MIDDLE TENNESSEE STATE UNIVERSITY

Data Science Undergraduate Degree Proposal

This proposal is for a Data Science undergraduate program at Middle Tennessee State University. As a university, we are uniquely positioned to offer an interdisciplinary program that includes courses from Math, Computer Science, Information Systems and Analytics, and Economics and Finance as well as specializations and minors that will create a well-rounded and educated student in the data science area.

Individuals involved in this process include:
Carlos Coronel (Information Systems & Analytics), Dennis Walsh (Math), Don Hong, Qiang Wu, Joshua L. Phillips (Computer Science), Bud Fischer (Dean of Basic and Applied Sciences), Charlie Apigian (Information Systems & Analytics), Scott Seipel (Information Systems & Analytics), Yeqian Liu (Math), Lu Xiong (Math), Ping Zhang (Math), Dong Ye (Math), Keith Gamble (Economics and Finance), John Wallin (Computational Science Ph.D.), Tim Greer (Information Systems & Analytics), Meda Sarkar (Computer Science), Peter Cunningham (Office of the Provost), and Brian Hinote (Office of Student Success).

Included in this document is a diagram (Figure 1) that shows the four levels of this degree, which include:

- General Education (41 hours)
- Data Science Core Curriculum (49 hours)
- Data Science Specialization (12 hours)
- Minor outside of the specializations (18 hours)

By creating a degree that is interdisciplinary with classes from several departments and colleges as well as layering the different levels of education, we feel that we could give students the technical and soft skills needed for the business environment as well as the ability for them to focus on a specific industry or discipline.

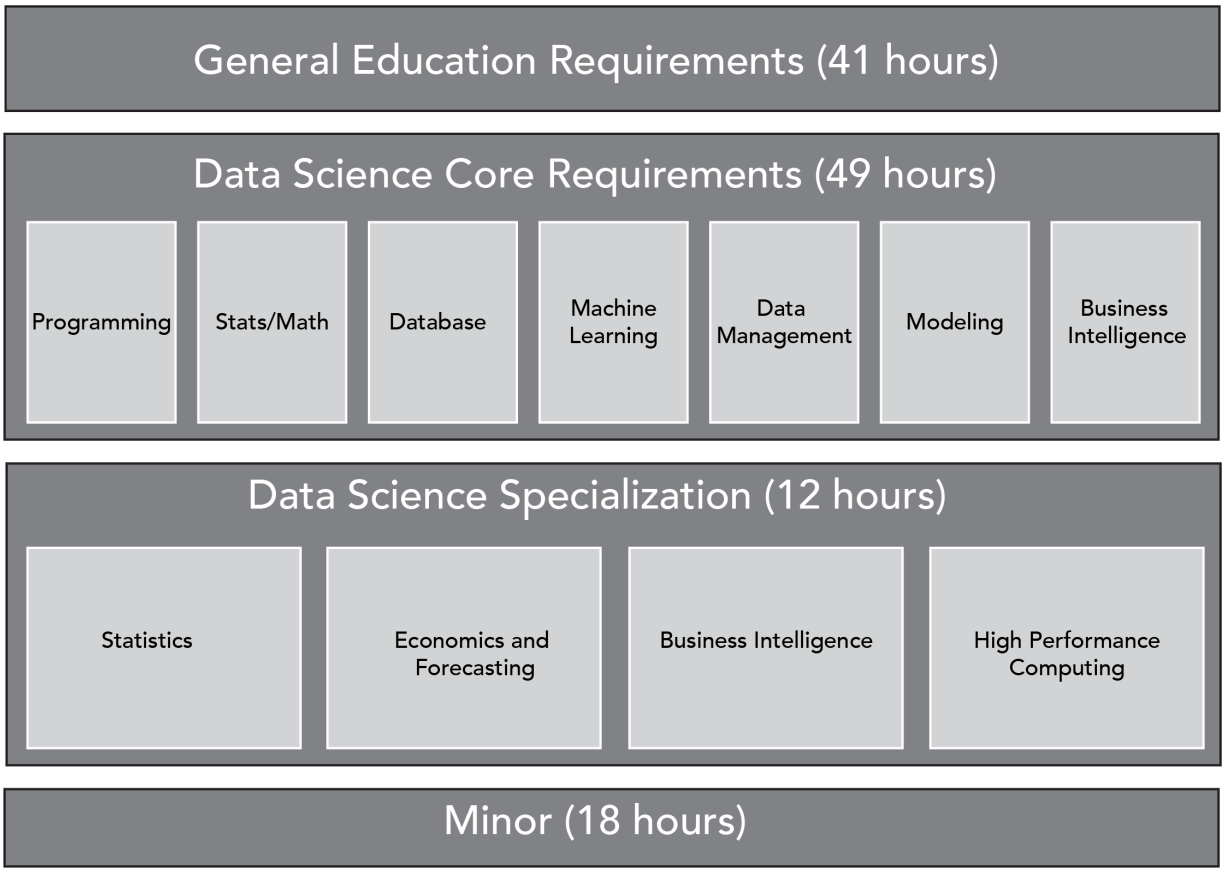

Figure 1: Diagram of the Data Science Undergraduate Program

General Education (41 hours)

The general education requirements are the same for all students at Middle Tennessee State University. Please see Table 2 the list of general education courses. As is customary in any four-year degree, the general education requirements give students the necessary skills that are the basis of a foundational skill set that all employers are looking for such as: communication skills, problem-solving skills, and many other skills that make a good employee, as well the necessary skills that build on data science such as math, science, and behavioral type classes.

Data Science Core Curriculum (49 hours)

The core curriculum looked at specific topics that should be included in a data science program. These areas include statistics, database, machine learning, data management, modeling, programming, and business intelligence (see Table 1). After identifying key areas, we then mapped courses to the specific topics and made sure we had the necessary coverage within each department to teach these courses.

Data Science Specialization (12 hours)
The specialization looks at allowing students the ability to learn more in a specific area that is of interest to them. We fully understand that it is not likely that one individual will know everything about data science, we expect them to be part of a team. Therefore, if they find an area that they feel they will excel and have an interest in, we want them to further their education within a specialization.

Proposed Specializations include:

- Statistics
- Economics and Forecasting
- Business Intelligence
- High Performance Computing

Minor outside of the specializations (18 hours)
Finally, by requiring a minor, students can learn domain knowledge within a specific discipline or industry that they have an interest. By allowing any minor we are acknowledging that data science can be used in any industry in any discipline.

Table 1: Topic Areas and Classes for Data Science Degree

	Programming	Stats/Math	Database	Machine Learning	Data Management	Modeling	Business Intelligence
Topics	SQL	Stats/Math	DB – Front End	Classification		Build a model	Visualization
	Python	Calculus	DB – Back End	Clustering			Tableau
	R	Algebra	Cloud Computing	Neural Nets			Power BI
			Network Infrastructure	Regressions			Excel
				PCA			Exploratory Data Analysis
Classes	CSCI1170	MATH1530	INFS4790	CSCI4350	DATA1500	ECON2410	BIA3620
	MATH2110	MATH1910	CSCI4560	CSCI4850	DATA3550	ECON2420	
	CSCI2170	MATH2010					
	CSCI3110	MATH2530		DATA3500			
		CSCI3080					

Table 2: List of Courses Proposed for a Data Science Degree

Courses	Credit Hours	Total Hours
GENED: COMM: ENGL 1010	3	
GENED: COMM: ENGL 1020	3	
GENED: MATH: MATH 1910	3	
GENED: COMM: COMM 2200	3	
GENED: SOC/BEH/CORE: ECON 2410 Principles of Macro Economics	3	
GENED: HUM/FA: ENGL 2020, 2030; HUM 2610	3	
GENED: HUM/FA (2 RUBRICS): ANTH 2210; ART 1030, 1920; DANC 1000; HIST 1010, 1020, 1110, 1120; MUS 1030; PHIL 1030; THEA 1030	6	41
GENED: HIST (2 COURSES): HIST 2010, 2020, 2030	6	
GENED: SOC/BEH: AAS 2100; ANTH 2010; GEOG 2000; GS 2010; HLTH 1530/1531; EMC/JOUR/RIM 1020; PS 1005,1010; PSY 1410; RS 2030; SOC 1010, 2010; WGST 2100	3	
GENED: SCI (2 RUBRICS): ASTR 1030/1031; BIOL 1030/1031, 1110/1111, 2010/2011, 2020/2021; CHEM 1010/1011, 1030/1031, 1110/1111; GEOL 1030/1031, 1040/1041; PHYS 1110, 2010/2011, 2110/2111; PSCI 1030/1031, 1130/1131	8	
CORE: DATA1500 - Issues in Data Science	3	
CORE: CSCI 1170 - Computer Science I (Python Programming)	4	
CORE: CSCI 2170 - Computer Science II	4	
CORE: MATH 2110 - R - Data Analysis	1	
CORE: Statistics (MATH1530 or BIA2610)	3	
CORE: MATH 2530 Applied Statistics II	3	
CORE: ECON 2420 Principles of Economics, Microeconomics	3	
CORE: BIA 3620/3621 Intro Bus Analytics	3	
CORE: MATH 2010 - Linear Algebra	3	49
CORE: DATA3500 - Predictive Modeling	3	
CORE: DATA3550 - Data Cleansing and Feature Engineering	3	
CORE: CSCI 4350 - Introduction to Artificial Intelligence	3	
CORE: CSCI 4850 - Neural Nets	3	
CORE: INFS4790 - Database Design and Development	3	
CORE: ECON 4620 - Econometrics and Forecasting	3	
CORE: DATA4950 - Data Science Capstone	3	
Elective (MATH 1910 4th hour)	1	
Specialization 1	3	
Specialization 2	3	12
Specialization 3	3	
Specialization 4 DATA4500 - Internship/Projects	3	
Minor 1 – 5 (At least 15 hours, if minor is 5 instead of 6 classes, student may take any elective)	15	18
Minor 6 or elective	3	
Total Hours		120

Note:

Classes in Red and Bold are new proposed courses.