# **CSE 4310-001**: Fundamentals of Computer Vision

Spring 2022

## Instructor Information

### Instructor(s)

Dr. Alex Dillhoff

### Office Number

ERB 651

### Office Telephone Number

(817) 272-3785 (Administrative Office)

### Email Address

alex.dillhoff@uta.edu

### Faculty Profile

<https://mentis.uta.edu/explore/profile/alex-dillhoff>

### Office Hours

MoWe 3:00PM – 4:00PM via Teams (or by appointment)

## Course Information

### Section Information

CSE 4310-001 (26688)

### Time and Place of Class Meetings

MoWeFr 9:00AM – 9:50AM ERB 130

### Description of Course Content

This course introduces students to basic concepts and techniques in computer vision. The topics covered include morphological operations, connected component analysis, image filters, edge detection, feature extraction, object detection, object recognition, tracking, gesture recognition, image formation and camera models, calibration, and stereo vision. A strong programming background is assumed, as well as familiarity with linear algebra (vector and matrix operations), and knowledge of basic probability theory and statistics. Prerequisite: Admitted into an Engineering Professional Program. C or better in each of the following: CSE 3318, IE 3301 or MATH 3313, and CSE 3380 or MATH 3330

### Student Learning Outcomes

Upon completion of this course, you should have a solid foundation in a wide array of methods for computer vision. Additionally, you will have experience in implementing some algorithms from scratch as well as using established frameworks to solve novel problems.

### Required Textbooks and Other Course Materials

There is no required textbook. However, here are some recommended texts.

* Richard Szeliski, “*Computer Vision : Algorithms and Applications”,* Springer Nature, 2020, (<https://szeliski.org/Book/>).
* David A. Forsyth and Jean Ponce, "*Computer Vision: A Modern Approach*", first edition, Prentice Hall, 2002.

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### Descriptions of major assignments and examinations

There will be 6-8 regular assignments throughout the semester. The final number of assignments will be dependent on the breadth of the assignments and material covered. Additionally, there will be a final project that is presented at the end of the semester. **There are no exams in this course.**

### Technology Requirements

Students should have access to a computer that can access Canvas, Microsoft Teams, Python 3, and OpenCV. Other software may be discussed, this will be publicly available for free.

## Grading Information

### Grading

The assignments are worth **80%** of the grade, with the other **20%** coming from the final project.

While I do encourage students to study together and share resources for learning, I expect

every student to do their own work and turn in their own code. Assignments requiring code will

be automatically checked for similarity with other student submissions as well as online sources.

I am required to report any suspicion of academic dishonesty to the Office of Student Conduct.

Any student who is found guilty of violating any part of the UTA Honor Code will receive a 0

on the assignment or exam in question. Additionally, your final grade will be dropped to the next lowest letter grade. A second violation will result in an F for the class.

Information on UTA’s Honor Code can be found at <https://www.uta.edu/student-affairs/community-standards/academic-integrity>

### Grade Grievances

The TA and I are human. We make mistakes like everyone else. If you have any issues with the way something is graded, please reach out to us and let us know. In most cases, it was something that was missed and can be corrected quickly.

## Course Schedule

The course schedule will cover the following topics (roughly in the given sequence). A more detailed schedule will be posted and updated on the course website (see Canvas). The detailed view will include suggested readings.

* Image Basics
  + Lighting and Shading
  + Color
  + Transformations
* Features
  + Linear Filters
  + Image Features
  + Edge Detection
* Matching
  + Template Matching
  + Hough Transforms
  + RANSAC
* Segmentation
* Motion
  + Optical Flow
* Tracking
* Cameras
  + Camera Models
  + Stereo Vision
  + Calibration
* Classification
* Detection
* Neural Networks
* Convolutional Neural Networks
* Depth Data

**“*As the instructor for this course, I reserve the right to adjust this schedule in any way that serves the educational needs of the students enrolled in this course. –First M. Last.”***

## Institution Information

UTA students are encouraged to review the below institutional policies and informational sections and reach out to the specific office with any questions. To view this institutional information, please visit the [Institutional Information](https://resources.uta.edu/provost/course-related-info/institutional-policies.php) page (https://resources.uta.edu/provost/course-related-info/institutional-policies.php) which includes the following policies among others:

* Drop Policy
* Disability Accommodations
* Title IX Policy
* Academic Integrity
* Student Feedback Survey
* Final Exam Schedule

## Additional Information

### **Recommended** Face Covering

Face masks or face coverings for all employees, students, visitors, and vendors are encouraged while in campus buildings and elsewhere on campus where social distancing measures are difficult to maintain (e.g., student shuttle buses, well-attended outdoor events, etc.). Cloth face masks will also be made available to individual employees and/or students at the University Center Campus Information Desk, the Main Library, and at The Commons Information Desk.

N95 masks are more effective at filtering aerosols than surgical or cloth masks. More information can be found here: <https://www.projectn95.org/>

### Attendance

At The University of Texas at Arlington, taking attendance is not required but attendance is a critical indicator of student success. Each faculty member is free to develop his or her own methods of evaluating students’ academic performance, which includes establishing course-specific policies on attendance.

I do not require attendance. Attendance is usually implicitly determined by student outcomes on assignments and exams. I will typically try and reach out to those that are waning in performance to see what we can do to stay on track.

However, while UT Arlington does not require instructors to take attendance in their courses, the U.S. Department of Education requires that the University have a mechanism in place to mark when Federal Student Aid recipients “begin attendance in a course.” UT Arlington instructors will report when students begin attendance in a course as part of the final grading process. Specifically, when assigning a student a grade of F, faculty report must the last date a student attended their class based on evidence such as a test, participation in a class project or presentation, or an engagement online via Canvas. This date is reported to the Department of Education for federal financial aid recipients.

### Emergency Exit Procedures

Should we experience an emergency event that requires evacuation of the building, students should exit the room and move toward the nearest exit, which is located out of the door to the left and down the hall. An alternate exit is located down the hall to the right, and then left down the stairwell. When exiting the building during an emergency, do not take an elevator but use the stairwells instead. Faculty members and instructional staff will assist students in selecting the safest route for evacuation and will make arrangements to assist individuals with disabilities.

An evacuation map for this room can be found here: <https://www.uta.edu/campus-ops/ehs/fire/Evac_Maps_All/Evac_ERB/Evac_ERB_130A.pdf>

### Student Success Programs

UT Arlington provides a variety of resources and programs designed to help students develop academic skills, deal with personal situations, and better understand concepts and information related to their courses. Resources include [tutoring](https://www.uta.edu/studentsuccess/learning-center/utsi/tutoring/index.php) by appointment, [drop-in tutoring](https://www.uta.edu/ideas/services/index.php), [mentoring](https://www.uta.edu/ideas/services/mentoring/index.php) (time management, study skills, etc.), [major-based learning centers](https://www.uta.edu/studentsuccess/success-programs/programs/resource-hotline.php), [counseling](https://www.uta.edu/caps/services/appointments.php), and [federally funded programs](https://www.uta.edu/studentsuccess/learning-center/mcnair-scholars/index.php). For individualized referrals, students may call the Maverick Resource Hotline at 817-272-6107, send a message to [resources@uta.edu](mailto:resources@uta.edu), or view the information at [Resource Hotline](https://www.uta.edu/studentsuccess/success-programs/programs/resource-hotline.php).

### Academic Success Center

The Academic Success Center (ASC) includes a variety of resources and services to help you maximize your learning and succeed as a student at the University of Texas at Arlington. ASC services include supplemental instruction, peer-led team learning, tutoring, mentoring and TRIO SSS. Academic Success Center services are provided at no additional cost to UTA students. For additional information visit: [Academic Success Center](https://www.uta.edu/student-success/course-assistance). To request disability accommodations for tutoring, please complete this [form](https://forms.office.com/Pages/ResponsePage.aspx?id=Q1vcXL7XqkyBc3KeOwpi2ccSjcIXpSJAqJFuDEhczLlUMVVHRVRIVlJJWDZJWlVYOUgxNjRPODdLVS4u).

The [IDEAS Center](https://www.uta.edu/ideas/) (https://www.uta.edu/ideas/) (2nd Floor of Central Library) offers FREE [tutoring](https://www.uta.edu/ideas/services/tutoring/index.php) and [mentoring](https://www.uta.edu/ideas/services/mentoring/index.php) to all students with a focus on transfer students, sophomores, veterans and others undergoing a transition to UT Arlington. Students can drop in or check the schedule of available peer tutors at www.uta.edu/IDEAS, or call (817) 272-6593.

**Counseling and Psychological Services**

Physical and mental wellness are an important part of learning. UTA offers counseling and psychiatry to all students enrolled in campus-based classes. For more information, go to https://www.uta.edu/caps/. This is an amazing resource to have as a student!

## Emergency Phone Numbers

In case of an on-campus emergency, call the UT Arlington Police Department at **817-272-3003** (non-campus phone), **2-3003** (campus phone). You may also dial 911. Non-emergency number 817-272-3381**.**