

## CSC320H – Introduction to Visual Computing Winter 2024

**Instructor:** Prof. Kyros Kutulakos

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**Office hour (in person):** W noon-1pm

**Office hour (zoom):** T 3:30-4:30pm

**Lectures:** L0101: T 1-3pm (FE230) L2501: T 6-8pm (BA1180)

**Tutorials:** L0101: R 1-2pm (FE230) L2501: T 8-9pm (BA1180)

**TAs:** R. Swanson, P. Mirdehghan, Z. Salehe, H. Qiu, Y.-C. Chen,  
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**Web site:** <http://www.cs.toronto.edu/~kyros/courses/320>

This course is a first-principles introduction to the acquisition and computational processing of 2D images. It is aimed at undergraduates interested in learning about computer vision, digital photography and computer graphics, and serves as a stepping stone for tackling more advanced courses on those subjects.

The course has four main goals: (1) *Mathematical and engineering foundations*: Introducing key concepts from geometry; multivariate calculus; linear algebra; image and signal processing; and human vision that are fundamental to delving deeper into vision, graphics and photography. (2) *Algorithms for early vision*: Putting these concepts to use in real-world applications, with an emphasis on the "early" stages of 2D visual processing. Specific topics include image warping, blending and stitching; image enhancement; image scissoring and inpainting; color image processing and display; modern smartphone camera processing pipelines; edge and feature detection; face recognition; and 2D image matching. (3) *Visual programming*: Providing hands-on experience with implementing several such early visual processing tools, through programming assignments. (4) *First look at vision and graphics research*: Most of the course's assignments involve reading a research paper and completing the starter code provided to fully implement the paper's technique. Understanding how to turn such algorithmic descriptions into working computer vision code--and how to evaluate its performance--will be key skills acquired in the course.

### Grading:

50% Assignments (four, weight of lowest-mark assignment is 8% the rest are 14%)

50% One term week of March 4-8, specific date & time TBD (15%) and a final exam (35%)

Late penalty for assignments is 15% per day for up to five days. No late assignments will be accepted after that. See MarkUS for hand-out and due dates of all assignments. A total grace period of 60 minutes over the entire term is available to all students, to account for last-minute upload issues. The grace period is not applicable to assignments submitted more than 60 minutes late.

### Required Textbooks/Readings (there is no required textbook)

- R. Szeliski, *Computer Vision: Algorithms and Applications*, 2<sup>nd</sup> ed., 2022.
- S. Marschner and P. Shirley, *Fundamentals of Computer Graphics*, 4<sup>th</sup> ed., 2018.

### Lecture/Tutorials Recording

This course, including student participation, may be recorded on video and for viewing remotely after each session. Course videos and materials belong to the instructor, the University, and/or other sources depending on the specific facts of each situation, and are protected by copyright. Downloading, copying, or sharing any course or student materials or videos without the explicit permission of the instructor is prohibited.

## Quercus

This course uses the University's learning management system, Quercus, to post information about the course. This includes posting links to lecture slides and other materials required to complete class activities and course assignments, as well as sharing important announcements and updates. The site is dynamic and new information and resources will be posted regularly as we move through the term, so please make it a habit to log in to the site on a regular, even daily, basis. To access the course website, go to the U of T Quercus log-in page at <https://q.utoronto.ca>. Once you have logged in to Quercus using your UTORid and password, you should see the link or "card" for CSC320H1S. You may need to scroll through other cards to find this. Click on the CSC320H1S link to open your course area, view the latest announcements and access your course resources.

There are Quercus help guides for students that you can access by clicking on the "?" icon in the left side column. SPECIAL NOTE ABOUT GRADES POSTED ONLINE: Please also note that any grades posted are for your information only, so you can view and track your progress through the course. No grades are considered official, including any posted in Quercus at any point in the term, until they have been formally approved and posted on ACORN at the end of the course.

Please contact me as soon as possible if you think there is an error in any grade posted on Quercus.

## Religious Accommodations

As a student at the University of Toronto, you are part of a diverse community that welcomes and includes students and faculty from a wide range of cultural and religious traditions. For my part, I will make every reasonable effort to avoid scheduling tests, examinations, or other compulsory activities on religious holy days not captured by statutory holidays. Further to University Policy, if you anticipate being absent from class or missing a major course activity (such as a test or in-class assignment) due to a religious observance, please let me know as early in the course as possible, and with sufficient notice (at least two to three weeks), so that we can work together to make alternate arrangements.

## Students with Disabilities or Accommodation Requirements

Students with diverse learning styles and needs are welcome in this course. If you have an acute or ongoing disability issue or accommodation need, you should register with Accessibility Services (AS) at the beginning of the academic year by visiting <http://www.studentlife.utoronto.ca/as/newregistration>.

Without registration, you will not be able to verify your situation with your instructors, and instructors will not be advised about your accommodation needs. AS will assess your situation, develop an accommodation plan with you, and support you in requesting accommodation for your course work. Remember that the process of accommodation is private: AS will not share details of your needs or condition with any instructor, and your instructors will not reveal that you are registered with AS.

## Academic Integrity

All students, faculty and staff are expected to follow the University's guidelines and policies on academic integrity. For students, this means following the standards of academic honesty when writing assignments, collaborating with fellow students, and writing tests and exams. Ensure that the work you submit for grading represents your own honest efforts. Plagiarism—representing someone else's work as your own or submitting work that you have previously submitted for marks in another class or program—is a serious offence that can result in sanctions. Speak to me or your TA for advice on anything that you find unclear. Consult the Code of Behaviour on Academic Matters for a complete outline of the University's policy and expectations.

For more information, please see <https://www.artsci.utoronto.ca/current/academic-advising-and-support/student-academic-integrity> and <http://academicintegrity.utoronto.ca>

Each assignment will have a written component and a programming component. The course policy is as follows. *Written components:* All reports submitted as part of your assignments in CSC320 are strictly individual work. No part of these reports should be shared with others, or taken from others. This includes verbatim text, paraphrased text, and/or images used. You are, however, allowed to discuss these components with others at the level of ideas, and indeed you are welcome to brainstorm together. *Programming components:* Collaboration on a programming component by individuals (whether or not they are taking the class) is encouraged at the level of ideas. Feel free to ask each other questions, brainstorm on algorithms, or work together on a (virtual or real) whiteboard. Be careful, however, about copying the actual code for programming assignments or merely adapting others' code. This sort of collaboration at the level of artifacts is permitted if explicitly acknowledged, but this is usually self-defeating. Specifically, you will get zero points for any portion of an artifact that you did not transform from concept into substance by yourself. If you neglect to label, clearly and prominently, any code that isn't your own or that you adapted from someone else's code, that's academic dishonesty for the purpose of this course and will be treated accordingly.

*The use of generative artificial intelligence (AI) tools is strictly prohibited in all programming assignments.* This includes, but is not limited to, ChatGPT, GitHub Copilot, and open-source models that you have trained and/or deployed yourself. You may not interact with, nor copy, paraphrase, or adapt any content from any generative AI for the purpose of completing programming assignments in this course. Use of generative AI will be considered use of an unauthorized aid, which is a form of academic misconduct under the Code of Behavior on Academic Matters. This course policy is designed to promote your learning and intellectual development and to ensure that our evaluations are a fair and accurate assessment of your learning. To that end, you will be required to include detailed comments along with the code you submit, and a random subset of students may be selected by a TA to explain their implementation in a live 1-1 meeting.

Lastly, you should never hand down assignment code to students taking the course in later years, or post it on sites such as GitHub.