

Data Science

Data Science Degrees and Certificates

THE DATA SCIENCE MAJOR (BS)

D
a
t
a
S
c
i
e
n
c
e
A
s
s
o
c
i
a
t
e
P
r
o
f
e
s
s
o
r
:
D
a
v
i
d
S
o
n
n
i

e
r
T
w
o
-
Y
e
a
r
V
i
s
i
t
i
n
g
A
s
s
o
c
i
a
t
e
P
r
o
f
e
s
s
o
r
:
M
a
r
c
u
s
B

**i
r
k
e
n
k
r
a
h
e**

**D
a
t
a
i
s
b
e
i
n
g
g
e
n
e
r
a
t
e
d
a
t
a
l
l
t
i
m
e
s
,
a
r
r
i
v
i
n
g
f
r
o
m
m
u**

l
t
i
p
l
e
s
o
u
r
c
e
s
a
t
a
n
i
n
c
r
e
d
i
b
l
e
r
a
t
e
. N
e
a
r
l
y
e
v
e
r
y
d
e
v
i
c
e
c
o
n
n
e
c
t
e
d
t
o

t
h
e
i
n
t
e
r
n
e
t
i
s
g
e
n
e
r
a
t
i
n
g
d
a
t
a
,
a
n
d
t
h
o
s
e
c
a
p
a
b
l
e
o
f
a
n
a
l
y
s
i
s
a
n
d
s
t
u
d

y
o
f
i
t
i
s
i
n
c
r
e
a
s
i
n
g
l
y
i
n
d
e
m
a
n
d
. T
h
e
o
n
g
o
i
n
g
g
e
n
e
r
a
t
i
o
n
o
f
" b
i
g
d
a
t
a
" h

a
s
r
e
s
u
l
t
e
d
i
n
a
n
e
w
j
o
b
m
a
r
k
e
t
:
b
u
s
i
n
e
s
s
l
e
a
d
e
r
s
,
s
c
i
e
n
t
i
s
t
s
,
e
n
g
i
n
e
e

r
s
a
n
d
l
e
a
d
e
r
s
i
n
a
l
l
w
a
l
k
s
o
f
l
i
f
e
h
a
v
e
r
e
a
l
i
z
e
d
t
h
a
t
t
h
e
y
n
e
e
d
s
c
i
e
n
t
i
s

t
s
w
i
t
h
t
h
e
k
n
o
w
l
e
d
g
e
a
n
d
a
b
i
l
i
t
y
t
o
a
n
a
l
y
z
e
,
a
n
d
u
n
d
e
r
s
t
a
n
d
t
h
e
i
m
p
l
i
c

a
t
i
o
n
s
o
f
t
h
e
d
a
t
a
a
n
d
t
h
e
n
c
o
m
m
u
n
i
c
a
t
e
t
h
e
i
r
f
i
n
d
i
n
g
s
. I
n
a
d
d
i
t
i
o
n
t
o
t

h
e
d
a
t
a
t
h
a
t
i
s
b
e
i
n
g
c
o
n
s
t
a
n
t
l
y
g
e
n
e
r
a
t
e
d
t
h
r
o
u
g
h
m
o
d
e
r
n
c
o
m
m
e
r
c
i
a
l
u

s
e
o
f
t
h
e
i
n
t
e
r
n
e
t
,
a
n
a
b
u
n
d
a
n
c
e
o
f
d
a
t
a
h
a
s
b
e
e
n
i
n
e
x
i
s
t
e
n
c
e
f
o
r
s
o
m
e
t
i

m
e
.
T
h
e
p
r
o
p
e
r
s
t
u
d
y
a
n
d
u
n
d
e
r
s
t
a
n
d
i
n
g
o
f
t
h
e
i
m
p
l
i
c
a
t
i
o
n
s
o
f
t
h
i
s
d
a
t
a

i
s
i
n
c
r
e
a
s
i
n
g
l
y
i
m
p
o
r
t
a
n
t
.
T
h
e
L
y
o
n
C
o
l
l
e
g
e
D
a
t
a
S
c
i
e
n
c
e
p
r
o
g
r
a
m
w
i
l

I
p
r
o
v
i
d
e
s
t
u
d
e
n
t
s
w
i
t
h
t
h
e
t
h
e
o
r
e
t
i
c
a
l
b
a
c
k
g
r
o
u
n
d
a
n
d
i
n
i
t
i
a
l
p
r
o
b
l
e

m
-
s
o
l
v
i
n
g
e
x
p
e
r
i
e
n
c
e
s
f
o
c
u
s
i
n
g
o
n
t
h
r
e
e
g
e
n
e
r
a
l
b
r
o
a
d
a
r
e
a
s
:
s
c
i
e
n
c
e

, b u s i n e s s a n d e c o n o m i c s , a n d s o c i a l s c i e n c e s a n d h u m a n i t i e s .

N O T E : T o

g
r
a
d
u
a
t
e
w
i
t
h
a
B
a
c
h
e
l
o
r
o
f
A
r
t
s
o
r
B
a
c
h
e
l
o
r
o
f
S
c
i
e
n
c
e
d
e
g
r
e
e
f
r
o
m
L
y
o
n
C

College, students must successfully complete a minimum of 120 semester c

redit hours comprised of four required Core Curriculum (44-48 hours); th

requirements of at least one major (credit hours vary per major), and as

e
l
e
c
t
i
o
n
o
f
o
u
r
L
i
b
e
r
a
l
A
r
t
s
e
l
e
c
t
i
v
e
s
. T
h
e
y
m
u
s
t
a
l
s
o
e
a
r
n
a
t
l
e
a
s
t
a
2
. 0

O
c
c
u
m
u
l
a
t
i
v
e
g
r
a
d
e
p
o
i
n
t
a
v
e
r
a
g
e
f
o
r
a
l
l
w
o
r
k
t
a
k
e
n
a
t
L
y
o
n
C
o
l
l
e
g
e
a
n
d
a
2

MATH CORE COMPETENCE

| Item # | Title | Credits |
|---------------|--------------------|----------------|
| MTH 210 | Calculus I | 4 |
| MTH 220 | Calculus II | 4 |
| MTH 330 | Linear Algebra | 3 |
| | MTH 360 or BUS 323 | 3 |
| | CSC 415 or MTH 415 | 3 |
| | Sub-Total Credits | 17 |

DATA SCIENCE CORE COMPETENCE

DATA SCIENCE SPECIALIZATION - TWO COURSES

| Item # | Title | Credits |
|---------------|---|----------------|
| DSC 302 | Data Visualization | 3 |
| DSC 401 | Data Science Applications and Programming | 3 |
| DSC 450 | Data Science Independent Study | 3 |
| DSC 482 | Data Science Special Topics | 3 |
| | Sub-Total Credits | 6 |

REQUIREMENTS FOR SCIENCE TRACK

| Item # | Title | Credits |
|---------------|---|----------------|
| | Data Science Elective Group - Science Track | 9 - 12 |
| | Data Science Independent Study Lab | 3 |
| | Sub-Total Credits | 12-15 |

REQUIREMENTS FOR BUSINESS & ECONOMICS TRACK

| Item # | Title | Credits |
|--------|--|---------|
| | Data Science Elective Group - Business & Economics Track | 15 |
| | Sub-Total Credits | 15 |

REQUIREMENTS FOR SOCIAL SCIENCES/ HUMANITIES/FINE ARTS TRACK

| Item # | Title | Credits |
|---------|--|---------|
| CSC 105 | Digital Humanities | 3 |
| | Data Science Independent Study Lab | 3 |
| | Data Science Elective Group - Social Sciences/Humanities/ Fine Arts | 6 |
| | Sub-Total Credits | 12 |

CORE CURRICULUM

| Item # | Title | Credits |
|--------|------------------------------|---------|
| | Core Curriculum Requirements | 44 - 48 |
| | Sub-Total Credits | 44-48 |

| | | |
|--|-----------------------|----------------|
| | Total credits: | 104-111 |
|--|-----------------------|----------------|

CATEGORY DESCRIPTIONS

CSC 100 or CSC 115

| Item # | Title | Credits |
|---------|-------------------------------------|---------|
| CSC 100 | Introduction to Programming in C++ | 3 |
| CSC 115 | Introduction to Programming in Java | 3 |

MTH 360 or BUS 323

| Item # | Title | Credits |
|---------|--|---------|
| MTH 360 | Probability and Statistics | 3 |
| BUS 323 | Statistical Applications to Business Decision Making | 3 |

CSC 415 or MTH 415

| Item # | Title | Credits |
|---------|--------------------|---------|
| CSC 415 | Numerical Analysis | 3 |
| MTH 415 | Numerical Analysis | 3 |

Data Science Elective Group - Science Track

The student will take three science classes 200 level or above.

The student will enroll in DSC 450, 1 hour, and participate in a course-related project under the supervision of the advisor and the professor for each class.

SCIENCE TRACK ELECTIVES

| Item # | Title | Credits |
|---------|---------------------------------|---------|
| BIO 220 | General Botany | 4 |
| BIO 222 | Zoology | 4 |
| BIO 250 | Cell Biology | 4 |
| BIO 260 | Human Anatomy and Physiology I | 4 |
| BIO 262 | Human Anatomy and Physiology II | 4 |
| BIO 340 | Ecology | 4 |
| BIO 345 | Speleology | 4 |
| BIO 350 | Microbiology | 4 |
| BIO 352 | Molecular Biology | 4 |

| | | |
|---------|---------------------------------------|-------|
| BIO 356 | Biochemistry | 4 |
| BIO 366 | Histology | 4 |
| BIO 370 | Evolution | 3 |
| BIO 382 | Special Topics in Biology | 3 - 4 |
| BIO 420 | Advanced Topics in Biology | 3 - 4 |
| BIO 425 | Advanced Biochemistry | 4 |
| CHM 210 | Organic Chemistry I | 4 |
| CHM 220 | Organic Chemistry II | 4 |
| CHM 224 | Quantitative Analysis | 4 |
| CHM 302 | Instrumental Analysis | 4 |
| CHM 304 | Environmental Chemistry | 4 |
| CHM 350 | Chemical Thermodynamics and Kinetics | 4 |
| CHM 356 | Biochemistry | 4 |
| CHM 360 | Quantum Chemistry and Spectroscopy | 4 |
| CHM 413 | Advanced Inorganic Chemistry | 4 |
| CHM 425 | Advanced Biochemistry | 4 |
| CHM 482 | Topics in Chemistry | 3 |
| PHY 210 | General Physics I | 3 |
| PHY 211 | General Physics I Laboratory | 1 |
| PHY 220 | General Physics II | 3 |
| PHY 221 | General Physics II Laboratory | 1 |
| PHY 240 | Fundamentals of Physics I | 3 |
| PHY 241 | Fundamentals of Physics I Laboratory | 1 |
| PHY 250 | Fundamentals of Physics II | 3 |
| PHY 251 | Fundamentals of Physics II Laboratory | 1 |
| PHY 282 | Special Topics in Physics | 3 |
| PHY 335 | Modern Physics | 3 |
| PHY 382 | Special Topics in Physics | 3 |

Data Science Independent Study Lab

For each class, the student will take a DS lab (1 hour) with a course related project.

INDEPENDENT STUDY LAB

| Item # | Title | Credits |
|---------|--------------------------------|---------|
| DSC 450 | Data Science Independent Study | 3 |

Data Science Elective Group - Business & Economics Track

The student will meet requirements for a minor in Business of Economics OR complete the following classes:

BUSINESS & ECONOMICS TRACK

| Item # | Title | Credits |
|---------|-----------------------------|---------|
| ECO 101 | Principles of Economics I | 3 |
| ECO 102 | Principles of Economics II | 3 |
| ACC 210 | Principles of Accounting I | 3 |
| ACC 211 | Principles of Accounting II | 3 |
| ECO 306 | Econometrics | 3 |

Data Science Elective Group - Social Sciences/Humanities/Fine Arts

With approval from your advisor and the professor for each class, the student will complete the following Social Science/Humanities/Fine Arts classes.

The student will take two classes from either Social Science, Humanities, or Fine Arts division.

For each class, the student will take a DS lab (1 hr) with a course related project.

SOCIAL SCIENCE/HUMANITIES/FINE ARTS TRACK

| Item # | Title | Credits |
|--------|-------|---------|
|--------|-------|---------|

| | | |
|---------|--|---|
| RPH 210 | The Legacy of Ancient Greek Civilization in the Era of Globalization | 3 |
| RPH 306 | Logic | 3 |
| RPH 310 | Philosophy of Art | 3 |
| RPH 320 | Christian Ethics | 3 |
| RPH 325 | Jesus and the Gospels | 3 |
| RPH 329 | The Early Church | 3 |
| RPH 335 | Women's Issues | 3 |
| RPH 337 | Plato's Dialogues | 3 |
| RPH 350 | Business and Professional Ethics | 3 |
| RPH 351 | Ancient Political Philosophy | 3 |
| RPH 353 | Modern Political Philosophy | 3 |
| RPH 360 | Introduction to Contemporary Critical Theory | 3 |
| RPH 362 | Environmental Ethics | 3 |
| RPH 365 | Topics in Religion | 3 |
| RPH 370 | Topics in Philosophy | 3 |
| RPH 470 | Advanced Seminar: In-depth Study of Religion and Philosophy | 3 |
| POL 201 | Comparative Politics | 3 |
| POL 205 | World Politics | 3 |
| POL 210 | Introduction to Legal Studies | 3 |
| POL 220 | Introduction to Research Methods in Political Science | 3 |
| POL 250 | Political Issues and Public Policy | 3 |
| POL 288 | Political Parties, Campaigns & Elections | 3 |
| POL 297 | International Conflict | 3 |
| POL 302 | Arkansas State and Local Government | 3 |
| POL 315 | U.S. Foreign and Security Policy | 3 |
| POL 325 | American Political Institutions | 3 |
| POL 346 | International Law and Organizations | 3 |
| POL 349 | The German Political and Cultural Tradition | 3 |
| POL 351 | Ancient Political Philosophy | 3 |
| POL 353 | Modern Political Philosophy | 3 |
| POL 358 | Modern Russia | 3 |
| POL 368 | Asian Politics | 3 |
| POL 370 | Political Economy of Public Issues | 3 |

| | | |
|---------|--|---|
| POL 371 | The Middle East | 3 |
| POL 380 | Civil Liberties | 3 |
| POL 382 | Special Topics in Political Science | 3 |
| POL 455 | Senior Seminar | 3 |
| HIS 280 | Historiography and the Historical Method | 3 |
| HIS 301 | British History I | 3 |
| HIS 302 | British History II | 3 |
| HIS 303 | History of Ireland | 3 |
| HIS 304 | History of Scotland | 3 |
| HIS 305 | Britain and the British Empire | 3 |
| HIS 306 | Celtic World in Film | 3 |
| HIS 307 | Scottish Enlightenment | 3 |
| HIS 308 | Topics in Scottish and Irish Studies | 3 |
| HIS 310 | Colonial America | 3 |
| HIS 312 | Founding America | 3 |
| HIS 325 | History and Film | 3 |
| HIS 334 | Recent European History | 3 |
| HIS 340 | The French Revolution and Napoleon | 3 |
| HIS 353 | The Evolution of War | 3 |
| HIS 355 | The Reformation | 3 |
| HIS 356 | The Spanish Golden Age | 3 |
| HIS 357 | Early Modern France | 3 |
| HIS 361 | The Civil War | 3 |
| HIS 367 | Life in 20th Century America | 3 |
| HIS 382 | Special Topics in History | 3 |
| HIS 470 | Celtic Studies Research | 3 |
| HIS 480 | Senior Seminar | 3 |
| ANT 205 | Human Origins | 3 |
| ANT 282 | Special Topics | 3 |
| ANT 307 | Ethnographic Methods | 3 |
| ANT 320 | Human Variation and Adaptation | 3 |
| ANT 323 | Globalization | 3 |
| ANT 331 | Gender and Culture | 3 |
| ANT 382 | Special Topics in Anthropology | 3 |

| | | |
|---------|--|---|
| ENG 203 | Classical Mythology and Literature | 3 |
| ENG 209 | Welsh Mythology | 3 |
| ENG 210 | Studies in Fiction | 3 |
| ENG 211 | Introduction to Poetry | 3 |
| ENG 212 | Topics in Literature | 3 |
| ENG 215 | Introduction to Shakespeare | 3 |
| ENG 290 | Survey of British Literature I | 3 |
| ENG 291 | Survey of British Literature II | 3 |
| ENG 323 | Nineteenth Century British Poetry | 3 |
| ENG 330 | American Literature to 1900 | 3 |
| ENG 331 | American Literature from 1900 | 3 |
| ENG 333 | Modern Poetry | 3 |
| ENG 334 | American Fiction of the 20th Century | 3 |
| ENG 335 | British Fiction | 3 |
| ENG 337 | Advanced Grammar | 3 |
| ENG 340 | Film Studies | 3 |
| ENG 363 | Advanced Composition | 3 |
| ENG 365 | Introduction to Contemporary Critical Theory | 3 |
| ENG 366 | Topics in Critical Theory | 3 |
| ENG 433 | Nineteenth-century British Literature | 3 |
| ENG 441 | Shakespeare | 3 |
| ENG 442 | Faulkner | 3 |
| ENG 443 | Major Writers | 3 |
| FMS 382 | Special Topics in Film and Screen Cultures | 3 |
| FRN 315 | Advanced Grammar and Composition | 3 |
| FRN 320 | French Linguistics and Phonetics | 3 |
| FRN 340 | Eighteenth-century French Studies | 3 |
| FRN 345 | Nineteenth-century French Studies | 3 |
| FRN 350 | Twentieth-century French Studies | 3 |
| FRN 355 | Contemporary France | 3 |
| FRN 382 | Special Topics in French | 3 |
| JRN 203 | News Writing | 3 |
| JRN 303 | News Editing | 3 |
| JRN 382 | Special Topics in Journalism | 3 |

| | | |
|---------|---|---|
| SPN 315 | Introduction to Spanish Linguistics | 3 |
| SPN 333 | Advanced Grammar and Composition | 3 |
| SPN 335 | Hispanic Cinema | 3 |
| SPN 360 | Hispanic Culture and Civilization | 3 |
| SPN 378 | Introduction to Peninsular and Latin American Literature I | 3 |
| SPN 379 | Introduction to Peninsular and Latin American Literature II | 3 |
| SPN 382 | Special Topics | 3 |
| SPN 385 | Studies in the Spanish Golden Age and Baroque | 3 |
| SPN 405 | Studies in Nineteenth-century Peninsular Literature | 3 |
| SPN 406 | Studies in Twentieth-century Peninsular Literature | 3 |
| SPN 410 | 20th Century Latin American Prose Fiction | 3 |
| SPN 415 | U.S. Latino Literature | 3 |
| MUS 205 | Advanced Music Theory | 3 |
| MUS 263 | Ceol Mor I (classical Bagpipe I) | 3 |
| MUS 291 | Topics in Music History | 3 |
| MUS 292 | Topics in Music Theory | 3 |
| MUS 293 | Topics in Performance Practice | 3 |
| MUS 295 | World Music | 3 |
| MUS 296 | Bach's Germany | 3 |
| MUS 311 | Medieval and Renaissance Music | 3 |
| MUS 320 | Baroque and Classical Music | 3 |
| MUS 325 | Nineteenth- and Twentieth-century Music | 3 |
| MUS 330 | Hymnody | 3 |
| MUS 363 | Ceol Mor II (classical Bagpipe II) | 3 |
| MUS 420 | Conducting | 3 |
| MUS 430 | Church Music | 3 |
| MUS 431 | Vocal Pedagogy | 3 |
| MUS 432 | Instrumental Pedagogy | 3 |
| MUS 433 | Keyboard Pedagogy | 3 |
| MUS 463 | Ceol Mor III (classical Bagpipe III) | 3 |
| ART 220 | Digital Studio I | 3 |
| ART 230 | History of Modern Art | 3 |
| ART 282 | Special Topics in Art | 3 |
| ART 299 | Art in Context | 1 |

| | | |
|---------|-----------------------|---|
| ART 308 | Renaissance Art | 3 |
| ART 340 | Film Studies | 3 |
| ART 382 | Special Topics in Art | 3 |

Core Curriculum Requirements

Developmental requirements (up to 6 credits):

Taken in the first semester, if placed into it:

- ENG 001 College English

Taken in the first year, if placed into it:

- MTH 001 Intermediate Algebra

Proficiency requirements (15 credits):

Taken in the first two years, if not placed out of it:

- MTH 101 College Algebra **or**
- MTH 103 College Algebra w/Lab **or**
- MTH 105 Mathematics for Liberal Arts

Taken in the first year (depending on placement):

- ENG 101 English Composition I (taken immediately if placed into it or immediately following completion of ENG 001 with a grade of 'C' or better)
- ENG 102 English Composition II (taken immediately following successful completion of ENG 101 with a grade of 'C' or better)

Recommended but not required in the first year:

- First-year of a foreign language

Common Core requirements (13-14 credits):

Taken in the first year (or within one year of completing any pre-requisite coursework):

- COR 100 Year One
- COR 101 Year One OH ONE

Taken anytime in the first TWO years:

- ENG 105 World Literature
- POL 105 The American Experience

Taken anytime prior to graduation:

- HIS 110 World Civilization
- HIS 112 World Civilization II

Distribution requirements:

One fine arts course (3 credits)

Select from the following:

- ART 101 Introduction to Visual Arts
- ART 201, 202 World Art I and II
- MUS 105 Language of Music
- MUS 110 Music Theory
- THE 101 Introduction to Theatre

One social science course (3 credits)

Select from the following:

- ANT 101 Introduction to Cultural Anthropology
- ECO 101 Principles of Economics I
- PSY 101 Introduction to Psychology

One mathematics course (3-4 credits)

Select from the following:

- MTH 105 Mathematics for Liberal Arts
- MTH 110 Elementary Functions
- MTH 115 Discrete Mathematics **or** MTH 290 Foundations of Modern Mathematics
- ECO 208 Quantitative Methods in Business, Economics, and Decision Science
- MTH 210 Calculus I
- BUS 323 Statistical Applications to Business Decision Making
- PSY 235 Statistics for the Behavioral Sciences

One lab science course (4 credits)

Select from the following:

- BIO 100, 100L Biology in Context
- BIO 110, 110L Principles of Biology I
- CHM 105, 105L Introduction to Chemistry
- CHM 110, 110L General Chemistry I
- PHY 210, 211 General Physics
- PHY 240, 241 Fundamentals of Physics

- SCI 100, 100L Physical Science for Liberal Arts

One religion/philosophy course (3 credits)

Select from the following:

- RPH 110 Old Testament
- RPH 120 New Testament
- RPH 130 Introduction to Christian Theology
- RPH 140 Introduction to World Philosophies
- RPH 150 World Religions
- RPH 205 Introduction to Ethics

Two physical education courses (0-2 credits)

Select from the following:

- PED courses with designations from 101 to 130
- OLP courses with designations from 120 to 130

NOTE: Only one activity (specified PED/OLP) course can be taken per semester. Additionally, only seven activity credits can be counted toward the graduation requirement.

Data Science (DSC) Classes

DSC 105: Introduction to Data Science

c
e
d
o
m
a
i
n
.
S
t
u
d
e
n
t
s
a
r
e
i
n
t
r
o
d
u
c
e
d
t
o
d
a
t
a
c
o
l
l
e
c
t
i
o
n
,
d
a
t
a
e
n
g
i
n
e
e
r
i
n
g
,
m
a

c
h
i
n
e
l
e
a
r
n
i
n
g
a
l
g
o
r
i
t
h
m
s
a
n
d
p
a
c
k
a
g
e
s
,
d
a
t
a
v
i
s
u
a
l
i
z
a
t
i
o
n
t
e
c
h
n
i
q
u
e
s
a
n
d

r
e
l
a
t
e
d
p
r
o
g
r
a
m
m
i
n
g
t
o
o
l
s
a
n
d
f
r
a
m
e
w
o
r
k
s
e
d
i
t
s
:
3
P
r
e
r
e
q
u
i
s
i
t
e
s
:
C
S
C
1
0
0
o
r

DSC 205: Introduction to Advanced Data Science

D
a
t
a
c
o
l
l
e
c
t
i
o
n
,
d
a
t
a

C
S
G
I
S
E
C
S
O
G
a
n
d
h
e
h
e
a
M
H
D
G
a
b
g
M
H
I
S
S
a
n
d
p
a
c
k
a
g
e
s
,
d
a
t
a
v
i
s
u
a
l
i
z
a
t
i
o

n
,
a
n
d
r
e
l
a
t
e
d
p
r
o
g
r
a
m
m
i
n
g
t
o
o
l
s
a
n
d
f
r
a
m
e
w
o
r
k
s
. T
h
e
s
e
t
o
p
i
c
s
a
r
e
c
o
v
e
r
e
d
i
n

D
S
C
1
0
1
,
b
u
t
h
e
r
e
t
h
e
y
w
i
l
l
b
e
d
i
s
c
u
s
s
e
d
i
n
m
o
r
e
d
e
p
t
h
,
a
n
d
p
r
o
j
e
c
t
s
w
i
l
l
r
e
f
l
e

c
t
r
e
a
l
w
o
r
l
d
c
h
a
l
l
e
n
g
e
s
:
i
n
a
d
d
i
t
i
o
n
,
d
a
t
a
m
i
n
i
n
g
t
e
c
h
n
i
q
u
e
s
a
n
d
m
o
r
e
a
d
v
a
n

c
e
d
m
a
c
h
i
n
e
l
e
a
r
n
i
n
g
a
l
g
o
r
i
t
h
m
s
w
i
l
l
b
e
i
n
t
r
o
d
u
c
e
d
.
I
n
s
o
m
e
c
a
s
e
s
,
t
h
e
s
t
a
t
i

s
t
i
c
a
l
c
o
n
c
e
p
t
s
b
e
h
i
n
d
s
o
m
e
o
f
t
h
e
a
l
g
o
r
i
t
h
m
s
w
i
l
l
b
e
d
i
s
c
u
s
s
e
d
. P
r
o
j
e
c
t
s
m
a

y
i
n
v
o
l
v
e
t
e
x
t
a
n
d
i
m
a
g
e
c
l
a
s
s
i
f
i
c
a
t
i
o
n
t
a
s
k
s
,
d
e
v
e
l
o
p
i
n
g
r
e
g
r
e
s
s
i
o
n
m
o
d
e
l

C
s
e
d
t
c
:
4
P
r
e
r
e
q
u
i
s
i
t
e
s
:
D
S
C
1
0
5
o
r
C
S
C
1
0
9

DSC 302: Data Visualization

T
h
i
s
c
o
u
r
s
e
p
r
e
s
e
n
t
s
t
h
e
a
r
t
a
n
d
s
c
i
e
n
c
e
o
f
t
u
r
n
i
n
g
d
a
t
a
i
n
t
o
r
e
a
d
a
b
l
e
g

r
a
p
h
i
c
s
.
W
e
,
l
l
e
x
p
l
o
r
e
t
h
e
d
e
s
i
g
n
a
n
d
c
r
e
a
t
i
o
n
o
f
d
a
t
a
v
i
s
u
a
l
i
z
a
t
i
o
n
s
b
a
s
e
d

o
n
d
a
t
a
a
v
a
i
l
a
b
l
e
a
n
d
t
a
s
k
s
t
o
b
e
a
c
h
i
e
v
e
d
. T
h
i
s
p
r
o
c
e
s
s
i
n
c
l
u
d
e
s
d
a
t
a
m
o
d
e
l
i

ng,
,
d
a
t
a
p
r
o
c
e
s
s
i
n
g
,
m
a
p
p
i
n
g
d
a
t
a
a
t
t
r
i
b
u
t
e
s
t
o
g
r
a
p
h
i
c
a
l
a
t
t
r
i
b
u
t
e
s
,
a
n
d
s

t
r
a
t
e
g
i
c
v
i
s
u
a
l
e
n
c
o
d
i
n
g
.
S
t
u
d
e
n
t
s
w
i
l
l
e
v
a
l
u
a
t
e
t
h
e
e
f
f
e
c
t
i
v
e
n
e
s
s
o
f
v
i
s
u

a
l
i
z
a
t
i
o
n
d
e
s
i
g
n
s
a
n
d
c
r
e
a
t
e
t
h
e
i
r
o
w
n
d
a
t
a
v
i
s
u
a
l
i
z
a
t
i
o
n
s
:
3

DSC 305: Machine Learning

r
e
r
e
q
u
i

T
h
i
s
c
o
u
r
s

s
d
i
s
c
u
s
s
e
d
i
n
D
S
C
1
0
1
a
n
d
D
S
C
2
0
1
. T
o
p
i
c
s
i
n
c
l
u
d
e
p
r
o
b
a
b
i
l
i
t
y
,
p
r
o
b

c
m
o
d
e
l
s
,
s
t
a
t
i
s
t
i
c
a
l
c
o
n
c
e
p
t
s
r
e
l
a
t
e
d
t
o
m
a
c
h
i
n
e
l
e
a
r
n
i
n
g
,
a
n
d
a
n
a
l
y
s
i
s
o
f

s
o
m
e
o
f
t
h
e
p
o
p
u
l
a
r
m
a
c
h
i
n
e
l
e
a
r
n
i
n
g
m
o
d
e
l
s
w
i
t
h
t
h
e
h
e
l
p
o
f
p
r
o
b
a
b
i
l
i
t
y
a
n
d
s

t
a
t
i
s
t
i
c
s
.
P
r
o
j
e
c
t
s
w
i
l
l
r
e
f
l
e
c
t
r
e
a
l
w
o
r
l
d
c
h
a
l
l
e
n
g
e
s
a
n
d
w
i
l
l
a
i
m
a
t
d
i
s
c
o

v
e
r
i
n
g
h
o
w
m
a
c
h
i
n
e
l
e
a
r
n
i
n
g
m
o
d
e
l
e
w
e
d
k
t
s
.
3
P
r
e
r
e
q
u
i
s
i
t
e
s
:
D
S
C
1
0
5
o
r
D
S
C
2

DSC 401: Data Science Applications and Programming

T
h
i
s
c
o
u
r
s
e
w
i
l
l
o
f
f
e
r
p
r
o
g
r
a
m
m
i
n

O
G
B
A
C
S
C
A
S
S
and
tech
nique
s
neces
sary
to
proc
ess
and
analy
zed
data
.
Spe
cial
em

ph
h
a
s
i
s
w
i
l
l
b
e
o
n
a
d
v
a
n
c
e
d
u
s
e
o
f
P
y
t
h
o
n
a
n
d
R
l
a
n
g
u
a
g
e
s
t
o
a
n
a
l
y
z
e
d
a
t
a
s
e
t
s
f
r

o
m
a
v
a
r
i
e
t
y
o
f
d
i
s
c
i
p
l
i
n
e
s
a
n
d
i
n
d
u
s
t
r
i
e
s

DSC 402: Data Science Capstone

s
:
3
P
r
e
r
e
q
u
i
s
i
t
e
s
:
C
S
C
2
4
5

S
t
u
d
e
n
t
s
w
i
l
l
a
p
p
l
y
t
h
e
i
r
d
a
t
a

s
c
i
e
n
c
e
k
n
o
w
l
e
d
g
e
a
n
d
t
e
c
h
n
o
l
o
g
y
t
o
a
r
e
a
l
w
o
r
l
d
s
c
e
n
a
r
i
o
.
S
t
u
d
e
n
t
s
c
a
n
a
c
c
o

m
p
l
i
s
h
t
h
i
s
b
y
w
o
r
k
i
n
g
w
i
t
h
a
l
l
o
c
a
l
b
u
s
i
n
e
s
s
e
s
,
a
c
q
u
i
r
i
n
g
d
a
t
a
f
r
o
m
g
o
v
e
r
n
m
e

n
t
a
l
e
n
t
i
t
i
e
s
,
o
r
t
h
r
o
u
g
h
a
n
i
n
t
e
r
n
s
h
i
p
. The
c
a
p
s
t
o
n
e
w
i
l
l
c
o
n
c
l
u
d
e
w
i
t
h
a
f
i

n
a
l
d
e
l
i
v
e
r
a
b
l
e
r
e
p
o
r
t
a
n
d
p
r
e
s
e
n
t
a
t
i
o
n
t
o
t
h
e
b
u
s
i
n
e
s
s
·
g
o
v
e
r
n
m
e
n
t
·
o
r
i
n
t

e
r
n
s
h
i
p
e
n
c
r
i
t
s
:
3

DSC 450: Data Science Independent Study

DSC 482: Data Science Special Topics

I
n
d
i
v
i
d
u
a
l
w
o
r
k
o
n
s
p
e
c
i
a
l
t
o
p
i
c
s
i
n
d
a
t
a
s
c
i
e
n
c
e
. C
r
e
d
i
t
a
y
e

f
s
e
l
e
c
t
e
d
t
o
p
i
c
s
i
n
d
a
t
a
s
c
i
e
n
c
e
C
r
e
d
i
t
s
:
3
P
r
e
r
e
q
u
i
s
i
t
e
s
:
P
r
e
r
e
q
u
i
s
i
t
e
s
w

i
l
l
v
a
r
y
d
e
p
e
n
d
i
n
g
o
n
c
o
u
r
s
e
.