CSCI 100: Information and Intelligence
Syllabus

Catalog Description

CSCI 100 Information and Intelligence. 3 hr. lec.; 3 cr.; No prerequisites. How information measurement, encoding, and transmission relate to the design of artificial intelligence agents such as search engines, robots, and programs that mimic human intelligence. Models of human and artificial intelligence; relations among information, meaning, and data; diagnostic and causal reasoning in the presence of uncertainty. Readings from the literature of information theory and artificial intelligence; writing assignments, completion of a project to design and/or construct an information-driven intelligent agent.

Overview

The course explores two basic concepts in computer science: *Information Theory* and *Artificial Intelligence*. Information Theory provides the basis for everything we call our "digital world," while Artificial Intelligence provides the mechanisms that make our digital devices and resources so useful. But our digital world is not all theory and abstractions: it's manifested in real hardware running real code, and we will explore some basic hardware and coding concepts through a set of in-class projects as well.

This course is offered as part of a Freshman Year Initiative "Learning Community." That means that you and 19 other first-semester students will take this course and a section of English 110 reserved just for us. At the end you will have satisfied two of your General Education requirements: English 110 satisfies the first College Writing requirement (English Composition I), and this course satisfies the Scientific World (SW) requirement.

Course Structure

The course meets twice a week for 75 minutes. Each class will begin with a brief quiz based on the reading and/or video assignment for the class. You will receive full credit for the quiz provided your answer looks "reasonable." But you can receive extra credit for a quiz answer that demonstrates a good understanding of the issue at hand. Classes will consist of a mixture of laboratory exercises, discussions, and presentation of group activities in which you are expected to participate actively. At the end of each class you will submit a very brief summary of your "takeaway" from the class. You will receive full credit for writing anything about the class; you can receive extra credit for producing an insightful question, comment, or critique based on the class.

There will be Midterm and Final Exams, which will be based on the technical content covered in the course. In addition, there will be short (3–5 pages) Midterm and Final Papers due at the times of the respective exams. The papers will address topics in the course; writing the papers will help you prepare for the exams.

There is also a laboratory component to the course. This work will be done in groups (2 people per group), and groups will present some of their projects to the class, either as videos or in person.

Course Grading

- 10% Quizzes, Takeaways
- 10% Participation in class discussions and activities
- 15% Midterm Paper
- 15% Midterm Exam
- 20% Final Paper
- 20% Final Exam
- 10% Laboratory Assignments

Class Schedule

*The schedule below is a tentative outline of what we will cover class by class and is subject to change. In general, reading assignments will average about 30 pages, never to exceed 55 pages. Viewing assignments can range anywhere from 3 to 30 minutes with an average viewing time of about 15 minutes. Students may provide SMS or E-mail information to receive updates on class scheduling and assignments.

Class	Topics	In-class Activity	Readings/Viewings Due	Pages/ Min	Coding Due
1.	Computer Science, Liberal Education, and Digital Literacy	Course, instructor, and student Introductions			
2.	"Efficiently Implementing Automated Abstractions"	Show and Tell: Relay	• Phillip Guo *What is Computer Science, Computer Science in Everyday Life* • TED Ed *Inside your computer* http://ed.ted.com/lessons/inside-your-computer-bettina-bair	5 pgs. 4 min.	
3.	Bits and Binary	Game: Nim	• Kernighan *Introduction, Chapters 1, 2, and Hardware Wrapup* • Computer Science for Everyone *Unit 2.2* http://www.computerscienceforeveryone.com/Course_1/Unit_2/Lesson_2/	34 pgs. 15 min.	
4.	Algorithms and Data Structures	Exercise: Cooper-Hewitt Planetary IPhone App	• Kernighan *Chapter 3 and 4* • TED Ed *What's an algorithm?* http://ed.ted.com/lessons/your-brain-can-solve-algorithms-david-j-malan	28 pgs. 5 min.	Module 1
5.	Program or Be Programmed/Coding Information	Game: Number guessing game	• Kernighan *Chapter 5 and 7, and Software Wrapup* • Code Academy: *Python Syntax* http://www.codecademy.com/tracks/python	31pgs. 15 min.	
6.	Baye's Theorem and Bayesian reasoning	Exercise: Cancer screening	• Khan Academy *Conditional Probability* https://www.khanacademy.org/math/applied-math/cryptography/random-algorithms-probability/v/bayes-theorem-visualized	5 min.	Module 2
7.	Data Storage and Finite State Machines		• TED Michelle Simmons *Quantum Computation* http://tedxsydney.com/site/item.cfm?item=2B8FBE09C290F6C9771E4D98A24DC681	16 min.	
8.	The Information Age	Debate: What is information	• Gleick *Prologue, Chapter 1* • Gleick *On Information and Communication* http://www.guardian.co.uk/books/video/2012/aug/24/edinburgh-book-festival-james-gleick-information-video	10 pgs. 9min.	Module 3
9.	Babbage and Lovelace	Show and Tell: Punch cards	• Gleick *Chapter 4* • TED John Graham-Cumming *The greatest machine that never was* http://www.ted.com/talks/john_graham_cumming_the_greatest_machine_that_never_was.html	46 pgs. 12 min.	
10.	Information Theory		• Gleick *Chapter 7* • *BBC Order and Disorder Part II: Information* http://documentaries-plus.blogspot.com/2012/11/order-and-disorder-bbc-horizon.html	28 pgs. 30 min.	Module 4
11.	Alan Turing and Thinking Machines	Debate: What is intelligence	• Gleick *Chapter 8* Finish BBC *Order and Disorder Part II: Information*	35 pgs. 30 min.	
12.	Creators and Consumers of Information	Exercise: Describe healthy information consumption	• Gleick *Chapter 15 and Epilogue* • TED JP Rangaswami *Information is food* http://www.ted.com/talks/jp_rangaswami_information_is_food.html	28 pgs. 17 min.	Module 5

13.	Midterm Review				
14.	Midterm Exam				
15.	Information Problems: Puzzles, Mysteries, and Probability	Exercise: Information problems we are dealing with today	• Treverton *Risks and Riddles* • TED Ed *Big Data* http://ed.ted.com/lessons/exploration-on-the-big-data-frontier-tim-smith • TED Ed *Network Theory* http://ed.ted.com/lessons/what-facebook-and-the-flu-have-in-common-marc-samet	3 pgs. 6 min. 11 min.	
16.	The Internet and the World Wide Web	Exercise: Every second on the Internet	• Kernighan *Chapter 9 and 10* • WSF *There and Back Again: A Packet's Tale* http://worldsciencefestival.com/videos/there_and_back_again_a_packets_tale	51 pgs. 3 min.	Module 6
17.	Information Systems and Information Freedom	Debate: Should information be open-source	• Abelson *Appendix* • TED Time Berners-Lee *On the next web* http://www.ted.com/talks/tim_berners_lee_on_the_next_web.html	15 pgs. 16 min.	
18.	The Physical and Virtual Worlds We Inhabit	Debate: Is technology good or bad	• Schmidt *introduction, Chapter 1* • TED Amber Case *We are all cyborgs now* http://www.ted.com/talks/amber_case_we_are_all_cyborgs_now.html	28 pgs. 8 min.	Module 7
19.	The Bits Explosion	Debate: Could A.I make better ethical decisions then humans	• Abelson *Preface, Chapter 1* • TED Christopher Steiner *Algorithms are taking over the world* http://tedxtalks.ted.com/video/Algorithms-Are-Taking-Over-The	20 pgs. 3 min.	
20.	Information Brokers	Debate: Is Google artificial intelligence	• Abelson *Chapter 4* • TED Eli Pariser *Beware online "filter bubbles"* http://www.ted.com/talks/eli_pariser_beware_online_filter_bubbles.html	51 pgs. 9 min.	Module 8
21.	Communications, Networks, and Your Digital Trail	Exercise: Data mining and app permisions	• Kernighan *Chapter 8 and 11* • TED Malte Spitz *Your phone company is watching* http://www.ted.com/talks/malte_spitz_your_phone_company_is_watching.html	34 pgs. 10 min.	
22.	Big Data, Security, and Privacy	Debate: Freedom or Security	• Abelson *Chapter 2* • TED Mikko Hypponen *Three types of online attack* http://www.ted.com/talks/mikko_hypponen_three_types_of_online_attack.html	53 pgs. 9 min.	Module 9
23.	The Quantified Self and its Digital Life	Re-debate: Is technology good or bad	• Abelson *Conclusion* • Kernighan *Chapter 12* • TED Juan Enriquez *Your online life, permanent as a tattoo* http://www.ted.com/talks/juan_enriquez_how_to_think_about_digital_tattoos.html	5 pgs. 3 pgs. 6 min.	
24.	Artificial Intelligence	Exercise: Cleverbot	• Christian *Prologue, Chapter 1 and 2* • TED Juan Enriquez *The next species of human* http://www.ted.com/talks/juan_enriquez_shares_mindboggling_new_science.html	35 pgs. 18 min.	Module 10
25.	Being Human	Debate: Humans are the only animal that…	• Christian *Chapter 3* • TED Jill Bolte-Taylor *My stroke of insight* http://www.ted.com/talks/jill_bolte_taylor_s_powerful_stroke_of_insight.html	35 pgs. 19 min.	
26.	Meaning in a Digital Age	Debate: Should A.I. mimic human behavior	• Christian *Chapter 4, Conclusion, Epilogue* • TED Sherry Turkle *Connected but alone* http://www.ted.com/talks/sherry_turkle_alone_together.html • On Being *When the Phone Rules All* http://www.onbeing.org/blog/when-the-phone-rules-all-video/5891	36 pgs. 11 min.	Module 11

27.	Group Presentations		• TED Jer Thorp *Make data more human* http://www.ted.com/talks/jer_thorp_make_data_more_human.html	17 min.	
28.	Final Review				Module 12

Hardware and Coding Modules

Module	Topics	Activity	Assignments Due
1	Hardware, Software, and Code	Assemble Teagueduino circuit board	• Complete component diagram
2	The Logic of Programming	Test drive Hangouts by watching Khan Academy "Intro to Programming" in groups	• Create Google+ Account • First set of entries in Component Glossary • Download and install Processing
3	Counting in Binary	Bit toggling exercise	• Read material on Boolean logic • Read material on state • Code for LED exercise, produced in Hangout session
4	Variables in Coding		• Variables exercise on Khan Academy • First set of entries in Programming Glossary
5	Binary Counter	Group troubleshooting of Binary Counter code	• Watch binary counter YouTube video • Begin to formulate Arduino code for Binary Counter in Hangouts
6	Introduction to Storage		• Complete individual Binary Counter tasks • Second set of entries in Programming Glossary
7	Storage continued	In groups, create header files for the Binary Counter and produce the code	• What basic functions can be performed without using storage? • Download and install code editor
8	Data Acquisition		• Read "Voltage, Current, Resistance, and Ohm's Law" • Read "Analog vs. Digital"
9	Data Sampling	In groups, write code to sample and store data from a sensor	• In Hangouts, choose sensor to work with
10	Analog to Digital	Analog to Digital graph sketching exercise	• Read "How Analog to Digital Converter Works"
11	Smoothing	In groups, modify code from Module 9 to smooth the gathered information in real time	• In a paragraph: what difficulties and drawbacks are inherent to the conversion of data from Analog to Digital?
12	Build Something	Within the constraints of the Teagueduino system, design an intelligent agent that does Orienting, Tracking, or Navigation	• Written design specifications. • Code implementing any part of the design