

## COURSE SCHEDULE

### Week 1: August 25---Introduction to the Course

Topics:

Introductions, review of syllabus and LibGuide, completion of student survey, selection of student research topics and discussion leaders, ice-breaker exercise, other administrative information, etc.

Readings:

None

### Week 2: September 1---What is Big Data & Why is it Important?

Topics:

The characteristics of big data, the three “V’s”; how does big data differ from small data?; the life-cycle of big data; the growing importance of big data; how big data is and will be affecting our daily lives; some examples of high value big data uses.

Readings:

“The Human Face of Big Data,” PBS (February 25, 2016) available at <https://www.youtube.com/watch?v=r6v15Z60eUI> (52 minutes in length)

“What is Big Data and Why Should You Care? Forbes (April 22, 2016) available at <https://www.youtube.com/watch?v=jGhRiwGHh30> (2:45 minutes in length)

“The Impact of Big Data on Business Efficiency,” insidebigdata.com (July 30, 2016) available at <http://insidebigdata.com/2016/07/30/the-impact-of-big-data-on-business-efficiency/>

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Week 3: September 8--- **The Collection, Consolidation and Storage of Data**

Topics: The generators of data (e.g. social networks, mobile devices, geo-fencing, internet of things, businesses, governments, etc.); the aggregators of data (e.g. data brokers, businesses, government, etc.); data storage, data management & processing technologies (e.g. Hadoop, MapReduce, Spark, Pig, NoSQL, etc.); public and private databases.

Readings:

Bernard Marr, "Big Data: 33 Brilliant and Free Data Sources for 2016," Forbes.co (February 12, 2016) available at <http://www.forbes.com/sites/bernardmarr/2016/02/12/big-data-35-brilliant-and-free-data-sources-for-2016/#4f51b75c6796>

Review the website of "Persona Non Data: Art in the Age of Big Data," artisopensource.net available at <http://www.artisopensource.net/2016/01/27/persona-non-data-turning-a-cultural-institute-into-a-data-generator/>

Brian Naylor, "Firms Are Buying, Sharing Your Online Info. What Can You Do About It?" NPR (July 11, 2016) available at <http://www.npr.org/sections/alltechconsidered/2016/07/11/485571291/firms-are-buying-sharing-your-online-info-what-can-you-do-about-it>

Kaushik Pal, "Impact of IoT on Big Data Landscape," KD Nuggets (July 2015) available at <http://www.kdnuggets.com/2015/07/impact-iot-big-data-landscape.html>

Week 4: September 15--- **The Mining, Analysis and Use of Data**

Topics:

The ABC's of algorithms, machine learning and artificial intelligence; descriptive vs. predictive analysis; de-identification and re-identification; reliability and limitations of big data analytics.

Readings:

Jennifer Golbeck, "How to Teach Yourself About Algorithms," (February 9, 2016) Slate, available at [http://www.slate.com/articles/technology/future\\_tense/2016/02/how\\_to\\_teach\\_yourself\\_about\\_algorithms.html](http://www.slate.com/articles/technology/future_tense/2016/02/how_to_teach_yourself_about_algorithms.html)

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Jacob Brogan, "What's the Deal With Algorithms," (February 2, 2016) Slate, available at [http://www.slate.com/articles/technology/future\\_tense/2016/02/what\\_is\\_an\\_algorithm\\_an\\_explainer.html?wpsrc=sh\\_all\\_dt\\_tw\\_top](http://www.slate.com/articles/technology/future_tense/2016/02/what_is_an_algorithm_an_explainer.html?wpsrc=sh_all_dt_tw_top)

Suresh Venkat, "When An Algorithm Isn't...", October 2, 2015 available at <https://medium.com/@geomblog/when-an-algorithm-isn-t-2b9fe01b9bb5>

Ed Finn, "Algorithms Aren't Like Spock," (February 22, 2016) Slate, available at [http://www.slate.com/articles/technology/future\\_tense/2016/02/algorithms\\_are\\_like\\_kirk\\_not\\_spock.html](http://www.slate.com/articles/technology/future_tense/2016/02/algorithms_are_like_kirk_not_spock.html)

Jeff Hawkins & Donna Dubinsky, "What is Machine Intelligence vs. Machine Learning vs. Deep Learning vs. Artificial Intelligence?", KD Nuggets (January 2016) available at <http://www.kdnuggets.com/2016/01/what-is-machine-intelligence-ml-deep-learning-ai.html>

Molly Galetto, "What is Big Data Analytics," ngdata.com (July 5, 2016) available at <http://www.ngdata.com/what-is-big-data-analytics/>

Alex Hern, "Google says machine learning is the future so I tried it myself", The Guardian (June 28, 2016). Available at <https://www.theguardian.com/technology/2016/jun/28/google-says-machine-learning-is-the-future-so-i-tried-it-myself>

**Homework/classroom activity on the use of machine learning for building a model.**

**Week 5: September 22---An Overview of the Potential Benefits & Dangers of Big Data**

Topics:

The benefits of better decision-making, financial gain & advancing social good; the risks of bias, discrimination, exploitation, inequity and inequality; loss of privacy and surveillance and tracking by business and government;

Readings:

Madeleine Clare Elish, "Algorithms Can Make Good Co-Workers," (February 22, 2016) Slate, available at [http://www.slate.com/articles/technology/future\\_tense/2016/02/algorithms\\_can\\_make\\_good\\_co\\_workers.html](http://www.slate.com/articles/technology/future_tense/2016/02/algorithms_can_make_good_co_workers.html)

Kenneth Cukier, "Big Data Dystopia," Tedx Talks (April 14, 2014) available at [https://www.youtube.com/watch?v=Z\\_HdhhzG-b0](https://www.youtube.com/watch?v=Z_HdhhzG-b0)

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Maciej Cegowski, "Haunted By Data," October 1, 2015 available at [http://idlewords.com/talks/haunted\\_by\\_data.htm](http://idlewords.com/talks/haunted_by_data.htm)

Michael Gregg, "How Data Brokers Threaten Consumer Privacy," Huffington Post (April 12, 2016) available at [http://www.huffingtonpost.com/michael-gregg/how-data-brokers-threaten\\_b\\_9661468.html](http://www.huffingtonpost.com/michael-gregg/how-data-brokers-threaten_b_9661468.html)

"Data Broker Defendants Settle FTC Charges They Sold Sensitive Personal Information to Scammers", FTC press release (February 18, 2016) available at <https://www.ftc.gov/news-events/press-releases/2016/02/data-broker-defendants-settle-ftc-charges-they-sold-sensitive>

"The Ethics of Data – Education & Self-management," BBC Research & Development (March 16, 2016) available at <https://www.youtube.com/watch?v=naaDBNSx610> (5:55 minutes in length)

David Ingold & Spencer Soper, "Amazon Doesn't Consider the Race of its Customers. Should it," Bloomberg News (April 21, 2016) available at <http://www.bloomberg.com/graphics/2016-amazon-same-day/>

Laura Sydell, "Can Computer Programs Be Racist & Sexist?" National Public Radio (March 15, 2016) available at <http://www.npr.org/sections/alltechconsidered/2016/03/15/470422089/can-computer-programs-be-racist-and-sexist>

#### Week 6: September 29--- **A Deeper Dive into Algorithms & Fairness Issues**

##### Topics:

What are the different types of algorithms? How do they work? Are algorithms fair, discriminatory, racist, biased etc.? Can they substitute for human judgment? Transparency, accountability and ethical issues issues.

##### Readings:

A Report on Algorithmic Systems, Opportunity and Civil Rights, Executive Office of the President (May 2016) available at [https://www.whitehouse.gov/sites/default/files/microsites/ostp/2016\\_0504\\_data\\_discrimination.pdf](https://www.whitehouse.gov/sites/default/files/microsites/ostp/2016_0504_data_discrimination.pdf)

How big data is unfair. Moritz Hardt. Available at <https://medium.com/@mrtz/how-big-data-is-unfair-9aa544d739de#.69j789w6z>

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Why Machines Discriminate---and How to Fix Them, Science Friday podcast (November 20, 2015) featuring Professor Venkat and Microsoft research Kate Crawford available at <http://www.sciencefriday.com/segments/why-machines-discriminate-and-how-to-fix-them/>

Hanna Wallach, "Big Data, Machine Learning and the Social Sciences: Fairness, Accountability and Transparency" (December 19, 2014) available at <https://medium.com/@hannawallach/big-data-machine-learning-and-the-social-sciences-927a8e20460d>

Taylor Owen, "The Violence of Algorithms: Why big data is only as smart as those who generate it." (May 25, 2015) *Foreign Affairs*. Available at <https://www.foreignaffairs.com/articles/2015-05-25/violence-algorithms>

Jonathan Zittrain, "Automation and Algorithms in the Digital Age," World Economic Forum, (February 24, 2015) available at <https://www.youtube.com/watch?v=l6gD7Yq-jk> (6:03 minutes in length)

"The Ethics of Data – Personal Data & Privacy" BBC Research & Development (March 16, 2016) available at <https://www.youtube.com/watch?v=naaDBNSx610> (6:14 minutes in length)

Robyn Caplan & Laura Reed, "Who Controls the Public Sphere in an Era of Algorithms: Case Studies," *Data & Society* (May 16, 2016) available at [http://www.datasociety.net/pubs/ap/CaseStudies\\_PublicSphere\\_2016.pdf](http://www.datasociety.net/pubs/ap/CaseStudies_PublicSphere_2016.pdf)

Dario Borghino, "Would You Buy a Car Programmed to Kill You For the Greater Good?" *newatlas.com* (June 23, 2016) available at <http://newatlas.com/driverless-car-ethics/43926/>

Go to the MIT "Moral Machine" website at <http://moralmachine.mit.edu/> and complete the exercise involving autonomous vehicles.

"Professor Sorelle Friedler on Discriminatory Machine Learning," *Data & Society Research Institute* (November 30, 2015) available at [https://www.youtube.com/watch?v=8qXCi41jNvs&list=PLRQQwX\\_klyfx\\_SVTC1tbDJt67wzoia2ET&index=9](https://www.youtube.com/watch?v=8qXCi41jNvs&list=PLRQQwX_klyfx_SVTC1tbDJt67wzoia2ET&index=9) (6:16 minutes)

## Week 7: October 6---**The Regulation/Governance of Big Data**

### Topics:

Existing laws, regulations, policies and best practices potentially applicable to the collection, management, use, analysis & privacy of data; ethical issues.

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Readings:

“Big Data: A Tool for Inclusion or Exclusion?” Federal Trade Commission Report (January 2016) available at

<https://www.ftc.gov/system/files/documents/reports/big-data-tool-inclusion-or-exclusion-understanding-issues/160106big-data-rpt.pdf>

John k. Higgins, “FTC Issues Regulatory Warning on Big Data Use,” Ecommerce Times (January 20, 2016) available at

<http://www.ecommercetimes.com/story/83004.html>

Nicholas Diakopoulos, “How to Hold Governments Accountable for the Algorithms They Use,” Slate.com (February 11, 2016) available at

[http://www.slate.com/articles/technology/future\\_tense/2016/02/how\\_to\\_hold\\_governments\\_accountable\\_for\\_their\\_algorithms.html](http://www.slate.com/articles/technology/future_tense/2016/02/how_to_hold_governments_accountable_for_their_algorithms.html)

Metcalf, Jacob, Emily F. Keller, and Danah Boyd, “Perspectives on Big Data, Ethics, and Society.” *Council for Big Data, Ethics, and Society*. (May 23, 2016)

<http://bdes.datasociety.net/council-output/perspectives-on-big-data-ethics-and-society/>.

Omer Tene & Jules Polonetsky, “Beyond IRB’s: Ethical Guidelines for Data Research,” Washington and Lee Law Review Online (June 7, 2016) available at

<http://scholarlycommons.law.wlu.edu/cgi/viewcontent.cgi?article=1044&context=wlur-online>

Julia Angwin, “Make Algorithms Accountable”, New York Times (August 1, 2016) available at <http://www.nytimes.com/2016/08/01/opinion/make-algorithms-accountable.html>

Joshua A. Kroll, Joanna Huey, Solon Barzas, Edward W. Felten, Joel R. Reidenberg, David G. Robinson & Harlan Yu, “Accountable Algorithms,” (March 31, 2016) available at <http://balkin.blogspot.com/2016/03/accountable-algorithms.html>

Cathy O’Neil, “The Ethical Data Scientist,” Slate (February 4, 2016) available at [http://www.slate.com/articles/technology/future\\_tense/2016/02/how\\_to\\_bring\\_better\\_ethics\\_to\\_data\\_science.html](http://www.slate.com/articles/technology/future_tense/2016/02/how_to_bring_better_ethics_to_data_science.html)

**Brainstorming on potential Spring semester Team Projects**

Week 8: October 13---**No Class- Fall Break**

Topics:

The benefits and dangers associated with using big data for crime prevention, interdiction and in the criminal justice system; predictive policing, data consolidation and sharing, identifying crime patterns and using big data for real-time situational threat assessment; the specter of “big brother” and mass surveillance; the loss of the human element in crime interdiction; data and sentencing.

Readings:

“How Predictive Policing Software Works,” The Verge (February 3, 2016) available at <https://www.youtube.com/watch?v=YxvyeaL7NEM> (2:04 minutes)

Jason Tashea, “Websites and Apps for Sharing Crime and Safety Have Become Outlets for Racial Profiling,” ABA Journal (August 1, 2106) available at [http://www.abajournal.com/magazine/article/crime\\_safety\\_website\\_racial\\_profiling/?utm\\_source=maestro&utm\\_medium=email&utm\\_campaign=tech\\_monthly](http://www.abajournal.com/magazine/article/crime_safety_website_racial_profiling/?utm_source=maestro&utm_medium=email&utm_campaign=tech_monthly)

“Is Predictive Policing the Law-Enforcement Tactic of the Future?” Wall Street Journal (April 24, 2016) available at <http://www.wsj.com/articles/is-predictive-policing-the-law-enforcement-tactic-of-the-future-1461550190>

Hector Chaidez, “Interactive Predictive Policing Program in South Pasadena, California,” (July 25, 2016) available at <https://www.youtube.com/watch?v=LqoFk0Y3XXg> (11:26 minutes)

Thomas H. Davenport, “How Big Data is Helping the NYPD Solve Crimes Faster,” Fortune.com (July 17, 2016) available at <http://fortune.com/2016/07/17/big-data-nypd-situational-awareness/>

“Algorithms in the Criminal Justice System,” Electronic Privacy Information Center available at <https://epic.org/algorithmic-transparency/crim-justice/>

Julia Angwin, Jeff Larson, Surya Mattu, Lauren Kirchner, “Machine Bias,” ProPublica (May 23, 2016) available at <https://www.propublica.org/article/machine-bias-risk-assessments-in-criminal-sentencing>

Response to ProPublica article by developer of computer program available at <https://www.documentcloud.org/documents/2998391-ProPublica-Commentary-Final-070616.html>

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ProPublica rejoinder to developer's response available at  
<https://www.propublica.org/article/propublica-responds-to-companys-critique-of-machine-bias-story>

Guest presenters:

David Robinson, Principal, Upturn

Jeremy Heffner, Azavea, Inc.

Week 10: October 27--- **Big Data and Education**

Topics:

Use of big data for admissions, retention, identifying students at risk, predicting success, course scheduling, student advising and delivery of courses. University use of outside vendors or data analytics; privacy and data security issues

Readings:

Candace M. Thille, "As Big Data Companies Come to Teaching, a Pioneer Issues a Warning," Chronicle of Higher Education (February 23, 2016) available at <http://chronicle.com/article/As-Big-Data-Companies-Come-to/235400>

Bridget Burns, "Big Data's Coming of Age in Higher Education," Forbes.com (January 29, 2016) available at <http://www.forbes.com/sites/schoolboard/2016/01/29/big-datas-coming-of-age-in-higher-education/#2f6ba732a325>

Mikaela Pitcan, "Real Life Harms of Student Data," Data & Society Research Institute (June 16, 2016) available at <https://points.datasociety.net/real-life-harms-of-student-data-956a30aaff32#.z185lmtuy>

Read pages 21-26 of Elana Zeide, "19 Ways Data Analysis Empowered Students and Schools," Future of Privacy Forum (March 16, 2016) available at [https://fpf.org/wp-content/uploads/2016/03/Final\\_19Times-Data\\_Mar2016-1.pdf](https://fpf.org/wp-content/uploads/2016/03/Final_19Times-Data_Mar2016-1.pdf)

Goldie Blumenstyk, "As Big Data Comes to College, Officials Wrestle to Set New Ethical Norms", The Chronicle of Higher Education (June 28, 2016) available at <http://chronicle.com/article/As-Big-Data-Comes-to-College/236934>

Jeffrey R. Young, "This Chart Shows the Promise and Limits of 'Learning Analytics'", The Chronicle of Higher Education (January 4, 2016) available at <http://chronicle.com/article/This-Chart-Shows-the-Promise/234573>



Guest Presentation:

Mike Martineau, Director of Institutional Analysis, University of Utah

Week 11: November 3---**Big Data and Business**

Topics:

Understanding customer needs and how businesses are using machines to make decisions not only in marketing and retail sales, but also in making hiring and other human resources decisions; consent and privacy issues when businesses collect information about consumers.

Readings:

Lisa Morgan, Big Data: 6 Real-Life Business Cases, Information Week August 30, 2016) available at [http://www.informationweek.com/software/enterprise-applications/big-data-6-real-life-business-cases/d/d-id/1320590?image\\_number=1](http://www.informationweek.com/software/enterprise-applications/big-data-6-real-life-business-cases/d/d-id/1320590?image_number=1)

Bernard Marr, "The 18 Best Analytic Tools Every Business Manager Should Know," Forbes.com (February 4, 2016) available at <http://www.forbes.com/sites/bernardmarr/2016/02/04/the-18-best-analytics-tools-every-business-manager-should-know/#257deae2c4a>

Rob Marvin, "Predictive Analytics, Big Data, and How to Make Them Work for You," pcmag.com (July 12, 2016) available at <http://www.pcmag.com/article/345858/>

Bernard Marr, "Four Ways Big Data Will Change Every Business," Forbes.com September 8, 2015) available at <http://www.forbes.com/sites/bernardmarr/2015/09/08/4-ways-big-data-will-change-every-business/#6c4956ff7900>

Review the Mirador company website at <https://www.miradortech.com/>

Guest Presenter:

Trevor Dryer, Founder and CEO, Mirador

Week 12: November 10---**Big Data and Healthcare**

Topics:

Precision medicine, electronic health records, privacy of medical information, aggregation and sharing of records, transparency, medical device wearables, improved efficiency, patient outcomes and reduction of costs.

Readings:

Donna Marbury, "Making Sense of Big Data: Data Projects Spur Progress," modernmedicine.com (July 3, 2016) available at <http://managedhealthcareexecutive.modernmedicine.com/managed-healthcare-executive/news/making-sense-big-data-data-projects-spur-progress?page=0,0>

Adam Tanner, "How Data Brokers Make Money Off Your Medical Records," Scientific American (February 1, 2016) available at <http://www.scientificamerican.com/article/how-data-brokers-make-money-off-your-medical-records/>

Agata Kwapien, "Top 5 Examples of Big Data in Healthcare That Can Save Lives," Datapine.com (February 24, 2016) available at <http://www.datapine.com/blog/big-data-examples-in-healthcare/>

Dylan Scott, "What Does the Mormon Church have to do With Biden's Cancer Moonshot?" Statnews.com (February 26, 2016) available at <https://www.statnews.com/2016/02/26/biden-cancer-moonshot-utah/>

John Russell, "Obama, NIH Announce Big Data Gathering Push for Precision Medicine," hpcwire.com (July 7, 2016) available at <https://www.hpcwire.com/2016/07/07/obama-nih-announce-big-data-gathering-push-precision-medicine/>

Tiffany Trader, "This Hospital Computer Knows When Your Days Are Numbered," hpcwire.com (September 25, 2015) available at <https://www.hpcwire.com/2015/09/25/this-hospital-computer-knows-when-your-days-are-numbered/> (read article and view embedded video)

Muqbil Ahmar, "Big Data Analytics and IoT Can Solve Some of the Hardest Medical Problems," techfirstpost.com (July 5, 2016) available at <http://tech.firstpost.com/biztech/big-data-analytics-and-iot-can-solve-some-of-the-hardest-medical-problems-323803.html>

Guest presenters:

Willard H. Dere, MD, Director of the Program in Personalized Health and Co-Director of Center for Clinical and Translational Science at the University of Utah Health Care System.

Loren Larsen, Chief Technology Officer, HireVue

Week 13: November 17---**Student Oral Presentations on Research Projects.**

Week 14: November 24--- **No Class-Thanksgiving holiday**

Week 15: December 1--- **Student Oral Presentation on Proposed Team Projects**

Week 16: December 8---**Final selection and Preliminary Planning on Team Projects**

Discuss detailed description of team project(s) and determine milestones and assignments over the semester break.