DATA 1010 SYLLABUS
FALL 2018
BROWN UNIVERSITY
SAMUEL S. WATSON

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WEBSITE	`http://sswatson.com/classes/data1010`
CLASS MEETING	Monday, Wednesday, Friday from 10:00 to 12:00 in CIT 227
OFFICE HOURS	Monday and Wednesday 13:00 to 15:00
COURSE DESCRIPTION	An introduction to the mathematical methods of data science through a combination of computational exploration, visualization, and theory. Students will learn programming basics, topics in numerical linear algebra and scientific computing, mathematical probability (probability spaces, expectation, conditioning, common distributions, law of large numbers and the central limit theorem), statistics (point estimation, confidence intervals, hypothesis testing, maximum likelihood estimation, density estimation, bootstrapping, and cross-validation), and machine learning (regression, classification, and dimensionality reduction, including Gaussian models, decision trees, neural networks, Bayesian networks, and principal component analysis).
TEXTBOOK	The course content will be rolled out as a sequence of book chapters, to be made available for free in PDF form on the website. For those who would like a traditional textbook with more examples and problems, I recommend *A first course in probability* by Sheldon Ross, *All of Statistics* by Larry Wasserman, and *Pattern Recognition and Machine Learning* by Christopher Bishop.
STUDENT SATISFACTION & INCLUSION	My top priority is for you to have an excellent learning experience in this course. I intend to set clear learning objectives and equip you with the right tools to achieve them. I invite comments, criticisms, concerns, and suggestions at any time. If you perceive that you are not doing as well as you'd like, please see me right away. I can help with math concepts, of course, but I am also happy to help you troubleshoot your approach to studying, problem solving, etc. I will grant you the assumption that you are doing your best to learn, and I have zero interest in making you feel judged for where you are in the learning process. *You should have every expectation that you can translate sustained hard work into a high level of course success*.
EDX	The course book is also available as a private edX course. We will have assigned readings for every class, and these readings will require you to solve exercises as you read and submit your answers in edX. You will be able to see solutions

immediately after you submit, and you will score your own answers for accuracy. We will spot check these answers to give you feedback on your writing.

The edX solutions that you submit **must** be completed individually; working in groups on these assignments will be considered an academic code violation. This policy might seem rigid, but (1) recording low scores on the edX problems will *not* inhibit you from achieving the highest possible marks in the course, (2) the edX scores will help us calibrate class activities, and neglecting to use the opportunity to see what you can do yourself will dilute that signal. And (3) collaboration will be emphasized in other course components. Learning mathematical ideas requires a balance of teamwork and individual effort, and we are using edX for the latter component.

GRADESCOPE HOMEWORK

Each week you will have a written homework assignment due at 11 PM on Thursday. You will scan and submit through a free grading platform called Gradescope. There will be a 2-hour grace period to help you out in the event of technical difficulties. There is no score penalty, but your work will be marred with a big red "late" indicator. No submissions are accepted after the grace period.

To sign up for Gradescope, visit www.gradescope.com and use the entry code 9NXV5X. Be sure to use your Brown email address to sign up, and also enter your Banner ID (the one that starts with B) in the student ID blank.

HOMEWORK POLICY

There are no dropped homework assignments. Dates are coordinated with DATA 1030, so curricular conflicts should not be an issue. In event of medical or family emergency, contact me for accommodation.

GRADING AND EXAMS

We will be using *standards-based grading* in this course. There are 40 learning standards, and your goal will be to demonstrate mastery or proficiency on as many of them as possible. Each topic will be assessed separately in three modes: edX, homework, and exams. You will achieve a gold medal (mastery), a silver medal (proficiency), a bronze medal (good-faith-effort completion) for each standard/mode as it is assessed. Every objective will be assessed multiple times, so you will have an opportunity to improve your medal in standards where you want to improve. Once you have achieved an exam gold medal on a given standard, you will no longer need to solve the problems keyed to that standard.

You will receive an overall medal for each learning standard based on your medals in the three assessment modes, with the following rules: your overall medal is equal to your exam medal if you have at least bronze in the other two modes. Otherwise, your overall medal is equal to the *second* highest medal (so if you don't complete the edX component, you need gold in homework and on the exam to get gold overall).

Some of the standards will pertain to prerequisite material (these will be indicated as such on the standards list), and for these standards your overall medal will simply be equal to your exam medal.

Your final letter grade will be determined by a minimum number of gold, silver,

and bronze medals (you must reach the prescribed numbers in all three categories to earn the given letter grade):

	Gold	Silver	Bronze
A	30	34	38
B	24	30	37
C	20	28	36

CLASS MEETINGS The class will be run using a partially flipped classroom model. You will prepare for each class by reading the course text and submitting typed solutions on edX, so in class we will (i) summarize and answer any questions, (ii) work through additional problems and examples together as a class, and (iii) work on problems (both pen-and-paper and computational) individually or in small groups, with facilitators available to help.

PREREQUISITES Prerequisites to this course include problem solving facility with sets and functions, basic programming skills, linear algebra, and some topics in multivariable calculus. We have prepared edX modules, aside from the ones we're using the develop the course content, to help you fill in or refresh any of this background.

COLLABORATION AND ACADEMIC INTEGRITY Your edX answers must be entirely your own work, as discussed in the edX section above. You may collaborate on solving homework problems, but you must write your solutions entirely by yourself, and you may not do so with reference to notes taken while working in a group. Writing solutions based on notes which represent the ideas of others short-circuits the exercise and impedes your learning. On each homework submission, write a statement on the front page either listing collaborators or confirming that you did not collaborate. Using the internet to look up solutions to homework problems is not acceptable, although of course you may freely use any available resources to learn the material more generally.

COURSE-RELATED WORK EXPECTATIONS Students will meet 2 hours per day in class (86 hours total), and readings for class will take about 45 minutes per class day (32 hours total). Homework and review for exams will total about 15 hours per week (210 hours total). In addition, there are two papers for which about 16 hours of work is assumed per paper (30 hours total).

DISABILITY SUPPORT Please inform me if you have a disability or other condition that might require modification of these procedures. I am happy to accommodate your learning needs. You should also contact the Student and Employee Accessibility Services at 401-863-9588 or SEAS@brown.edu.