In-Person Bachelor's Degree Programs in Data Science: A Survey

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ABSTRACT

Data science has become a popular professional field with many unfilled jobs [1]. In response to the emerging need on data science professions in today's workforce, higher education institutions have become more and more interested in creating undergraduate programs in Data Science. In July 2020, ABET approved the initial criteria for accrediting undergraduate data science programs for public review and comment [2]. The current ABET criteria for data science, data analytics, and similarly named programs are included in its criteria for accrediting computing programs in 2025-26 [3].

To inform the design of new data science bachelor's degree programs and support the continuous improvement of existing data science bachelor's degree programs at higher education institutions in the United States, this study seeks to answer six questions regarding 1) the names and types of data science bachelor's programs, 2) the lowest academic units where data science bachelor's programs are hosted, 3) the related academic disciplines to which the courses required for a data science bachelor's degree program belong, 4) the core courses typically required for a data science bachelor's degree program in data science and related academic disciplines, 5) the elective courses typically included in a data science bachelor's degree program, and 6) the extent to which the topics in ABET's curriculum criterion are covered by core courses and elective courses, respectively, in data science bachelor's degree programs.

To answer these research questions, we exhaustively went through the list of all currently ABET-accredited data science programs [4] and the list titled "60 bachelor degrees in data science" [8]. Using these two lists, we found 48 domestic, in-person bachelor's degree programs in data science. By no means did we intend to make the list for this study exhaustive. While knowing that it does not include all such programs, we believe the list of 48 programs for this study is comprehensive. It includes programs offered at a diverse range of institutions in the United States, including public and private institutions, research-intensive doctoral universities and liberal arts colleges, minority-serving and faith-based institutions, and institutions of varying size. Moreover, it is our intention to focus on the programs developed by institutions that played a pioneering role in the creation of in-person undergraduate data science programs in the U.S.

In this paper, based on the analysis of these 48 programs, we present the names and types of data science programs, the lowest academic units they are hosted, and the mathematics, statistics, computer science, data science, as well as information- and business-related courses included in their curricula. Furthermore, this paper discusses the extent to which the general computing and data science topics specified in ABET's curriculum criterion for accrediting data science programs are covered in these programs. Results of this study provide valuable insights for the educators at higher education institutions in the U.S., especially those who are interested in creating or continuously improving their bachelor's degree programs in data science.

KEYWORDS

curriculum design, data science, ABET accreditation, undergraduate, computing programs

1 Introduction

Data science has become a popular professional field with many unfilled jobs [1]. In response to the emerging need on data science professions in today's workforce, the educators at higher education institutions have become more and more interested in creating undergraduate programs in data science or related to data science.

To guide the creation of undergraduate data science programs, in July 2020, ABET approved the initial criteria for accrediting undergraduate data science programs for public review and comment [2]. The most recent ABET criteria for data science, data analytics, and similarly named programs are included in its criteria for accrediting computing programs in 2025-26 [3]. Together with other computing programs such as computer science, cybersecurity, and information systems, data science programs are evaluated by the Computing Accreditation Commission of ABET [3].

About three years ago, our institution began planning the development of a bachelor's degree program in data science to meet the growing demand for professionals in this field. The ABET criteria for data science, data analytics, and similarly named programs provided us high-level guidance on student outcomes and topics. Referring to ABET criteria ensures that our proposed curriculum would align with recognized academic and professional standards. However, ABET criteria do not offer sufficient detail on how to structure or design a specific program. We needed more detailed information to answer the questions we had while designing this degree program, such as in which department or school this degree program should be hosted, what courses in which disciplines should be included in its curriculum, what courses should be included as core courses, what courses could be used as electives, etc. We investigated a small number of established data science programs, made deeper examination of curriculum content, sequencing, and integration of topics, found answers to our questions, and successfully created the bachelor's degree program in data science at our institution.

To substantially expand the study conducted prior to the creation of our undergraduate data science program, provide systematic analysis results, and inform the design of new data science bachelor's degree programs at other higher-education institutions, we exhaustively went through the list of all nine ABET accredited data science programs [4] and the list titled "60 bachelor degrees in data science" at MastersInDataScience.org [8]. After removing online programs, hybrid programs, programs offered at oversea institutions, programs that do not exist anymore, and graduate programs, and selecting the most representative track for a degree program instead of counting its multiple tracks as multiple programs, we obtained a list of 48 in-person data science bachelor's degree programs offered at domestic institutions. To make this study objective, the data science program newly created at our institution is not included in this list.

In this paper, based on the analysis of these 48 programs, we present the names and types of data science programs, the lowest academic units they are hosted, and the mathematics, statistics, computer science, data science, as well as information- and business-related courses included in their curricula. Moreover, this paper discusses the extent to which the general computing and data science topics specified in ABET's curriculum criterion are covered in these programs. We hope that the description of our data collection and analysis methods as well as the findings

presented in this paper will provide meaningful information for educators and academic leaders in U.S. higher education, particularly those engaged in the development or refinement of bachelor's degree programs in data science.

The remainder of this paper is organized as follows. Section 2 reviews the related literature. Section 3 presents the research questions, data collection and analysis methods. Section 4 reports the results and discusses the findings. Section 5 further examines the results with a specific focus on the coverage of topics within ABET's curriculum criterion. Finally, Section 6 concludes the paper by summarizing the key contributions and significance of the study, acknowledging its limitations, and outlining directions for future work.

2 Related Work

Efforts have been made in creating undergraduate data science programs and courses nationwide. Milonas *et al.* studied and compared the curricula of the data science programs in six leading institutions in the United States and eight leading institutions in China [10]. Through examining the syllabi of 40 U.S. courses and 42 Chinese courses in undergraduate data science programs at these institutions, they identified the knowledge, skills, and thematic trends in the core curricula of these programs.

In [11], Schubert *et al.* described the vision, strategy, plan, and realization of a state-wide rigorous data science educational ecosystem. Over more than four years of collaborations, in the data science discipline, they developed A.S. degree programs, B.S. degree programs, 2+2 degree programs, a state-wide common curriculum, and a high-school data science track. In [7], Ergezer *et al.* shared the development and implementation of the B.S. in Data Science degree program at their institution. Their program intends to foster diversity and inclusivity and to increase the presence of underrepresented and marginalized groups in computing, data analysis, and artificial intelligence.

Badir *et al.* reported the Environmental Data Science course that was recently created at their university [5]. Their paper presents the unique components of this course, selected environmental engineering projects, and students' perceptions to this new course. Carson *et al.* did the case studies of sociotechnical integration in two undergraduate technical courses: a junior-level data science fundamentals course and a senior-level inference and decision-making course [6]. Both courses include practical exercises of applying principles and techniques to real-world data. Their paper reflects on the broader goal of building a sociotechnically integrated undergraduate data science curriculum.

As of December 2025, there are a total of nine ABET-accredited data science programs [4]. Four of these nine programs are B.S. in Data Science, one is B.S. in Computing and Information Sciences - Data Science Concentration, one is M.S. in Data Science, one is B.S. in Applied Statistics and Data Science, one is B.S. in Data Science and Analytics, and one is B.S. in Data Science and Artificial Intelligence. Two of these nine programs are offered by international universities outside the United States. This study surveys all six domestic data science bachelor's degree programs currently accredited by ABET [12], [17], [38], [46], [48], [52].

The criteria for ABET's accreditation to data science bachelor's degree programs are presented

in two sections [3]. Section I describes the *general criteria* for baccalaureate-level computing programs. Section IV provides specific program criteria, including the *program criteria* specified for data science, data analytics and similarly named computing programs.

The text below is quoted from the *curriculum criterion* in ABET's *general criteria* for baccalaureate-level computing programs [3].

> "*The computing topics must include:*
> 1. *Techniques, skills, and tools necessary for computing practice.*
> 2. *Principles and practices of security and privacy in computing.*
> 3. *Local and global impacts of computing solutions on individuals, organizations, and society.*"

In addition, the following is quoted from the *curriculum criterion* in ABET's *program criteria* for data science, data analytics and similarly named computing programs [3].

> "*At least 45 semester credit hours (or equivalent) of data science course work that must cover:*
> 1. *Fundamental data science lifecycle topics:*
>   a) *Data acquisition and representativeness*
>   b) *Data management*
>   c) *Data preparation and integration*
>   d) *Data analysis*
>   e) *Model development and deployment*
>   f) *Visualization and communication of the knowledge obtained from the data*
> 2. *Concepts that span and are applied to the data science lifecycle:*
>   a) *Data ethics including legitimate use and algorithmic fairness*
>   b) *Governance including privacy, security, and stewardship*
>   c) *Applied statistical and mathematical topics including inference, modeling, linear algebra, probability, and optimization*
>   d) *Computing including data structures and algorithms*
> 3. *Advanced data science coursework that provides depth.*
> 4. *Coverage of at least one application area to provide a context for data science activities.*
> 5. *A major project that incorporates an application area and requires integration and application of knowledge and skills acquired in earlier course work.*"

3 Research Questions, Data Collection, and Methods

To inform the design of new data science bachelor's degree programs and support the continuous improvement of existing data science bachelor's degree programs at higher education institutions in the United States, the study presented in this paper seeks to answer six *research questions*, as follows.

Q1. What are the names and types of data science bachelor's programs?
Q2. In which lowest academic units are data science bachelor's programs hosted?
Q3. To which related academic disciplines do the courses required for a data science bachelor's degree program belong?

Q4. What are the core courses typically required for a data science bachelor's degree program in data science and related disciplines?
Q5. What are the elective courses typically included in a data science bachelor's degree program?
Q6. To what extent are the topics in ABET's curriculum criterion covered by core and elective courses, respectively, in data science bachelor's degree programs?

Initially, we planned to obtain the list of domestic undergraduate data science programs for this study from ABET's list of accredited programs [4]. However, when we started this work, less than five ABET-accredited undergraduate data science programs were listed by ABET at [4] and one of them is offered by an international institution.

Therefore, we decided not to limit our study only to ABET accredited programs and found a list titled "60 bachelor degrees in data science" at MastersInDataScience.org [8]. Being owned by 2U, LLC, which is the parent company of edX®, MastersInDataScience.org conducts their own research and evaluations into the programs and schools listed, aiming to keep their listings comprehensive (not exhaustive though), current, and accurate [9]. If 2U is financially compensated by a university, this university is labeled by "SPONSORED" in any list where it is included [9]. In the list for 60 bachelor's degrees in data science, only one university is tagged with the label "SPONSORED", whose data science program, anyway, is not included in this study because it is an online program. Not restricted by its name, MastersInDataScience.org not only posts the lists of "20+ schools with data science master's programs" and "online data science master's degrees" but also includes lists for bachelor's degrees in data science, MBA data science programs, data science PhD programs, and data science certificate programs.

We thoroughly reviewed the list of "60 bachelor degrees in data science" posted at MastersInDataScience.org [8] and found it to be indeed comprehensive. It contains a diverse range of higher education institutions [12]–[59]. We also found that this list actually includes *less than* 60 bachelor's degree programs in data science [8]. MastersInDataScience.org possibly counts different concentrations, tracks, or specializations of the same bachelor's degree program in data science at an institution as multiple bachelor's degrees offered by this institution in data science and has not excluded the programs that do not exist anymore (in December 2025). Additionally, currently (in December 2025), there are nine ABET-accredited data science degree programs, six of which are domestic, in-person undergraduate programs offering bachelor's degrees. Eventually, for this study, we obtained a list of **48** *in-person bachelor's degree* (*major*) programs in *data science*, offered by **48** *higher-education institutions inside the United States* [12]–[59], by combining the lists from MastersInDataScience.org [8] and ABET [4] and reviewing and validating every program in these two lists, as follows.

1. There used to be three in-person bachelor's degree programs in data science, offered by three different departments at an institution, but they are merged into one program, co-sponsored by two departments, in the 2025-26 catalog [40].
2. In MastersInDataScience.org's list [8], two domestic in-person bachelor's degree programs in data science do not exist anymore and, thus, are excluded from this study.
3. Any data science bachelor's degree program consisting of multiple concentrations, tracks, or specializations is counted as one program in our study [21], [28], [42], [44].
4. In the list from MastersInDataScience.org [8], there are four online programs and one

hybrid program. They are not included in the list for this study.

5. In the ABET's list [4], there are four domestic in-person bachelor's degree programs in data science [12], [48], [52], [46] not being included in the list from MastersInDataScience.org [8]. These four programs are added into our list.

In no way did we intend to make the list for this study exhaustive. Acknowledging that it does not include all domestic in-person bachelor's degree programs in data science, we believe the list identified for this study is comprehensive. It includes programs offered at a diverse range of higher-education institutions, including public and private institutions, research-intensive doctoral universities and liberal arts colleges, minority-serving and faith-based institutions, and institutions of varying size. The undergraduate data science programs launched in 2023 or later are very likely to be missing in this list. This study focuses on data science bachelor's degree programs developed by institutions that played a pioneering role in the establishment of in-person undergraduate-level data science programs inside the United States.

Figure 1. 48 institutions offering in-person bachelor's degree programs in data science

Figure 1 shows the locations of the 48 higher-education institutions in the United States that each offers an in-person bachelor's degree program in data science studied in this research.

The online documents published at these 48 institutions' websites [12]–[59] are the *primary resources* used in this study. The data for this study were collected manually through systematic review of institutional websites. Starting from each institution's homepage, we navigated the academic sections to identify and retrieve documents describing the data science bachelor's degree program. Examples of these documents include university or college undergraduate catalogs, data science major or degree requirements, curricula of data science programs, course descriptions of all courses included in a data science curriculum (each as a core or elective course), and webpages of hosting departments, schools, or colleges. All these 48 institutions publish their online university or college undergraduate catalogs for the current academic year on their websites. A few of these catalogs are published in .pdf files and the rest are published as interactive webpages. A university or college undergraduate catalog includes course information such as prefix, course title, prerequisites, and course description, undergraduate programs and

their requirements, and academic units at all levels. Meanwhile, academic program information is typically accessed through the academic navigation section of an institution's website, which typically links to listings of academic units and degree offerings.

Furthermore, the author has been reviewing course transfer evaluation requests and making course transfer decisions for the department for eight years and has access to TES, the Transfer Evaluation System [60]. Being used as an *additional resource* in this study, TES® is an interactive resource for course data from institutions of higher education [60]. As of today, TES® contains information on 173,459,540 courses in 179,626 catalogs at 7,687 higher-education institutions [60]. To evaluate a course transfer request, not only the course information such as prefix, prerequisites, and contents is used but also the context for this course, i.e., the curriculum in which this course belongs to, other courses in the same curriculum, and the institution offering this course, needs to be studied. Hence, this author has studied numerous courses in computer science, computer engineering, computer information systems, cybersecurity, mathematics, statistics, and data science as well as a variety of undergraduate curricula in these disciplines at many higher-education institutions. The study presented in this paper is grounded in extensive expertise developed through years of course transfer evaluation.

The data analysis in this study employs the *qualitative content analysis* method in combination with the *framework analysis* method to examine the publicly available online documents, including webpages, related to these 48 bachelor's degree programs in data science. Within the qualitative content analysis, *inductive coding* was adopted to generate categories directly from the data relevant to the first through five research questions (Q1 through Q5) listed at the beginning of this section. Given that undergraduate data science is a relatively new and rapidly evolving discipline without a fully standardized curricular framework, an inductive approach allowed patterns and emphases to emerge from the 48 degree programs themselves rather than being constrained by predefined categories. In contrast, *deductive coding*, within the qualitative content analysis, was used to analyze the data relevant to the sixth research question (Q6), with categories predefined by the topics listed in ABET's curriculum criterion [3].

The following steps detail the data analysis procedures used to systematically analyze the documents, which were manually collected from those 48 institutions' websites and the TES® website, to address the research questions.

1. ***Familiarization***. We thoroughly read through all the online documents identified for each research question and initially observed reoccurring areas.
2. ***Development of Thematic Framework***. For each of Q1 through Q5, based on online documents relevant to this question for all 48 institutions, we constructed one or more sets of categories using the *inductive coding* approach. For example, the set of categories for program names in Q1 includes "Data Science", "Data Science Analysis", "Data Science, Analytics and Visualization", "Data Science and Predictive Analysis", "Statistics and Data Science", "Applied Statistics and Data Science", "Statistical and Data Sciences", "Mathematics and Data Science", and "Computing and Information Sciences - Data Science Concentration". The set of categories for Q2 is shown in the second column of Table 1. The set of categories for academic disciplines in Q3 contains "Mathematics and Statistics", "Computer Science", "Data Science", and "Information or Business related". For Q6, a set of categories was established using a *deductive coding*

approach based on the topics outlined in ABET's curriculum criterion [3].

3. ***Indexing (Coding)***. For each set of categories developed to address a research question, the thematic framework was systematically applied to all relevant documents, and each degree program was coded into one or more thematic categories.
4. ***Charting***. A framework matrix was created for each set of categories, where rows are for degree programs and columns are for categories. A cell specifies information relevant to a degree program in a category. For example, in the framework matrix created for program names in Q1, a cell is filled with either "Yes" or "No". In the framework matrix created for courses, a cell is filled with "core", "elective", or "neither".
5. ***Mapping and Interpretation***. Utilizing framework matrices, patterns were analyzed across degree programs to find the answers to research questions. The analysis results are presented in Section 4, as follows.

4 Results and Discussion

This section visualizes the review results and discusses our findings. The names and types of these 48 domestic in-person data-science bachelor's degree programs are categorized and illustrated in Figure 2. We can see that "Data Science" is clearly the most popular name used by these institutions. The dominate type of these programs is Bachelor of Science (B.S.) while there are a few Bachelor of Arts (B.A.) programs. The keyword "Analytics" is included in five programs. By including the keyword "statistics" or "statistical" in program names, five institutions emphasize the nature connection of data science programs to statistics.

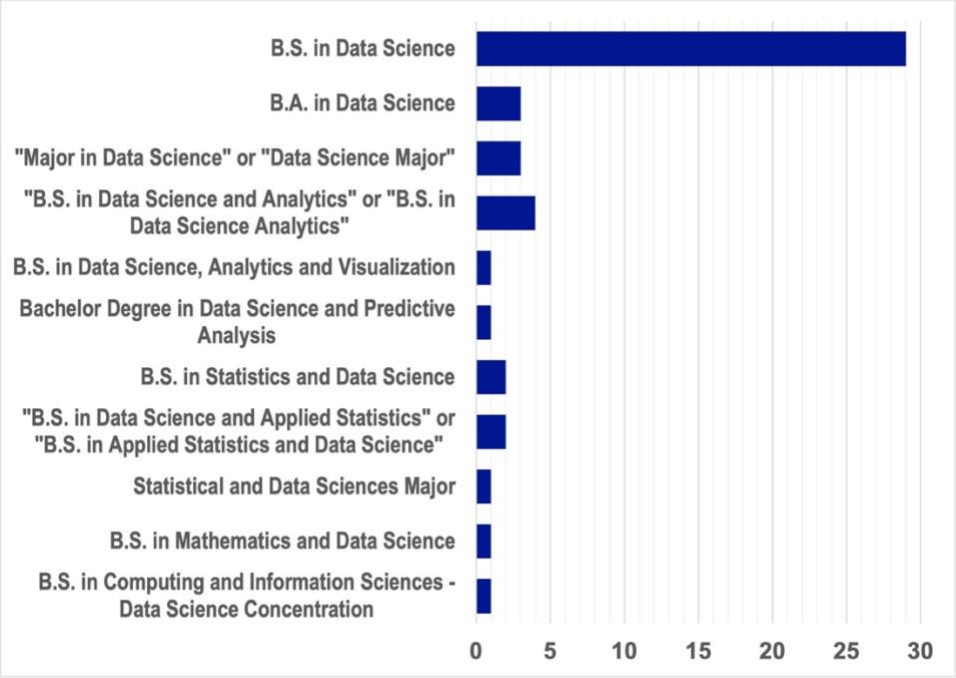

Figure 2. Names and types of 48 domestic in-person bachelor's degree programs in data science

Due to the interdisciplinary nature of Data Science and the fact that it is a relevantly new discipline emerged in the last decade, the lowest academic units hosting the bachelor's degree program in data science vary significantly across institutions. Table 1 lists the lowest academic

Table 1. The lowest academic units hosting these 48 bachelor's degree programs in data science

	lowest hosting unit: department, school, or college	***frequency***
Department of Computer Science	Department of Computer Science	5
	Department of Computer Science and Software Engineering	1
Department of Mathematics and/or Statistics	"Department of Mathematics" or "Department of Mathematical Science(s)"	6
	Department of Mathematics and Statistics	5
	Department of Statistics	1
Department of Information Science, Systems, or Analytics	Department of Library and Information Science	1
	Department of Information Science	1
	Department of Information Systems and Analytics	1
Department of two or more of the following disciplines: Data Science, Computer Science, Mathematics, Statistics, Information Science, and Business Analytics	Department of Computer and Data Sciences	1
	Department of Mathematics, Computer Science, and Data Science	1
	Department of Computer, Information, and Data Sciences	1
	Department of Math and Computer Science	1
	Department of Computer and Information Sciences	1
	Department of Statistics and Data Science	2
	Department of Data Science and Business Analytics	1
Co-hosted or co-sponsored by two or three departments	Department of Computer Science and Engineering AND Department of Statistics	1
	Department of Computer Science AND Department of Mathematics	2
	Department of Computer Science AND Department of Mathematical and Statistical Sciences	1
	Department of Electrical Engineering and Computer Science AND Department of Statistics	1
	Department of Computer Science AND Department of Mathematics and Statistics AND School of Business and Management	1
Hosted directly at the school or college level rather than at the department level	College of Computer Science	1
	School of Computing	1
	School of Computer Science and Mathematics	1
	College of Computing and Digital Media	1
	School of Computing and Analytics	1
	School of Natural Sciences and Mathematics	1
	College of Nature Sciences	1
	School of Arts and Sciences	1
	College of Liberal Arts and Sciences	1
	College of Information Sciences and Technology	1
	School of Business and Technology	1
	School of Business and Enterprise	1
Specifically created	Institute for Data Science and Artificial Intelligence	1

units hosting the undergraduate data-science major programs at 48 higher-education institutions. Even though it is most likely for a data science program to be hosted in a Department of Computer Science (5 out of 48), a Department of Mathematics or Mathematical Science(s) (6 out of 48), or a Department of Mathematics and Statistics (5 out of 48), the majority of the data science programs (32 out of 48) studied in this research do not fall within these three cases. Statistics or Statistical Science. Interestingly, 12 institutions host their data science programs At eight institutions, the names of the departments hosting their data science programs reflect

multiple disciplines, including two or more of the following: Data Science, Computer Science, Mathematics, Statistics, Information Science, and Business Analytics. The data science programs at six institutions are co-hosted by two or three departments, typically including a Department of Computer Science, a Department of Mathematics or Mathematical Science, or a Department of directly at the school or college level, instead of at the department level where established disciplines are usually hosted, to foster cross-discipline collaboration. We think this might become a preferred approach in more and more higher-education institutions. At one university, an institute was created specifically for its interdisciplinary data science mission and collaborates with a wide variety of departments and programs across the university.

When examining the curricula of 48 bachelor's degree programs in data science, we found that they include not only courses covering a variety of data science topics but also courses in mathematics, statistics, and computer science. Some of these courses cover foundational knowledge in mathematics, statistics, or computer science that prepares students for advanced data science courses. The others are advanced mathematics, statistics, or computer science courses that are closely related to the data science field. Meanwhile, a small number of data science curricula include a few information science or business analytics courses.

Figures 3 through 6 present the inclusion of mathematics, statistics, computer science, data science, and information science or business analytics courses, respectively, in the 48 data science bachelor's degree programs studied in this research. We rely on course descriptions to accurately identify course contents and what courses are included in a data science curriculum because a course covering similar topics may be named differently at different institutions. While it is straightforward to categorize most courses into four groups: Mathematics and Statistics courses, Computer Science courses, Data Science courses, and Information Science and Analytics courses, the classification of a few courses varies across institutions. For example, Discrete Structures is a computer science course at some institutions, however, it is a mathematics course and often named as Discrete Mathematics at other institutions. Formal Methods is deeply rooted in mathematics but is about using rigorous mathematical techniques to design and verify hardware and software systems. In this study, we classify both courses as mathematics courses, given the historical roots of computer science in applied mathematics.

In every data science curriculum, a course shown in Figure 3, Figure 4, Figure 5, or Figure 6 is classified as a "core" course if it is a course that all data science majors are required to take for this data science bachelor's degree program, as a "elective" course if it is explicitly provided in a list of elective courses for data science majors to choose from for this major program and the number of courses that a student needs to choose from this list is less than the total number of courses provided in this list, or as "neither" otherwise. It is worth noting that general or free electives in a data science curriculum are not considered to be "elective" courses specifically required for or directly related to the data science bachelor's degree program and, hence, are classified as "neither" in this study.

As demonstrated in Figure 3, Statistics is included as a required core course in all 48 undergraduate data science curricula in this study. This is not surprising, as statistics constitutes one of the core foundational disciplines of data science. At 44 out of 48 institutions, Calculus is a core course required for their data science bachelor's degree programs, likely because it is a prerequisite to advanced mathematics and statistics courses. At many institutions, calculus is

believed to play a foundational, integrative, and gatekeeping role in undergraduate STEM curricula. Linear Algebra, Probability, and Linear Regression or Regression Analysis are required core courses in 35 or more (out of 48) data science curricula and are included in 40 or more. Data science relies on linear algebra for data representation, model construction, dimensionality reduction, and scalable computation. Probability theory provides data science a formal framework for modeling uncertainty, randomness, and variability in data. Regression analysis, particularly linear regression, plays a foundational role in data science by articulating a principled framework for modeling relationships between variables and for linking statistical inference with predictive modeling. Additionally, we found that Discrete Mathematics or Structures and Modeling are also popular mathematics courses included in most data science curricula as core or electives.

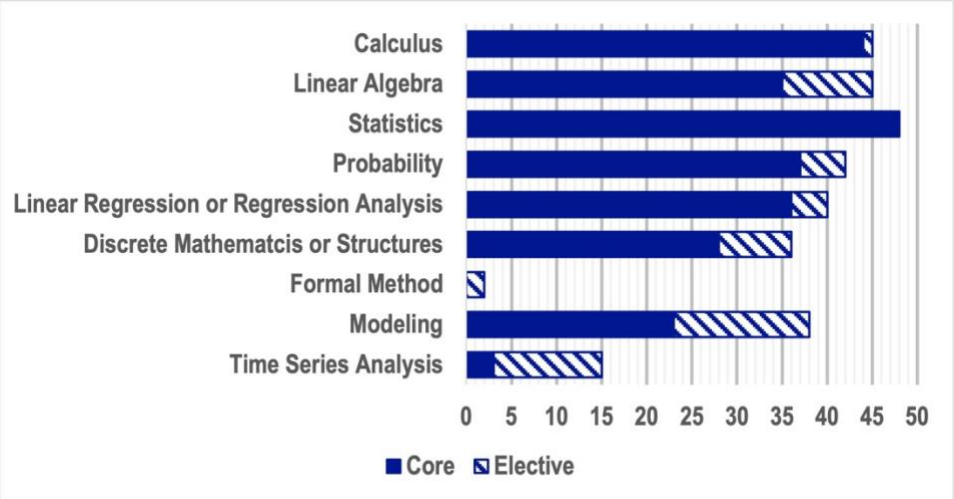

Figure 3. Mathematics and Statistics courses in data science bachelor's degree programs

It is shown in Figure 4 that Computer Science 1, an introductory programming course that is typically taught in a modern object-oriented language and often covers fundamental software development skills, is included in all 48 data science bachelor's degree programs as a required core course. This is because Computer Science 1 is widely recognized as a foundational prerequisite that forms the basis for subsequent computer science coursework beyond introductory programming.

Three computer science courses: Machine Learning (including Deep Learning or Natural Language Processing), Database Design or Systems, and Data Structures and Basic Algorithms, are required core components in at least 31 of the 48 data science curricula and are included in 40 or more curricula, either as core courses or electives. Machine learning supplies algorithmic techniques needed in the data science discipline to build models for making predictions, to discover patterns in large or complex datasets, and to automate the processes of decision making. Database design or systems supports the data science discipline by covering the topics on how to efficiently store, retrieve, and manage complex, large-scale datasets. They form a critical infrastructural foundation for data-driven analysis. Data structures (e.g., arrays, lists, trees, and hash tables) and basic algorithms (e.g., searching algorithms and sorting algorithms) is another foundational computer science course that is required in the vast majority of, if not all, computer science bachelor's degree programs. Within the data science discipline, this course provides the

computational foundation necessary for storing datasets with the appropriate structures and manipulating them with efficient data processing algorithms. Meanwhile, R or Python Programming for Data Science, Artificial Intelligence, and Advance Algorithms are included in most of the 48 data science curricula as core or elective courses.

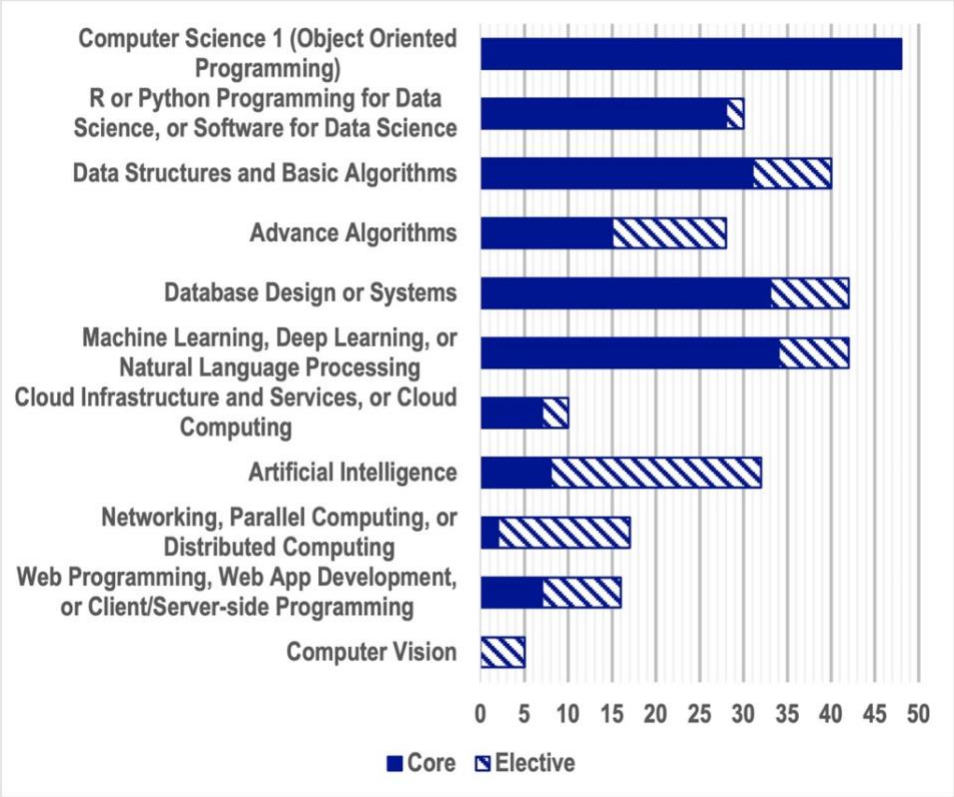

Figure 4. Computer Science courses in data science bachelor's degree programs

Figure 5 depicts the inclusion of data science topics in courses that are specifically designed for the data science discipline in 48 data science bachelor's degree programs studied in this research. In these data science courses, the tools, algorithms, methods, and theories from mathematics, statistics, and computer science are applied to collect data, prepare data, analyze data, model data, and communicate data. Unlike established mathematics, statistics, and computer science courses such as Calculus and Computer Science 1 that have well-defined course contents, how data science topics are organized into courses varies at these 48 institutions. For example, the core component of data analytics is to apply appropriate exploratory and statistical analysis on data. We found that at some institutions, a data analytics course covers data visualization regardless of whether the course title contains the keyword "visualization" [38] or not [26]. At some other institutions, data visualization is covered in a separate course that is dedicated to "visualizing scientific data" and "representing large datasets in informative ways" [56]. Meanwhile, at some institutions, the in-depth coverage on data analytics is provided through an intermediate-level statistics course [12], [56]. Another example is the coverage on data acquisition, representation, manipulation, and management in these 48 data science curricula. While this topic may be included in an introductory to data science course, it may also be covered in the same course where data analysis is covered [12], [51]. Therefore, we call the list

in Figure 5 as a list of data science topics or courses. At an institution whose data science bachelor's degree program is examined in this research, a core or elective course may cover one or a few topics in this list and a topic is covered by the program as long as it is taught in a core or elective course, alone or together with other topics. The only exception is the Data Science Capstone or Research course in this list. A program is considered to cover Data Science Capstone or Research only when it contains a full-term course, either core or elective, dedicated to capstone or research projects.

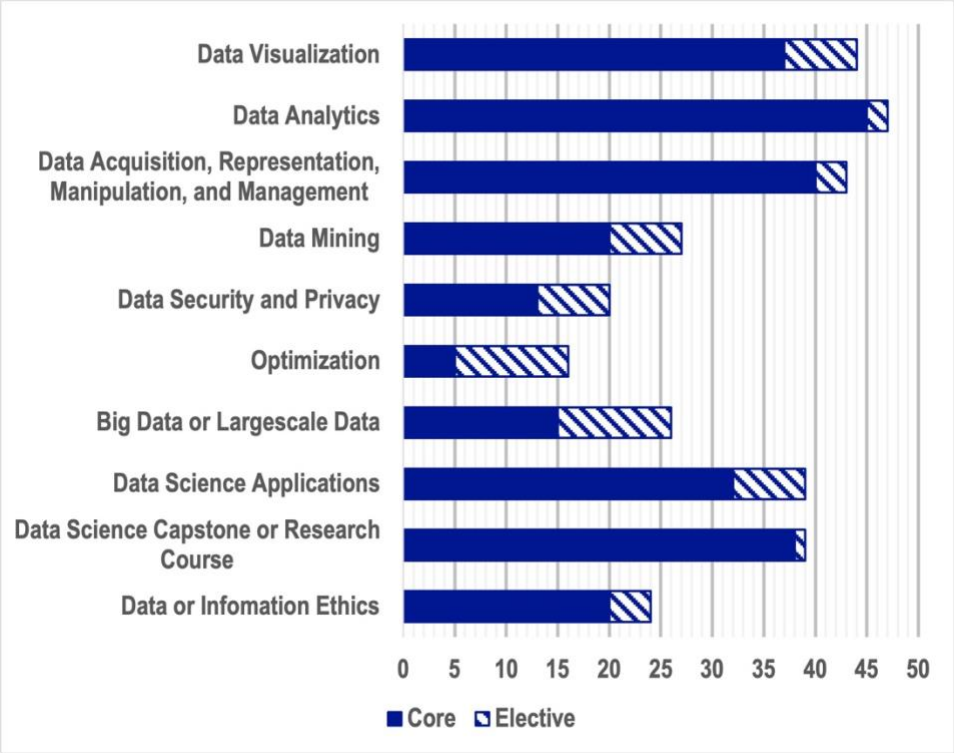

Figure 5. Data Science topics or courses in data science bachelor's degree programs

Data Analytics is the most commonly included topic among the 48 programs, incorporated as a required core topic or course in 45 programs and as an elective in two programs. Three other topics or courses: Data Acquisition, Representation, Manipulation, and Management, Data Visualization, and Data Science Capstone or Research Course, are also prevalent across programs, with 37 or more programs covering them in core courses and 39 or more programs including them in either core or elective courses.

In Figure 5, Data Science Applications refers to a wide range of courses, each of which studies data within one applied domain, including business and economics, biology, biomedical science, brain and cognitive science, geographic information systems, computer vision, robotics, healthcare, finance, chemistry, sensor-based systems, security, earth and environmental science, linguistics, physics, and political science. 32 programs cover this topic in required core courses, and seven programs offer the coverage to this topic through elective courses.

Figure 5 also reveals that less than half of the institutions both recognize the need to and have the capacity to require Data Security and Privacy and Data or Information Ethics in their data

science bachelor's degree programs. Considering the importance of these topics in applying data science to solve real-world problems, this finding suggests a potential concern that existing and emerging data science programs may need to address.

As shown in Figure 6, information- and business-related courses such as Information Theory or Informatics, Information Infrastructure, Systems, or Technology, and Business Analytics are included in a limited number of programs as core or elective courses. However, their inclusion does not represent a common curriculum design across data science bachelor's degree programs.

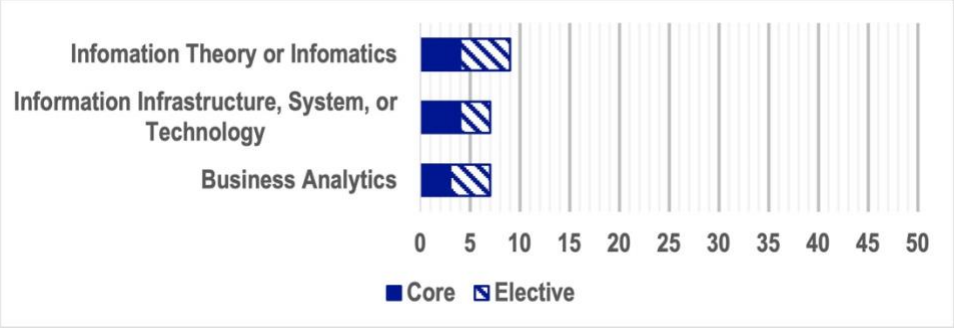

Figure 6. Information- and Business-related courses in data science bachelor's degree programs

5. Results and Discussion on the Coverage of Topics in ABET's Curriculum Criterion

The six ABET-accredited data science bachelor's degree programs studied in this paper certainly cover all *three general computing topics* listed in the general criteria and all *five data science topics* specified in the program criteria, which are quoted in Section 2. In this work, we also investigated how these topics are covered in the curricula of the other 42 data science bachelor's degree programs.

In our study, for every program, regardless of whether it is ABET-accredited or not, each general computing or data science topic is classified as being covered in a core course, being covered in an elective course, or not being covered. Figure 7 summarizes the classification results. The following statements provide clarifications in our classification efforts.

1. Every general computing or data science topic is classified as being covered in a core course for each of the six ABET-accredited data science bachelor's degree programs.
2. It is well known that ABET's curriculum requirements specify topics, but do not prescribe specific courses [3]. Therefore, the inclusion of courses illustrated in Figures 3 through 6 are not identical to the coverage of topics shown in Figure 7. For example, the data science topic 5 in Figure 7 may be covered by including a course project that satisfies ABET's requirements on this topic in an upper-division course that either is or is not a capstone project or research course listed in Figure 5.

It is indicated in Figure 7 that even though only six out of the 48 data science bachelor's degree programs we studied are currently accredited by ABET, most of these programs have a decent coverage on most of the general computing and data science topics required by ABET. Techniques, skills, and tools necessary for computing practice (i.e., general computing topic 1) is universally included in all 48 curricula. In addition, all fundamental data science lifecycle topics (i.e., data science topics 1.a through 1.f) are taught in required core courses in at least 38

programs. Furthermore, 40 or more programs cover applied statistical and mathematical topics (i.e., data science topic 2.c), advanced data science coursework that provides depth (i.e., data science topic 3), and a major project in applied data science (i.e., data science topic 5) in required core courses.

By contrast, it is observed that, in most of the 48 programs, there appears to be a lack of coverage of principles and practices of security and privacy in computing (i.e., general computing topic 2), local and global impacts of computing solutions (i.e., general computing topic 3), and data ethics and governance (i.e., data science topics 2.a and 2.b) in required core courses.

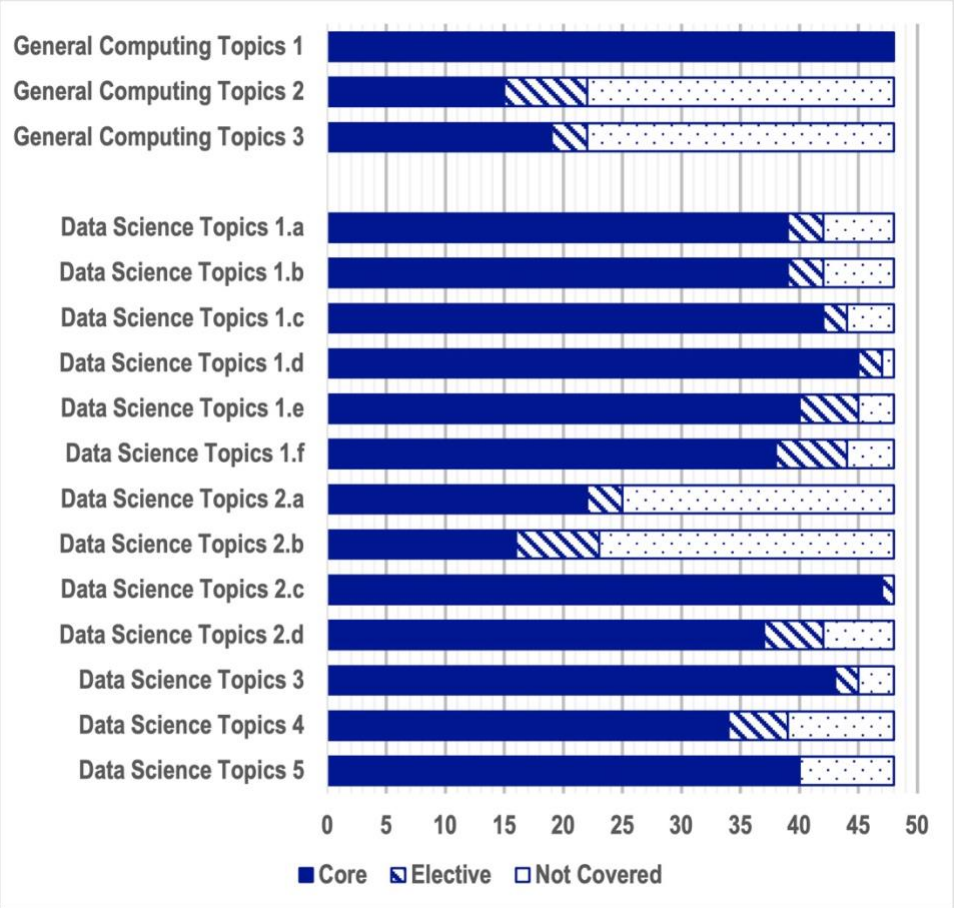

Figure 7. Coverage of ABET's general computing and data science topics in 48 programs

6 Conclusions and Future Work

This paper studies 48 bachelor's degree programs in data science offered at higher education institutions in the United States. These programs are identified from the list of currently ABET-accredited data science programs [4] and the list titled "60 bachelor degrees in data science" at MastersInDataScience.org [8]. While not being exhaustive, this list contains 48 programs that are offered at a wide range of institutions in the United States, including public and private institutions, research-intensive doctoral universities and liberal arts colleges, minority-serving and faith-based institutions, and institutions of varying size.

6.1 Contributions and Significance

Through thoroughly examining the online documents posted at these institutions' websites [12]–[59] and at TES® [60], this paper studies the names and types of these programs, the lowest academic unites in which these programs are hosted, the core and elective courses included in their degree requirements, and the extent to which the topics required in ABET's curriculum criterion are covered by the courses in their curricula.

The significance of this study lies in its role as a practical bridge between high-level accreditation criteria and the actual logistical demands of building a data science bachelor's degree program. While the 2025-26 ABET criteria [3] set the "destination", they lack the granular detail required for actual construction, which is the detail asked by the six research questions in Section 3. By manually analyzing 48 domestic, in-person data science bachelor's degree programs, through the lens of a veteran transfer evaluator and full professor in computer science, this paper provides objective data-driven observations for the "how-to" of curriculum design. This study uses *inductive coding* to allow patterns to emerge naturally from existing programs offered at a diverse range of 48 institutions that played a pioneering role in establishing programs in a relatively new field of undergraduate education. This identifies which courses are viewed by the majority of these 48 institutions as the core of a data science curriculum. It also clarifies how mathematics, statistics, and computer science are integrated, together with specifically designed data science courses, to create a cohesive data science identity.

Moreover, data science is widely known to be interdisciplinary, often leading to administrative confusion and possible internal structural hurdles. This paper provides empirical data on the lowest academic units where a data science bachelor's degree program is hosted at 48 institutions. This provides useful real-world data for university administrators to make an informed decision by combining it with institutional factors, strengths, and capacities. This paper also offers a systematic look at the names and types of 48 programs currently in existence, helping educators and curriculum designers choose names and types for their new offerings.

In addition, this study provides a critical, large-scale examination of how 48 domestic bachelor's degree programs in data science, six of which are currently ABET-accredited, statistically align with the topics required in the 2025-26 ABET curriculum criterion [3]. In our study, *deductive coding* was used to measure the extent to which these programs, naturally or intentionally, cover the topics required in ABET's curriculum criterion. By mapping these in-practice curricula against a formal standard, this paper provides a practical benchmark that reveals how frequently current programs meet the ABET's requirements on topics.

Last but not least, we do not contend that a single, one-size-fits-all model exists for the design of a bachelor's degree program in data science. While conducting data analysis for this paper, we found that, despite certain areas of commonality, the 48 programs examined are meaningfully distinct, each exhibiting unique characteristics. Accordingly, this paper presents evidence-based findings and observations in an objective manner. We deliberately refrain from offering prescriptive or subjective recommendations to educators, curriculum designers, or university administrators regarding the design or ongoing refinement of their data science bachelor's degree programs. Instead, we encourage stakeholders to interpret and integrate the insights presented in this study in light of their own institutional contexts, capacities, and strategic priorities.

Decisions about program design and continuous improvement should be informed not only by empirical evidence but also by each institution's distinctive strengths, mission, and available resources.

6.2 Limitations

Below are the limitations in our efforts made to classify a general computing or data science topic in ABET's curriculum criterion [3] as being covered in a core course, being covered in an elective course, or not being covered by a degree program.

1. Compared with the self-study report and the large volume of supporting documents submitted to ABET for accreditation review, the documents available for use in this study are much more limited. The degree requirements of each program and the course descriptions posted on the university's website constitute the only materials available for our analysis. For example, coverage of a topic may be missed if it is not clearly described in any course description, or if it is covered in a General Studies course instead of in any course required for the data science major. We acknowledge the potential inaccuracies in the classifications due to limited available information.
2. Under no circumstances do we claim the classifications suggest whether a data science bachelor's degree program studied in this paper satisfies ABET's curriculum criterion. ABET's review for accrediting a degree program is much more than the coverage of topics, not to mention that these are only best-effort classifications based on limited resources. To earn the ABET accreditation, covering all required topics is only a small step on the right direction.

Furthermore, this research replies on data that is published on their websites by 48 institutions [12]–[59] or TES® [60]. Our work indicates that it is feasible to find answers to the six research questions listed in Section 3. However, it is not realistic to expect the assessment data on student learning outcomes, instructional coherence, or students' workforce preparation to be publicly available. It is also very unlikely, if not impossible, for institutions to share the assessment data with outsiders even if such data is collected. Therefore, in the context of this study, below are the questions that this data-driven study cannot, and does not intend to, answer.

1. How are curricular patterns connected to student learning outcomes at these 48 institutions?
2. How are curricular patterns connected to instructional coherence, i.e., the tight alignment and coordination of all components within an educational system, such as curriculum, instruction, assessment, and professional development, at these 48 institutions?
3. How are curricular patterns connected to students' workforce preparation at these 48 institutions?

6.3 Future Work

The study presented in this paper is extensive and time intensive. We intentionally limited the scope of our study to maintain feasibility within a single conference paper. Nevertheless, throughout the research process, several additional questions emerged that warrant further exploration. We outline below a selection of these directions for future work.

1. What core skills and competencies are required for the data science workforce to effectively operate in the AI-driven era?

2. What courses in a data science bachelor's degree program prepare students for the core kills and competencies required for the data science workforce?
3. How do differences in disciplinary emphasis (e.g., statistics-heavy vs. computer science-heavy curricula) influence student competencies?
4. How are curricular patterns linked to student learning outcomes?
5. How are curricular patterns connected to students' workforce preparation?

To conduct research on these directions, the context of this study will not work. We will need to find collaborators who have access to the data on their own data science programs, such as course syllabi, lecturing materials, assignments, and assessment data. Also, this future study will investigate a much smaller number of data science bachelor's degree programs, which very likely will be limited to the programs offered at collaborators' institutions.

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