Ira A. Fulton Schools of Engineering
Arizona State University

1. Contact Information

Instructor: YZ Yezhou Yang
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2. Office Hours

TBD

3. Course Description:

Title: Frontier Topics in GenAI

Explore the cutting-edge realm of Generative AI with our "Frontier Topics in Generative AI" Seminar Series. As the field experiences unprecedented growth, delving into areas such as large-language models, text-to-image synthesis, video generation, multimodal reasoning, science discovery, and robotics becomes increasingly vital. While applied research flourishes, it remains crucial to illuminate the foundational works underpinning these advancements.

Our seminar series offers a deep dive into grounded research across GenAI, spanning vision, language, and other critical domains. Join us in unraveling the core principles driving innovation and shaping the future of this dynamic field.

List of topics (tentative)

1. Introduction to Generative AI: Fundamentals and Recent Advancements
2. Large-Language Models: From GPT to Beyond
3. Text-to-Image Synthesis: Generating Realistic Visual Content
4. Video Generation: Techniques and Applications
5. Multimodal Reasoning: Bridging Vision, Language, and Beyond
6. Generative AI in Science Discovery: Accelerating Science Innovation
7. Robotics and Generative AI: Enhancing Automation and Human-Robot Interaction
8. Ethical Considerations in Generative AI: Bias, Privacy, and Responsible Innovation
9. Future Directions and Emerging Trends in Generative AI

4. Course Objectives

1. Understand the fundamentals of Generative AI, including the principles and techniques behind large language models and diffusion models.
2. Explore the historical development of Generative AI, tracing its evolution and key milestones.
3. Learn how large language models function and their applications across various use cases, enabling participants to leverage them effectively.
4. Gain insight into text-to-image diffusion models, understanding their mechanisms and potential applications.
5. Familiarize oneself with essential tools and setups for working with Generative AI, ensuring practical proficiency in experimentation and implementation.

5. Course Learning Outcomes

1. Gain a comprehensive understanding of Generative AI, tracing its historical development to the current technology landscape.
2. Explore the inner workings of large language models and diffusion models, acquiring insights into

their mechanisms and algorithms.
3. Identify the main capabilities and practical applications of large language models and text-to-image Generative AI, enabling participants to recognize opportunities for utilization in various domains.
4. Discuss frontier research topics in Generative AI, delving into emerging trends and cutting-edge advancements shaping the field's future trajectory.

6. Enrollment Requirements

Linear Algebra, Intro to Statistics, Data Structure and Algorithms

7. Grade Policies

1. Group project: 60%
2. Midterm: 10%
3. Homework: 30%

8. Absence policies and the conditions under which assigned work and/or tests can be made up, which should include

a. The instructor's polidy is standard.
b. [excused absences related to religious observances/practices that are in accord with ACD 304–04, "Accommodation for Religious Practices"]
c. [excused absences related to university sanctioned events/activities that are in accord with ACD 304–02, "Missed Classes Due to University-Sanctioned Activities"]
d. [excused absences related to missed class due to military line-of-duty activities that are in accord with ACD 304–11]

9. Lists of any required readings, assignments, examinations, special materials and extracurricular activities

Instructor-prepared lecture notes will be distributed.

10. Policy regarding expected classroom behavior (e.g., use of pagers, cell phones, recording devices)

Standard.

11. Academic Integrity

Mandatory Statement

Students in this class must adhere to ASU's academic integrity policy, which can be found at https://provost.asu.edu/academic-integrity/policy). Students are responsible for reviewing this policy and understanding each of the areas in which academic dishonesty can occur. In addition, all engineering students are expected to adhere to both the ASU Academic Integrity Honor Code and the Fulton Schools of Engineering Honor Code. All academic integrity violations will be reported to the Fulton Schools of Engineering Academic Integrity Office (AIO). The AIO maintains record of all violations and has access to academic integrity violations committed in all other ASU college/schools.

Specific academic integrity announcements for this class are…[* When discussing sanctions please use language like, *recommended sanctions for these violations will be…*this allows for the fact that the AIO may want to discuss the sanction with you and it also improves the ability to increase the penalty when it is a multiple violation]

12. Copyright

Mandatory Statement

Course content, including lectures, are copyrighted materials and students may not share outside the class, upload to online websites not approved by the instructor, sell, or distribute course content or notes taken during the conduct of the course (see ACD 304–06, "Commercial Note Taking Services" and ABOR Policy 5-308 F.14 for more information).

You must refrain from uploading to any course shell, discussion board, or website used by the course instructor or other course forum, material that is not the student's original work, unless the students first comply with all applicable copyright laws; faculty members reserve the right to delete materials on the grounds of suspected copyright infringement.

13. Policy against threatening behavior, per the Student Services Manual, SSM 104–02

Mandatory statement

Students, faculty, staff, and other individuals do not have an unqualified right of access to university grounds, property, or services. Interfering with the peaceful conduct of university-related business or activities or remaining on campus grounds after a request to leave may be considered a crime. All incidents and allegations of violent or threatening conduct by an ASU student (whether on- or off-campus) must be reported to the ASU Police Department (ASU PD) and the Office of the Dean of Students.

14. Disability Accommodations

Mandatory statement

Suitable accommodations will be made for students having disabilities. Students needing accommodations must register with the ASU Disabilities Resource Center and provide documentation of that registration to the instructor. Students should communicate the need for an accommodation in sufficient time for it to be properly arranged. See ACD 304-08 Classroom and Testing Accommodations for Students with Disabilities.

15. Harassment and Sexual Discrimination

Mandatory statement

Arizona State University is committed to providing an environment free of discrimination, harassment, or retaliation for the entire university community, including all students, faculty members, staff employees, and guests. ASU expressly prohibits discrimination, harassment, and retaliation by employees, students, contractors, or agents of the university based on any protected status: race, color, religion, sex, national origin, age, disability, veteran status, sexual orientation, gender identity, and genetic information.

Title IX is a federal law that provides that no person be excluded on the basis of sex from participation in, be denied benefits of, or be subjected to discrimination under any education program or activity. Both Title IX and university policy make clear that sexual violence and harassment based on sex is prohibited. An individual who believes they have been subjected to sexual violence or harassed on the basis of sex can seek support, including counseling and academic support, from the university. If you or someone you know has been harassed on the basis of sex or sexually assaulted, you can find information and resources at https://sexualviolenceprevention.asu.edu/faqs.

Mandated sexual harassment reporter: As a mandated reporter, I am obligated to report any information I become aware of regarding alleged acts of sexual discrimination, including sexual violence and dating violence. ASU Counseling Services, https://eoss.asu.edu/counseling, is available if you wish discuss any concerns confidentially and privately.