. They should be able to generate a research agenda, execute the technical portion of the research and then disseminate the results. In addition the graduate should be able to educate others on the specific methods and nuances of analytics and data science.
Plan_3Competencies	3		•Ability to identify feasible, original research ideas of measureable value to the body of knowledge; •Ability to present study results to both technical and managerial audiences at different levels; •Ability to develop educational materials that effectively convey opportunity and appropriate use of data science technologies to students and practitioners at different levels.
Measure	3	1	Student performance on the written and oral Dissertation Proposal Defense.
PC	3	1	Satisfactory performance is indicated when at least 90% of Ph.D. students receive a Pass from the Examining Committee for both the acceptability of their dissertation proposal research goals and the coherence of their research plan.
Measure	3	2	Student performance in completing and disseminating original research.
PC	3	2	Satisfactory performance is indicated when at least 90% of Ph.D. students receive acceptance notification of a first author publication in a leading journal or conference proceedings as appropriate for their discipline prior to graduation.
Measure	3	3	Ph.D. Candidate performance on educational presentation.
PC	3	3	Satisfactory performance is indicated when at least 90% of Ph.D. students receive a satisfactory performance evaluation as a Graduate T. A. that includes class material preparation and presentation or, positively evaluated performance on a conference presentation.

If you have questions, please e-mail assessment@asu.edu or call UOEEE at (480) 727-1731.

APPENDIX III

LETTERS OF COLLABORATION/IMPACT

Ira A Fulton Schools of Engineering – Official Submission

From: Sergio Quiros
Sent: Thursday, February 27, 2020 2:27 PM
To: Curriculum Planning <CurriculumPlanning@exchange.asu.edu>
Cc: Ronald Askin <Ron.Askin@asu.edu>; Sandeep Gupta <Sandeep.Gupta@asu.edu>; Jeremy Helm <JEREMY.HELM@asu.edu>; James Collofello <JAMES.COLLOFELLO@asu.edu>; Allison Curran <Allison.Curran@asu.edu>
Subject: FSE - Establishment - PHD in Data Science, Analytics and Engineering & DSE Prefix

Hello,

Attached for your review is the following proposals:

> **Ira A Fulton Schools of Engineering**
> *School of Computing, Informatics, and Decision Systems Engineering*
> Establishment of a graduate Program
> PHD in Data Science, Analytics and Engineering

> **Ira A. Fulton Schools of Engineering**
> *School of Computing, Informatics, and Decision Systems Engineering*
> Establishment of a new graduate prefix
> DSE - Data Science, Analytics and Engineering

Best,

Sergio S. Quiros

Specialist Senior, Academic, and Student Affairs
Ira A. Fulton Schools of Engineering
Arizona State University
Tempe, AZ 85287-8109
Phone: 480/727-5770
Email: Sergio.Quiros@asu.edu

School of Computing, Informatics, and Decision Systems Engineering

ASU Ira A. Fulton Schools of
Engineering
Arizona State University

School of Computing,
Informatics, and
Decision Systems
Engineering

P.O. Box 878809
Tempe, AZ 85287-8809

(480) 965-3190
Fax: (480) 965-2751
cidse.engineering.asu.edu

September 5, 2019

To: ASU Administration

To Whom It May Concern:

The Industrial Engineering Program in the School of Computing, Informatics, and Decision Systems Engineering supports the creation of the proposed PhD in Data Science, Analytics and Engineering and that we believe the proposed program will increase opportunities for our students without negatively impacting the current programs.

Regards,

Nong Ye, Ph.D.
Professor and Chair of the Industrial Engineering Program
School of Computing, Informatics, and Decision Systems Engineering
Ira A. Fulton School of Engineering
ARIZONA STATE UNIVERSITY
Box 878809
Tempe, Arizona 85287-8809
Phone: (480) 965-7812
Fax: (480) 965-2751
Email: nongye@asu.edu

The College of Liberal Arts and Sciences

From:	Patrick Kenney
To:	James Collofello
Cc:	Sergio Quiros; Nancy Gonzales
Subject:	RE: Impact / Support Letter
Date:	Thursday, March 26, 2020 12:44:02 PM

Yes, this is fine with us. We support the degree and look forward to working with FSE.

From: James Collofello <JAMES.COLLOFELLO@asu.edu>
Sent: Thursday, March 26, 2020 8:52 AM
To: Patrick Kenney <pkenney@asu.edu>
Cc: Sergio Quiros <Sergio.Quiros@asu.edu>
Subject: Impact / Support Letter

Patrick,

I am writing to request an impact/support letter (email will suffice) for our proposed Doctor of Philosophy (PhD) in Data Science, Analytics and Engineering (see attached). This degree program is a collaboration between the School of Computing, Informatics, and Decision Systems Engineering (CIDSE) and the School of Mathematical and Statistical Sciences in The College of Liberal Arts and Sciences. Please let me know if you have questions or concerns.

jim

James S. Collofello
Vice Dean for Academic and Student Affairs
Professor of Computer Science and Engineering
School of Computing Informatics and Decision Systems Engineering
Ira A. Fulton Schools of Engineering
Arizona State University

School of Mathematical and Statistical Sciences

Ron,

The School of Mathematical and Statistical Sciences enthusiastically supports the creation of this new PhD program in Data Science, Analytics and Engineering, which is jointly sponsored by the Schools in Engineering and in Mathematical and Statistical Sciences.

Sincerely,

Al Boggess, Director
School of Mathematical and Statistical Sciences

Ronald G. Askin, Professor
School of Computing, Informatics, and Decision Systems Engineering
Arizona State University
Tempe, AZ 85287-8809
Ron.askin@asu.edu
Office: 480-965-2567

New College of Interdisciplinary Arts and Sciences

From:	Todd Sandrin (DEAN)
To:	James Collofello
Cc:	Sergio Quiros
Subject:	Re: Impact / Support Letter
Date:	Friday, March 27, 2020 11:30:41 AM
Attachments:	Outlook-1496446183.png

Jim,

New College is happy to support IAFSE's effort to develop this innovative and highly relevant PhD program in Data Science. In fact, we offer a master's degree in Biological Data Science (https://newcollege.asu.edu/biological-data-science-ms), and we'd welcome the opportunity to explore whether students enrolled in this program might be able to access courses in your program to enhance their work.

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

From: James Collofello <JAMES.COLLOFELLO@asu.edu>
Sent: Thursday, March 26, 2020 8:54 AM
To: Todd Sandrin (DEAN) <Todd.Sandrin@asu.edu>
Cc: Sergio Quiros <Sergio.Quiros@asu.edu>
Subject: Impact / Support Letter

Todd,

I am writing to request an impact/support letter (email will suffice) for our proposed Doctor of Philosophy (PhD) in Data Science, Analytics and Engineering (see attached). This degree program is a collaboration between the School of Computing, Informatics, and Decision Systems Engineering (CIDSE) and the School of Mathematical and Statistical Sciences in The College of Liberal Arts and Sciences. Please let me know if you have questions or concerns.

jim

James S. Collofello
Vice Dean for Academic and Student Affairs
Professor of Computer Science and Engineering
School of Computing Informatics and Decision Systems Engineering
Ira A. Fulton Schools of Engineering
Arizona State University

Mary Lou Fulton Teachers College

From:	Carole Basile (Dean)
To:	James Collofello
Cc:	Sergio Quiros
Subject:	Re: Impact / Support Letter
Date:	Thursday, March 26, 2020 6:28:16 PM

I have no concerns. We are in full support.

cb

Carole G. Basile
Dean
Arizona State University
Mary Lou Fulton Teachers College
P.O. Box 871811, Tempe, AZ 85281-1811

O: 480.965.3463 | M: 480.310.6887

On Mar 26, 2020, at 8:55 AM, James Collofello
<JAMES.COLLOFELLO@asu.edu> wrote:

Carole,

I am writing to request an impact/support letter (email will suffice) for our proposed
Doctor of Philosophy (PhD) in Data Science, Analytics and Engineering (see attached).
This degree program is a collaboration between the School of Computing, Informatics,
and Decision Systems Engineering (CIDSE) and the School of Mathematical and
Statistical Sciences in The College of Liberal Arts and Sciences. Please let me know if
you have questions or concerns.

jim

James S. Collofello
Vice Dean for Academic and Student Affairs
Professor of Computer Science and Engineering
School of Computing Informatics and Decision Systems Engineering
Ira A. Fulton Schools of Engineering
Arizona State University

Watts College of Public Service and Community Solutions

From:	William Terrill
To:	James Collofello; Sergio Quiros; Jonathan Koppell; William Terrill
Subject:	Impact/Support Letter
Date:	Friday, March 27, 2020 11:46:21 AM

Good Morning Jim and Sergio,

The Watts College of Public Service and Community Solutions is supportive of your proposed Doctor of Philosophy (PhD) in Data Science, Analytics and Engineering.

If there is anything else I can assist with please do not hesitant to let me know.

Best regards,

Bill

William Terrill, PhD

Arizona State University

Interim Associate Dean, Watts College of Public Service and Community Solutions

Professor, School of Criminology & Criminal Justice

Co-Editor, *Policing: A Journal of Policy & Practice*

From: Sergio Quiros <Sergio.Quiros@asu.edu>
Sent: Thursday, March 26, 2020 9:57 AM
To: Jonathan Koppell <koppell@asu.edu>
Cc: James Collofello <JAMES.COLLOFELLO@asu.edu>
Subject: RE: Impact / Support Letter

Good Morning Jonathan,

Below is the link to the proposal:

> **Ira A Fulton Schools of Engineering**
> *School of Computing, Informatics, and Decision Systems Engineering*
> Establishment of a graduate Program
> PHD in Data Science, Analytics and Engineering

Thank you,

Sergio Z. Quiros
Specialist Senior, Academic, and Student Affairs
Ira A. Fulton Schools of Engineering
Arizona State University
Tempe, AZ 85287-8109
Phone: 480/727-5770
Email: Sergio.Quiros@asu.edu

From: James Collofello <JAMES.COLLOFELLO@asu.edu>
Sent: Thursday, March 26, 2020 8:58 AM
To: Jonathan Koppell <koppell@asu.edu>
Cc: Sergio Quiros <Sergio.Quiros@asu.edu>
Subject: Impact / Support Letter

Jonathan,

I am writing to request an impact/support letter (email will suffice) for our proposed Doctor of Philosophy (PhD) in Data Science, Analytics and Engineering (see attached). This degree program is a collaboration between the School of Computing, Informatics, and Decision Systems Engineering (CIDSE) and the School of Mathematical and Statistical Sciences in The College of Liberal Arts and Sciences. Please let me know if you have questions or concerns.

jim

James S. Collofello

Vice Dean for Academic and Student Affairs

Professor of Computer Science and Engineering

School of Computing Informatics and Decision Systems Engineering

Ira A. Fulton Schools of Engineering

Arizona State University

W. P. Carey School of Business

From:	Amy Hillman (DEAN)
To:	Sergio Quiros
Cc:	James Collofello
Subject:	Re: Impact / Support Letter
Date:	Friday, March 27, 2020 10:08:28 AM
Attachments:	image001.png

The W. P. Carey School has no objections to the new PhD in Data Science, Analytics and Engineering as long as "Engineering" is in the title of the degree.

We would have liked to collaborate on this with FSE and The College to offer a PhD in Data Science, Analytics and Business. If interested, reach out in the future.

Amy

Amy Hillman, PhD
Dean
Charles J. Robel Dean's Chair
W. P. Carey School of Business
amy.hillman@asu.edu | Ph: 480.965.3402

ASU W. P. Carey
School of Business
Arizona State University

Where Business is Personal®

From: Sergio Quiros <Sergio.Quiros@asu.edu>
Date: Thursday, March 26, 2020 at 9:56 AM
To: Amy Hillman <AMY.HILLMAN@asu.edu>
Cc: James Collofello <JAMES.COLLOFELLO@asu.edu>
Subject: RE: Impact / Support Letter

Dear Amy,

Below is the link to the proposal:

> **Ira A Fulton Schools of Engineering**
> *School of Computing, Informatics, and Decision Systems Engineering*
> Establishment of a graduate Program
> PHD in Data Science, Analytics and Engineering

Thank you,

Sergio Y. Quiros

Thunderbird School of Global Management

From:	Sanjeev Khagram (Dean)
To:	James Collofello
Cc:	Sergio Quiros
Subject:	Re: Impact / Support Letter
Date:	Thursday, March 26, 2020 12:11:22 PM

Dear Jim,

We at Thunderbird support this doctoral program!

Good luck, Sanjeev

Get Outlook for iOS

From: James Collofello <JAMES.COLLOFELLO@asu.edu>
Sent: Thursday, March 26, 2020 8:59:06 AM
To: Sanjeev Khagram (Dean) <Sanjeev.Khagram@thunderbird.asu.edu>
Cc: Sergio Quiros <Sergio.Quiros@asu.edu>
Subject: Impact / Support Letter

Sanjeev,

I am writing to request an impact/support letter (email will suffice) for our proposed Doctor of Philosophy (PhD) in Data Science, Analytics and Engineering (see attached). This degree program is a collaboration between the School of Computing, Informatics, and Decision Systems Engineering (CIDSE) and the School of Mathematical and Statistical Sciences in The College of Liberal Arts and Sciences. Please let me know if you have questions or concerns.

jim

James S. Collofello
Vice Dean for Academic and Student Affairs
Professor of Computer Science and Engineering
School of Computing Informatics and Decision Systems Engineering
Ira A. Fulton Schools of Engineering
Arizona State University

College of Health Solutions

From:	Deborah Helitzer (Dean)
To:	James Collofello
Cc:	Sergio Quiros
Subject:	Re: Impact / Support Letter
Date:	Thursday, March 26, 2020 10:46:33 AM
Attachments:	image001.png

James – The College of Health Solutions provides its support to your proposed PhD in Data Science, Analytics and Engineering.

Regards,

Deborah

Deborah L. Helitzer, Sc.D.
Dean and Professor
College of Health Solutions
Arizona State University

550 North 3rd Street
Phoenix AZ 85004
602.496.2511
deborah.helitzer@asu.edu
Web: chs.asu.edu

For appointments and information, please contact Daniel Eckstrom (Daniel.Eckstrom@asu.edu)

From: James Collofello <JAMES.COLLOFELLO@asu.edu>
Date: Thursday, March 26, 2020 at 9:15 AM
To: "Deborah Helitzer (Dean)" <Deborah.Helitzer@asu.edu>
Cc: Sergio Quiros <Sergio.Quiros@asu.edu>
Subject: Impact / Support Letter

Deborah,

I am writing to request an impact/support letter (email will suffice) for our proposed Doctor of Philosophy (PhD) in Data Science, Analytics and Engineering (see attached). This degree program is a collaboration between the School of Computing, Informatics, and Decision Systems Engineering (CIDSE) and the School of Mathematical and Statistical Sciences in The College of Liberal Arts and Sciences. Please let me know if you have questions or concerns.

jim

College of Integrative Sciences and Arts

From:	Duane Roen (Dean)
To:	James Collofello
Cc:	Sergio Quiros
Subject:	RE: Impact / Support Letter
Date:	Thursday, March 26, 2020 9:36:46 AM

Jim,

CISA is delighted to support the proposal for your Doctor of Philosophy (PhD) in Data Science, Analytics and Engineering.

Please let me know if there is anything else that I can do to help.

Best,
Duane

Duane Roen
Vice Provost, Polytechnic campus
Dean, College of Integrative Sciences and Arts
Arizona State University
Mail Code: 2780
7271 E Sonoran Arroyo Mall
Mesa, AZ 85212-6415
P: 480-727-1415

From: James Collofello
Sent: Thursday, March 26, 2020 9:16 AM
To: Duane Roen (Dean) <Duane.Roen@asu.edu>
Cc: Sergio Quiros <Sergio.Quiros@asu.edu>
Subject: Impact / Support Letter

Duane,

I am writing to request an impact/support letter (email will suffice) for our proposed Doctor of Philosophy (PhD) in Data Science, Analytics and Engineering (see attached). This degree program is a collaboration between the School of Computing, Informatics, and Decision Systems Engineering (CIDSE) and the School of Mathematical and Statistical Sciences in The College of Liberal Arts and Sciences. Please let me know if you have questions or concerns.

jim

James S. Collofello
Vice Dean for Academic and Student Affairs
Professor of Computer Science and Engineering
School of Computing Informatics and Decision Systems Engineering
Ira A. Fulton Schools of Engineering
Arizona State University

School for the Future of Innovation in Society

To be provied prior to University Graduate Council support to proceed through governance reveiws.

School of Sustainability

From:	Christopher Boone
To:	Sergio Quiros
Cc:	James Collofello
Subject:	RE: Impact / Support Letter
Date:	Thursday, March 26, 2020 3:07:37 PM

Dear Sergio,

The School of Sustainability is happy to support the proposal for the new PhD in Data Science, Analytics, and Engineering.

Christopher Boone
Dean and Professor

School of
Sustainability
Arizona State University

P.O. Box 875502 | Tempe, Arizona | 85287-5502
PH: 480-965-2236 | Main: 480-965-2975
Executive Assistant: Lorraine.Protocollo@asu.edu

SchoolOfSustainability.asu.edu
The School of Sustainability embraces ASU's mission as being a comprehensive public research university, measured not by whom it excludes, but rather by whom it includes and how they succeed; advancing research and discovery of public value; and assuming fundamental responsibility for the economic, social, cultural and overall health of the communities it serves. We support and foster a culture of inclusiveness, tolerance, and respect that promotes equal opportunity and diversity among SOS faculty, staff, and students and through our engagement with diverse communities within and beyond the University.

From: Sergio Quiros <Sergio.Quiros@asu.edu>
Sent: Thursday, March 26, 2020 9:56 AM
To: Christopher Boone <Christopher.G.Boone@asu.edu>
Cc: James Collofello <JAMES.COLLOFELLO@asu.edu>
Subject: RE: Impact / Support Letter

Good Morning,

Below is the link to the proposal:

Ira A Fulton Schools of Engineering
School of Computing, Informatics, and Decision Systems Engineering
Establishment of a graduate Program
PHD in Data Science, Analytics and Engineering

Thank you,

Sergio Z. Quiros

Specialist Senior, Academic, and Student Affairs
Ira A. Fulton Schools of Engineering
Arizona State University
Tempe, AZ 85287-8109
Phone: 480/727-5770
Email: Sergio.Quiros@asu.edu

From: James Collofello <JAMES.COLLOFELLO@asu.edu>
Sent: Thursday, March 26, 2020 9:17 AM
To: Christopher Boone <Christopher.G.Boone@asu.edu>
Cc: Sergio Quiros <Sergio.Quiros@asu.edu>
Subject: Impact / Support Letter

Christopher,

I am writing to request an impact/support letter (email will suffice) for our proposed Doctor of
Philosophy (PhD) in Data Science, Analytics and Engineering (see attached). This degree program is a
collaboration between the School of Computing, Informatics, and Decision Systems Engineering
(CIDSE) and the School of Mathematical and Statistical Sciences in The College of Liberal Arts and
Sciences. Please let me know if you have questions or concerns.

jim

James S. Collofello
Vice Dean for Academic and Student Affairs
Professor of Computer Science and Engineering
School of Computing Informatics and Decision Systems Engineering
Ira A. Fulton Schools of Engineering
Arizona State University

Walter Cronkite School of Journalism and Mass Communication

To be provied prior to University Graduate Council support to proceed through governance reveiws.

(NEW GRADUATE INITIATIVES)

PROPOSAL PROCEDURES CHECKLIST

Academic units should adhere to the following procedures when requesting new curricular initiatives (degrees, concentrations or certificates).

☐ **Obtain the required approval from the Office of the Provost to move the initiative forward for internal ASU governance reviews/approvals. Please see the academic strategic plan website at: https://provost.asu.edu/curriculum-development.**

☐ **Submit any new courses that will be required for the new curricular program to the Curriculum ChangeMaker online course approval system for review and approval.**

- Additional information can be found at the Provost's Office Curriculum Development website: Courses link
- For questions regarding proposing new courses, send an email to: courses@asu.edu

☐ **Prepare the applicable proposal template and operational appendix for the proposed initiative.**

☐ **Obtain letters or memos of support or collaboration (if applicable).**

- when resources (faculty or courses) from another academic unit will be utilized
- when other academic units or degree programs may be impacted by the proposed request
- if the program will have an online delivery option support will be required from the Provost's office and ASU Online. (*Please complete the ASU Online Offering form in Curriculum ChangeMaker to begin this request.*)

☐ **Obtain the internal reviews/approvals of the academic unit.**

- internal faculty governance review committee(s)
- academic unit head (e.g. Department Chair or School Director)
- academic unit Dean or their designee (will submit approved proposal to the curriculumplanning@asu.edu email account for further ASU internal governance reviews (as applicable, University Graduate Council, CAPC and Senate)

Additional Recommendations

All new graduate programs require specific processes and procedures to maintain a successful degree program. Below are items that the Graduate College strongly recommends that academic units establish after the program is approved for implementation.

☐ **Establish satisfactory academic progress policies, processes and guidelines** – Check within the proposing academic unit and/or college to see if there are existing academic progress policies and processes in place. If none have been established, please go to http://graduate.asu.edu/faculty_staff/policies and scroll down to the **academic progress review and remediation processes** (for faculty and staff) section to locate the reference tool and samples for establishing these procedures.

☐ **Establish a Graduate Student Handbook for the new degree program** – Students need to know the specific requirements and milestones they must meet throughout their degree program. A Graduate Student Handbook, provided to students when they are admitted to the degree program and published on the website for the new degree, gives students this information. To be included in the handbook are the unit/college satisfactory academic progress policies, current degree program requirements (outlined in the approved proposal) and a link to the Graduate Policies and Procedures website: http://graduate.asu.edu/faculty_staff/policies.