CSCI 699: Computer Graphics Research – A Roleplaying Seminar

Units: 4.0
Fall 2023 – Tuesday & Thursday – 4:30-6:20pm

Location: THH 106
Course website: odedstein.com/teaching/hs-2023-csci-699

Instructor: Oded Stein
Office: SAL 344
Office Hours: Thursday, 11-11:50am
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Course Description

In this course we will learn how the research process works in computer graphics by simulating the entire research process: from the conception of the idea, to the writing of a paper, the creation of illustrations, peer-review, and reception by the public. Each week we will read a different computer graphics paper. In the Thursday class, we will learn some of the background required to understand this week's paper. In the Tuesday class, each student will role-play a different member of the research process, rotating weekly: the PhD student, to the creator of illustrations, the peer-reviewer, the industry partner, and so on. Every week, student will prepare a 5min presentation in their role, followed by a discussion with the rest of the class. Through this process we will acquire a holistic understanding of the research process.
This course employs the role-playing seminar structure of Jacobson and Raffel https://colinraffel.com/blog/role-playing-seminar.html with additional instruction.

Learning Objectives and Outcomes

The students will learn how the computer graphics research process works beyond just the paper writing – from the conception of ideas, all the way to eventual use by the public.
The students will learn about recent advances in computer graphics, especially in the realm of geometry processing and physical simulation.

Prerequisite(s): proficiency in linear algebra, calculus, Python, C++

Co-Requisite(s): -

Concurrent Enrollment: -

Recommended Preparation: computer graphics

Course Notes

This course is an in-person seminar. Active participation is required of all students in the preparation of presentations for class, and in in-class discussion.

Description and Assessment of Assignments

Students have to complete one assignment per week (except for the first week).
The assignment consists of reading this week's paper, reflecting on the paper, and preparing a 5min presentation for class each week.
Students have to participate in the discussion of their peers' presentations in class each week.

Grading Breakdown

Including the above detailed assignments, how will students be graded overall? Participation should be no more than 15%, unless justified for a higher amount. All must total 100%.

Assignment	% of Grade
Weekly assignments	85
In-class discussion participation	15
TOTAL	100

Assignment Submission Policy

Assignments are presented each week in class.

Grading Timeline

Assignment grades will be available approximately one week after the lecture when they were due.

Additional Policies

Students are expected to attend each week in person, except when the class is held on Zoom. Reasonable accommodations for special circumstances will be provided. Please provide sufficient advance notice of such special absences.
You can miss up to one assignment for the course if you provide advance notice of one week.
Everyone must do the "coder" role at least once.
There are no make-up assignments.
Students are expected to participate in in-class discussion.

Course Schedule: A Weekly Breakdown

	Topics/Daily Activities	**Readings and Homework**	**Deliverable/ Due Dates**
Week 1	Introduction to course and explanation of format		**Study roles** **Sign up for roles**
Week 2 **ZOOM**	**Geometry acquisition (via Zoom)**	Lorensen and Cline 1987 Marching cubes: A high resolution 3D surface construction algorithm Chen and Zhang 2021 Neural Marching Cubes	**Presentations for this week's papers**
Week 3	**Geometry acquisition**	Kazhdan et al. 2006 Poisson Surface Reconstruction Sellán & Jacobson 2022 Stochastic Poisson Surface Reconstruction	**Presentations for this week's papers**
Week 4	**Geometry processing: parametrization**	Mullen et al. 2008 Spectral Conformal Parametrization Smith & Schaefer 2015 Bijective parameterization with free boundaries	**Presentations for this week's papers**
Week 5	**Geometry processing: smoothing**	Desbrun et al. 1999 Implicit Fairing of Irregular Meshes using Diffusion and Curvature Flow Kazhdan et al. 2012 Can Mean-Curvature Flow be Modified to be Non-singular?	**Presentations for this week's papers**

Week 6	**Geometry processing: deformation**	Sorkine et al. 2004 Laplacian surface editing Sorkine & Alexa 2007 As-Rigid-As-Possible Surface Modeling	**Presentations for this week's papers**
Week 7	**Geometry processing: animation**	Baran and Popović 2007 Automatic Rigging and Animation of 3D Characters Jacobson et al. 2011 Bounded Biharmonic Weights	**Presentations for this week's papers**
Week 8	**Geometry processing: mesh editing**	Garland & Heckbert 1997 Surface simplification using quadric error metrics Botsch & Kobbelt 2004 A remeshing approach to multiresolution modeling	**Presentations for this week's papers**
Week 9	**Geometry processing: mesh generation**	Shewchuck 2005 Triangle: Engineering a 2D Quality Mesh Generator and Delaunay Triangulator Hu et al. 2018 Tetrahedral meshing in the wild	
Week 10	**Physical simulation**	Chao et al. 2010 A simple geometric model for elastic deformations Bouaziz et al. 2013 Projective Dynamics: Fusing Constraint Projections for Fast Simulation	**Presentations for this week's papers**
Week 11	**Shape classification**	Qi et al. 2017 PointNet: Deep Learning on Point Sets for 3D Classification and Segmentation Wang et al. 2018 Dynamic Graph CNN for Learning on Point Clouds	**Presentations for this week's papers**

Week 12	**Shape classification**	Hanocka et al. 2019 MeshCNN: A Network with an Edge Smirnov & Solomon 2021 HodgeNet: Learning Spectral Geometry on Triangle Meshes	**Presentations for this week's papers**
Week 13	**Geometry processing: fabrication**	Jacobson et al. 2013 Robust inside-outside segmentation using generalized winding numbers Rabinovich et al. 2018 Discrete Geodesic Nets for Modeling Developable Surfaces	**Presentations for this week's papers**
Week 14 Thanks-giving	**Geometry processing: fabrication**	Zhang et al. 2015 Computational hydrographic printing	**Presentations for this week's paper**
Week 15	**Fluid simulation**	Stam 2003 Real-time fluid dynamics for games Da et al. 2016 Surface-Only Liquids	**Presentations for this week's papers**
FINAL	**No final**		

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, comprises 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.