Table of Contents

- Optional Items: Activity Resume, Letter(s) of Recommendation and/or Personal Statement

Applications will be evaluated for both fall and spring admission. Students must have a 3.3 or higher GPA to get the minimal merit scholarship. For students who chose to test, the average SAT is 1000-1210 (reading and math only) and average ACT is 19-26.

Curriculum

The proposed BS in Data Science will require 120 credit hours to complete the degree. Along

Human Creativity (3 cr)
Interpreting the Petcr)

Course Prerequisites

CS 252. Introduction to Unix for Programmers (1 cr)
CS 361. Data Structures and Algorithms (3 cr)

Concentration Courses

Pick One:

BDA 411 Introduction to Machine Learning (3 cr)
CS 422/522. Introduction to Machine Learning (3 cr)

Pick One:

Use statistics to represent data and test hypotheses	STAT 130M**.** Elementary Statistics DASC 3XX. Ethics and Data	Formative: Chapter tests, homework assignments, use of statistical software Summative: Final Exam

Geographic Information Systems Concentration

The Geospatial Information Systems (GIS) concentration enables students to develop advanced skills and expertise in geospatial science and technology. Graduates in this concentration will be able to:

- Use GIS as a tool for manipulating spatial information
- Design spatial database structures for analytical operations
- Apply methods, standards, and policies for use of GIS on the Internet

Relation to Existing Old Dominion University Degree Programs

Current academic programs at Old Dominion University in data science and related fields are spread across numerous departments, several colleges, and the recently created School of Cybersecurity. This causes some fields of study to be difficult to locate under their present titles. This proposal advocates for the creation of an undergraduate bachelor's degree in data science that draws from applicable coursework across university programs but provides a single home for undergraduate data science students. It provides a consistent curriculum for data science students.

The Department of Information Technology & Decision Sciences in the Strome College of Business offers the Business Analytics and Intelligence major that develop skills in the use of the computer as a decision-making tool. The BS in Data Science degree leverages some of this coursework in the Visualization concentration. The proposed program does not overlap with the BSBA in Information Technology degree, also offered by this department. The Batten College of Engineering and Technology offers a Data Analytics Engineering concentration for the BS ECE and BS COME degrees. Some of these courses are optional courses in the Visualization concentration. Finally, the Department of Computer Science within the College of Sciences allows students to choose electives from a range of data science topics; these courses will be used to form the Artificial Intelligence & Machine Learning concentration. The Department of Mathematics and Statistics offers a BS Mathematics with a Big Data Analytics major. This is a math-intensive major and there is no coursework from this curriculum used in the proposed program.

The proposed BS in Data Science

programs will close as a result of the initiation and operation of the proposed degree program.

Aeronautics are in Hampton, Virginia, and Jefferson Laboratory is located nearby in Newport News. Norfolk, where Old Dominion University is located, is home to major command centers from every branch of the military, including the largest naval base in the world, Norfolk Naval Station. The Norfolk/Virginia Beach area includes health care providers Sentara Medical Group and Eastern Virginia Medical School (EVMS). The Port of Virginia—which includes Newport News Marine Terminal, Norfolk International Terminals, Portsmouth Marine Terminal and Virginia International Gateway in Portsmouth, Virginia— is the only U.S. East Coast port with Congressional authorization of 55-ft depth channels and currently stands as the third largest container port on the East Coast. Moreover, Amazon, with its existing workforce of more than 10,000 full-time employees in the state of Virginia, is building two operations facilities in Hampton Roads, creating 1,500 additional jobs. Furthermore, Norfolk and Virginia Beach host several financial and insurance data centers.

notes that " About 10,200 openings for operations research analysts are projected each year, on average, over the decade. As technology advances and companies seek efficiency and cost

basics of programing, modeling, machine learning, data visualization, database structures, and ethics in data science.

Similarities

The BS in Data Science requires a minimum of 40 credits of identified data science coursework. The program consists of 21 credits of core courses including a capstone, and nine credits of mathematics. The remaining credits are fulfilled by selecting one of the required tracks

Summary of Projected Enrollments in Proposed Program

0 .88 6496 62/M ct <<f(E)-5 (0 3 EMC /Arti ct <<Tw 12 0 0 13 EC88.836 64956 36.f9.56 0 0 .88 649

Year 1		Year 2		Year 3		Year 4			**Year 5 Target Year**		
2023 - 2024		2024 - 2025		2025 - 2026		2026 - 2027			2027 - 2028		
HDC	FTES	HDCT	FTES	HDC	FTES	HDCT	FTES	GRAD	HDCT	FTES	GRAD
75	50	100	70	150	100	200	140	50	220	155	60

The School of Data Science will provide 4 part-time faculty, resulting in 2.0 part-time instructional effort in the initiation semester through the target year in 2027-28.

The Department of Computer Science will provide 1 part-time faculty, resulting in 0.50 part-time instructional effort in the initiation semester through the target year in 2027-28.

The Department of Mathematics and Statistics will provide 1 part-time faculty, resulting in 0.50 part-time instructional effort through the target year in 2027-28.

The Department of Philosophy and Religious Studies will provide 1 part-time faculty, resulting in 0.50 part-time instructional effort through the target year in 2027-28.

The Department of Electrical and Computer Engineering will provide 1 part-time faculty, resulting in 0.50 part-time instructional effort through the target year in 2027-28.

The Department of Political Science and Geography will provide 1 part-time faculty, resulting in 0.50 part-time instructional effort through the target year in 2027-28.

Adjunct Faculty
No adjunct faculty are required to launch and sustain the proposed degree program.

Graduate Assistants
No graduate assistants are required to launch and sustain the proposed degree program.

Classified Positions
The administrative assistant employed by the School of Data Science will support the proposed degree program. The program will require .5 FTE of classified support to launch the program and sustain the level of effort will remain constant through the target year. Salary for the administrative assistant will be $25,000 in salary and $11,812 in benefits.

Equipment (including computers)
No new equipment, including computers is necessary to launch and sustain the proposed degree program.

Library
No additional library resources are required to launch and sustain the proposed degree program. The University Libraries has resources to include journals, magazines, electronic materials, and other publications for data science and analytics. As a member of the Virtual Library of Virginia (VIVA), online access to journals is available.

Telecommunications
No new telecommunications resources are required to launch and sustain the proposed degree program.

Space
No new space is required to launch and sustain the proposed degree program.

Targeted Financial Aid
No targeted financial aid is required to launch and sustain the proposed degree program.

Other Resources (specify)
No other resources are needed to initiate or sustain the proposed degree program.

Funds to Initiate and Operate the Degree Program

Note: Institutions must use the recommended student-faculty ratio when estimating FTE enrollments and required faculty FTEs.

Appendices

Appendix A – Sample Plan of Study

Full Time Student

Year	Fall

Credit Hours – Freshman – Fall Semester – 15
Credit Hours – Freshman – Spring Semester – 15
Credit Hours – Sophomore – Fall Semester – 14
Credit Hours – Sophomore – Spring Semester – 14
Credit Hours – Junior – Fall Semester – 16
Credit Hours – Junior – Spring Semester – 16
Credit Hours – Senior – Fall Semester – 15
Credit Hours – Senior – Spring Semester – 15

Total Credit Hours 120

Appendix B – Course Descriptions

New courses are denoted with an asterisk.

Core Courses

BDA 200T. Elements of Data Science. 3 Credits.
This course offers a non-technical introduction to the emerging and interdisciplinary area of data science. Students will be introduced to the development, fundamental tools, and the impact of data science in a wide range of disciplines such as business, the sciences and engineering. Fundamental data visualization techniques and basic concepts of machine learning will be applied through real-life data science projects. Moreover, students will explore the general framework for ethical thinking and practicing data science, the current challenges, the benefits, the potential harms and risks posed by developing data science models and technology. Prerequisites: MATH 102M or MATH 103M.

CS 150. Problem Solving and Programming I. 4 Credits.
Laboratory work required. Introduction to computer-based problem solving and programming in C++. Topics include problem solving methodologies, program design, algorithm development, and testing. C++ language concepts include variables, data types and expressions, assignment, control-flow statements, functions, arrays, pointers, structs, and classes. Pre- or corequisite: MATH 163.

CS 250. Problem Solving and Programming II. 4 Credits.
Laboratory work required. Design issues arising in software systems and C++ programming techniques aiding in their solution. Topics include the software life cycle, methods of functional decomposition, design documentation, abstract data types and classes, common data structures, dynamic data structures, algorithmic patterns, and testing and debugging techniques. Term project required. Prerequisites: CS 150 or ENGN 150 with a grade of C or better. Pre- or corequisite: CS 252 and MATH 211.

*__DASC/CS 15X Computing Languages for Data Science.__ 3 Credits

__*DASC 300G. Foundations of Data Science.__ 3 credits**.** This course provides an interdisciplinary overview of data sciences drawing on key elementary topics related to data analytics. A specific focus is given to the way that decisions made about data from those disciplinary pursuits inform policy, product development, and humanity.

__*DASC 3XX Ethics and Data.__ 3 Credits

__*DASC 434 Data Science Research Methods__

__*DASC 436W Data Science Capstone Project.__ 3 Credits. Students work individually or in groups to plan, design, and carry out a research project demonstrating expertise with data science. Final papers which report the results for the study are presented in a formal research seminar. The projects reflect knowledge gained from undergraduate work and training received

in discipline-specific research methods and statistics courses. Senior standing.

MATH 211. Calculus I. 4 Credits.
A first course in calculus and analytic geometry. Topics include differentiation and integration of algebraic and transcendental functions of one variable and applications. Prerequisites: A grade of C or better in MATH 163 or MATH 166.

MATH 212. Calculus II. 4 Credits.
A second course in calculus and analytic geometry. Topics include techniques of integration, polar coordinates, infinite series, solid geometry, vectors, lines and planes. Prerequisite: A grade of C or better in MATH 211.

Course Prerequisites

CS 252. Introduction to Unix for Programmers. 1 Credit.
Laboratory work required. Available for pass/fail grading only. An introduction to Unix with emphasis on the skills necessary to be a productive programmer in Unix, Linux, and related environments. Topics include command line shells, files and directories, editing, compiling and common command line utilities. Prerequisites: A grade of C or better
in 211Credisr

c)4 (t) datf Ctes 1lie ctrs.lissiecksеu-2 (e)4 (s)-1 (d)TJTs1 (t)-14ismapshe-2 (ap)4 (s)-1(ng a)4 g2 (o)-10k raph-2 (s)-1S (ra)-1

models, support vector machine, decision trees, neural networks, etc.), unsupervised learning (scaling, dimension reduction, clustering, etc.), reinforcement learning, and model evaluation. The course will also discuss applications on image analysis, text processing, and biomedical informatics. Prerequisites: MATH 316 and CS 150 (or equivalent programming experience).

CS 480/580. Introduction to Artificial Intelligence. 3 Credits.
Laboratory work required. Introduction to concepts, principles, challenges, and research in major areas of AI. Areas of discussion include natural language and vision processing, machine learning, machine logic and reasoning, robotics, expert an.002 Tw g, mxdw g, mogixperimon pras 4 (s)-1 ((e)-6

based perspective; 2) collect, create and examine geographically referenced demographic, social, and criminological data; 3) learn to use GIS mapping software to visualize, manage and analyze this data in order to investigate the relationship between geographic, demographic, social and criminological variables; and 4) arrive upon decisions and conclusions and communicate these via the creation of publishable maps. Prerequisites: SOC 201S or CRJS 215S or permission of the instructor.

ECE 475/575. Transportation Data Analytics. 3 Credits.
This course presents the basic techniques for transportation data analytics. It will discuss statistical modeling, prominent algorithms, and visualization approaches to analyze both small- and large-scale data sets generated from transportation systems. Practices of using different data for various real-world traffic/transportation applications and decision making will also be discussed. Prerequisites: Basic probability and statistics (e.g., STAT 330 or ECE 304); any programming language such as C, Python or Java is beneficial but not required.

ECE 407/507. Introduction to Game Development. 3 Credits.
An introductory course focused on game development theory and modern practices with emphasis on educational game development. Topics include game architecture, computer graphics theory, user interaction, audio, high level shading language, animation, physics, and artificial intelligence. The developed games can run on a variety of computer, mobile, and gaming platforms. (Cross listed with MSIM 408.) (Offered spring)
Prerequisites: CS 361 or MSIM 331.

ECE 441/541. Advanced Digital Design and Field Programmable Gate Arrays. 3 Credits.
Course will present FPGA technologies and methods using CAD design tools for implementation of digital systems using FPGAs. Topics include advanced methods of digital circuit design including specification, synthesis, implementation and prototyping; managing multiple clock domains, static timing analysis, timing closure, system reset design, simulation, and optimization; troubleshooting using embedded logic analyzers and integrated development environments (IDEs). Practical system design examples include general purpose data processing, system on a chip (SOC) prototyping, hardware accelerators, and an introduction to domain specific architectures. (Offered spring) Prerequisites: ECE 341.

GAME 440. Advanced Visual Design and Digital Graphics for Games. 3 Credits.
This course focuses on advanced visual design and digital graphics for game-based applications, including but not limited to topics such as 3D modeling, texturing, texture mapping, animation, optimization, shaders, and particle systems. Conceived as a studio course, it provides students with hands-on experience working with a variety of digital software applications to create and optimize graphical assets for games and similar applications. Prerequisitp:

Prerequisites: GEOG 402.

Appendix D - Employee Demand Job Announcements

Number Date Retrieved

- Work with large datasets and mine relevant information for use in AI/ML applications
- Demonstrate ability to develop approaches and solutions to complex problems in the forms of proposals, software, documents or other work products

Benefits

- Salary Range: $107,400 - $169,600 (SCS III)
- At Jefferson Lab, we believe that a comprehensive employee benefits program is an important and meaningful part of the compensation employees receive
- Medical, Dental, and Vision Care Plans
- Flexibleĩ…
-
-
-
-
-

recognized exemptions to the COVID-19 vaccination.

Posting Date: 07/27/2022
Salary Range: $107,400 - $169,600 (SCS III)
Work Location Type: Flexible On-site (working more than 60% on-site)

Come join our team at Jefferson Lab, where great minds matter.

What your job will be like:

The Computational Sciences and Technology (CST) division is responsible for the support of scientific computing projects and the computing infrastructure that advance the science mission of the laboratory. The mission for the data science department is to develop and apply advance data analytics to advance the Jefferson Lab scientific objective and regional scientific efforts. The Data Science Department at Jefferson Lab is conducting research and development in machine learning and data analysis focused on:
• Uncertainty quantification for single pass deep learning models
• Automated and autonomous for design and control applications
• Robust and scalable Machine Learning (ML)/Artificial Intelligence (AI) solutions

In this role you will:
• Identify, lead and complete technical efforts in data science for projects at Jefferson Lab and sponsors
• Contribute to program development by assisting in proposal writing, attend DOE workshops and identifying new collaboration
• Develop software for HPC system across the DOE computing facilities
• Work with large datasets and mine relevant information for use in AI/ML applications
• Demonstrate ability to develop approaches and solutions to complex problems in the forms of proposals, software, documents or other work products.

- + Proven skills in data science related to data wrangling and analysis of data
- + Applicants selected for this position must be eligible for security clearances, will be subject to a government security investigation, and must meet eligibility requirements for access to classified information.
- + Typically requires a minimum of 5 years of related experience with a Bachelor's degree; or 3 years and a Master's degree; or a PhD with relevant experience who can immediately contribute at this job step; or equivalent combination of related education and work experience.
- + Experience in a customer-facing environment
- + Experience working with teams
- + Experience with cyber analytics
- + Experience with data visualization
- + Demonstrated experience visualizing multi-dimensional data using tools such as Tableau, Qlik, Kibana, neo4j, ggplot2, Plotly, matplotlib, or D3.
- + Demonstrated experience with one modern programming language such as Python, C
- $107,500 - $134,500 - $161,500 Annual
- Newly hired employees must be fully vaccinated prior to their employment start date.
- MITRE will provide reasonable accommodation to individuals who are legally entitled to an exemption under applicable laws so long as it does not create an undue hardship for MITRE and/or does not pose a direct threat to the health or safety of the employee or others in the workplace.
- MITRE is proud to be an equal opportunity employer.
- MITRE recruits, employs, trains, compensates, and promotes regardless of age; ancestry; color; family medical or genetic information; gender identity and expression; marital, military, or veteran status; national and ethnic origin; physical or mental disability; political affiliation; pregnancy; race; religion; sex; sexual orientation; and any other protected characteristics.
- MITRE intends to maintain a website that is fully accessible to all individuals.
- If you are unable to search or apply for jobs and would like to request a reasonable accommodation for any part of MITRE's employment process, please contact MITRE's Recruiting Help Line at 703-983-8226 or email at recruitinghelp@mitre.org.
- Copyright © 1997-2021, The MITRE Corporation.
- All rights reserved.
- MITRE is a registered trademark of The MITRE Corporation.
- Material on this site may be copied and distributed with permission only.
- Benefi ђ

VSHFLILFDWLRQV 3HUIRUP RQJRLQJ UHVHDUFK WR H[SORUH QHZ IHDW
UHFRPPHQGDWLRQV WR RUHLQ&DQFH RXU RI

6NLOOV +HDOWKFDUH 'DWD NQRZOHGJH DQG H[SHULHQFH +HDOWKFDU

([SHULHQFH DQG (GXFDWLRQ 5HTXLUHPHQWV
‡ %DFKHORUV GHJUHH LQ &RPSXWHUHQ&LHQFH ,QIRUPDWLRQ7HFKQRORJ 25 HT
H[SHULHQFH
‡ \HDUV RI KDQGV RQ H[SHULHQFH SURJUDPPLQJ LQ 64/
‡ \HDUV RI H[SHULHQFH EXLOGLQJ DQG PDLQWDLQLQJ DXWRPDWHG G
VWUHDPLQJ SURFHVVHV

6NLOOV 5HTXLUHG
‡ 64/
‡ 'DWDEDQVIRUPDWLRQ
‡ 'DWD 0RGHOLQJ
‡ 'DWD 4XDOLW\
‡ 'DWDVHWV
‡ 3URFHVV ,PSURYHPHQW
‡ H7FKQLFDO 6SHFLILFDWLRQV
‡ 8VHU ([SHULHQFH
‡ 'DWD *RYHUQDQFH
‡ 'DWD 0DQDJHPHQW
‡ 'DWD 6RXUFHV
‡ 'DWDEDVHV
‡ (7/
‡ *RYHUQDQFH
‡ 0DLQWDLQ 'DWD

7R $SSO\

7R EH FRQVLGHUHG SOHDVH DSSO\ GLUHFWO\ WR WKLV UHTXLVLWLRQ

&7*¶V %HQHILWV 3ODQ DOORZV \RX WR VHOHFW LQVXUDQFH FRYHUDJH \
SURJUDPV DQG HGXFDWLRQDO DVVLVWDQFH SURJUDPV 6SHQGLQJ $FFRXQWV D N 5HW
6WRFN 3XUFKDVH SODQ 2XU HGXFDWLRQDO SODQ FRPSULVHV DFFHVV
DQG EXVLQHVV GHYHORSPHQW FRXUVHV

&7* LV D OHDGLQJ SURYLGHU RI GLJLWDO WUDQVIRUPDWLRQ VROXWLR
DFKLHYHPHQW RI WKHLU GHVLUHG ,7 DQG EXVLQHVV RXWFRPHV 2XU Y
WKH SUHIHUUHG FDUHHU GHVWLQDWLRQ IRU GLJLWDO DQG WHFKQRORJ

JOREDO RSHUDWLRQV

&7* ZLOO FRQVLGHU IRU HPSOR\PHQW DOO TXDOLILHG DSSOLFDQWV LQ
ZLWK WKH UHTXLUHPHQWV RI DOO DSSOLFDEOH ORFDO VWDWH DQG I

&7* LV DQ (TXDO 2SSRUWXQLW\ (PSOR\HU &RQVLGHUDWLRQ ZLOO RHUVXUH HTXDO RSSRUW
DOO DSSOLFDQWV DQG HPSOR\HHV LQ UHFUXLWPHQW VHOHFWLRQ SO
DQG UHOHDVH RI LQGLYLGXDOV ZLWKRXW QDWLRQDO RULJLQ HQFH[H
LGHQWLW\ DQG JHQGHU H[SUHVVLRQ RULHQWDWLRQ DQG WDWXV FLWL]HQ\
IDFWRUV DV UHTXLUHG E\ $FWLRQ SURJUDP VHUYHV WR SURPRWH
JRRG IDLWK HI &7* LV IXOO\ FRPPLWWHG WR SURPRWLQJ HPSOR\PHQW

”××çÓÚÚû”ÚØţÚÒÒ+ -4 -

4. ' Ñ"-
ÛûÓÓ

* /$*)

*

))*0) ( )/)0(-
ÚÓÓØÔÚÓÚÓÔÔÚ

)/-')0(-
ØÙÕÚÙÛÕÒÒ

#$ %% $*+)/*

'+

+0 '$

æææ$$5).ç /$) '.*-/#*. 2#**2 '' "$) /*/# æææ

' -$$ /$)!-*(/# ") 4

æææ$$5).

0/$

$#$) /# + -/( )/*! !). * ç/# ++*$)/( )/*!- /$ ($$ -4((-. 2$#$) ÓÚÒ 4. $($/ '4!*''*2$)" - /$ ( )/ / /* $1$$) +*.$$) $.0 %//*/# +-*1$$).*!×)$ //. * ÕÕÔØæ

'. *-) Î -ÓÔÛÕÓÚ×Û(0./ -"$/ - !*- ' /$1 -1$ æ

-/# +- '$($) -4) /$)2$ $)%) /$)*) æææÉÜÜÜÜÕç ûÓÚ1 $) /$).2$')*/ $(+' ( )/ *-)!*- æ*-(*- $)!*-(/$)*)1 $) ./ /0.) 2*-&+' . ! /4 +-*/* *'-,0$ ( )/.. $$) ')!*-(/$) '*2æ

*02$' -,0$ /** / $)) ($)/ $)) $)/ -$( ) *-!$) ' -/. 0-$4 ' -) +-$-/*)/-) *) 0/4æ $0- /** / $)) ($)/ $)/# -,0$ ' 1'*! ' -) (4 -.0'/$)/# 2$# -2'*! % *Í -*--(*1'

#$ +*.$$)(4-,0$ /-1'!-*( )*-(' 0/4./ /$)/*)) (4 $) '0 -(*/ *-$*'/ .$.æ*0(0./ ' /*/-1'*)($$ -4) *((-$' $ -Î !*- 3/) + -$.*!/$ æ

0 '$$ /$).

*- ûÓÓè

) $$)/*/# .$,0$ ( )/. 0 /$) ç4*0--.0((0./ (*)./-/ /' ./ *) 4 -*!.+ $'$5 3+ -$) /*- ,0$1 ')//*/# ûÒÛ"- ' 1'*-+4) $)/# -'. -1$ *- ,0$1 ')/ 3+ -$) $)/# +-$1/ *-+0 '$. /*-æ+ $'$5 3+ -$) (0./ (*)./-/ /# !*''*2$)"è

û *) 0/$)" #$ -)$)" '"*-$#(. .2 '' . 3/- /$)" /-).!*-($)" $' / !*-/# 1'*+( )/*! + -)$)" '"*-$#(. æ

û 1'*+$)") .0++*-/$)") '4/$..*'0/$).*/ - .., 0./$).æ

û ++'4$)" -* +-*!..$) '&)*2' " $)/# - .*!*+ - /$).- . - #ç(* '$)") .$(0' /$)ç / . $) ç*- *(+0/ -. $) .0Í$$)//*. -1$. *).0'/)/) *- / #)$ ' 1$*-/*.)$-.0 %/(// -.+ $'$/*-( ) " ( )/*Í$$'.æ

û -*1$$)"/- $$)"*)./ /$/$ ') / . $) /**'..0 # . / -$&ç /0 $ç 4/#*) 0+$ -) *))*/ **&ç))$ /*) '45 /) 1'*+.*'0/$).*/ 0.$ .. +-* '(.æ

û -*!$$) 4$)*) *-(*- +-*"-((($)"')"0 " ..0 # . 1 ç žžç $0 ' .$ç æ

*- ûÒÛè

) $$)/*/# .$,0$ ( )/. 0 /$) ç4*0--.0((0./ (*)./-/ /' ./ *) 4 -*!.+ $'$5 3+ -$) /*- ,0$1 ')//*/# ûÒÙ"- ' 1'*-+4) $)/# -'. -1$ *- ,0$1 ')/ 3+ -$) $)/# +-$1/ *-+0 '$. /*-æ+ $'$5 3+ -$) (0./ (*)./-/ /# !*''*2$)"è

û ..$/$)"2$# 0$ $)"./ /$/$ '(* '.ç ++'4$)"(#$) ' -)$)"/ #)$0.!*-/ -"/ .*'0/$).!*- Í /$1 *((0)$ /$)æ

û 1'*+$)"!$) $)". /#-*0"#$)/ - /$1 1$0 '$5 /$).ç * 0( )/.) +- .)/ /$).æ

û - /$)" 0/*(/)*('4 / /$).4./(.) *)./)//- &$)"æ

û)#) $" / *'' /$) +-* 0- . /* $ '0 $!*-(/$) /* 0$) '4/$ .4./ (.æ
û -*!$$) 4$ *) *-(*- +-*"- (($" ')"0 " . .0 # . 1 ç žžç $0 ' .$ç æ

$$) ' , 0 '$$ /$) $!*-(/$)) !*0) !-*(` æ€Ð €

KWWSV XVDZ REV JRY MRE "XWPBFDPSDLJQ JRRJOHBMREVBDSSO\ XWPBVRXUFH JRR

, 0$ * 0( )/.

*(+' / - .0($ - , 0$ æ*0- - .0((0./ .#*2 - ' 1)/ 3+ -$) ç% /$' ç 0/$.
) *(+'$#( )/.æ*0- - .0((0./ .#*2 *(+' / $)!*-(/$) !*- #%)/-4/*
.0++*-/ ($)$(0(, 0 '$$ /$) .æ# !*''*2$)" $)!*-(/$) .#*0' +-*1$ $) 4*0- - .0(ç
0/$$ +/ ' /* +-*1$ '. 2# - $) 4*0- ++'$ /$) + &" è (+'*4 -ï.) (ç./ -/$"
)) / . * - ç#*0-

0(0./ '. +-*1$ /# ++'$ ' .0++*-/$" * 0( )/ /$) *!4*0- $ $$4 ææ$ $$4
' // -!-*(/# . . -$ *) /) - *-(ûÓ× ûÓ× æ
#//+è 222æ+(æ*1!*-(. + ! !

#$/*+# - -$ + 4

#*)

Ù×Ù ÕÖÖóÕÖÖÕ

($

#-$æ$ + 4) 14æ$

- ..

ÖÙÓ ./ /- /
-!'&çÔÕ×ÓÓ

-) (*- *0//#$ ") 4

3/ ./ +.

0 '$$ ++'$)/.2$' - ! -- /*/# #$$" ( ) " -æ# . ' /$" *É!9#%$0Ð

(*-

1

ÓxÒÓ) - ' /# (/$.) / /$/$.

0+ -1$*-4./ /0.
*

0-$4 ' -)
- /

-0" / ./
*

))*0) ( )/)0(-
ùóóøôúóúóûôôù

)/-')0(-
øùõúùûõòò

/0-) /* /*+

---

*0)/

*(
-*!$
* 0( )/.
1 %.
1 . -#.

'+

'+)/ -
*0/
.
*)/ /0.
/./ -/

$)$ / / . Í$ *! -.*)) ') " ( )/2 .$ æ

*'$4 / / ( )/

)XOO WLPH

-RE KLJKOLJKWV

,GHQWLILHG E\ *RRJOH IURP WKH RULJLQDO MRE SRVW

4XDOLILFDWLRQV

‡ &DQGLGDWH VKRXOG KDYH D VWURQJ ZRUNLQJ NQRZOHGJH DQG H[SHULHQFH GHYHORSLQJ FORXG VRIWZDUH EDVHG FDSDELOLWLHV DQG GDWD VFLHQFH UHODWHG H[SHUWLVH LQFOXGLQJ PDFKLQH OHDUQLQJ RU DUWLILFLDO LQWHOOLJHQFH

‡ &DQGLGDWH VKRXOG KDYH DQ LQTXLVLWLYH QDWXUH UHVSRQVLYHQHVV DQG H[FHOOHQW WHVWLQJ VNLOOV

‡ 0XVW DOVR SRVVHVV VWURQJ WURXEOHVKRRWLQJ VNLOOV DQG WKH DELOLW\ WR ZRUN XQGHU SUHVVXUH ZLWK PXOWLSOH GHDGOLQHV

‡ %DFKHORU V GHJUHH LQ WHFKQLFDO GLVFLSOLQH L H GDWD VFLHQFH FRPSXWHU VFLHQFH HQJLQHHULQJ PDWKHPDWLFV HWF DQG \HDUV RI UHOHYDQW H[SHULHQFH

‡ $W OHDVW \HDUV RI H[SHULHQFH DV D GDWD VFLHQWLVW

‡ (GXFDWLRQDO UHTXLUHPHQWV PD\ EH DGMXVWHG IRU DSSOLFDEOH ZRUN H[SHULHQFH

‡ : RUN H[SHULHQFH PD\ EH DGMXVWHG IRU KLJKO\ VSHFLDOL]HG

NQRZOHGJH RU XQLTXHO\
DSSOLFDEOH H[SHULHQFH

‡([SHULHQFH LQ 5(67IXO ZHE
VHUYLFHV DQG RU 2EMHFW 2ULHQWHG
3URJUDPPLQJ 223 SDUDGLJPV

‡([SHULHQFH ZLWK 3\WKRQ 5 RU
RWKHU GDWD VFLHQFH UHODWHG WRROV

‡([SHULHQFH TXHU\LQJ GDWD IURP
64/ GDWDEDVHV

‡([SHULHQFH ZLWK PDFKLQH
OHDUQLQJ DUWLILFLDO LQWHOOLJHQFH
QHXUDO QHWZRUNV H J

‡([SHULHQFH ZLWK WKH /LQX[
RSHUDWLQJ V\VWHP

‡([SHULHQFH ZLWK FRQILJXUDWLRQ
PDQDJHPHQW WRROV H J

‡*LW 1H[XV 0DYHQ

‡([SHULHQFH ZLWK WKH DJLOH
VRIWZDUH OLIHF\FOH

‡([SHULHQFH ZLWK DQRPDO\
GHWHFWLRQ WLPH VHULHV
IRUHFDVWLQJ DQG SUHGLFWLYH
PDLQWHQDQFH

‡+DV D SURYHQ DELOLW\ WR OHDUQ
TXLFNO\ DQG ZRUNV ZHOO ERWK
LQGHSHQGHQWO\ DV ZHOO DV LQ D
WHDP VHWWLQJ

‡.DIND 6SDUN)OLQN 6PWD€ð

‡

‡

‡

‡

‡ +DV D SURYHQ DELOLW\ WR OHDUQ TXLFNO\ DQG ZRUNV ZHOO ERWK

'HVLUHG 6NLOOV

‡ ([SHULHQFH UDSLGO\ VFDOLQJ GDWD VWRUDJH DQG SURFHVVLQJ

‡ ([SHULHQFH ZLWK FDXVDO DQDO\VLV PHWKRGV IRU URRW FDXVH DQD

‡ ([SHULHQFH LQ 0RGHUQ -DYD)UDPHZRUNV DQG /LEUDULHV H J 6SUL

‡ ([SHULHQFH ZLWK GDWD YLVXDOL]DWLRQ

‡ ([SHULHQFH ZLWK ZHE IUDPHZRUNV H J 5HDFW DQG DFF

‡ ([SHULHQFH LQ GLVWULEXWHG GDWDEDVHV 1R64/ RU *UDSK GDWDE

‡ ([SHULHQFH LQ VWUHDPLQJ DQG RU EDWFK DQDO\WLFV H J .DIND 6

‡ ([SHULHQFH LPSOHPHQWLQJ D GLVWULEXWHG VWRUDJH V\VWHP VXFK

‡ ([SHULHQFH FUHDWLQJ D GLVWULEXWHG $5 DQDO\WLFV HQJLQH VWUHDP

0XVW EH DEOH WR REWDLQ DQG PDLQWDLQ D 6HFUHW FOHDUDQFH 86
‡ FM

6HFXULW\ &OHDUDQFH 1RQH

)XOO WLPH

-RE KLJKOLJKWV

,GHQWLILHG E\ *RRJOH IURP WKH RULJLQDO MRE SRVW

4XDOLILFDWLRQV

‡ \HDUV RI H[SHULHQFH ZLWK VFULSWLQJ DQG VFLHQWLILF ODQJXDJHV LQFOXGLQJ & RU -DYD

‡ \HDUV RI H[SHULHQFH ZLWK WRROV WR PDQDJH GDWD DQG LQFOXGLQJ 0LFURVRIW $FFHVV 6KDUH3RLQW RU 6XP

‡ \HDUV RI H[SHULHQFH ZLWK GDWD FROOHFWLRQ GDWD SURFHVVLQJ GDWD YLVXDOL]DWLRQ DQG GDVKERDUG GHVLJQ WRROV

‡ .QRZOHGJH RI VWDWLVWLFDO PHDVXUHV LQFOXGLQJ LQWHUYDOV DQG WKH VLJQLILFDQFH RI HUURU PHDVXUHPHQWV

‡ $ELOLW\ WR REWDLQ D VHFXULW\ FOHDUDQFH

‡ %$ RU %6 GHJUHH

‡ \HDUV RI H[SHULHQFH ZLWK DSSO\LQJ PDFKLQH OHDUQLQJ WHFKQLTXHV DQG WKH NH\ SDUDPHWHUV DQG SHUIRUPDQFH

5HVSRQVLELOLWLHV

‡ :RUN FORVHO\ ZLWK \RXU VWXGHQW WR XQGHUVWDQG WKHLU UHTXLUHPHQWV DQG QHHGV DQG WKHQ GLJ LQWR WKHLU GDWD ULFK HQYLURQPHQW WR ILQG WKH SLHFHV RI WKHLU LQIRUPDWLRQ SX]]OH

‡ &ROOHFW GHYHORS GDWD FROOHFWLRQ SURFHVVHV GDWD YLVXDOL]DWLRQV DQG GDVKERDUGV DOJRULWKPV VFULSWV WR SURFHVV GDWD RU FRQGXFW SUHGLFWLYH DQDO\WLFV OHYHUDJLQJ PDFKLQH OHDUQLQJ RU RWKHU DSSURDFKHV

‡ DQG XVH WKH ULJKW FRPELQDWLRQ RI WRROV DQG IUDPHZRUNV WR WXUQ FRQILGHQFH WKDW VHW RI GLVSDUDWH GDWD SRLQWV

‡ :RUN FORVHO\ ZLWK \RXU VWXGHQW WR XQGHUVWDQG WKHLU UHTXLUHPHQWV DQG WKHQ GLJ LQWR WKHLU GDWD ULFK HQYLURQPHQW WR ILQG WKH SLHFHV RI WKHLU LQIRUPDWLRQ SX]]OH

‡ &ROOHFW GHYHORS GDWD FROOHFWLRQ SURFHVVHV GDWD YLVXDOL]DWLRQV DQG GDVKERDUGV DOJRULWKPV VFULSWV WR SURFHVV GDWD RU FRQGXFW SUHGLFWLYH DQDO\WLFV OHYHUDJLQJ PDFKLQH OHDUQLQJ RU RWKHU DSSURDFKHV

‡ DQG XVH WKH ULJKW FRPELQDWLRQ RI WRROV DQG IUDPHZRUNV WR WXUQ FRQILGHQFH WKDW VHW RI GLVSDUDWH GDWD SRLQWV

‡ \HDUV RI H[SHULHQFH ZLWK %LJ 'DWD SURJUDPPLQJ WHFKQRORJLHV LQFOXGLQJ +DGRRS 6SDUN 5 RU +LYH

‡ \HDUV RI H[SHULHQFH LQ ZRUNLQJ ZLWK D ZLGH UDQJH RI SUHGLFWLYH DQG GHFLVLRQ PRGHOV DQG WRROV IRU GHYHORSLQJ PRGHOV

‡([SHULHQFH ZLWK XVLQJ VWDWLVWLFDO VRIWZDUH DSSOLFDWLRQV LQFOXGLQJ 6$6 5 7/$% 6366 RU 6WDWD

‡([SHULHQFH ZLWK GHYHORSLQJ VWDWLVWLFDO DQG VLPXODWLRQ PRGHOV

‡

‡

‡

‡

0XVW EH DEOH WR REWDLQ DQG PDLQWDLQ D 6HFUHW FOHDUDQFH 86

- ,GHQWLI\ QHZ VHFXULW\ PRQLWRULQJ XVH FDVHV EDVHG RQ DYDLODEOH GDWD
- ,PSOHPHQW DQG VXSSRUW XVHU DQG WKUHDW EHKDYLRU DQDO\WLFV
- &UHDWH F\EHU WKUHDW LQWHOOLJHQFH FRQFOXVLRQV E\ XVLQJ GDWD VFLHQFH DQG DQDO\VLV H J RXWOLHU GHWHFWLRQ JDS DQDO\VLV QRUPDOL]DWLRQ PDFKLQH OHDUQLQJ DXWRPDWHG PRGHOV QDWXUDO ODQJXDJH SURFHVVLQJ HWF WHFKQLTXHV

%HQHILWV

- *UHDW %HQHILWV ! RI PHGLFDO SUHPLXPV FRVW VKDUH SDLG E\ 6N\H3RLQW VHYHUDO LQVXUDQFH RSWLRQV LQFOXGLQJ +02 DQG +LJK 'HGXFWLEOH SODQV ZLWK +HDOWK 6DYLQJV $FFRXQWV +6$V)OH[6SHQGLQJ $FFRXQWV)6$V)XOO 'HQWDO 3ODQV 67 / 'LVDELOLW\ ,QVXUDQFH IORDWLQJ IHGHUDO KROLGD\ RSWLRQV DQG N PDWFKHG
- &HUWLILFDWLRQ ,QFHQWLYH 3URJUDP
- 3DLG 5HIHUUDO 3URJUDP
- &RUSRUDWH 6SRQVRUHG &RPPXQLW\ (QJDJHPHQW *LYLQJ %DFN HYHQWV HYHU\ TXDUWHU
- 6N\H3RLQW 'R' 6NLOO%ULGJH ,QGXVWU\ 3DUWQHU)HOORZVKLS 3URJUDP
- 6N\H3RLQW 3URIHVVLRQDO *URZWK 3URJUDPV ,QWHUQDO 7UDLQLQJ DQG 0HQWRULQJ
- 6N\H3RLQW 3URIHVVLRQDO 6SRUWV 7LFNHW 3HUNV 4XDUWHUO\ (PSOR\HH 0RUDOH /XQFKHV DQG 6HPL $QQXDO WHDP EXLOGLQJ HYHQWV
-)OH[LEOH:RUN:(QYLURQPHQW

)XOO GHVFULSWLRQ

2YHUYLHZ

6N\H3RLQW 'HFLVLRQV LV D OHDGLQJ &\EHUVHFXULW\ $UFKLWHFWXUH DQG $SSOLFDWLRQV 'HYHORSPHQW DQG 0DLQWHQDQFH ,7 JVLHQLYDLEHWSKU I DFURVV WKH S8U6RY1GH LQQRYDWLYH HQWHUSULVH ZLGH VROXWLRQV DV FKDOOHQJHV IDFHG E\ RXU IHGHUDO

VHOHFWHG IRU D VHFXULW\ FOHDUDQFH ZLOO EH VXEMHFW WR D VHFX
DFFHVV WR FODVVLILHG LQIRUPDWLRQ

:KDWH: &DQ2UX
‡ *UHDW %HQHILWV ! RI PHGLFDO SUHPLXPV FRVW VKDUH SDLG E
+02 DQG +LJK 'HGXFWLEOH SODQV ZLWK +HDOWK 6DYLQJV $FFRXQWV +
3ODQV 76'LVDELOLW\,QVXUDQFH IORDWLQJ IHGHUDO KROLGD\ RSWLRQV
‡ &HUWLILFDWLRQ ,QFHQWLYH 3URJUDP
‡ 3DLG 5HIHUUDO 3URJUDP
‡ &RUSRUDWH 6SRQVRUHG &RPPXQLW\ (QJDJHPHQW *LYLQJ %DFN HYH
‡ 6N\H3RLQW 'R' 6NLOO%ULGJH ,QGXVWU\ 3DUWQHU)HOORZVKLS 3URJU
‡ 6N\H3RLQW 3URIHVVLRQDO *URZWK3URJUDPV(QJDJHPHQW7
‡ 6N\H3RLQW $]XUH 'HYHORSPHQW (QYLURQPHQW DYDLODEOH WR EGH-HYHORSHUV
FXVWRPHUV DQG RU WR FUHDWH LQQRYDWLRQ WR ZLQ QHZ EXVLQHVV
‡ 6N\H3RLQW 3URIHVVLRQDO 6HUYLFHV 3URJUDP4XDUWHUO\ (PSOR\HH 0RUDOH /XQFK
HYHQWV
‡)OH[LEOH:RUN (QYLURQPHQW
6N\H3RLQW 'HFLVLRQV LV DQ HVWDEOLVKHG ,62 DQG ,62 ,(&
DW &00, /HYHO ZLWK 6$0 6RF 9HULI\ DFFRXQW YLVLRQ RI H[FHOOHQFH
FXOWXUH EXLOW XSRQ LQGLYLGXDO:HOOQHVVPDQDJHPHQW6XSSRUWLQJ
FOLHQWV ,W LV DW K:H 6N\H3RLQW:H:XO IRU WKH RSSRUWXQLW\ WR ZRUN
FRPPXQLWLHV ZH VHUYH 2XU HPSOR\HHV YDOXH WKH IOH[LELOLW\ DW
WKHLU SHUVRQDO OLYHV

$V D IHGHUDO &RQWUDFWRU VXEMHFW WR DQ\ IHGHUDO YDFFLQH PDQ
UHTXLUHPHQWV $OO QHZ KLUHV DUH UHTXLUHG WR UHSRUW WKHLU YD

6N\H3RLQW 'HFLVLRQV LV FRPPLWWHG WR KLULQJ DUHQG QUHTXDLQ2SSRUW
PDNLQJ GHFLVLRQV ZLWKRXW UHJDUG WR[UDFH:HLJKW RULJLQ RU DQ\
SURWHFWHG FODVV 8 6 &LWL]HQVKLS LV UHTXLUHG IRU PRVW SRVLWI

*RYHUQPHQW DV ZHOO DV FXVWRPHUV RI QRQ-SURILW RUJDQL]DWLRQV WR HIIHFWLYHO\ WHFKQRORJ\ WR DQDO\]H LQIRUPDWLRQ LGHQWLI\ DQG PDQDJH ULVN
+HDGTXDUWHUHG LQ &ROXPEXLD KDV UHGXFHG LWV %LJ%HDU ZLOO UHTXHVW &29,' YDFFLQDWLRQ VWDWXV LQIRUPDWLRQ
&DOLIRUQLD

Table of Contents

Description of the Proposed Program 1

Program Background 1

Institutional Mission 2

Admission Criteria 2

Curriculum 3

Faculty Resources 6

Student Learning Assessment 7

Employment Skills 9

Relation to Existing Old Dominion University Degree Programs 10

Justification of the Proposed Program 11

Response to Current Needs (Specific Demand) 11

Employment Demand 14

Duplication 15

Student Demand 17

Projected Resource Needs for the Proposed Program 18

Resource Needs 18

Appendices 22

Appendix A ± Sample Plan of Study A-1

Appendix B ± Course Descriptions B-1

Appendix C ± Faculty Curriculum Vitae (abbreviated) C-1

Appendix D ± Employment Demand Job Announcements D-1

Description of Proposed Program

Program Background

Old Dominion University (ODU) in Norfolk, Virginia seeks approval for a Bachelor of Science (BS) degree in Data Science. The proposed program will be housed in ODU's new School of Data Science. The target date of the proposed program's initiation is Fall 2023.

The purpose of the BS in Data Science program is to provide students foundational knowledge in the core competency areas of data science. The proposed program will provide skills in computer science, mathematics and statistics, and data analytics. Students will learn to use data for identifying trends and patterns, solving problems, communicating results, and recommending solutions. Additionally, it will provide opportunities for students to practice these skills across application areas from different domains. The program will provide project-based learning and students will discover how to use data to solve real-world problems. Graduates will be knowledgeable and skilled at developing statistical models to detect trends and lead teams in organizing, managing, and modeling data. The program will prepare graduates to work in public or private settings that require data-driven solutions to gain insights, make decisions, and communicate solutions.

The proposed BS in Data Science will offer three concentrations initially. The concentrations will prepare students to focus on different aspects of data science and gain deeper knowledge in these sub-areas. Students who choose the artificial intelligence and machine learning concentration will take courses that address topics such as object-oriented programming, algorithms and data structures, and information retrieval. Students will learn computational data analysis and natural language processing. Graduates who choose this concentration will be prepared to enter rapidly emerging science and statistical fields. Students who choose the visualization concentration will take courses in data visualization, data structures, and computer graphics. Students will gain skills for data modeling, simulation, and rendering results. Graduates of this concentration will be prepared to select and apply appropriate techniques for data visualization to support analyses from different domains. Finally, students who choose the geospatial analysis concentration will take courses in geographic information systems, spatial analysis, and remote sensing. The concentration provides the skills for spatial predictive modeling, geostatistics, and object detection. Graduates from this concentration will be prepared to uncover spatial patterns to enhance cartography analytics and communications.

The increased amount of available data has escalated the demand for data science professionals. As data science continues to grow, more and more colleges and universities are working to equip undergraduate and graduate students with the skills that will be required to perform data science related W D V N V L Q D Y D U L H W \ R I H Q J D J H G Z R U N I R U F H Q H H G V ´ U H V S R Q V L Y H D Q G L W V E D F K H O R U ¶ V O H Y H O S U R J U D P V K D Y H W R E H F H U W L I L F U H V S R Q V L Y H W R [1] Z R U N I R U F H Q H H G V ´

Organizations seek to take advantage of the vast amount of data they collect day in and day out.

[1] Burning Glass Technologies. ·'The Quant Crunch. How The Demand for Data Science Skills Is Disrupting the Job Market." https://www.burning-glass.com/wp-content/uploads/The Quant Crunch.pdf pg. 3

[3] 7KH \ ZDQW WR XVH WKDW GDWD-looking predictions: The requires a new generation of advanced analytics, higher-level diagnostic and predictive, and the employees who have the skill sets to use them.[2] Virginia houses the third-largest tech industry workforce in WKH QDWLRQ DQG WKH QHHG IRU TXDOLILHG GDWD VFLHQWLVWV DQG DQDO\WLFDO VFLHQFH HPSOR\PHQW DFFRUGLQJ WR Commonwealth currently has one of the highest concentrations of data scientists and PDWKHPDWLFDO VFLHQFH HPSOR\PHQW DFFRUGLQJ WR[3]

The proposed BS degree program in Data Science will help provide the next generation of data scientists. Graduates of this program will have the skills to lead data-driven activities and manage data science resources supporting a range of applications. This program will meet workforce needs by providing students with the skills necessary for data-focused roles as scientists and analysts. Students educated in computational and statistical data science techniques have the potential to become future leaders in data-driven industry, government, and academia careers. ODU is fully committed to offering the proposed degree program to ensure professionals are prepared and trained to enter industry needs.

Institutional Mission

7KH PLVVLRQ VWDWHPHQW RI 2OG 'RPLQLRQ 8QLYHUVLW\ LV The City of Norfolk in the metropolitan Hampton Roads region of coastal Virginia, is a dynamic public research institution that serves its students and enriches the Commonwealth of Virginia, the nation, and the world through rigorous academic programs, strategic partnerships, and active FLYLF HQJDJHPHQW´

The proposed BS in Data Science VXSSRUWV 2'8¶V PLVVLRQ E\ providing a rigorous academic program in data science that will supply qualified graduates to regional and national industry SDUWQHUV WR HQULFK WKH FRPPRQZHDOWK RI 9LUJLQLD professionals. As part of 2'8¶V strategic plan (2014-2019), the university committed LQYHVWPHQWV LQ GDWD VFLHQFH WR VXSSRUW 2'8¶V UHSX forward a data science initiative.[4] Additionally, the Colleges of Sciences, Engineering, and Business have all built capability in data analytics and data-intensive research.

Admission Criteria

Students applying to the BS program in Data Science should meet the minimum university admission requirements for Undergraduate Admission. Because the curriculum requires a number of computer science and mathematics courses, it is highly recommended that prospective students feel confident in their high school math and science skills. Required criteria for freshman applicants include:

- A completed online application and associated application fee
- Official High School Transcript (or GED Transcript)
- SAT/ACT Scores, Self-reported Scores, or Test Optional

[2] Jachimski, S. & Delurey, M. (2019). Predictive Analytics Handbook for National Defense, Booz Allen Hamilton
[3] https://issuu.com/vedpvirginia/docs/vedp_q421_issuu/62
[4] https://www.odu.edu/about/planning/strategic-plan-14-19

- Optional Items: Activity Resume, Letter(s) of Recommendation and/or Personal Statement

Applications will be evaluated for both fall and spring admission. Students must have a 3.3 or higher GPA to get the minimal merit scholarship. For students who chose to test, the average SAT is 1000-1210 (reading and math only) and average ACT 19-26.

Curriculum

The proposed BS in Data Science will require 120 credit hours to complete the degree. Along with the core coursework, the curriculum includes three concentrations: artificial intelligence and machine learning, visualization, and geographic information systems. It also includes the general education requirements and undesignated electives. The program requires a capstone course for graduation.

The focus of the curriculum is on the foundational data science areas of statistics, computer science, and information technology. Students will learn programming to develop statistical models and how to use data for identifying trends and patterns, communicating results, and recommending optimal solutions. Through the core curriculum, students will gain knowledge about using data in various ways to solve problems.

Students will choose a concentration area to gain knowledge, skills, and abilities that are more specific to an interest area. Coursework for the artificial intelligence and machine learning concentration focuses on topics such as object-oriented programming, algorithms and data structures, and information retrieval. Coursework for the visualization concentration focuses on data visualization, data structures, computer graphics, and visual design. Coursework for the geospatial analysis concentration focuses on geographic information systems, spatial analysis, and remote sensing.

Students will be exposed to various application domains through problem-based learning that uses data to solve real-world problems. Students will have opportunities to participate in faculty lead research and industry internships. The capstone project will provide an opportunity for students to synthesize knowledge from their coursework and apply it to solve real-world data analytics problems.

New courses are denoted with an asterisk.

<u>Program Requirements</u>

General Education Requirements (32 credit hours)

Written Communication (6 cr)
Oral Communication (3 cr)
Mathematics (MATH 162M required) (3 cr)
Language and Culture (Anticipated met through High School credits, otherwise 6 credits)
Information Literacy and Research (0 cr) (Met through Foundations of Data Science Class)

Course Prerequisites

CS 252. Introduction to Unix for Programmers (1 cr)
CS 361. Data Structures and Algorithms (3 cr)

Concentration Courses

Pick One:

BDA 411 Introduction to Machine Learning (3 cr)
CS 422/522. Introduction to Machine Learning (3 cr)

Pick One:

CS 480/580. Introduction to Artificial Intelligence (3 cr)
MSIM 480/580. Introduction to Artificial Intelligence (3 cr)

Pick Three *

CS 330. Object-Oriented Programming and Design (3 cr)
CS 432/532. Web Science (3 cr)
ECE 407/507. Introduction to Game Development (3 cr)
CYSE 420 Applied Machine Learning in Cybersecurity (3 cr)
ECE 450/550. Introduction to Machine Learning for Data Analytics Engineering. (3 cr)
DASC 450 Machine Learning and Society (3 cr)

Visualization Concentration (29 credit hours)

The purpose of this concentration is to give student skills in data modeling, simulation, and results rendering. Students who choose the visualization concentration will take courses in visualization, data structures, and computer graphics.

Math Prerequisites

MATH 212. Calculus II (4 cr)

Course Prerequisites

BNAL 206. Business Analytics I (3 cr)
BNAL 306. Business Analytics II (3 cr)
CS 252. Introduction to Unix for Programmers (1 cr)
GAME 201T Introduction to Game Studies (3 cr)

Concentration Courses

BNAL 403/503 Data Visualization and Exploration (3 cr)
CS 361. Data Structures and Algorithms (3 cr)
ECE 406/506 Computer Graphics and Visualization (3 cr)
GAME 340. Visual Design and Digital Graphics for Games (3 cr)

Pick Two: *

ARTH 320W. History of Graphic Design (3 cr)
CRJS 344 Social Science and Crime Mapping (3 cr)
ECE 475 Transportation Data Analytics (3 cr)
ECE 407 Introduction to Game Development (3 cr)
GAME 440. Advanced Visual Design and Digital Graphics for Games (3 cr)
IT 325. Web Site and Web Page Design (3 cr)

Geographic Information Systems Concentration (27 Credit Hours)

The purpose of this concentration is to provide the skills for spatial predictive modeling, geostatistics, and space

The nature of the program is interdisciplinary involving faculty from mathematics, statistics, physics, computer science, engineering and information technology. The faculty chosen to teach in this program are currently actively teaching and performing research in this area. ODU currently has 51 faculty teaching and conducting research in data science or related areas, including business, computer science, engineering, geography, mathematics and statistics, and ocean and earth sciences. This includes 22 new data science hires during the last 5 years. Appendix C provides some faculty abbreviated CVs.

Student Learning Assessment

Students who complete the proposed BS in Data Science degree will possess the appropriate knowledge, skills, and abilities needed to work in a wide variety of data science positions. Student learning will be assessed throughout the proposed program through a variety of formative and summative measures. Assessment measures include, but are not limited to assigned papers, quizzes, tests, and projects assigned during classroom instruction. Students will be evaluated on their ability to synthesize knowledge from their coursework and apply it to solve real-world data analytics programs. Additionally, students will be required to complete a capstone project. This project will require students work in teams to solve a data science/analytics problem in a real-world business, industry, or government setting using established techniques and methods within the field.

Learning Outcomes

Student learning outcomes cover many of the technical competencies that are required for the area data science. Specifically, graduates will be able to:

Use statistics to represe data and test hypothese	STAT 130M.	Elementary Statistics

Geographic Information Systems Concentration

The Geospatial Information Systems (GIS) concentration enables students to develop advanced skills and expertise in geospatial science and technology. Graduates in this concentration will be able to:

- Use GIS as a tool for manipulating spatial information
- Design spatial database structures for analytical operations
- Apply methods, standards, and policies for use of GIS on the Internet

Relation to Existing Old Dominion University Degree Programs

&XUUHQW DFDGHPLF SURJUDPV DW 2OG 'RPLQLRQ 8QLYHUVLWLHV VSUHDG DFURVV QXPHURXV GHSDUWPHQWV VHYHUDO FROOHJHV &\EHUVHFXULW\ WDNHV D KROLVWLF DSSURDFK WR RELHFWLYHV WKDW RFFXS\ WR OHDUQ XQGHUVWDQG 7KLV SURSRVDO DGYRFDWHV IRU WKH FUHDWLRQ RI DQ XQGHUJUDGXDWH GHJUHH SURJUDP WKDW GUDZV IURP DSSOLFDEOH FRXUVHZRUN IURP YDULRXV GHSDUWPHQWV DQG FROOHJHV DW 2OG 'RPLQLRQ 8QLYHUVLWLHV

The Department of Information Technology & Decision Sciences in the Strome College of Business offers the Business Analytics and Intelligence major that develop skills in the use of the computer as a decision-making tool. The BS in Data Science degree leverages some of this coursework in the Visualization concentration. The proposed program does not overlap with the BSBA in Information Technology degree, also offered by this department. The Batten College of Engineering and Technology offers a Data Analytics Engineering concentration for the BS ECE and BS COME degrees. Some of these courses are optional courses in the Visualization concentration. Finally, the Department of Computer Science within the College of Sciences allows students to choose electives from a range of data science courses, these courses will be used to form the Artificial Intelligence & Machine Learning concentration. The Department of Mathematics and Statistics offers a BS Mathematics with a Big Data Analytics major. This is a math-intensive major and there is no coursework from this curriculum used in the proposed program.

The proposed BS in Data Science program will utilize the existing data science course resources currently available at ODU. However, the curriculum was purposely designed to ensure that students are prepared with the correct course prerequisites to take the available data science courses offered across departments as they progress through the program. The program provides an educational pathway starting at the freshman level for students to obtain a data science degree by identifying the appropriate math, prerequisite, core and concentration course sequences. Without this program, many students find that they cannot access data science courses, as most of these courses are at the upper undergraduate level and they are not prepared with the prerequisite courses.

The proposed BS in Data Science program is not an expansion of an existing program, and will not compromise any existing degree programs at Old Dominion University. No degree

programs will close as a result of the initiation and operation of the proposed degree program.

Justification of the Proposed Program

Response to Current Needs (Specific Demand)

Data Science is a rapidly growing field of study. The magnitude of data that are being generated and stored every day is overwhelming. Data science makes it possible to uncover important information that would otherwise remain hidden. With the growth of data mining techniques and the need for more data driven decisions, more data science and analytical skills are needed in the workforce. Industry, government, health care and other organizations need graduates trained with skills to manipulate data, analyze information and determine solutions to complex

Aeronautics are in Hampton, Virginia, and Jefferson Laboratory is located nearby in Newport News. Norfolk, where Old Dominion University is located, is home to major command centers from every branch of the military, including the largest naval base in the world, Norfolk Naval Station. The Norfolk/Virginia Beach area includes health care providers Sentara Medical Group and Eastern Virginia Medical School (EVMS). The Port of Virginia, which includes Newport News Marine Terminal, Norfolk International Terminals, Portsmouth Marine Terminal and Virginia International Gateway in Portsmouth, Virginia, is the only U.S. East Coast port with Congressional authorization of 55-foot depth channels and currently stands as the third largest container port on the East Coast. Moreover, Amazon, with its existing workforce of more than 10,000 full-time employees in the state of Virginia, is building two operations facilities in Hampton Roads, creating 1,500 additional jobs. Furthermore, Norfolk and Virginia Beach host several financial and insurance data centers.[19]

Data Science jobs grew by 10% in Hampton Roads from 2015-2025.[20] Key areas of high growth were found in cybersecurity, marine engineering, and logistics occupations. Hiring consistently outpacing separations, indicating a stable regional demand for data sciences talent over time and consistently growing workforce.[21] In Hampton Roads, federal workforce, defense, and maritime industries were by far the leading employers. However, demand was not limited to just one industry sector, but cross-cutting industry demand with over 15,552 unique postings for jobs with Data Science-related skill sets in the Hampton Roads region over the 5-year period.[22]

related tasks in a variety of industries and positions.[25]

Graduates of the proposed BS in Data Science program will be qualified to work in a variety of industries including private and public businesses, health organizations, and government agencies. The knowledge and skills learned through the curriculum will be applicable to meet organizations' needs for professionals who can develop statistical models, perform analytics on complex data and use data science and analytics to solve problems and create new strategies for success. The BS in Data Science provides students broad exposure to concepts, methods, and tools that data science professionals should be familiar with prior to entering the workforce: computer science, statistics, and data visualization.[26] 2: 8 ¶ V S U R J U D P L V ³ S U R D F W L Y H to the rising demand for analytics skills with programs that prepare students for the analytics U H O D W H G U R O H V R I[27] W R G D \ D Q G W R P R U U R Z ´

Employment Demand

Graduates of the proposed BS in Data Science degree program will be qualified to work as data focused professionals, such as data scientists and data analysts, along with a wide variety of related fields. Graduates will be prepared to work in a variety of domains, such as finance, health care, logistics, defense, among others. O*Net Online, the Department of Labor website that allows users access to occupational information, describes the work of Data Scientists as ³develop and implement a set of techniques or analytics applications to transform raw data into meaningful information using data-oriented programming languages and visualization software.´[28] They apply tools including data mining, data modeling, natural language processing, and machine learning to extract and analyze information from large structured and unstructured datasets, which they then visualize, interpret, and report data findings.

The Bureau of Labor Statistics (BLS) and the Virginia Employment Commission (VEC) do not have data or a job category for data scientists or data analysts. The closest occupations on which there are some data are operations research analysts. The BLS indicates that operations research analysts "use advanced mathematical and analytical methods to help organizations solve problems and make better decisions." Moreover, operations research analysts "use statistical analysis, simulations, predictive modeling, or other methods to analyze information and develop practical solutions to business problems ... and, advise managers and other decision makers on the effects of various courses of action to take in order to address a problem."[29] Graduates of the BS in Data Science will possess the same skill set and be able to use mathematical and analytical methods to solve problems and make decisions.

The BLS indicates that between from 2020 to 2030, employment of operations research analysts is "projected to grow 25 percent, much faster than the average for all occupations." The BLS

[25] https://issuu.com/vedpvirginia/docs/vedp_q421_issuu/62
[26] Knopp, B. et al., 2016. Defining the Roles, Responsibilities, and Functions for Data Science, The RAND Corporation https://w/62

notes that "About 10,200 openings for operations research analysts are projected each year, on average, over the decade. As technology advances and companies seek efficiency and cost savings, demand for operations research analysis should continue to grow. In addition, increasing demand should occur for these workers in the field of analytics to improve business planning and decision making."[30] Operations research analysts will continue to be needed to provide support for the Armed Forces and to assist in developing and implementing policies and programs in other areas of government.

Graduates of the proposed program will be prepared to serve businesses in Virginia. The Virginia Employment Commission, Labor Market Index shows strong demand in Virginia for operations research analysts and mathematicians and statisticians. Virginia is one of the states with the highest concentration of jobs and location quotients in Data Scientists and Mathematical Science Occupations, which is projected to grow 22 percent from 2020 to 2030, much faster than the average for all occupations. About 7,200 openings for computer and information research scientists are projected each year, over the decade.[31] At this point in time there are over 300 job openings in the state of Virginia (July 2022).

Labor Market Information: Bureau of Labor Statistics, 2018-2028 (10-Yr)

Occupation Title	Base Year Employment	Projected Employment	Total % Change	Typical Entry Level Education
Operations research analyst	104,100	129,700	25%, 25,600	% D F K H O R Degree

Labor Market Information: Virginia Employment Commission, 2018-2028 (10-Yr)

Occupation Title	Base Year Employment	Projected Employment	Total % change and	Annual Change	Education
Operations research analysts	9,324	12,036	29%, 2,712	271	% D F K H O Degree

Appendix D provides employment announcements.

Duplication

Three public four-year institutions in Virginia offer a comparable degree program: College of William and Mary, George Mason University and Virginia Tech. Each offers BS degrees in Data Science or a related field.

College of William and Mary
The College of Arts and Sciences offers a BS Degree in Data Science.[32] The focus of the core curriculum is to provide students with a solid foundation in data science through learning the

[30] Bureau of Labor Statistics, U.

basics of programing, modeling, machine learning, data visualization, database structures, and ethics in data science.

Similarities
The BS in Data Science requires a minimum of 40 credits of identified data science coursework. The program consists of 21 credits of core courses including a capstone, and nine credits of mathematics. The remaining credits are fulfilled by selecting one of four required tracks

Differences
The concentrations, data applications, algorithms, or spatial data analysis, are different than those offered by the proposed ODU program. This program emphasizes the ethical, moral, and societal implications of data science and students are encouraged to work with faculty to conduct research, while the ODU capstone is project based, focused on real world applications

George Mason University (GMU)
The College of Science, Computational and Data Sciences Department offers a BS in Computational and Data Science.[33] As an interdisciplinary STEM designated program, this degree addresses the role of computation in the areas of big data, modeling, and simulation and combines real world computer science skills, data acquisition and analysis, scientific modeling, applied mathematics, and simulation.

Similarities
This program requires 120 credit hours including 16 credits from core coursework and 18 credits from courses selected from the extended core that support the major. These courses are augmented with 11 credits from math courses and six credits from statistics courses.

Differences
While the program provides the full data science skill set, it does not allow students to choose a specific concentration area for their studies, as is offered in the proposed ODU program.

Virginia Tech (VT):
The College of Sciences offers the Computational Modeling and Data Analytics (CMDA) program that draws on expertise from three primary departments: Mathematics, Statistics, and Computer Science.[34] The program focuses on extracting information from large data sets, as well as analyzing and solving problems by modeling, simulation, and optimization and emphasizes techniques of applied computation.

Similarities
This program requires 120 credit hours consisting of 36 credits from core coursework and 12 credits of restricted electives.

Differences
Students in this program choose one of the following concentrations: Biological Sciences, Cryptography & Cybersecurity, Economics, Geosciences or Physics. Except for Geosciences,

[33] https://science.gmu.edu/academics/departments-units/computational-data-sciences/computational-and-data-science-bs
[34] https://vt.edu/academics/majors/computational-modeling-and-data-analytics.html

these options are very different from the ODU proposed program concentrations.

Location

Old Dominion University is located in coastal Virginia. The proposed degree program will be the only undergraduate degree program in data science in the area.

Enrollment and Degrees Awarded at Comparable Programs in Virginia

Enrollment	Fall 17	Fall 18	Fall 19	Fall 20	Fall 21
College of William & Mary	NA	NA	NA	38	72
George Mason University	29	81	117	159	195
Virginia Tech	NA	NA	NA	NA	593

Summary of Projected Enrollments in Proposed Program

Year 1		Year 2		Year 3		Year 4			Year 5 Target Year		
2023- 2024		2024- 2025		2025 - 2026		2026- 2027			2027- 2028		
HDC 75	FTES 50	HDCT 100	FTES 70	HDC 150	FTES 100	HDCT 200	FTES 140	GRAD 50	HDCT 220	FTES 155	GRAD 60

Assumptions:
Retention percentage: 80%
Full-time students: 100% Part-time students: 0%
Full-time students credit hours per semester: 15
Full-time students graduate in 4 years

Projected Resource Needs for the Proposed Program

Resource Needs

The School of Data Science will provide 4 part-time faculty, resulting in 2.0 part-time instructional effort in the initiation semester through the target year in 2026-2027.

The Department of Computer Science will provide 1 part-time faculty, resulting in 0.50 part-time instructional effort in the initiation semester through the target year in 2026-2027.

The Department of Mathematics and Statistics will provide 1 part-time faculty, resulting in 0.50 part-time instructional effort through the target year in 2026-2027.

The Department of Philosophy and Religious Studies will provide 1 part-time faculty, resulting in 0.50 part-time instructional effort through the target year in 2027-2028.

The Department of Electrical and Computer Engineering will provide 1 part-time faculty, resulting in 0.50 part-time instructional effort through the target year in 2026-2027.

The Department of Political Science and Geography will provide 1 part-time faculty, resulting in 0.50 part-time instructional effort through the target year in 2026-2027.

Adjunct Faculty
No adjunct faculty are required to launch and sustain the proposed degree program.

Graduate Assistants
No graduate assistants are required to launch and sustain the proposed degree program.

Classified Positions
The administrative assistant employed by the School of Data Science will support the proposed degree program. The program will require .5 FTE of classified support to launch the program and sustain the level of effort will remain constant through the target year. Salary for the administrative assistant will be $25,000 in salary and $11,812 in benefits.

Equipment (including computers)
No new equipment, including computers is necessary to launch and sustain the proposed degree program.

Library
No additional library resources are required to launch and sustain the proposed degree program. The University Libraries has resources to include journals, magazines, electronic materials, and other publications for data science and analytics. As a member of the Virtual Library of Virginia (VIVA), online access to journals is available.

Telecommunications
No new telecommunications resources are required to launch and sustain the proposed degree program.

Space
No new space is required to launch and sustain the proposed degree program.

Appendices

Credit Hours ±Freshman±Fall Semester±15
Credit Hours ±Freshman±Spring Semester±15
Credit Hours ±Sophomore±Fall Semester±14
Credit Hours ±Sophomore±Spring Semester±14
Credit Hours ±Junior ±Fall Semester±16
Credit Hours ±Junior ±Spring Semester±16
Credit Hours ±Senior ±Fall Semester±15
Credit Hours ±Senior ±Spring Semester±15

Total Credit Hours 120

Appendix B ± Course Descriptions

New courses are denoted with an asterisk.

Core Courses

BDA 200T. Elements of Data Science. 3 Credits.
This course offers a non-technical introduction to the emerging and interdisciplinary area of data

in discipline-specific research methods and statistics courses. Senior standing.

IT 360T. Principles of Information Technology. 3 Credits.
A survey of computer hardware, software, procedures, applications, and management information concepts. Provides an understanding of the application of the computer to the support of managerial decision making. Information Systems majors may not use this course for credit toward the B.S.B.A. degree. Prerequisites: completion of general education information literacy and research requirement and junior standing and a declared major in the University or permission of the Dean's Office.

IT 450. Database Concepts. 3 Credits.
Introduction to database concepts. Historical development, data models, database analysis, design and implementation, query languages, data security, and introduction to business transaction systems. Prerequisites: IT 201 with a C or better or IT 360T for non-IT major students and a declared major in the university or waiver approved through the Strome College of Business Undergraduate Advising; permission of the instructor is required for non-IT major students.

MATH 163. Precalculus II. 3 Credits.
The second course in a two-course sequence designed to provide strong preparation for calculus. Topics include exponential and logarithmic functions/equations, trigonometric functions/equations, trigonometric identities, laws of sines and cosines, vectors, polar representation of complex numbers, binomial theorem, and conic sections. Prerequisite: A grade of C or better in MATH 162M.

STAT 130M. Elementary Statistics. 3 Credits.
Topics included data description, elementary probability, binomial and normal distributions, interval estimation, hypothesis testing, and correlation. The role of probability in inference is emphasized. Prerequisites: qualifying score on a placement test administered by the University Testing Center, qualifying SAT or ACT score, MATH 100 or a C or better in MATH 101M, or a

MATH 211 Calculus I. 4 Credits.

models, support vector machine, decision trees, neural networks, etc.), unsupervised learning (scaling, dimension reduction, clustering, etc.), reinforcement learning, and model evaluation. The course will also discuss applications on image analysis, text processing, and biomedical informatics. Prerequisites: MATH 316 and CS 150 (or equivalent programming experience).

CS 480/580 Introduction to Artificial Intelligence. 3 Credits.
Laboratory work required. Introduction to concepts, principles, challenges, and research in major areas of AI. Areas of discussion include natural language and vision processing, machine learning, machine logic and reasoning, robotics, expert and mundane systems. Prerequisites: A grade of C or better in CS 361.

BDA 411/511. Introduction to Machine Learning. 3 Credits.
An introductory course on machine learning. Machine Learning is the science of discovering pattern and structure and making predictions in data sets. It lies a

algorithms, which learn from examples. Topics include multiple machine learning models: linear regression, logistic regression, neural networks, support vector machines, deep,learning Bayesian learning and unsupervised learning. Students are expected to use popular machine learning tools and algorithms to solve real data engineering problems. (Offered spring) Prerequisites: A grade of C or better in ENGN 150 or CS 150. Pre or corequisite: ECE

3. Geospatial Analysis

General Prerequisites

GEOG 102T. Digital Earth: Geospatial Technology and Society. 3 Credits.
This course provides an overview and exploration of 1) the digital representation of the Earth and 2) geospatial science and technology. The course investigates geospatial technological innovations affecting the environment, resources, and society, including satellite global positioning systems, geographic information systems, and earth observations. Students develop hands-on skills as well as critical thinking skills concerning the role of increasingly ubiquitous geospatial technology and their influences on social, economic, and human-environment interactions.

Course Prerequisites

GEOG 402/502. Geographic Information Systems. 3 Credits.
A study of the conceptual basis of GIS as a tool for manipulating spatial information. The course focuses on how geographic information can be input and organized within the framework of a GIS. Students will work on a computer-based GIS to gain a greater understanding of spatial database structures and analytical operations. Prerequisites: Junior standing or permission of instructor.

GEOG 404/504. Digital Techniques for Remote Sensing. 3 Credits.
Study of the theory and application of remote sensing, emphasizing environmental applications and aerial and satellite imagery. Covers the fundamentals of multispectral digital image processing, including sensors, preprocessing, enhancement, classification, accuracy assessment, and GIS data integration. Prerequisites: Junior standing or permission of instructor.

Courses

GEOG 419/519 Spatial Analysis of Coastal Environments. 3

Prerequisites: GEOG402.

GEOG 462/562. Advanced Spatial Analysis. 3 Credits.
This course introduces the essential theoretical concepts and analytical tools for analyzing spatial process, spatial autocorrelation, spatial patterns, techniques for spatial interpolation, network connectivity, big data, and landscape patterns. The course culminates with students carrying out their own spatial analysis projects. This course assumes that students understand the basic

Appendix D - Employee Demand Job Announcements

- Work with large datasets and mine relevant information for use in AI/ML applications
- Demonstrate ability to develop approaches and solutions to complex problems in the forms of proposals, software, documents or other work products

Benefits

- Salary Range: $107,400 - $169,600 (SCS III)
- At Jefferson Lab, we believe that a comprehensive employee benefits program is an important and meaningful part of the compensation employees receive
- Medical, Dental, and Vision Care Plans
- Flexibleĩ…
-
-
-
-
-

recognized exemptions to the COVID-19 vaccination.

Posting Date: 07/27/2022
Salary Range: $107,400 - $169,600 (SCS III)
Work Location Type: Flexible On-site (working more than 60% on-site)

Come join our team at Jefferson Lab, where great minds matter.

What your job will be like:

The Computational Sciences and Technology (CST) division is responsible for the support of scientific computing projects and the computing infrastructure that advance the science mission of the laboratory. The mission for the data science department is to develop and apply advance data analytics to advance the Jefferson Lab scientific objective and regional scientific efforts. The Data Science Department at Jefferson Lab is conducting research and development in machine learning and data analysis focused on:
• Uncertainty quantification for single pass deep learning models
• Automated and autonomous for design and control applications
• Robust and scalable Machine Learning (ML)/Artificial Intelligence (AI) solutions

In this role you will:
• Identify, lead and complete technical efforts in data science for projects at Jefferson Lab and sponsors
• Contribute to program development by assisting in proposal writing, attend DOE workshops and identifying new collaboration
• Develop software for HPC system across the DOE computing facilities
• Work with large datasets and mine relevant information for use in AI/ML applications
• Demonstrate ability to develop approaches and solutions to complex problems in the forms of proposals, software, documents or other work products.

- + Proven skills in data science related to data wrangling and analysis of data
- + Applicants selected for this position must be eligible for security clearances, will be subject to a government security investigation, and must meet eligibility requirements for access to classified information.
- + Typically requires a minimum of 5 years of related experience with a Bachelor's degree; or 3 years and a Master's degree; or a PhD with relevant experience who can immediately contribute at this job step; or equivalent combination of related education and work experience.
- + Experience in a customer-facing environment
- + Experience working with teams
- + Experience with cyber analytics
- + Experience with data visualization
- + Demonstrated experience visualizing multi-dimensional data using tools such as Tableau, Qlik, Kibana, neo4j, ggplot2, Plotly, matplotlib, or D3.
- + Demonstrated experience with one modern programming language such as Python, C
- $107,500 - $134,500 - $161,500 Annual
- Newly hired employees must be fully vaccinated prior to their employment start date.
- MITRE will provide reasonable accommodation to individuals who are legally entitled to an exemption under applicable laws so long as it does not create an undue hardship for MITRE and/or does not pose a direct threat to the health or safety of the employee or others in the workplace.
- MITRE is proud to be an equal opportunity employer.
- MITRE recruits, employs, trains, compensates, and promotes regardless of age; ancestry; color; family medical or genetic information; gender identity and expression; marital, military, or veteran status; national and ethnic origin; physical or mental disability; political affiliation; pregnancy; race; religion; sex; sexual orientation; and any other protected characteristics.
- MITRE intends to maintain a website that is fully accessible to all individuals.
- If you are unable to search or apply for jobs and would like to request a reasonable accommodation for any part of MITRE's employment process, please contact MITRE's Recruiting Help Line at 703-983-8226 or email at recruitinghelp@mitre.org.
- Copyright © 1997-2021, The MITRE Corporation.
- All rights reserved.
- MITRE is a registered trademark of The MITRE Corporation.
- Material on this site may be copied and distributed with permission only.
- Benefi ђ