UNIVERSITY OF DETROIT MERCY
COLLEGE OF LIBERAL ARTS & EDUCATION

SYLLABUS • Winter 2019

Science and Data

DATA 5001

Instructor: Douglas A. MacDonald, Ph.D.

Office:

Phone: 313-993-1094

Email: macdonda@udmercy.edu

Class Time & Location: Online through Blackboard Knowledge (student access through Titan Connect Account)

Office Hours:

Instructor is generally available during regular business hours Monday through Thursday and after 3pm on Fridays. Students are encouraged to email the instructor with any questions or requests and he will respond promptly (usually within a few hours).

Prerequisites:

None.

Note— Even though this is not a statistics course, some prior knowledge of statistics will be a definite asset for students.

Required Texts:

There are no texts which are required for this course per se. This fully online course will expose students to essential concepts, information and skills through a variety of means ranging from recorded lectures/presentations and interactive discussion boards, to assigned reading materials and websites. A non-exhaustive list of resources that will be utilized in the course appears in Appendix A of this syllabus.

Course Description:

This course is designed to introduce students to data science and analytics with attention given to understanding how to apply critical reasoning to the analysis and interpretation of data. The course provides coverage of scientific reasoning as applicable to a wide range of disciplines, research and data acquisition methodologies, ways of evaluating data quality, and ethics related to the responsible development, completion, and utilization of data analytic projects.

Course Objectives:

✓ To facilitate the development of critical thinking skills with particular attention given to the cultivation and application of scientific reasoning to practical problems encountered in business, industry, and science.

✓ To instill an understanding of ethics concerning the responsible analysis, interpretation, and utilization of information related to data analysis projects.

✓ To develop knowledge regarding how to evaluate the quality of data prior to analysis and how to engage in responsible and effective data cleaning practices.

✓ To develop knowledge of different forms of statistical analysis with emphasis given to multivariate, predictive, and modeling analytics, and data mining techniques.

✓ To develop communication skills to facilitate the sharing of information and findings in an efficient and practical manner.

Specific Learning Outcomes

▷ Knowledge and skill at critical thinking both as a general skill set and as a skill set related to completing data analysis projects.

▷ Knowledge of different forms of bias and questionable research practices and how to avoid them.

▷ Knowledge of how to design a data-driven project for different applications (e.g., business, biology, medicine, neuroscience, education).

▷ An understanding of how deductive versus inductive approaches to science relate to data science as a discipline.

▷ An understanding of ethics as related to science in general and data science as a specific discipline.

▷ Knowledge about the relationship of statistics to data and research methodologies.

▷ Knowledge of how to evaluate the quality of data.

▷ Knowledge of best practices for data cleaning.

▷ Skill at selecting appropriate research design and statistical analyses based upon type of research question and data.

▷ Knowledge of science-informed approaches to measurement and sampling.

▷ Knowledge about the limits of statistics and data analytics and an understanding regarding their ethical use in data projects.

▷ Skill at practical interpretation of statistical outcomes to inform decision-making and innovation.

▷ Skill at effective and responsible communication of outcomes of data analysis projects to diverse audiences.

Course Requirements:

- ✓ Course Calibration and Student Interests Essay (worth 5% of final grade)

- ✓ Completion of CITI Research Ethics Program (worth 20% of the final grade)

- ✓ Weekly Homework Assignments (worth 25% of final grade)

- ✓ Weekly Discussion Board Posts (worth 10% of final grade)

- ✓ Term Project Involving Critical Analysis of a Data Analysis Project (worth 40% of final grade)

Course Calibration and Student Interest Essay

In order to make this course a valuable learning experience for all students, the instructor endeavors to adapt the course as much as possible to the interests, knowledge and skill level of each student. This required essay is the means through which the instructor acquires information about the background, aspirations, and interests of students to accomplish this aim. The information obtained about students through this essay will be used to tailor the course, particularly the homework assignments and term project, to best fit each student's capabilities and interests.

With that in mind, students are required to complete a 2-5 page essay (double spaced, 12 point font, in Microsoft Word format) which provides answers to questions that will be provided by the instructor. Students are welcome to use the questions as headings in their essays if they so choose.

When submitting the essay (which must be done through Blackboard), students should use the file name "CCSIEssay" followed by first and last initial. For example, if the instructor were to submit the essay, he would use the file name "CCSIEssayDM.doc." If a student had the name of Jane Smith, then the file name for the essay would be "CCSIEssayJS.doc."

On the top right corner of the first page of the essay, students should provide their name and student ID.

Essays should be written well (e.g., proper grammar, spelling, punctuation, etc) but do not have to be academic in tone or content (e.g., students do not need to cite any literature. However, if literature is cited, then students are expected to include a reference list for all works cited).

Completion of the essay is worth 5% of the final grade in the course. The essay is due January 13.

CITI Research Ethics Program

One of the key topics of this course is ethics as they relate to science and data analytic research.

To help ensure that all students have a thorough understanding of research ethics as they apply to research involving humans, in addition to material covered by the instructor and through selected readings, students are required to complete an online course through what is known as the Collaborative Institutional Training Initiative (CITI).

Information about the mission and history of CITI can be found at the following link:

https://about.citiprogram.org/en/mission-and-history/

The University of Detroit Mercy is a member institution and, as such, students are able to register free of charge to complete one or more of the various research ethics programs that they offer.

In order to access and complete the course, students need to visit the following link and register for an account: https://www.citiprogram.org/index.cfm?pageID=14

Note— The registration link appears on the top right of the webpage. When registering, students must complete seven steps. The first step involves providing your institutional affiliation. For this, students should enter "University of Detroit Mercy." Do not register as an independent learner or else you will need to pay to complete the course! Once you enter the name of the school, just follow the instructions that appear on the screen to complete the registration process.

Also note—This basic course consists of 19 modules which takes anywhere from 6-20 hours to complete. Students are required to complete the Stage 1 Basic Course for Social/Behavioral Researchers but are welcome to complete additional courses if they so choose. Just keep in mind that no course credit will be given for the completion of any additional courses.

When a student has successfully completed the required course, the CITI program generates a completion certificate that you should be able to download.

Students are required to submit the certificate of completion to Blackboard by midnight of March 3. When submitting the certificate, please name the file "CITICert" and add your first and middle initial. For example, if the instructor were to submit the certificate, he would name the file CITICertDM. If a student by the name of Jane Smith were to submit the certificate, then the filename would be CITICertJS.

Completion of the CITI Course is worth 20% of the final grade in the course. Deadline for submission is March 3.

Weekly Homework & Discussion Board Assignments

Weekly Homework

- Starting with the second week of classes, students will be provided with information on the Blackboard site regarding the weekly topic and given an assignment related to one or more aspects of that topic. In general, the assignment will entail writing a 2-5 page paper (double spaced, 12 point font; Microsoft Word format) that fulfills the requirement of the assignment. Students are expected to use their own words wherever possible in their submissions (i.e., students are not permitted to simply provide extended quotations from recorded lectures, readings, and/or websites). Use of citations to support arguments or claims made is encouraged but not required except where indicated for an assignment. If/when citations are used, then students should also provide a reference list.

- All homework assignments must be submitted to the instructor through the Blackboard course site by midnight of the dates specified in the lecture and assignment schedule (given later in this syllabus). When submitting assignments, please name the file "WEEKX" where the "X" is the week, followed by first and last initials. For example, if the instructor submitted the assignment for week 2, the file name would be "WEEK2DM.doc". If a student by the name of Jane Smith submitted the assignment for week 12, the file name would be "WEEK12JS.doc".

In total, completion of homework assignments comprises 25% of the final grade in the course.

Weekly Discussion Board Posts

- The instructor will be monitoring the discussion board on a regular basis with an effort toward making it as interactive as possible.

- Starting in the second week of classes, weekly discussion boards will be initiated by the instructor. On these boards, the instructor will create different threads for students to post comments and questions. Students are required to provide at least two discussion board posts every week up to the end of the 15th week in the winter term (i.e., up to midnight of April 21) with the exception of the March 4 10 (this is spring break). This means that in total, each student should make at least 26 posts by the end of the course.

- Note In order for it to count toward a student's grade, each post should involve thoughtful and respectful response to a discussion thread. A post of "I agree" or "I don't know" or "I have no opinion" is not considered a thoughtful response and will not count. Students are permitted to make posts in response to other student's posts or to instructor responses to student posts.

Discussion board posts are worth 10% of the final grade in the course.

Term Project

In order to facilitate the integration of information and skills covered in the course, students are required to complete an application oriented term project. More specifically, the project will entail the writing of a proposal for a data analysis project. Students will select one scenario from a number of hypothetical scenarios that may be encountered in business, industry, biology, medicine, psychology, and/or neuroscience (the instructor will provide the various scenarios on the course site based upon student interests share in the Course Calibration and Student Interests Essay) and then write a proposal detailing (a) relevant questions that could be answered given the parameters of the selected scenario, (b) selection of appropriate data gathering methods with attention given to sampling and modes of measurement, (c) discussion of potential ethical considerations that come to bear on the execution of the proposed project and/or the utilization of its results, (d) general discussion of how data would be assessed for quality and how data cleaning would be done if issues with quality were to be identified, (e) general recommendations of data analytic strategies (e.g., statistics) to be used to analyze the data, (f) possible outcomes of the project with attention given to potentially novel insights or innovations that could be identified and used, and (g) considerations of how the results of the study should be best communicated to relevant audiences.

The written projects should be between 10-20 pages in length (double spaced, 12-point font; Microsoft Word formatted) and include the use of literature to support ideas and arguments made. An appropriate and complete reference list of all works cited must be provided.

The paper should be submitted to the instructor through the Blackboard site. Deadline for submissions is midnight of April 27th, 2019. When submitting the project, use the file name "TERMPROJECT" followed by first and last initials. For example, if the instructor were submitting the project, he would use the file name "TERMPROJECTDM.doc". If a student by the name of Jane Smith were submitting the project, then the file name would be "TERMPROJECTJS.doc".

Term project is worth 40% of the final grade in the course. Due date for submission is April 27.

Grading Scheme and Miscellany

Grade	Range
A	95.0 100
A-	90.0 94.9
B+	85.0 89.9
B	80.0 84.9
B-	75.0 79.9
C+	70.0 74.9
C	65.0 69.9
C-	60.0 64.9
D+	55.0 55.9
D	50.0 54.9
F	49.9 or lower

Course Evaluations:

Student course evaluations are a highly valued in the College of Liberal Arts and Education. Feedback from students serves as an important source of information that enables instructors to improve upon the quality of the course in terms of its content and delivery. Students are strongly encouraged to complete the online course evaluations for this course and all courses for which they are formally registered. The online evaluation form for this course will be made available during the week preceding final examinations each term. Students who are enrolled in the course will receive an email from the university near the end of the term that provides instructions on how to complete the evaluation.

Students who complete the evaluation and email the instructor with evidence of having done so will be given one extra credit point that will be added to their final mark in the course (e.g., if a student has a final mark of 78 out of 100 in the course, the completion of the evaluation will result in the mark being adjusted to 79 out of 100).

Notifications of Important Messages:

Any important messages regarding any aspect of the course will be communicated to students via Blackboard and/or Detroit Mercy email addresses. Please check your email and the course site often!

Subject-to-Change Statement:

The instructor reserves the right to change or modify any aspect of the course or class schedule at any time. Students will be notified of any changes by the instructor.

Questions, Complaints or Concerns about the Course:

If you have any questions, complains or concerns about the course, then please let the instructor know via email. If you are not satisfied with the instructor's response, then you are encouraged to contact the Associate Dean of the College of Liberal Arts & Education. Her name is Dr. Victoria Mantzopoulos. Her phone number is (313) 993-3254 and her email address is armstrov@udmercy.edu. You are also welcome to contact the Dean of the College of Liberal Arts & Education. His name is Dean Mark Denham. His phone number is (313) 993-3250 and his email address is denhamma@udmercy.edu

University of Detroit Mercy Policies Related to Student Behavior:

Students at Detroit Mercy are expected to behave in accordance with all university and college policies and practices. A complete list of all policies can be found in the Detroit Mercy Student Handbook.

A specific policy with which all students are required to comply relates to academic dishonesty. Students are expected to demonstrate the highest levels of honesty with respect to their work. Cheating (on homework, quizzes, tests, examinations) and plagiarism (i.e., representing the work of another person as one's own) are unacceptable behaviors and will not be tolerated. If the instructor determines that a student has cheated on an examination or plagiarized the work of another person on an assignment, then the instructor will automatically assign a failing grade on that examination or assignment (i.e., the examination or assignment will be given a numerical grade of 0). In addition, the instructor will bring the behavior to the attention of university officials (e.g., Dean or Associate Dean) to determine if additional sanctions are warranted. Such sanctions could include the assignment of a failing grade for the course and even dismissal from the university.

Title IX:

University of Detroit Mercy is committed to fostering a safe and productive learning environment for all students. Detroit Mercy's Policy Prohibiting Sex and Gender-based Discrimination applies to sex and gender-based harassment, sexual exploitation, sexual assault, attempted sexual assault, intimate partner violence/dating violence, stalking, cyberstalking, and retaliation.

Concerns or complaints regarding potential sex and gender-based harassment, sexual exploitation, sexual assault or attempted sexual assault, intimate partner violence/dating violence, stalking, and retaliation may be conveyed or reported to Marjorie Lang, Title IX Coordinator, by contacting her at langma@udmercy.edu or 313.993.1802. Ms. Lang's office is located on the 5th floor of the Fisher Administration Center on the McNichols campus. You may view the University's Policy Prohibiting Sex and Gender-based Discrimination at http://www.udmercy.edu/academics/academic-affairs/titleix/.

Academic Support Services:

Detroit Mercy has a range of resources available to facilitate student academic success. These include Library and Media services, Academic Learning/Writing Center, and Computing Services, among others. Students are encouraged to consult with the instructor and/or their University Student Handbook, to learn how to access these services.

Susan Trudeau, Director, Student Success Center
McNichols Campus Library, Room 319
Email: trudeasm@udmercy.edu
Phone: 313-993-1143

Note. Free tutoring services for statistics are available at the Student Success Center for students who feel they need it. The Student Success Center (aka Learning Center) is located on the third floor of the Detroit Mercy McNichols Library.

Disability Support Services and Accommodations:

If you need an accommodation because of a disability, have emergency medical information to share, or if you need special arrangements in case the building must be evacuated, please contact:

Laura Bagdady, Assistant Director, Student Disability & Accessibility Support Services
Student Success Center, McNichols Campus Library, Room 319
Email: bagdadlm@udmercy.edu
Phone: 313-993-1158

It is very important for students to be proactive with regard to requesting their disability accommodations every semester. While it is never required that you disclose your disability to your professors, all students at the university are encouraged to talk to their professors to discuss their needs and concerns. However, you must be registered with Disability Support Services, and your faculty must receive official notification from the DSS office before they can make arrangements for your accommodations.

Religious Observances:

It is the policy of the University of Detroit Mercy to respect the faith and religious obligations of each student. Students with exams and classes that conflict with their religious observances should notify the instructor at the beginning of the semester in order to work out a mutually agreeable alternative. Please note that, regardless of whether an absence is "excused" or "unexcused," the student is responsible for all missed course content and activities.

TOPIC and ASSIGNMENT SCHEDULE

Week	Dates	Topics and Assignments
1	Jan 7-13	**Welcome to the Course!!** *Assignment Due by midnight Jan 13: Course Calibration and Student Interest Essay*
2	Jan 14-20	**What is Big Data/Data Science?** (Definition, Parameters of Application; Promise and Challenges) **Assignments Due by midnight Jan 20: (a) Homework Assignment, (b) Discussion Board posts**
3	Jan 21-27	**What is Science?** (Definition and key attributes; Place of theory and method; Advantages over other approaches to inquiry and knowledge; Inductive vs. deductive science; Exploratory vs confirmatory science; Relation to Data Science) *Assignments Due by midnight Jan 27: (a) Homework Assignment, (b) Discussion Board posts*
4	Jan 28-Feb 3	**What is Science? Continued** (Characteristics of critical scientific reasoning; Forms of bias/misjudgment and ways detecting and avoiding them; Examples of good and bad science) *Assignments Due by midnight Feb 3: (a) Homework Assignment, (b) Discussion Board posts*
5	Feb 4-10	**Science and Ethics (The importance of ethics in science)** *Assignments Due by midnight Feb 10: (a) Homework Assignment, (b) Discussion Board posts*
6	Feb 11-17	**Ethics of Big Data/Data Science** (Focused overview of ethical concerns about big data analytics and ways for data scientists to proactively address them) *Assignments Due by midnight Feb 17: (a) Homework Assignment, (b) Discussion Board posts*
7	Feb 18-24	**What are Data and Where Do They Come From?** (Definition of data with attention given to their different forms [qualitative vs. quantitative] and methods for their acquisition) *Assignments Due by midnight Feb 24: (a) Homework Assignment, (b) Discussion Board posts*
8	Feb 25-Mar 3	**Data Hygiene and Preparation** (Guidelines for evaluating quality of data and data cleaning practices) *Assignments Due by midnight Mar 3: (a) Homework Assignment, (b) Discussion Board Posts, (c) CITI Certificate of Completion*
9	Mar 4-10	**Mid-Winter/Spring Break** *No Assignments Due this week*
10	Mar 11-17	**Data Hygiene and Preparation Continued** (Advanced issues related to evaluation of data) *Assignments Due by midnight Mar 17: (a) Homework Assignment, (b) Discussion Board posts*

TOPIC and ASSIGNMENT SCHEDULE

Week	Dates	Topics and Assignments
11	Mar 18-24	**Data and Statistics** (Overview of how data and statistics relate with attention given to assumptions underlying different families of statistics) *Assignments Due by midnight Mar 24: (a) Homework Assignment, (b) Discussion Board posts*
12	Mar 25-31	**Data and Statistics Continued** (Overview of how data and statistics relate with attention given to assumptions underlying different families of statistics) *Assignments Due by midnight Mar 31: (a) Homework Assignment, (b) Discussion Board posts*
13	Apr 1-7	**Data and Statistics Continued** (Overview of how data and statistics relate with attention given to assumptions underlying different families of statistics) *Assignments Due by midnight Apr 7: (a) Homework Assignment, (b) Discussion Board posts*
14	Apr 8-14	**Applications of Data Science** (Overview of application of scientific reasoning and data analytic approaches to specific areas of inquiry including Business, Education, Engineering, Biology, Medicine, and Neuroscience) *Assignments Due by midnight Apr 14: (a) Homework Assignment, (b) Discussion Board posts*
15	Apr 15-21	**Applications of Data Science Continued** (Overview of application of scientific reasoning and data analytic approaches to specific areas of inquiry including Business, Education, Engineering, Biology, Medicine, and Neuroscience) *Assignments Due by midnight Apr 21: (a) Homework Assignment, (b) Discussion Board posts*
16	Apr 22-27	**FINAL EXAM WEEK**—No Lectures or Topics covered *Assignments Due by midnight Apr 27: Term Project Note—April 27th is a Saturday!!!!*

Appendix A: Non-Exhaustive List of Texts, Articles and Online Resources

There are a wide number of excellent published and online resources related to data science and to the various topics covered in this course. Below are a number of carefully selected recommendations that students will find useful in augmenting what is covered in the course and in assisting in the completion of course assignments. Many of the scholarly publications can be found online in their entirety. Where a publication is made available open access, the link to the publication is provided. Students are strongly encouraged to explore these resources and to contact the instructor if there are any questions or issues with finding any of them. Students are also encouraged to inform the instructor of the existence of any useful publications or websites that may be beneficial to add to this list.

Béranger, J. (2016). *Big Data and Ethics: The Medical Datasphere*. Kidlington, Oxford, UK: Elsevier
ISBN 978-1-785-48025-6

Bunge, M. (July/August 2006). The Philosophy Behind Pseudoscience. *Skeptical Inquirer, 30*(4), 29-37.

Cohen, I., Lynch, H., Vayena, E., & Gasser, U. (Eds.). (2018). *Big Data, Health Law, and Bioethics*. Cambridge, UK: Cambridge University Press. ISBN: 978-1-108-14797-2. doi:10.1017/9781108147972

Davis, K. (2012). *Ethics of Big Data: Balancing Risk and Innovation.* Sebastopol, CA, USA: O'Reilly Media, Inc.
ISBN: 978-1-449-31179-7

Dolincar, S., Grun, B., & Leisch, F. (2016). Increasing sample size compensates for data problems in segmentation studies. Journal of Business Research, 69(2), 992-999.
Full text available at: https://www.sciencedirect.com/science/article/pii/S0148296315003926

Faber, J. & Fonseca, L. M. (2014). How sample size influences research outcomes. Dental Press Journal of Orthodontics, 19(4), 27-29. Full text available at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4296634/

Feyerabend, P. (1975). *Against method*. New York, NY, USA: New Left Books
ISBN: 0-902308-91-2

Kaplan, R. M., Chambers, D. A. & Glasgow, R. E. (2014). Big data and large sample size: A cautionary note on the potential for bias. *Clinical and Translational Science, 7*(4), 342-346.
Full text article available at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5439816/

Kuhn, T. (2012). *The structure of scientific revolutions* (4th ed.). Chicago, IL, USA: University of Chicago Press.
ISBN: 978-0-226-45812-0

Levy, D. A. (1997). *Tools of Critical Thinking: Metathoughts for Psychology*, Needham Heights, MA, USA: Allyn and Bacon. ISBN: 0-205-26083-7

Lin, M., Lucas, H. C. & Shmueli, G. (2013). Research Commentary—Too Big to Fail: Large samples and the p-value problem. Information Systems Research, 24(4), 906-917.
Full text available at https://pdfs.semanticscholar.org/262b/854628d8e2b073816935d82b5095e1703977.pdf

MacRitchie, F. (2018). *The Need for Critical Thinking and the Scientific Method*. Boca Raton, FL, USA: CRC Press (Taylor & Francis). ISBN: 978-0-8153-6775-8.

Mittelstadt, B. D. & Floridi, L. (Eds.). (2016). *The Ethics of Biomedical Big Data*. Cham, Switerland, Springer.
ISBN: 978-3-319-33523-0

Levy, D. A. (1997). *Tools of Critical Thinking: Metathoughts for Psychology*, Needham Heights, MA, USA: Allyn and Bacon. ISBN: 0-205-26083-7

Lin, M., Lucas, H. C. & Shmueli, G. (2013). Research Commentary—Too Big to Fail: Large samples and the p-value problem. Information Systems Research, 24(4), 906-917.
Full text available at https://pdfs.semanticscholar.org/262b/854628d8e2b073816935d82b5095e1703977.pdf

MacRitchie, F. (2018). *The Need for Critical Thinking and the Scientific Method*. Boca Raton, FL, USA: CRC Press (Taylor & Francis). ISBN: 978-0-8153-6775-8.

Mittelstadt, B. D. & Floridi, L. (Eds.). (2016). *The Ethics of Biomedical Big Data*. Cham, Switerland, Springer. ISBN: 978-3-319-33523-0

Osborne, J. W. (2013). *Best Practices in Data Cleaning*. Thousand Oaks, CA, USA: Sage.
ISBN: 978-1-4129-8801-8

Paul, R. W., & Elder, L. (2002). Critical *Thinking: Tools for Taking Charge of Your Professional and Personal Life.* Upper Saddle River, NJ, USA: Financial Times Prentice Hall (Pearson Education). ISBN: 0-13-064760-8

Paul, R., & Elder, L. (2012). *The Thinker's Guide to Scientific Thinking Based on Critical Thinking Concepts and Principles*. Tomales, CA, USA: Foundation for Critical Thinking. ISBN: 978-0-944583-18-0

Popper, K. (1959/2002). *The Logic of Scientific Discovery*. Abington-on-Thames, UK: Routledge.
ISBN: 0-41527843-0

Richterich, A. (2018). *The Big Data Agenda: Data Ethics and Critical Data Studies*. University of Westminster Press.
Open access book available for free download at http://www.oapen.org/search?identifier=649695

Siegel, H. (1989). The rationality of science, critical thinking and science education. *Synthese, 80*, 9-41.
Full text article available at
https://www.researchgate.net/profile/H_Siegel/publication/226143745_The_rationality_of_science_critical_thinking_and_science_education/links/551063030cf20352196a20f8/The-rationality-of-science-critical-thinking-and-science-education.pdf

Slater, S. Joksimovic´, S., Kovanovic, V., Baker, R. S. , & Gasevic, D. (2017). Tools for educational data mining: A review. *Journal of Educational and Behavioral Statistics, 42*(1), 85-106.
Full text article available at http://journals.sagepub.com/doi/pdf/10.3102/1076998616666808

Staley, K. W. (2014). *An Introduction to the Philosophy of Science*. Cambridge, UK: Cambridge University Press.
ISBN: 978-0-521-12999-2

Turnitin (2012). White Paper: Plagiarism Spectrum (Version 0512).Oakland, CA, USA: iParadigms, LLC

Online Big Data Bibliography of guidelines, books, reports, and articles on ethics in big data
http://www.onlineethics.org/Resources/40348/39960.aspx

RationalWiki: A website dedicated to exposing pseudoscience and antiscience
https://rationalwiki.org/wiki/Main_Page

The Logic of Science: A website dedicated to educating the public about science and critical thinking
https://thelogicofscience.com/2016/05/10/most-scientific-studies-are-wrong-but-that-doesnt-mean-what-you-think-it-means/

The Skeptics Guide to the Universe: A website dedicated to educating the public about science and critical thinking.
Link is to page on logical fallacies (great stuff)
https://www.theskepticsguide.org/resources/logical-fallacies

Websites that provide information on Data Science

https://www.digitalvidya.com/blog/best-websites-learn-data-science/

https://www.datasciencecentral.com/

http://bigdata-madesimple.com/175-analytic-and-data-science-web-sites/

https://www.ngdata.com/top-data-science-resources/

https://jessesw.com/websites/

https://www.sisense.com/blog/12-websites-every-data-analyst-should-follow/

https://www.kdnuggets.com/websites/index.html

https://medium.com/@exastax/top-20-data-science-blogs-and-websites-for-data-scientists-d88b7d99740

https://www.kaggle.com/

https://www.tableau.com/learn/articles/data-science-blogs

https://blog.feedspot.com/data_science_blogs/

https://www.businessprocessincubator.com/content/top-10-websites-for-data-science/

Appendix B: Statistics Websites

While there are no prerequisites for DATA 5001, having some knowledge of statistics will be of significant benefit for students wanting to be successful in this course. To aid students, below is a list of helpful websites that provide extensive information on statistics. Students are strongly encouraged to utilize these resources whenever needed.

http://statistics-help-for-students.com/

http://www.statsoft.com/Textbook

http://stattrek.com/

http://davidmlane.com/hyperstat/

http://www.businessbookmall.com/Statistics%20Internet%20Library.htm

http://www.statstutor.ac.uk/

http://www.talkstats.com/

http://www.stat-help.com/

http://www.statsmakemecry.com/

https://statistics.laerd.com/