



Course ID and Title: EE599 Intelligent Multimedia Systems

Units: 4

Term—Day—Time: Spring 2024, Monday and Wednesday, 2:00 pm - 3:50 pm

Location: Kaprielian Hall (KAP) 166

Instructor: Feng Qian

Office: EEB 240

Office Hours: By Appointment

Contact Info: fenggqian@usc.edu

Course Description

Multimedia systems such as video streaming, teleconferencing, and VR/AR systems have become part of our daily lives. This course will cover various topics of multimedia systems, including but not limited to:

- Adaptive streaming of multimedia content
- Network and system support for multimedia
- Virtual and augmented reality content and systems
- Multiview, 360 degrees, 3D, and volumetric videos
- Mobile multimedia and 5G/6G
- Cloud and edge computing for multimedia systems
- AI/ML (Artificial Intelligence / Machine Learning) for multimedia systems
- Multimedia Quality of Experience (QoE)
- Analytics for multimedia systems
- Multimedia systems for unmanned vehicles
- Video games and cloud gaming
- Internet of Things (IoTs) and multimedia

With guidance from the instructor, students will discuss research papers from top conferences, brainstorm cool ideas, and work on course projects related to multimedia systems.

Learning Objectives

By the end of this course, students will be able to

- Understand the key concepts and principles of modern multimedia systems.
- Familiarize with the state-of-the-art landscape of multimedia system research.
- Develop a prototype multimedia system through the course project.

Prerequisite(s): Undergraduate computer networks or operating systems. Programming experience on multimedia systems is a plus for the project, but not required.

Course Notes

- This course will be delivered in person. In rare circumstances (e.g., the professor is traveling for university business), the course may be delivered over Zoom.
- In most lectures (called “regular” lectures), we will discuss two or three research papers. First, one or two students will each give a ~30-minute presentation of a paper they select. Then the instructor will give some overview and cover the remaining paper(s) (if any), followed by

discussions. Some lectures are allocated for the course project, including idea brainstorming, proposal presentations, and final project presentations. We will also have some guest lectures.

- This course uses standard letter (A-F) grading.
- Course materials and other class information will be posted on Blackboard.

Required Readings and Supplementary Materials

- The main source of reading materials consists of research papers published at top-tier conferences, including but not limited to: ACM SIGCOMM, USENIX NSDI, USENIX OSDI, ACM MobiCom, ACM MobiSys, ACM Multimedia, and ACM MMSys. The reading assignments will be posted at least one week prior to each lecture. Here is a sample paper that we will study and discuss: https://feng-qian.github.io/paper/flare_mobicom18.pdf
- This course does not use any textbook.

Description and Assessment of Assignments

The assignments of this course consist of three components: paper presentation, paper summaries, and course project, which are elaborated below.

- **Paper presentation**
Each student will present n papers at regular lectures over the semester (n can be 1 or 2, as to be determined based on the course enrollment).
- **Paper summaries**
Each student needs to submit one (and only one) summary of one paper before each regular lecture. The paper(s) to be discussed in each lecture will be posted on Blackboard about one week before the lecture date. If there are multiple papers, you are free to select any one among them. A good summary should include the following key points:
 1. What is the problem the paper tries to solve?
 2. What is the high-level approach used?
 3. What are the key results?
 4. How does this work advance the state-of-the-art?
 5. What are the limitations of the work?
 6. What is the potential future work enabled by this paper?The summaries must be submitted electronically via Blackboard before the lecture starts. The grade, on a scale of 0 to 3, can be one of the following: 3 (above average), 2 (average), 1 (below average), or 0 (no submission or invalid submission). Late submissions will also receive 0.
- **Course Project**
The project is a key component of this course. A project must be an individual project (involving only **one** student). The merit of your project will be evaluated by the following metrics:
 1. Novelty - How novel is your proposed idea compared to the state-of-the-art?
 2. Design - Do you have a good design of your system / measurement / experiments?
 3. Implementation - How solid is your implementation?
 4. Report - Is the final report well written?

To keep good progress, three documents must be submitted before their respective deadlines.

- Project proposal (1~2 pages single column, 11 pt font).
 - Status report (1~2 pages single column, 11 pt font).
 - Final report (at least 6 pages double columns, 10 pt font, in ACM format).
- LaTeX and Microsoft Word templates for the project report will be distributed.

Exams

There will be an in-classroom, closed-book exam at the end of the semester. The exam problems will be developed from all the reading materials. More details will be provided later.

Grading Breakdown

Project: **42 points** (Proposal report: 4%, Status report: 3%, Final report: 35%)

Paper summary: **30 points**

In-class presentation: **8 points**

Final exam (in-classroom, closed-book): **20 points**

Total: **100 points**

Grading Scale

Course final grades will be determined using the following scale:

Letter grade	Corresponding numerical point range
A	95-100
A-	90-94
B+	87-89
B	83-86
B-	80-82
C+	77-79
C	73-76
C-	70-72
D+	67-69
D	63-66
D-	60-62
F	59 and below

Assignment Submission Policy

Assignments will be submitted electronically through Blackboard.

Late Policies

Unless approved by the instructor, **late submissions of paper summaries receive no credit**. Late submissions of project documents (proposal, status report, and final report) receive partial credit, as follows.

Late for no more than 12 hours: 80% of the credits.

Late for more than 12 hours but no more than 24 hours: 70% of the credits.

Late for more than 24 hours but no more than 48 hours: 60% of the credits.

Late for more than 48 hours: no credit.

Attendance

In-person attendance is required for this course. Permitted exceptions include but are not limited to: student athletes with approved Travel Request Letters and students who give advance notice of religious observation.

Attendance checks will be performed at each class.

- If a student misses 3 to 5 classes without the instructor's approval, their letter grade will be reduced by one level (e.g., A to A-, A- to B+).
- If a student misses 6 to 8 more classes without the instructor's approval, their letter grade will be reduced by two levels (e.g., A to B+, A- to B).
- If a student misses 9 or more classes without the instructor's approval, their letter grade will be F.

Academic Integrity

The University of Southern California is foremost a learning community committed to fostering successful scholars and researchers dedicated to the pursuit of knowledge and the transmission of ideas. Academic misconduct is in contrast to the university's mission to educate students through a broad array of first-rank

academic, professional, and extracurricular programs and includes any act of dishonesty in the submission of academic work (either in draft or final form).

This course will follow the expectations for academic integrity as stated in the [USC Student Handbook](#). All students are expected to submit assignments that are original work and prepared specifically for the course/section in this academic term. You may not submit work written by others or “recycle” work prepared for other courses without obtaining written permission from the instructor(s). Students suspected of engaging in academic misconduct will be reported to the Office of Academic Integrity.

Other violations of academic misconduct include, but are not limited to, cheating, plagiarism, fabrication (e.g., falsifying data), knowingly assisting others in acts of academic dishonesty, and any act that gains or is intended to gain an unfair academic advantage.

The impact of academic dishonesty is far-reaching and is considered a serious offense against the university and could result in outcomes such as failure on the assignment, failure in the course, suspension, or even expulsion from the university.

For more information about academic integrity see the [student handbook](#) or the [Office of Academic Integrity's website](#), and university policies on [Research and Scholarship Misconduct](#).

Policy for the use of AI Generators in your course

Since creating, analytical, and critical thinking skills are part of the learning outcomes of this course, all assignments should be prepared by the student working individually or in groups. Students may not have another person or entity complete any substantive portion of the assignment. Developing strong competencies in these areas will prepare you for a competitive workplace. Therefore, using AI-generated tools is prohibited in this course, will be identified as plagiarism, and will be reported to the Office of Academic Integrity.

Collaboration Policy and Group Work

In this class, you are expected to submit work that demonstrates your individual mastery of the course concepts. Except for the course project (see “Description and Assessment of Assignments”), all assignments are expected to be completed individually.

Course Content Distribution and Synchronous Session Recordings Policies

USC has policies that prohibit recording and distribution of any synchronous and asynchronous course content outside of the learning environment.

Recording a university class without the express permission of the instructor and announcement to the class, or unless conducted pursuant to an Office of Student Accessibility Services (OSAS) accommodation. Recording can inhibit free discussion in the future, and thus infringe on the academic freedom of other students as well as the instructor. ([Living our Unifying Values: The USC Student Handbook](#), page 13).

Distribution or use of notes, recordings, exams, or other intellectual property, based on university classes or lectures without the express permission of the instructor for purposes other than individual or group study. This includes but is not limited to providing materials for distribution by services publishing course materials. This restriction on unauthorized use also applies to all information, which had been distributed to students or in any way had been displayed for use in relationship to the class, whether obtained in class, via email, on the internet, or via any other media. ([Living our Unifying Values: The USC Student Handbook](#), page 13).

Course Schedule

	Topics	Readings	Deliverables
Week 1	Course overview and logistics On-demand video streaming	Research papers	Paper summaries
Week 2	On-demand video streaming	Research papers	Paper summaries
Week 3	360-degree video streaming	Research papers	Paper summaries
Week 4	Volumetric video streaming	Research papers	Paper summaries
Week 5	Mobile multimedia and 5G/6G Project proposal presentation	Research papers	Paper summaries Project proposal
Week 6	Mobile multimedia and 5G/6G	Research papers	Paper summaries
Week 7	VR/AR systems	Research papers	Paper summaries
Week 8	VR/AR systems	Research papers	Paper summaries
Week 9	AI/ML for multimedia systems	Research papers	Paper summaries
Week 10	AI/ML for multimedia systems	Research papers	Paper summaries Project progress report
Week 11	Analytics for multimedia systems Multimedia QoE	Research papers	Paper summaries
Week 12	Cloud and edge computing for multimedia systems	Research papers	Paper summaries
Week 13	Large-scale deployment of multimedia systems	Research papers	Paper summaries
Week 14	Cloud gaming Multimedia systems for unmanned vehicles	Research papers	Paper summaries
Week 15	Miscellaneous topics Final project presentation	Research papers	Paper summaries
FINAL	Final Exam (in-classroom, closed-book)		Project final report Project code and data

Statement on Academic Conduct and Support Systems

Academic Integrity:

The University of Southern California is a learning community committed to developing successful scholars and researchers dedicated to the pursuit of knowledge and the dissemination of ideas. Academic misconduct, which includes any act of dishonesty in the production or submission of academic work, compromises the integrity of the person who commits the act and can impugn the perceived integrity of the entire university community. It stands in opposition to the university's mission to research, educate, and contribute productively to our community and the world.

All students are expected to submit assignments that represent their own original work, and that have been prepared specifically for the course or section for which they have been submitted. You may not submit work written by others or "recycle" work prepared for other courses without obtaining written permission from the instructor(s).

Other violations of academic integrity include, but are not limited to, cheating, plagiarism, fabrication (e.g., falsifying data), collusion, knowingly assisting others in acts of academic dishonesty, and any act that gains or is intended to gain an unfair academic advantage.

The impact of academic dishonesty is far-reaching and is considered a serious offense against the university. All incidences of academic misconduct will be reported to the Office of Academic Integrity and could result in outcomes such as failure on the assignment, failure in the course, suspension, or even expulsion from the university.

For more information about academic integrity see [the student handbook](#) or the [Office of Academic Integrity's website](#), and university policies on [Research and Scholarship Misconduct](#).

Please ask your instructor if you are unsure what constitutes unauthorized assistance on an exam or assignment, or what information requires citation and/or attribution.

Students and Disability Accommodations:

USC welcomes students with disabilities into all of the University's educational programs. [The Office of Student Accessibility Services](#) (OSAS) is responsible for the determination of appropriate accommodations for students who encounter disability-related barriers. Once a student has completed the OSAS process (registration, initial appointment, and submitted documentation) and accommodations are determined to be reasonable and appropriate, a Letter of Accommodation (LOA) will be available to generate for each course. The LOA must be given to each course instructor by the student and followed up with a discussion. This should be done as early in the semester as possible as accommodations are not retroactive. More information can be found at osas.usc.edu. You may contact OSAS at (213) 740-0776 or via email at osasfrontdesk@usc.edu.

Support Systems:

[Counseling and Mental Health](#) - (213) 740-9355 – 24/7 on call

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

[988 Suicide and Crisis Lifeline](#) - 988 for both calls and text messages – 24/7 on call

The 988 Suicide and Crisis Lifeline (formerly known as the National Suicide Prevention Lifeline) provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week, across the United States. The Lifeline is comprised of a national network of over 200 local crisis centers, combining custom local care and resources with national standards and best practices. The new, shorter phone number makes it easier for people to remember and access mental health crisis services

(though the previous 1 (800) 273-8255 number will continue to function indefinitely) and represents a continued commitment to those in crisis.

[Relationship and Sexual Violence Prevention Services \(RSVP\)](#) - (213) 740-9355(WELL) – 24/7 on call

Free and confidential therapy services, workshops, and training for situations related to gender- and power-based harm (including sexual assault, intimate partner violence, and stalking).

[Office for Equity, Equal Opportunity, and Title IX \(EEO-TIX\)](#) - (213) 740-5086

Information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants.

[Reporting Incidents of Bias or Harassment](#) - (213) 740-5086 or (213) 821-8298

Avenue to report incidents of bias, hate crimes, and microaggressions to the Office for Equity, Equal Opportunity, and Title for appropriate investigation, supportive measures, and response.

[The Office of Student Accessibility Services \(OSAS\)](#) - (213) 740-0776

OSAS ensures equal access for students with disabilities through providing academic accommodations and auxiliary aids in accordance with federal laws and university policy.

[USC Campus Support and Intervention](#) - (213) 740-0411

Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

[Diversity, Equity and Inclusion](#) - (213) 740-2101

Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

[USC Emergency](#) - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call

Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

[USC Department of Public Safety](#) - UPC: (213) 740-6000, HSC: (323) 442-1200 – 24/7 on call

Non-emergency assistance or information.

[Office of the Ombuds](#) - (213) 821-9556 (UPC) / (323-442-0382 (HSC)

A safe and confidential place to share your USC-related issues with a University Ombuds who will work with you to explore options or paths to manage your concern.

[Occupational Therapy Faculty Practice](#) - (323) 442-2850 or otfp@med.usc.edu

Confidential Lifestyle Redesign services for USC students to support health promoting habits and routines that enhance quality of life and academic performance.