

COMP 5900: Image Processing and Stylization

Contact

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Nature of the course

This is a graduate course on image processing through the lens of image stylization applications. We will cover basic linear and nonlinear filters as well as past and modern developments in stylization techniques. One of the main approaches to the material will be reading the primary literature: several weeks will be spent discussing specific papers, with individual students from the class responsible for leading the discussion. Students will also make at least one paper presentation during the term as well as presenting their final projects.

Textbooks and Resources

There is no required textbook for the course. You may find a textbook on image processing useful; two suggestions are

- Milan Sonka, Vaclav Hlavac, Roger Boyle. *Image Processing, Analysis, and Machine Vision*.
- Rafael Gonzalez, Richard Woods. *Digital Image Processing*.

The following comprehensive book on image stylization is highly relevant to this course:

- Paul Rosin, John Collomosse. *Image and Video-Based Artistic Stylization*.

Papers for the course will typically come from the ACM Digital Library. You have direct access to the ACM DL while on campus; off campus, you will need to go through the Carleton library.

Topics

The course's main topics include the following, not necessarily in order.

- Linear filtering
- Edges
- Gradient-based processing
- Segmentation

- Color models and palette extraction
- Texture synthesis
- Nonlinear filtering
- Halftoning
- Stroke-based rendering
- Extreme stylization

Evaluation

- Assignments: 30%
- In-class presentations: 10%
- Paper discussions: 15%
- Course project: 30%
- Final exam: 15%

Course Project

Propose your own project. You will produce an implementation and a final writeup in the style of a scientific paper, including abstract, background, algorithm description, evaluation with sample results, and references. Your writeup should be 8-12 pages in length, single-spaced in two-column format. I recommend using LaTeX and the “acmsiggraph” LaTeX class.

Typically a project will be of one of three types:

1. A novel algorithm for some stylization task, which might be
 - simulating an artistic style or medium not previously seen in the literature
 - an improvement on an existing stylization method
 - an interactive system for stylization
 - a procedural method for novel aesthetic images (possibly abstract)
 - data fusion using multiple images or video
2. An implementation of a system for performing some desired real-world task, possibly inspired by problems in medicine or robotics.
3. A substantial implementation of an existing method, as described in a recent research paper (within the last ten years).

Select your topic by end of January. In late February, we will have in-class progress presentations. In the final week of class, you will present your final results.

Appendix: Academic Accommodation

Requests for Academic Accommodation

You may need special arrangements to meet your academic obligations during the term. For an accommodation request, the processes are as follows:

Pregnancy obligation

Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, visit the Equity Services website:

carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf

Religious obligation

Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, visit the Equity Services website:

carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf

Academic Accommodations for Students with Disabilities

If you have a documented disability requiring academic accommodations in this course, please contact the Paul Menton Centre for Students with Disabilities (PMC) at 613-520-6608 or pmc@carleton.ca for a formal evaluation or contact your PMC coordinator to send your instructor your Letter of Accommodation at the beginning of the term. You must also contact the PMC no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). After requesting accommodation from PMC, meet with your instructor as soon as possible to ensure accommodation arrangements are made. carleton.ca/pmc

Survivors of Sexual Violence

As a community, Carleton University is committed to maintaining a positive learning, working and living environment where sexual violence will not be tolerated, and its survivors are supported through academic accommodations as per Carleton's Sexual Violence Policy. For more information about the services available at the university and to obtain information about sexual violence and/or

support, visit: carleton.ca/sexual-violence-support

Accommodation for Student Activities

Carleton University recognizes the substantial benefits, both to the individual student and for the university, that result from a student participating in activities beyond the classroom experience.

Reasonable accommodation must be provided to students who compete or perform at the national or international level. Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist.

<https://carleton.ca/senate/wp-content/uploads/Accommodation-for-Student-Activities-1.pdf>

For more information on academic accommodation, please contact the departmental administrator or visit:

students.carleton.ca/course-outline