



## CCTP-607: Leading Ideas in Technology: AI to the Cloud

**Professor: Martin Irvine**

**Time and Dates: Tues. 11:00AM-1:30PM | Jan. 17- May 2, 2021**

**Location: Car Barn 318**

### **Course Resources:**

In addition to in-class discussions and exercises, students will participate in the course with a suite of Web-based platforms and e-text resources:

- (1) A custom-designed Website created by the professor for the syllabus, links to readings, and weekly assignments: <https://irvine.georgetown.domains/607>
- (2) An e-text course library and access to shared Google Docs: most readings (and research resources) will be available in pdf format in a shared Google Drive folder prepared by the professor. Students will also create and contribute to shared, annotatable Google Docs for certain assignments and dialogue (both during synchronous online class-time, and working on group projects outside of class-times).
- (3) The Canvas Discussion platform for weekly assignments.
- (4) Zoom video conferencing for virtual office hour meetings (when necessary).

**Professor Contact Information:** email: [irvinem@georgetown.edu](mailto:irvinem@georgetown.edu)

**Office Hours:** Before class meetings, and by appointment.



## COURSE DESCRIPTION

This course will provide a conceptual and design-oriented introduction to some of the leading ideas in computing and data technologies that everyone needs to know. The course is especially designed for students from non-technical backgrounds, but all students can benefit from learning the methods in this course.

The main learning objectives are gaining conceptual competencies and critical thinking skills for understanding, interpreting, and explaining the key design principles for (1) contemporary, networked computing systems, (2) kinds of data and data processes, (3) "artificial intelligence" (AI) and "machine learning" (ML), (4) Cloud Computing and "Big Data" systems, and (5) how these technologies are now combined and integrated. With the "design principles" approach, students will understand why certain technologies are designed the way that they currently are, and be able to distinguish between design and implementation, that is, the difference between product implementations and more universal design principles that make them possible.

### Framework and Main Approaches

Every day, the news media, popular discourse, marketing, and advertising are full of statements about these technologies, but they are treated as unfathomable "black boxes" and corporate-branded products. To reverse this "blackboxing," this course will provide the methods, key concepts, and analytical tools for understanding the designs of the systems, devices, and interfaces that we use every day.

We will combine four main methods and approaches for an interdisciplinary deblackboxing method (exposing the designs and concepts behind what we can't observe when using a technology). This integrated method works to reveal how everyone, not just technical people, can understand the meaning of the ideas behind our technologies and find ways to participate in how they can be used. We will combine:

- (1) "Systems Thinking" to understand how a specific technology is part of a larger, interrelated system (for example, computing systems, kinds of software, networks, and social contexts);
- (2) "Design Thinking" for uncovering how and why certain technologies are designed the way they are, including the history of designs and the consequences of design choices;
- (3) "Semiotic Thinking" for understanding these technologies as artefacts of human symbolic thought, which includes (a) understanding how sign systems and media can be digitally encoded as "information" or data, (b) the relationship between abstract models (e.g., algorithms, code, data models) and how (or whether) they can be implemented technically, and (c) understanding the social meanings, values, and purposes of the technical systems;
- (4) the "Ethics and Policy" viewpoint for evaluating the social consequences of design choices in the large-scale adoption of certain kinds of technologies, and for analyzing proposals for ethical decisions and governmental policy.



## COURSE LEARNING OBJECTIVES

The course will include individual and group writing assignments for students to learn how to use our methods and analytical tools for better ways of interpreting these technologies and explaining them to others. By the end of the course, students will have achieved a competency in design thinking and systems thinking as applied to the technologies we study, and will be able to work with others in providing "de-blackboxed," clear explanations and "translations" of design principles for communicating across technical and non-technical communities.

## COURSE READINGS AND REQUIRED BOOKS

Many of the course readings are provided as pdf documents linked in each week unit on the course syllabus website: <https://irvine.georgetown.domains/607/>

There are three required books, from which I have relevant sections in pdfs in the e-text library. These books will be at the GU bookstore, but, of course, you can get them from online sellers as well. The most important book: you should your own copy of Denning and Martell (2015) for ongoing reference and your own annotations.

- Ethem Alpaydin. *Machine Learning: The New AI*. Rev. ed. Cambridge, MA: MIT Press, 2021.
- Peter J. Denning and Craig H. Martell. *Great Principles of Computing*. Cambridge, MA: The MIT Press, 2015.

## COURSE ASSIGNMENTS AND GRADING CRITERIA

### Graded Assignments

Grading will be based on:

- (1) Class participation: weekly writing assignments, and group projects (as assigned) (50%).
- (2) An individual final research essay or creative project based on applying the concepts and methods of the course (50%).



## COURSE SCHEDULE

This course is divided into 14 weekly modules. For more information on the course structure and assignments, see the course website: <https://irvine.georgetown.domains/607/>

### Canvas Discussions:

Please note that **all readings and assignments are to be completed during the week *before* the numbered week units**. Each week unit defines what we will be covering in class discussions for that week.

Weekly writing assignments must be posted in Canvas **at least 6 hours before class**, so that all class members can review each other's work and be prepared for discussion in class.

### Course Outline:

See the [course website](#) for the content of each week unit in this topic outline. Note: Contents of units are subject to revision. The updated syllabus outline and content will always be on the course website.

Week 1: Leading Ideas: Introduction to Main Topics and Methods

Week 2: Booting Up: Introduction to Key Concepts, Approaches, Questions

Week 3: Computing Principles & System Design → AI Design

Week 4: Information, Data, and Meaning (1)

Week 5: Information, Data, Meaning (2)

Week 6: The Foundations of AI / ML in Computing: Introduction to Pattern Recognition

Week 7: Introduction to Natural Language Processing (NLP)

Week 8: "OK, Computer": AI and the Algorithms of Everyday Interaction

Week 9: The Ethical, Social, and Governmental Concerns for AI

Week 10: What is Cloud Computing? (AI/ML Applications Now Part of Cloud Services)

Week 11: "Big Data": Combining Data Analytics, Cloud Platforms, and AI

Week 12: Synthesis and Planning Final Projects

Week 13: Discussion: Planning Final Research Projects

Week 14: Wrap Up and Discussion of Final Projects

Final Project due date: May 10.



## COURSE POLICIES AND EXPECTATIONS

### Expectations of Students

This course will be conducted as a seminar and requires each student's direct participation in the learning objectives in each week's course unit. Each syllabus unit is designed as a building block in the interdisciplinary learning path of the course, and students will write weekly short essays that reflect on and apply the main concepts and approaches in each week's unit. Students will also work in teams and groups on collaborative in-class projects and group presentations prepared before class meetings.

You are expected to complete all readings, assignments, and activities **on time before each class meeting**.

Participation is essential to your success in this class. You are expected to actively participate in weekly discussions with fellow students and to contribute to group assignments. In order to get full credit for participation, you will have to complete all of your assignments on time.

### Time Expectations

Students should plan on spending approximately **10 hours per week** on the work for each week unit.

### Communication Expectations

#### *Communication with Peers*

You will be expected to engage with your fellow classmates via the Canvas Discussions platform, and on other platforms as assigned (e.g., Google docs).

#### *Communication with the Professor*

Please feel free to email me with your questions, concerns, and/or to schedule a time to meet over Zoom. When sending emails please remember to follow the guidelines outlined below.

Note: most general questions can be answered by consulting the information in the course website.

- *Be patient.* If you have a concern and send me a message, you can expect a response within 1 day.
- *Specify subject.* Subject line should include the topic of the message and class title.
- *Greet & Close.* E-mails should begin with a formal greeting and end with you signing your name in all messages/emails.
- *Check your writing.* Proofread (i.e. grammar and spelling) your message before sending.



## *Netiquette Guidelines*

To promote the highest degree of education possible, we ask each student to respect the opinions and thoughts of other students and be courteous in the way that you choose to express yourself. Students should be respectful and considerate of all opinions.

In order for us to have meaningful discussions, we must learn to genuinely try to understand what others are saying and be open-minded about others' opinions. If you want to persuade someone to see things differently, it is much more effective to do so in a polite, non-threatening way rather than to do so antagonistically. Everyone has insights to offer based on his/her experiences, and we can all learn from each other. Civility is essential.

## LEARNING AND RESEARCH RESOURCES

### Georgetown Library & eResources for Learning and Research

The Georgetown Library is one of the best in the US. As soon as possible, get to know how to search for books and articles from the library's main page:

<https://library.georgetown.edu/>

Increasingly, publishers are providing books and journals in eText form, and Georgetown Library subscribes to most of the sources you will need for your studies.

If you have a question for a librarian you can go to their “Ask Us” page where you will have the option to chat online, send an email, or schedule a Zoom appointment to discuss a research topic, develop a search strategy, or examine resources for projects and papers. Librarians offer an overview of and in-depth assistance with important resources for senior or master's theses, dissertations, papers and other types of research. This service is available to currently enrolled students who need assistance with Georgetown-assigned projects and papers. Please review the [Services & Resources Guide for Online Students](#) for additional information.

Students enrolled in courses have access to the University Library System's eResources, including 500+ research databases, 1.5+ million ebooks, and thousands of periodicals and other multimedia files (films, webinars, music, and images). You can access these resources through the [Library's Homepage](#) by using your NetID and password.

### Learning Resources

Georgetown offers a host of [learning resources](#) to its students. Two that you might find particularly helpful in this course are the [Writing Center](#) and [Refworks](#).

- [The Writing Center](#) offers peer tutoring by trained graduate and undergraduate students who can assist you at any point in the writing process. They help at any stage of your writing process, from brainstorming to revision. Tutors can offer advice on thesis development, use of evidence, organization, flow, sentence structure, grammar, and more. The Writing Center will not proofread or edit papers; rather, they will help to improve your proofreading and editing skills to become a better writer. Appointments can be booked online through their website.
- [Refworks](#) is an online research management tool that aids in organizing, storing, and presenting citation sources for papers and projects.



## Technical Support

All students have 24/7 access to Canvas technical support 24 hours a day, 7 days a week, including live chat and a support hotline at 855-338-2770. Use the 'Help' icon in the lower left of your Canvas window to view all available support and feedback options. If you're looking for help on a specific feature, check out the [Canvas Student Guide](#).

## UNIVERSITY POLICIES AND SERVICES

### ACADEMIC INTEGRITY

Students at Georgetown University are expected to maintain the highest standards of academic and personal integrity. Although most Georgetown students conduct themselves in accordance with these standards, occasionally, there are students who violate the code of conduct. Cheating harms the University community in many ways. For example, honest students are frustrated by the unfairness of cheating that goes undetected and students who cheat can skew the grading curve in a class, resulting in lower grades for students who worked hard and did their own work.

Academic dishonesty in any form is a serious offense, and students found in violation are subject to academic penalties that include, but are not limited to failure of the course, termination from the program, and revocation of degrees already conferred. All students are expected to fully adhere to the policies and procedures of [Georgetown's Honor System](#) and to take the Honor Code Pledge:

#### Honor Code Pledge

*In pursuit of the high ideals and rigorous standards of academic life I commit myself to respect and to uphold the Georgetown University honor system; to live out a commitment to integrity in all my words and actions; to be honest in every academic endeavor; and to conduct myself honorably, as a responsible member of the Georgetown community as we live and work together; to live out the ideals of Georgetown University I commit myself to be a person for others in my daily life, respectful of difference and disagreement; To care for this venerable campus and all of those with whom I share it; and to fulfill in all ways the trust placed in me to carry on the Georgetown tradition.*

#### Plagiarism

Stealing someone else's work is a terminal offense in the workplace, and it will wreck your career in academia, too. Students are expected to work with integrity and honesty in all their assignments. The Georgetown University Honor System defines plagiarism as "the act of passing off as one's own the ideas or writings of another." More guidance is available through the [Gervase Programs](#).



If you have any doubts about plagiarism, paraphrasing, and the need to credit, check out [Plagiarism.org](https://www.plagiarism.org).

All submissions must be your original work. Any submission suspected of plagiarism will be immediately referred to the Honor Council for investigation and possible adjudication. All students are expected to follow Georgetown's honor code unconditionally. If you have not done so, please read the honor code material located online at the [Honor Council website](#).

## ACCOMODATIONS

### Students with Disabilities

Under the Americans with Disabilities Act (ADA) and the Rehabilitation Act of 1973, individuals with disabilities have the right to specific accommodations that do not fundamentally alter the nature of the course. Some accommodations might include note takers, books on tape, extended time on assignments, and interpreter services among others. Students are responsible for communicating their needs to the [Academic Resource Center](#), the office that oversees disability support services, (202-687-8354):

[arc@georgetown.edu](mailto:arc@georgetown.edu); <https://academicsupport.georgetown.edu/disability/>

before the start of classes to allow time to review the documentation and make recommendations for appropriate accommodations.

The University is not responsible for making special accommodations for students who have not declared their disabilities and have not requested an accommodation in a timely manner. Also, the University need not modify course or degree requirements considered to be an essential requirement of the program of instruction. For the most current and up-to-date policy information, please refer to the [Georgetown University Academic Resource Center website](#). Students are highly encouraged to discuss the documentation and accommodation process with an Academic Resource Center administrator.

### Accessibility and Inclusion

One of the central tenets of Georgetown's educational mission is *cura personalis*, a Latin phrase meaning "care of the whole person." Georgetown is committed to showing care and concern for each student by creating an inclusive and accessible learning environment that follows universal design principles to meet the needs of its diverse student body.

I am committed to creating a learning environment for my students that supports a diversity of thoughts, perspectives and experiences, and honors your identities (including race, gender, class, sexuality, religion, ability, etc.). If your name or pronoun needs to be corrected, please let me know early in the semester so that I can make the appropriate changes to my records.

### Title IX/Sexual Misconduct

Georgetown University and its faculty are committed to supporting survivors and those impacted by sexual misconduct, which includes sexual assault, sexual harassment, relationship violence, and stalking. Georgetown requires faculty members, unless otherwise designated as





confidential, to report all disclosures of sexual misconduct to [the University Title IX Coordinator or a Deputy Title IX Coordinator](#). If you disclose an incident of sexual misconduct to a professor in or outside of the classroom (with the exception of disclosures in papers), that faculty member must report the incident to the Title IX Coordinator, or Deputy Title IX Coordinator. The coordinator will, in turn, reach out to the student to provide support, resources, and the option to meet. [Please note that the student is not required to meet with the Title IX coordinator.]

Please note that University policy requires faculty to report any disclosures about sexual misconduct to the Title IX Coordinator, whose role is to coordinate the University's response to sexual misconduct. Georgetown has a number of fully confidential professional resources who can provide support and assistance to survivors of sexual assault and other forms of sexual misconduct. These resources include:

- Jen Schweer, MA, LPC, Associate Director of Health Education Services for Sexual Assault Response and Prevention (202) 687-0323 | [jls242@georgetown.edu](mailto:jls242@georgetown.edu)
- Counseling and Psychiatric Services (CAPS), (202) 687-6985 | After Hours: (833) 960-3006
- Sexual Assault Response and Prevention (SARP) confidential email: [sarp@georgetown.edu](mailto:sarp@georgetown.edu)
- [Get Help Resources](#)

More information about reporting options and resources can be found on the [Sexual Misconduct Website](#). If you would like to find out how recent changes to Title IX regulations are impacting Georgetown's policies and procedures, see [this video briefing](#).

## **Title IX/Pregnancy and Parenting Accommodations**

Georgetown University is committed to creating an accessible and inclusive environment for pregnant and parenting students. Students may request adjustments based on general pregnancy needs or accommodations based on a pregnancy-related complication. Specific adjustments will be handled on a case by case basis and will depend on medical needs and academic requirements. Students seeking a pregnancy adjustment or accommodation should follow the process laid out on the [Title IX website](#).

Discrimination based on sex, including sexual misconduct and discrimination based on pregnancy or parenting status, subverts the University's mission and threatens permanent damage to the educational experience, careers, and well-being of students, faculty, and staff.



## SUPPORT SERVICES

Georgetown offers a variety of support services for students that can be accessed online and has put together [this newsletter](#) which aims to provide you with information about well-being resources and virtual meetings that can connect you with mental health professionals on and off campus during this time. Below are some resources available to you:

- [Academic Resource Center](#): 202-687-8354 | [arc@georgetown.edu](mailto:arc@georgetown.edu)
- [Counseling and Psychiatric Services](#): 202-687-6985
- [Institutional Diversity, Equity & Affirmative Action \(IDEAA\)](#): (202) 687-4798