Course Information

CS 448E: Research Topics in Computer Graphics

Vladlen Koltun and David Salesin

Stanford University, Spring 2010

Course description

This course is devoted to cultivating research skills in computer graphics and related areas. These include choosing a problem, focusing on specific publication-size questions, identifying the right techniques, writing and presenting. The instructors will closely guide the students through two projects, providing constructive feedback on all stages of the process.

We will explore the research process through the theme of computational aesthetics and creativity support. This broad theme provides fertile ground for innovative work. Several class sessions will focus on specific aspects of research, such as problem selection and effective writing. We will also analyze a number of recent publications in detail, focusing on the factors that led to success.

Class time and location

- Time: Mon/Wed, 11:00-12:15pm
- Location: Hewlett 103

Course staff

- Instructor: Prof. Vladlen Koltun
  - Office Hours: Wed 4-6pm, Gates 374 (except 3/31)
  - Contact: vladlen@stanford.edu (but please email the staff list except in unusual circumstances that require private communication)
- Instructor: David Salesin, Senior Principal Scientist, Adobe Systems
  - Office Hours: by appointment
  - Contact: salesin@adobe.com (but please email the staff list except in unusual circumstances that require private communication)
- Teaching assistant: Jerry Talton
  - Office hours: Mon 6-7pm, Gates 396
  - Contact: jtalton@cs.stanford.edu (but please email the staff list except in unusual circumstances that require private communication)

Contact

Contact the course staff at cs448e-spr0910-staff@lists.stanford.edu

Grading

- **Contribution to class discussions (20%).** Constructive criticism and useful suggestions for other teams' project presentations. Active participation in paper discussions and other class sessions.
- **Paper critiques (10%).** Before each "paper analysis and discussion" session, every student is required to submit a short (half-page to a page) critique of the reading. Critiques are due by 7:00am the day of the class. The submission system closes at 7:00am sharp. In the critique, do not summarize the paper. Instead, use the critique for non-obvious commentary. Discuss the paper's strengths and weaknesses. What is different about this paper? How does it compare to most papers you have encountered? How could it be better? Does it inspire any research ideas for you that are not listed in the paper itself?
- **Paper presentation (10%).** Each paper analysis and discussion session will be structured as follows: In the first 30 minutes, a team of students will give a detailed presentation of the technical content of the paper. In the remaining 45 minutes, the instructor will lead a discussion and analysis of the paper.

  The goal of the students' presentation is to explain the *technical details* of the paper that may be hard to understand for students with insufficient technical background in the particular area of the paper. There is no need to describe the motivation, situate the paper in the context of previous work, clarify the contribution, etc. (In other words, there is no need to do some of the things that are otherwise indispensable to a good paper presentation.) The reason is that the papers we cover generally do a very good job at these things already, and everybody is required to read the papers before class. We will also dwell on these aspects of the work quite a bit in the discussion.

  Thus the purpose of the students' presentation is to elucidate the technical content of the paper that might be hard for some students to understand. Your goal is to explain the algorithms and the mathematics used in the paper, such that all students in the class will understand. This can be quite challenging and instructive. The team responsible for the presentation will meet with the course staff during the week preceding the presentation to go over the slides. The final presentation will incorporate feedback from this meeting.

  Submit your top three preferences for papers you would like to be assigned to by emailing the staff list by Friday, Apr 2. If you would like to team up with someone specific for the presentation, please specify that in the email as well. You can give one name or several. The assignments will be made by the course staff on Saturday, Apr 3.
- **Research projects (2x30%).** Each project will be undertaken in teams of 2-4 students. The grade is shared by all team members. Teams should form by Wednesday, March

31 (resp. Friday, April 30). If you haven't formed a team by the end of the day on Monday, March 29 (resp. Wednesday, April 28), please email the course staff. Teams for each project must be different, no two students can be in the same team more than once.

The theme of Project 1 is *content enhancement*. The broad goal of the project is to develop a method for enhancing a particular type of content, either fully automatically or with user interaction. Enhancement can mean manipulating the input to increase its aesthetic appeal, mapping the input to a different medium, or other interpretations. This is a broad theme that covers a wide variety of media, types of content, and possible ways to manipulate this content.

The theme of Project 2 is *data-driven creativity*. The goal of this project is to develop a data-driven technique that supports creativity in a particular domain. Data can be used in numerous ways, which include providing relevant content that stimulates the creative process, or enhancing content produced during the process. The key theme here is the use of data. Data must be used to enable a more powerful creation workflow, possibly by automating some of its steps, by enhancing the results of such steps, or by introducing new aspects to the process.

Each project's grade comprises the following components.

- **(5%) Project presentations**: early-stage, mid-way, and final. Grade covers ability to motivate the problem and convey the technical issues, clarity of exposition, and ability to distinguish between central and peripheral issues.
- **(5%) Responsiveness to feedback**. Flexibility in light of relevant criticism. Ability to incorporate useful feedback. It is not necessary to address all feedback provided during the discussions. Rather, it is important to show discernment and be able to formulate a productive course of action in light of all the feedback that was offered. However you choose to handle the feedback you receive, you must be able to justify your choices.
- **(15%) Quality of research**. Problem motivation. Identification of an important direction. Ability to focus the problem and set a scope that is tractable in a given time – four weeks for Project 1 and five weeks for Project 2 – yet allows for a contribution to be made. Identification of appropriate techniques, their justification, and their skillful employment. Identification of the necessary scope for technical contribution. Strength of technical contribution. Compelling demonstration of results. Demonstration of the technique's performance under controlled variable manipulation. Evaluation of design choices vs. alternative options. Evaluation vs. competing techniques. Identification of limitations.
- **(5%) Writing quality in project report**. Each project will culminate with a short paper (2-4 pages) in the SIGGRAPH format. Quality of writing is an important part of the projects' evaluation. This includes all aspects of good writing discussed in class. The reports are due on April 26 and May 31 respectively.