

Course Number and Title: ISTA 352: Images: Past, Present, and Future

Course Description:

A significant portion of the human brain is devoted to understanding spatial data and its relation to the world. Through the ages humans have naturally developed external representations of such information for communication, planning, understanding, and entertainment. Further, the digital age has led to an explosion of images available to everyone in forms that are convenient to share, manipulate, and automatically mine for information. In this thematic course we will study images from perspectives that transcend disciplines, and applicable to many of them, including the arts, science and biomedicine, computational intelligence, geography, and security. We will study what images are, how images are stored and distributed, the reproduction of images, how they can be manipulated, using images for visualization, and extracting semantics from images.

Prerequisite(s): An introductory programming course (e.g., ISTA 130), basic matrix algebra, and basic calculus (e.g. Math 124 or equivalent).

Units: 3 (lecture)

(1) Instructor information:

Kobus Barnard
520-621-4237
kobus@cs.arizona.edu

(2) Office hours:

Fixed times confirmed by email 36 hours in advance; alternative times available by appointment.

(3) Course Description and Objectives:

To develop a solid fundamental understanding including historical context of: 1) what images are; 2) how they are stored and distributed; 3) how they are reproduced; 4) using them for visualization and communication; 5) manipulating them; and 6) analyzing them to extract information.

Topics:

- Mathematical foundations for representing spatial data
- Images and (videos) as spatial data; diverse examples of images
- Images through the ages (art and maps)
- Ambiguity in image data and perceptual illusions
- Color and perspective in cameras, eyes, and art
- Digital encoding of images and movies
- Visualization of spatial data, and spatially visualizing non-spatial data
- Image and color reproduction
- From computer models to digital images (graphics)
- Image analysis and interpretation
- Image enhancement and manipulation
- Image and video search and retrieval
- Biomedical images and applications
- Surveillance systems

(4) Grade policies:

The grading breakdown will be as follows:

Attendance (10%), four quizzes (10% each), five assignments (average 10% each).

Given N missed classes, the attendance grade out of 10 will be computed as:

$$\min(10, \max(0, 13-N))$$

Note that this formula means that missing up to 3 classes is still perfect attendance, which means that most “life happens” events are covered, and you should only need to contact the instructor if you need to miss a significant number of classes. Note also that N will always be a lower bound because the instructor will not always take attendance.

The computation of the attendance grade does not consider any lecture designated as a tutorial session, any extra session outside of class time, and the day before thanksgiving which will be used as a demo time slot. Bonus marks will also sometimes be available in the form of easy questions on quizzes about SISTA seminars relevant to images.

Testable material includes assignments, lectures designated as being part of the attendance grade (INCLUDING guest lectures), AND tutorials.

90% guarantees an A, 80% guarantees a B, 70% a C, and 60% a D.

(5) Absence policy:

Good attendance is expected. Exams must be attended at their appointed time unless you have permission in advance to do otherwise. If you are not able to make an exam time due to extenuating circumstances, the instructor must be contacted in advance to verify that alternative arrangements are justified.

All holidays or special events observed by organized religions will be honored for those students who show affiliation with that particular religion. Absences pre-approved by the UA Dean of Students (or Dean's designee) will be honored. If the final exam coincides with convocation, and students in the class would like to attend, an alternative final exam time will be provided.

(6) Required Text(s):

There is no required text. Material for the course will be posted on-line.

(7) Number of required examinations and papers:

See grade policies above.

(8) Policies on expected classroom behavior:

Mature adult behavior is expected. Students are requested to keep their cell phones, pagers, and similar devices on mute or manner mode.

(9) Policies against plagiarism:

Students are bound by the Code of Academic Integrity (see <http://catalog.arizona.edu/policies/974/acacode.htm>). This code prohibits all forms of student academic dishonesty, including but not limited to cheating, fabrication, and plagiarism. Violations can result in serious penalties, including expulsion from the University.

Exams and written assignments must be the sole work of the student (or student team). Students may help each other with the problem analysis and general strategies relevant to the programming assignments, but detailed help or code sharing is not permitted. All code in programming assignments will be assumed to have been written by the student (or student team) unless attribution is given. An obvious exception to this rule is sample code which has been provided by the instructor for this course through the course web page tree. Such code does not require attribution (we know where it came from). It is also permissible to include with attribution code from external sources provided that the code is published, has not been solicited, and was not written for course requirement for this or a similar course given elsewhere.

(10) Policies against threatening behavior:

Students are reminded that the Student Code of Conduct (5-308.F.11) dictates that no person or organization may interfere with or threaten University-sponsored classroom activities (see <http://web.arizona.edu/~policy/threaten.shtml>).

(11) Required extracurricular activities:

There are no required extracurricular activities.

(12) Required or Special Materials:

None.

(13) Notice of Potentially Offensive Material:

None.

(14) Notice to students with disabilities:

Students with disabilities, who may require academic adjustments or reasonable accommodations in order to participate fully in course activities or to meet course requirements, must first register with the Disability Resource Center (DRC) (<http://drc.arizona.edu>).

DRC staff will qualify students for services, and provide a letter to the instructor listing accommodations to be made. This letter should be submitted by the student directly to the instructor as soon as possible during the first week of classes.

The student should meet as soon as possible with the instructor by appointment or during office hours to discuss accommodations and how course requirements and activities may impact your ability to fully participate.

(15) “Subject to Change” Statement:

The instructors reserve the right to change with advance notice where appropriate the content of the course. This right does not apply to posted grading and absence policies.