INFO 6105

Data Science Engineering Methods

(Computational Biology Emphasis)

Course Syllabus

Course Information

Professor: Nik Bear Brown

Email: [ni.brown@neu.edu](mailto:ni.brown@neu.edu)

Office: 505A Dana Hall

Office Hours: Zoom Only

Note: I am also a master’s student at Northeastern. Do not send e-mail to my student e-mail [brown.ni@husky.neu.edu](mailto:brown.ni@husky.neu.edu) I almost never read that e-mail.

All classes will be held on ground in Boston.

Course website: Canvas

The class sessions will be hybrid through Zoom and in-class. You have the choice to attend in class or through Zoom. They are synchronous. You are expected to attend class during the class time.

Course Prerequisites

A basic knowledge of the python programming language is required. Assignments are done in python .

Course Description

Introduces the core concepts of machine learning with a unique emphasis on computational biology. This course covers all foundational topics typically addressed in an introductory machine learning course, but all examples and case studies are rooted in biology and medicine. Students will gain a comprehensive understanding of various machine learning algorithms, their implementation, evaluation, and best practices. They will delve into the intricacies of how learning models are formulated from intricate data pipelines, both from an algorithmic and practical perspective.

Topics include:

Supervised learning (parametric/nonparametric algorithms, support vector machines, kernels, neural networks, deep learning).

Unsupervised learning (clustering, dimensionality reduction, recommender systems).

All case studies and real-world examples provided will draw from biological and medical datasets, allowing students to apply machine learning techniques to relevant challenges in the fields of biology and medicine.

The ability to use python is part of the grade. Students must demonstrate ability to setup data for learning, train, test, and evaluation using either python or R, but all assignment examples and solutions will be presented in python. The assignments include paper exercises designed to reinforce conceptual understanding. Quizzes and exams. A term project is required. A portfolio blog is required.

Communication

Communication between instructor and students is through

● Email via the Canvas distribution list

● Announcements posted on Canvas

● Notes posted on the Canvas discussion board

● Private email exchanges

Course Structure

* Regularly test students on paper/algorithmic exercises
* Evaluate students’ implementation competency, using assignments that require coding on given datasets
* Evaluate ability to setup data, code, and execute using python language
* Student will be required to do “data digging”: run analysis scripts and failure analysis
* Final project is typically asking and answering a “real world” question of interest using machine learning techniques

Course GitHub

The course GitHub (for all lectures, assignments and projects):

<https://github.com/nikbearbrown>

nikbearbrown YouTube channel

Over the course of the semester I’ll be making and putting additional data science and machine learning related video’s on my YouTube channel.

<https://www.youtube.com/user/nikbearbrown>

The purpose of these videos is to put additional advanced content as well as supplemental content to provide additional coverage of the material in the course. Suggestions for topics for additional videos are always welcome.

Schedule

| Week | Topic | Assignments |
| --- | --- | --- |
| 1) Week 1 | Intro to python  Exploratory Data Analysis  Research projects | Readings; Assignment 1  HackerRank Online Quiz |
| 2) Week 2 | Probability:  Counting  Understanding Probability Distributions  Random variables, quantiles, mean variance  Conditional probability, Bayes' theorem, base rate fallacy  Joint distributions, covariance, correlation, independence  Central limit theorem  Bias versus variance | Readings  HackerRank Online Quiz |
| 3) Week 3 | Statistics:  Bayesian inference with known priors, probability intervals  Conjugate priors  Bayesian inference with unknown priors  Frequentist significance tests and confidence intervals  Resampling methods: bootstrapping | Readings; Project proposal  Assignment 2  HackerRank Online Quiz |
| 4) Week 4 | Unsupervised Learning (Clustering)  Selecting and Evaluating Models  Theory of Modeling  Validation  Cross-Validation  ROC curves  Exam | HackerRank Online Quiz |
| 5) Week 5 | Linear Models, Model Inference and Interpretation  Regression  Logistic Regression  Regularization | Readings; Assignment 3  HackerRank Online Quiz |
| 6) Week 6 | Supervised Learning  Decision trees  k-Nearest Neighbors algorithm (k-NN)  Support Vector Machines  Data Visualization | Exam 1 |
| 7) Week 7 | Text Mining & NLP  Exam | Readings; Assignment 4  HackerRank Online Quiz |
| 8) Week 8 | Research progress reports | Readings; Project progress report.  HackerRank Online Quiz |
| 9) Week 9 | Time Series Analysis  ARIMA models  Trend Analysis  Seasonal Models | Readings; Assignment 5  HackerRank Online Quiz |
| 10) Week 10 | Data collection through web APIs  Recommender systems | HackerRank Online Quiz |
| 11) Week 11 | Naïve Bayesian Classifiers (NBCs)  Network Analysis  Social network analysis (SNA) | Readings; Assignment 6  HackerRank Online Quiz |
| 12) Week 12 | Neural Networks  Intro to Deep Learning | HackerRank Online Quiz |
| 13) Week 13 | Course Review | Readings; Assignment 7  Exam 2 |

Teaching assistants

The Teaching assistants are:

TBA

Programming questions should first go to the TA’s. If they can’t answer them then the TA’s will forward the questions to the Professor.

Learning Assessment

Achievement of learning outcomes will be assessed and graded through:

● Quizzes

● Exams

● Completion of assignments involving scripting in R or python, and analysis of data

● Completion of a term paper asking and answering a “real world” question of interest using machine learning techniques

● Portfolio piece

● Partidipcation (Counts as a 100 point assingment) the TAs will keep track of meaningful contributions to the class and give a score between 0-100 at the end of finals.

● ATTENDANCE (Counts as a 100 point assingment) the TAs will keep track of whether you are in class Zoom attendance does not count as .attendance.

Reaching out for help

A student can always reach out for help to the Professor, Nik Bear Brown [nikbearbrown@gmail.com](mailto:nik@ccs.neu.edu). In an online course, it’s important that a student reaches out early should he/she run into any issues.

Grading Policies

Students are evaluated based on their performance on assignments, performance on exams, and both the execution and presentation of a final project. If a particular grade is required in this class to satisfy any external criteria—including, but not limited to, employment opportunities, visa maintenance, scholarships, and financial aid—it is the student’s responsibility to earn that grade by working consistently throughout the semester. Grades will not be changed based on student need, nor will extra credit opportunities be provided to an individual student without being made available to the entire class.

Grading Rubric

A point system is used. Everything that you are expected to turn in has points. Points can range from 1 point to 1000 points Assignments get a 10% deduction for each day they are late rounded up. Exams cannot be made up unless arraignments are made before the exam.

I expect to use the following as a rough grading scale at the end of the semester. You should not expect a curve to be applied; but I reserve the right to use one. The curve may go up or down. That is it is possible for a 95 to be an A-.

| Score | Grade |
| --- | --- |
| 93 – 100 | A |
| 90 – 92 | A- |
| 88 – 89 | B+ |
| 83 – 87 | B |
| 80 – 82 | B- |
| 78 – 79 | C+ |
| 73 – 77 | C |
| 70 – 72 | C- |
| 60 – 69 | D |
| <60 | F |

Typically grades will end up roughly 25% A, 25% A-, 25% B+, 20% B , 5% less than B but that depends on students’ performance.

Canvas

You will submit your assignments via Canvas. Click the title of assignment (Canvas -> assignment -> <Title of Assignment>), to go to the submission page. You will know your score on an assignment, project or test via Canvas. Canvas only represents only the raw scores. Not normalized or curved grades. A jupyter notebook file ALONG with either a .DOC or .PDF rendering of that jupyter notebook file must be submitted with each assignment.

Multiple files must be zipped. No .RAR, .bz, .7z or other extensions.

Assignment file names MUST start with students last name then first name OR the groups name and include the class number and assignment number.

Assignment MUST estimate the percentage of code written by the student and that which came from external sources.

Assignment MUST specify a license at the bottom of each notebook turned in.

All code must adhere to a style guide and state which guide was used.

Due dates

Five percent (i.e. 5%) is deducted for each day an assignment is late. Solutions will be posted the following Monday. Assignments will receive NO CREDIT if submitted after the solutions are posted. Any extensions MUST be granted via e-mail and with a specific new due date.

Course Materials

*Required text (All free online)*

Some textbooks are all available for free to NEU students via SpringerLink ([http://link.Springer.com/](http://link.springer.com/)). You must access SpringerLink from an NEU IP address to have full access and/or download these books.

If you are off-campus, in order to access resources provided through the Northeastern library outside the network, you should use their bookmarklet to load any page through the proxy: <http://library.northeastern.edu/bookmarklet>

*Required Texts*

The *required* textbooks we will be using in this class are:

An Introduction to Statistical Learning with Applications in R (2013)

Authors: Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani

Free online via SpringerLink (http://link.Springer.com/) [http://link.Springer.com/book/10.1007/978-1-4614-7138-7](http://link.springer.com/book/10.1007/978-1-4614-7138-7)

The Elements of Statistical Learning: Data Mining, Inference, and Prediction (2017)

Authors: Trevor Hastie, Robert Tibshirani and Jerome Friedman

Free online <https://web.stanford.edu/~hastie/ElemStatLearn/printings/ESLII_print12.pdf>

Beginning Python

From Novice to Professional

Authors: Magnus Lie Hetland 2017

ISBN: 978-1-4842-0029-2 (Print) 978-1-4842-0028-5

[https://link.Springer.com/book/10.1007/978-1-4842-0028-5](https://link.springer.com/book/10.1007/978-1-4842-0028-5)

Python Recipes Handbook

A Problem-Solution Approach

Authors: Joey Bernard 2016

ISBN: 978-1-4842-0242-5 (Print) 978-1-4842-0241-8

[https://link.Springer.com/book/10.1007/978-1-4842-0241-8](https://link.springer.com/book/10.1007/978-1-4842-0241-8)

Lean Python

Learn Just Enough Python to Build Useful Tools

Authors: Paul Gerrard 2016

ISBN: 978-1-4842-2384-0 (Print) 978-1-4842-2385-7

[https://link.Springer.com/book/10.1007/978-1-4842-2385-7](https://link.springer.com/book/10.1007/978-1-4842-2385-7)

Learn to Program with Python

Authors: Irv Kalb 2016

ISBN: 978-1-4842-1868-6 (Print) 978-1-4842-2172-3

[https://link.Springer.com/book/10.1007/978-1-4842-2172-3](https://link.springer.com/book/10.1007/978-1-4842-2172-3)

*Recommended Texts*

The Definitive Guide to MongoDB: A complete guide to dealing with Big Data using MongoDB (2015)

Authors: David Hows, Peter Membrey, Eelco Plugge, Tim Hawkins

ISBN: 978-1-4842-1183-0 (Print) 978-1-4842-1182-3 (Online)

[http://link.Springer.com/book/10.1007/978-1-4842-1182-3](http://link.springer.com/book/10.1007/978-1-4842-1182-3)

Deep Learning - Adaptive Computation and Machine Learning series by Ian Goodfellow, Yoshua Bengio, and Aaron Courville

<https://github.com/HFTrader/DeepLearningBook>

Beginning Python

From Novice to Professional

Authors: Magnus Lie Hetland 2017

ISBN: 978-1-4842-0029-2 (Print) 978-1-4842-0028-5

[https://link.Springer.com/book/10.1007/978-1-4842-0028-5](https://link.springer.com/book/10.1007/978-1-4842-0028-5)

Deep Learning with Python

A Hands-on Introduction

Authors: Nikhil Ketkar 2017

ISBN: 978-1-4842-2765-7 (Print) 978-1-4842-2766-4

[https://link.Springer.com/book/10.1007/978-1-4842-2766-4](https://link.springer.com/book/10.1007/978-1-4842-2766-4)

Pro Hadoop Data Analytics

Designing and Building Big Data Systems using the Hadoop Ecosystem

Authors: Kerry Koitzsch 2017

ISBN: 978-1-4842-1909-6 (Print) 978-1-4842-1910-2

[https://link.Springer.com/book/10.1007/978-1-4842-1910-2](https://link.springer.com/book/10.1007/978-1-4842-1910-2)

Pro Apache Hadoop

Authors: Sameer Wadkar, Madhu Siddalingaiah 2014

ISBN: 978-1-4302-4863-7 (Print) 978-1-4302-4864-4

[https://link.Springer.com/book/10.1007/978-1-4302-4864-4](https://link.springer.com/book/10.1007/978-1-4302-4864-4)

Pro Spark Streaming

The Zen of Real-Time Analytics Using Apache Spark

Authors: Zubair Nabi 2016

ISBN: 978-1-4842-1480-0 (Print) 978-1-4842-1479-4

[https://link.Springer.com/book/10.1007/978-1-4842-1479-4](https://link.springer.com/book/10.1007/978-1-4842-1479-4)

Pro Python Best Practices

Debugging, Testing and Maintenance

Authors: Kristian Rother 2017

ISBN: 978-1-4842-2240-9 (Print) 978-1-4842-2241-6 (Online)

[https://link.Springer.com/book/10.1007/978-1-4842-2241-6](https://link.springer.com/book/10.1007/978-1-4842-2241-6)

Mastering Machine Learning with Python in Six Steps

A Practical Implementation Guide to Predictive Data Analytics Using Python

Authors: Manohar Swamynathan 2017

ISBN: 978-1-4842-2865-4 (Print) 978-1-4842-2866-1

[https://link.Springer.com/book/10.1007/978-1-4842-2866-1](https://link.springer.com/book/10.1007/978-1-4842-2866-1)

Introduction to Data Science

A Python Approach to Concepts, Techniques and Applications

Authors: Laura Igual, Santi Seguí 2017

ISBN: 978-3-319-50016-4 (Print) 978-3-319-50017-1

[https://link.Springer.com/book/10.1007/978-3-319-50017-1](https://link.springer.com/book/10.1007/978-3-319-50017-1)

Python Recipes Handbook

A Problem-Solution Approach

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[https://link.Springer.com/book/10.1007/978-1-4842-2172-3](https://link.springer.com/book/10.1007/978-1-4842-2172-3)

Big Data Made Easy

A Working Guide to the Complete Hadoop Toolset

Authors: Michael Frampton 2015

ISBN: 978-1-4842-0095-7 (Print) 978-1-4842-0094-0

[https://link.Springer.com/book/10.1007/978-1-4842-0094-0](https://link.springer.com/book/10.1007/978-1-4842-0094-0)

ggplot2: Elegant Graphics for Data Analysis (2009)

Authors: Hadley Wickham

Free online via (http://link.Springer.com/)

[http://link.Springer.com/book/10.1007/978-0-387-98141-3](http://link.springer.com/book/10.1007/978-0-387-98141-3)

R Quick Syntax Reference

Authors: Margot Tollefson

Free online via SpringerLink ([http://link.Springer.com/)](http://link.springer.com/))

[http://link.Springer.com/book/10.1007/978-1-4302-6641-9](http://link.springer.com/book/10.1007/978-1-4302-6641-9)

Probability for Statistics and Machine Learning Fundamentals and Advanced Topics (2011)

Authors: Anirban DasGupta Springer Texts in Statistics

Free online via SpringerLink ([http://link.Springer.com/](http://link.springer.com/) [http://link.Springer.com/book/10.1007/978-1-4419-9634-3](http://link.springer.com/book/10.1007/978-1-4419-9634-3)

The Elements of Statistical Learning: Data Mining, Inference, and Prediction (2011)

Authors: Trevor Hastie, Robert Tibshirani and Jerome Friedman

Free online <http://web.stanford.edu/~hastie/local.ftp/Springer/OLD/ESLII_print4.pdf>

Data Manipulation with R

Authors: Statistical Computing Facility Phil Spector

Free online via SpringerLink ([http://link.Springer.com/)](http://link.springer.com/))

[http://link.Springer.com/book/10.1007/978-0-387-74731-6](http://link.springer.com/book/10.1007/978-0-387-74731-6)

Beginning Data Science with R (2014)

Authors: Manas A. Pathak

ISBN: 978-3-319-12065-2 (Print) 978-3-319-12066-9 (Online)

[http://link.Springer.com/book/10.1007/978-3-319-12066-9](http://link.springer.com/book/10.1007/978-3-319-12066-9)

The Definitive Guide to SQLite (2010)

Authors: Grant Allen, Mike Owens

ISBN: 978-1-4302-3225-4 (Print) 978-1-4302-3226-1 (Online)

[http://link.Springer.com/book/10.1007/978-1-4302-3226-1](http://link.springer.com/book/10.1007/978-1-4302-3226-1)

The Definitive Guide to MongoDB: A complete guide to dealing with Big Data using MongoDB (2015)

Authors: David Hows, Peter Membrey, Eelco Plugge, Tim Hawkins

ISBN: 978-1-4842-1183-0 (Print) 978-1-4842-1182-3 (Online)

[http://link.Springer.com/book/10.1007/978-1-4842-1182-3](http://link.springer.com/book/10.1007/978-1-4842-1182-3)

Beginning CouchDB (2009)

Authors: Joe Lennon

ISBN: 978-1-4302-7237-3 (Print) 978-1-4302-7236-6 (Online)

[http://link.Springer.com/book/10.1007/978-1-4302-7236-6](http://link.springer.com/book/10.1007/978-1-4302-7236-6)

Beginning Neo4j (2015)

Authors: Chris Kemper

ISBN: 978-1-4842-1228-8 (Print) 978-1-4842-1227-1 (Online)

[http://link.Springer.com/book/10.1007/978-1-4842-122](http://link.springer.com/book/10.1007/978-1-4842-122)

A Tiny Handbook of R

Authors: Mike Allerhand

Free online via SpringerLink ([http://link.Springer.com/)](http://link.springer.com/))

[http://link.Springer.com/book/10.1007/978-3-642-17980-8](http://link.springer.com/book/10.1007/978-3-642-17980-8)

R Statistical Application Development by Example Beginner's Guide

Authors: Robert J Knell

PDF: <http://www.introductoryr.co.uk/Introductory%20R%20example%20chapters.pdf>

Beginning Data Science with R

Authors: Manas A. Pathak

Free online via SpringerLink ([http://link.Springer.com/)](http://link.springer.com/))

[http://link.Springer.com/book/10.1007/978-3-319-12066-9](http://link.springer.com/book/10.1007/978-3-319-12066-9)

Data Mining with Rattle and python The Art of Excavating Data for Knowledge Discovery (2011)

Authors: Graham Williams

Free online via SpringerLink ([http://link.Springer.com/](http://link.springer.com/)) [http://link.Springer.com/book/10.1007/978-1-4419-9890-3](http://link.springer.com/book/10.1007/978-1-4419-9890-3)

Bayesian Essentials with R

Authors: Jean-Michel Marin, Christian P. Robert

Free online via SpringerLink ([http://link.Springer.com/)](http://link.springer.com/))

[http://link.Springer.com/book/10.1007/978-1-4614-8687-9](http://link.springer.com/book/10.1007/978-1-4614-8687-9)

Text Analysis with python for Students of Literature

Authors: Matthew L. Jockers

Free online via SpringerLink ([http://link.Springer.com/)](http://link.springer.com/))

[http://link.Springer.com/book/10.1007/978-3-319-03164-4](http://link.springer.com/book/10.1007/978-3-319-03164-4)

Introductory Time Series with R

Authors: Andrew V. Metcalfe, Paul S.P. Cowpertwait

Free online via SpringerLink ([http://link.Springer.com/)](http://link.springer.com/))

[http://link.Springer.com/book/10.1007/978-0-387-88698-5](http://link.springer.com/book/10.1007/978-0-387-88698-5)

Data Analytics - Models and Algorithms for Intelligent Data Analysis 2012

Authors: Thomas A. Runkler

ISBN: 978-3-8348-2588-9 (Print) 978-3-8348-2589-6 (Online)

[http://link.Springer.com/book/10.1007/978-3-8348-2589-6](http://link.springer.com/book/10.1007/978-3-8348-2589-6)

Computational Social Network Analysis: Trends, Tools and Research Advances 2010

Editors: Ajith Abraham, Aboul-Ella Hassanien, Vaclav Sná¿el

ISBN: 978-1-84882-228-3 (Print) 978-1-84882-229-0 (Online)

[http://link.Springer.com/book/10.1007/978-1-84882-229-0](http://link.springer.com/book/10.1007/978-1-84882-229-0)

Biostatistics with R

Authors: Babak Shahbaba

Free online via SpringerLink ([http://link.Springer.com/)](http://link.springer.com/))

[http://link.Springer.com/book/10.1007/978-1-4614-1302-8](http://link.springer.com/book/10.1007/978-1-4614-1302-8)

Introduction to Probability Simulation and Gibbs Sampling with R

Authors: Eric A. Suess, Bruce E. Trumbo

Free online via SpringerLink ([http://link.Springer.com/)](http://link.springer.com/))

[http://link.Springer.com/book/10.1007/978-0-387-68765-0](http://link.springer.com/book/10.1007/978-0-387-68765-0)

A Modern Approach to Regression with R

Authors: Simon Sheather

Free online via SpringerLink ([http://link.Springer.com/)](http://link.springer.com/))

[http://link.Springer.com/book/10.1007/978-0-387-09608-7](http://link.springer.com/book/10.1007/978-0-387-09608-7)

R by Example

Authors: Jim Albert, Maria Rizzo

Free online via SpringerLink ([http://link.Springer.com/)](http://link.springer.com/))

[http://link.Springer.com/book/10.1007/978-1-4614-1365-3](http://link.springer.com/book/10.1007/978-1-4614-1365-3)

Graphical Models with R

Authors: Søren Højsgaard, David Edwards, Steffen Lauritzen

Free online via SpringerLink ([http://link.Springer.com/)](http://link.springer.com/))

http://link.Springer.com/book/10.1007/978-1-4614-2299-0

Data Manipulation with R

Authors: Statistical Computing Facility Phil Spector

Free online via SpringerLink ([http://link.Springer.com/)](http://link.springer.com/))

http://link.Springer.com/book/10.1007/978-0-387-74731-6

A Tiny Handbook of R

Authors: Mike Allerhand

Free online via SpringerLink ([http://link.Springer.com/)](http://link.springer.com/))

[http://link.Springer.com/book/10.1007/978-3-642-17980-8](http://link.springer.com/book/10.1007/978-3-642-17980-8)

Bayesian Networks in R

Authors: Radhakrishnan Nagarajan, Marco Scutari, Sophie Lèbre

Free online via SpringerLink ([http://link.Springer.com/)](http://link.springer.com/))

http://link.Springer.com/book/10.1007/978-1-4614-6446-4

Introducing Monte Carlo Methods with R

Authors: Christian Robert, George Casella

Free online via SpringerLink ([http://link.Springer.com/)](http://link.springer.com/))

[http://link.Springer.com/book/10.1007/978-1-4419-1576-4](http://link.springer.com/book/10.1007/978-1-4419-1576-4)

Two-Way Analysis of Variance

Statistical Tests and Graphics Using R

Authors: Christian Robert, George Casella

Free online via SpringerLink ([http://link.Springer.com/)](http://link.springer.com/))

http://link.Springer.com/book/10.1007/978-1-4614-2134-4

Applied Spatial Data Analysis with R

Authors: Roger S. Bivand, Edzer Pebesma, Virgilio Gómez-Rubio

Free online via SpringerLink ([http://link.Springer.com/)](http://link.springer.com/))

[http://link.Springer.com/book/10.1007/978-1-4614-7618-4](http://link.springer.com/book/10.1007/978-1-4614-7618-4)

Nonlinear Regression with R

Authors: Christian Ritz, Jens Carl Streibig

Free online via SpringerLink ([http://link.Springer.com/)](http://link.springer.com/))

http://link.Springer.com/book/10.1007/978-0-387-09616-2

An Introduction to python for Quantitative Economics

Authors: Vikram Dayal

Free online via SpringerLink ([http://link.Springer.com/)](http://link.springer.com/))

[http://link.Springer.com/book/10.1007/978-81-322-2340-5](http://link.springer.com/book/10.1007/978-81-322-2340-5)

The Environment in Economics and Development

Authors: Vikram Dayal

Free online via SpringerLink ([http://link.Springer.com/)](http://link.springer.com/))

[http://link.Springer.com/book/10.1007/978-81-322-1671-1](http://link.springer.com/book/10.1007/978-81-322-1671-1)

Software

python Anaconda

* <https://www.continuum.io/anaconda-overview>

R (Statisical programming language)

* R project <https://www.r-project.org/>

RStudio (IDE)

* RStudio <https://www.rstudio.com/products/rstudio/download3/>

Python Tutorials

Dive into Python <http://diveintopython.org>

Python 101 – Beginning Python <http://www.rexx.com/~dkuhlman/python_101/python_101.html>

The Official Python Tutorial <http://www.python.org/doc/current/tut/tut.html>

The Python Quick Reference <http://rgruet.free.fr/PQR2.3.html>

Python Fundamentals Training – Classes <http://www.youtube.com/watch?v=rKzZEtxIX14>

Python 2.7 Tutorial Derek Banas· <http://www.youtube.com/watch?v=UQi-L-_chcc>

Python Programming Tutorial - thenewboston <http://www.youtube.com/watch?v=4Mf0h3HphEA>

Google Python Class <http://www.youtube.com/watch?v=tKTZoB2Vjuk>

Nice free CS/python book <https://www.cs.hmc.edu/csforall/index.html>

datacamp.com <https://www.datacamp.com/tracks/python-developer>

R Tutorials

LearnR

<https://youtu.be/p3i7Kz6C_-4?list=PLFAYD0dt5xCwDNFdrqeNoU9t-nhAWkbKe>

Try python @codeschool: <http://tryr.codeschool.com>

Datacamp python Tutorials

<https://www.datacamp.com/>

rstudio online learning

<https://www.rstudio.com/online-learning/>

Deep Learning Tutorials

MIT 6.S191: Introduction to Deep Learning <http://introtodeeplearning.com/>

Stanford Winter Quarter 2016 class: CS231n: Convolutional Neural Networks for Visual Recognition <https://youtu.be/NfnWJUyUJYU>

Deep Learning - Adaptive Computation and Machine Learning series by Ian Goodfellow, Yoshua Bengio, and Aaron Courville

<https://github.com/HFTrader/DeepLearningBook>

Participation Policy

Participation in discussions is an important aspect on the class. It is important that both students and instructional staff help foster an environment in which students feel safe asking questions, posing their opinions, and sharing their work for critique. If at any time you feel this environment is being threatened—by other students, the TA, or the professor—speak up and make your concerns heard. If you feel uncomfortable broaching this topic with the professor, you should feel free to voice your concerns to the Dean’s office.

Collaboration Policies

Students are strongly encouraged to collaborate through discussing strategies for completing assignments, talking about the readings before class, and studying for the exams. However, all work that you turn in to me with your name on it must be in your own words or coded in your own style. Directly copied code or text from any other source MUST be cited. In any case, you must write up your solutions, in your own words. Furthermore, if you did collaborate on any problem, you must clearly list all of the collaborators in your submission. Handing in the same work for more than one course without explicit permission is forbidden.

Feel free to discuss general strategies, but any written work or code should be your own, in your own words/style. If you have collaborated on ideas leading up to the final solution, give each other credit on what you turn in, clearly labeling who contributed what ideas. Individuals should be able to explain the function of every aspect of group-produced work. Not understanding what plagiarism is does not constitute an excuse for committing it. You should familiarize yourself with the University’s policies on academic dishonesty at the beginning of the semester. If you have any doubts whatsoever about whether you are breaking the rules – ask!

Any submitted work violating the collaboration policies WILL BE GIVEN A ZERO even if “by mistake.” Multiple mistakes *will be sent to OSCCR for disciplinary review.*

To reiterate: **plagiarism and cheating are strictly forbidden. No excuses, no exceptions*.*** *All incidents of plagiarism and cheating will be sent to OSCCR for disciplinary review.*

Assignment Late Policy

Assignments are due by 11:59pm on the due date marked on the schedule. Late assignments will receive a 5% deduction per day that they are late, including weekend days. It is your responsibility to determine whether or not it is worth spending the extra time on an assignment vs. turning in incomplete work for partial credit without penalty. Any exceptions to this policy (e.g. long-term illness or family emergencies) must be approved by the professor.

Five percent (i.e. 5%) is deducted for each day an assignment is late. Assignments will receive NO CREDIT if submitted after the solutions are posted. Any extensions MUST be granted via e-mail and with a specific new due date.

Only ONE extension will be granted per semester.

Student Resources  
 **Special Accommodations/ADA:**In accordance with the Americans with Disabilities Act (ADA 1990), Northeastern University seeks to provide equal access to its programs, services, and activities. If you will need accommodations in this class, please contact the Disability Resource Center (www.northeastern.edu/drc/) *as soon as possible* to make appropriate arrangements, and please provide the course instructors with any necessary documentation. The University requires that you provide documentation of your disabilities to the DRC so that they may identify what accommodations are required, and arrange with the instructor to provide those on your behalf, as needed.

**Academic Integrity:** All students must adhere to the university’s Academic Integrity Policy, which can be found on the website of the Office of Student Conduct and Conflict Resolution (OSCCR), at <http://www.northeastern.edu/osccr/academicintegrity/index.html>. Please be particularly aware of the policy regarding plagiarism. As you probably know, plagiarism involves *representing anyone else’s words or ideas as your own*. It doesn’t matter where you got these ideas—from a book, on the web, from a fellow-student, from your mother. It doesn’t matter whether you quote the source directly or paraphrase it; if you are not the originator of the words or ideas, *you must state clearly and specifically where they came from*. Please consult an instructor if you have any confusion or concerns when preparing any of the assignments so that together. You can also consult the guide “Avoiding Plagiarism” on the NU Library Website at <http://www.lib.neu.edu/online_research/help/avoiding_plagiarism/>. If an academic integrity concern arises, one of the instructors will speak with you about it; if the discussion does not resolve the concern, we will refer the matter to OSCCR.

**Writing Center:** The Northeastern University Writing Center, housed in the Department of English within the College of Social Sciences and Humanities, is open to any member of the Northeastern community and exists to help any level writer, from any academic discipline, become a better writer.  You can book face-to-face, online, or same day appointments in two locations: 412 Holmes Hall and 136 Snell Library (behind Argo Tea).  For more information or to book an appointment, please visit <http://www.northeastern.edu/writingcenter>/.