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CS 695 001: Mobile Immersive Computing (Spring 2022)

Department of Computer Science

George Mason University

Instructor: Dr. Bo Han (bohan@gmu.edu)

This syllabus is tentative and subject to change

- **Basic Information**

Time & Location:	Friday 1:30PM -- 4:10PM EST (Nguyen Engineering Building 1103)
Credits:	3
Textbook:	None
Office Hour:	By Appointment
Teaching Assistant:	None
Piazza URL:	TBD

- **Course Description**

  By its name, immersive computing creates a sense of immersion by blurring the boundary between the digital and the physical worlds. Examples of immersive computing technologies are virtual reality (VR), augmented reality (AR), mixed reality (MR), 360° videos, volumetric videos, light field videos, *etc*. Mobile immersive computing was made possible due to recent advances in hardware, software and wireless communication, especially with the deployment of 5G. On the hardware side, numerous consumer devices, such as Microsoft HoloLens and Facebook Oculus Quest, have been produced for supporting

immersive computing. On the software side, Google released ARCore and Apple released ARKit for developing mobile AR applications. In this course, we will discuss recent technical papers from top-notch conferences, brainstorm cool research ideas, and investigate/build real mobile immersive systems through team projects.

- **Prerequisites**

  There is no specific prerequisite. However, this course assumes basic knowledge in Computer Networks (CS 455) and Mobile Computing (CS 655).

- **Course Format**

  In most lectures, we will discuss a particular topic of mobile immersive computing. First, the instructor will give a brief overview of the selected topic. Then, four students will each give a 30-minute presentation of a research paper, including a 5-minute Q&A. Finally, we will discuss the papers and brainstorm new research ideas. Some part of the lectures will be allocated for your project, including proposal presentation, status report, and final project presentation. In addition, we will have up to two guest lectures.

- **Your Responsibilities** (there are no midterm or final exams)

  1. Read four assigned papers before each lecture and submit your summaries
  2. Give a 30-minute presentation of one selected paper from a reading list (depending on the size of the class)
  3. Conduct a team project (three key deadlines: proposal, status report, and final report)

- **Grading Policy**

  Project: 70% (Proposal Report: 25%, Status Report: 10%, Final Report: 35%)
  Paper Presentation: 10%
  Paper Summary: 10%
  Participation: 10%

  The final grade is computed based on the following rules:
  A+: >= 95%; A: [90%, 95%); A-: [86%, 90%)
  B+: [84%, 86%); B: [82%, 84%); B-: [80%, 82%)
  C+: [76%, 80%); C: [73%, 76%); C-: [70%, 73%)
  D+: [66%, 70%); D: [63%, 66%); D-: [60%, 63%)
  F: < 60%

- **Email Policy**

  The instructor can be reached at bohan@gmu.edu. Please include CS 695 in the subject line of emails for prompt response. Students must use their GMU email account to receive important University information, including communications related to this course. The instructor cannot respond to messages sent from or send messages to a non-Mason email address. To protect your privacy, the instructor cannot list your GMU email address on any public forum or provide it to any other students. You may, of course, give your email address to any other students.

- **Tentative Course Schedule**

  Always keep an eye on Blackboard for the latest announcements and updates. You are strongly encouraged to suggest topics that you want to explore in this area.

Date	Topic
01/28	Introduction
02/04	Mobile Virtual Reality
02/11	Mobile Augmented Reality
02/18	3D Augmented Reality
02/25	Mixed Reality & **Presentation of Project Proposal**
03/04	Multi-user Extended Reality
03/11	Security & Privacy in Extended Reality
03/18	No Class
03/25	Mobile Immersive Applications
04/01	6DoF Localization & **Presentation of Project Status**
04/08	Immersive Video Streaming
04/15	Emerging Videos & Holoportation
04/22	Autonomous Driving & Depth Data
04/29	Guest Lectures
05/06	**Final Project Presentation**

- **Paper Summary**

  The summaries, with a one-page limit, must be submitted electronically through Blackboard before 06:00 PM EST on Thursday. **Please do not email the instructor your paper summaries.** The papers that are required to read will be posted on Blackboard. A good summary should include the following:

  1. What is the problem that the paper aims to solve?
  2. What is the high-level approach used?
  3. What are the key motivations, observations, and results?

4. How does this work advance the state-of-the-art?
5. What are the limitations of the proposed work?
6. What is the potential future work enabled by this paper?

- **Project**

  The project is a key component of this course. The list of suggested project ideas will be posted on Blackboard. You can also develop your own project idea. The project could be open-ended explorations to some extent. Team projects with at most two students, especially multi-disciplinary collaborations, are encouraged. Individual projects are also allowed for this course. The project can be either implementation/evaluation based or a survey paper. To keep good progress, three documents must be submitted before their deadlines. For a team project, the whole team must submit one unified version of each document instead of having each member submitting his/her own. The due dates will be announced on Blackboard.

  1. Project Proposal (2 pages in single-column 11-point format)
  2. Status Report (1 page in single-column 11-point format)
  3. Final Report (at least 6 pages in double-column 10-point ACM format)

  LaTeX and Microsoft Word templates for the final project report will be available on Blackboard.

- **Late Policy**

  Late submissions of paper summary receive no credit.

  Late submissions of project reports receive partial credit:
  - Late for no more than 12 hours: 90% of credit
  - Late for more than 12 hours but no more than 24 hours: 80% of credit
  - Late for more than 24 hours but no more than 48 hours: 60% of credit
  - **Late for more than 48 hours: no credit**

- **Honor Code**

  Please see the Office for Academic Integrity (https://oai.gmu.edu/) for a full description of the code and the honor committee process, and the Honor Code Policies of the Department of Computer Science (https://cs.gmu.edu/resources/honor-code/) regarding the course project. GMU is an Honor Code university. The principle of academic integrity is taken seriously and violations are treated gravely. If you rely on someone else's work in an aspect of the course project, you should give full credit in the proper, accepted form. Another aspect of academic integrity is the free play of ideas. Vigorous discussion and debate are

encouraged in this course, with the firm expectation that all aspects of the class will be conducted with civility and respect for differing ideas, perspectives, and traditions. When in doubt (of any kind) please ask for guidance and clarification.

- **Inclusion**
  Every student in this course is exactly where they belong and it is our honor to welcome each of you to join us in learning throughout this semester. Every student in this course, regardless of background, sex, gender, race, ethnicity, class, political affiliation, physical or mental ability, veteran status, nationality, or any other identity category, is an equal member of our course. You have the right to be called by whatever name you wish, to be referred to by whatever pronoun you identify, and to adjust these at any point. If you feel uncomfortable in any aspect of our instruction that results in any barrier to your inclusion in this course, please contact the instructor directly.

- **Disabilities**
  Students with a disability or other condition (documented with GMU's Office of Disability Services, ODS) that may impact academic performance should speak with the instructor as soon as possible to discuss appropriate accommodations. If you are in a situation that even temporarily affects your ability to learn or work, such as with a broken limb or other such injury, contact the Office of Disability Services to get accommodations. The instructor is happy to assist as is appropriate, but it must be documented ahead of time by ODS. Even if you do not know if you plan on utilizing the accommodations, it is in your best interest to prepare them in advance.

- **Sexual Harassment and Interpersonal Violence**
  As a faculty member and designated "Responsible Employee," the instructor is required to report all disclosures of sexual assault, interpersonal violence, and stalking to Mason's Title IX Coordinator per university policy 1412. If you wish to speak with someone confidentially, please contact the Student Support and Advocacy Center (703-380-1434), Counseling and Psychological Services (703-993-2380), Student Health Services, or Mason's Title IX Coordinator (703-993-8730, cde@gmu.edu).

- **Privacy**
  Video recordings of class meetings that are shared only with the instructors and students officially enrolled in a class do not violate FERPA or any other privacy expectation. All course materials posted to Blackboard or other course site are private; by federal law, any

materials that identify specific students (via their name, voice, or image) must not be shared with anyone not enrolled in this class.