

Winter 2023

ECE 8300 A01 – Computer Vision

COURSE DESCRIPTION:

A study of the shape tracking in computer vision such as tracking triangulated foreground shapes, optical flow, directional change and divergence of picture element brightness levels over time and computerized rendition of reflected light and the effect of changing physical surfaces. Topics will include machine learning approach to separating image foreground from background, persistence of shapes in video frame sequences, space-time character of visual scene shapes, image cell complexes and cycles.

COURSE OBJECTIVE:

The focus of this course is on various forms of computational methods in detecting, tracking, measure and comparing visual scene shapes over time in computer vision. The goal of this course is to introduce computational basis for the detection, analysis, measurement, comparison, low pass filtering and classification of physical surface shapes as well as vector fields in digital images.

PRE-REQUISITES:

Undergraduate background in numerical methods in engineering.

CONTACT HOURS:

3-hours per week

COURSE CONTENT:

The following topics will be discussed:

- Machine learning in separating image foreground from background;
- Image shape tracking in video frame sequences.
- Color, greyscale, binary images;
- Relation between picture elements and visible spectrum;
- Triangulation of key points in digital images;
- Image filtering;
- Image vector fields and filtering;
- Computer vision applications in Matlab.

Additional advanced research topics as determined by the instructor.

HOMEWORK:

Homework will consist of assignments, preparation of a seminar on an assigned article from the research literature, and an individual design project.

TEXTBOOK:

J.F. Peters, Computer Vision Lecture Notes, 2021-2023

Recommended:

J.F. Peters, Foundations of Computer Vision, Springer, 2017.

J.F. Peters, Computational Geometry, Topology and Physics of Digital Images with Applications, Springer, 2020.

GRADE ANNOUNCEMENTS:

Grades for this course will be announced by May, 2023. EVALUATION:

Your final course grade is determined by your performance in the components list below in the Evaluation Table (seminar, assignments, project, mid-term, and a final examination. **Students must receive a minimum of 50% on the final examination and must complete and pass all components in the course in order to be eligible to receive a passing grade.**

Each component is weighted as follows:

COMPONENT	NO	VALUE %	TOTAL VALUE	DETAILS / ADDITIONAL INFO
Seminars	1	5%	5	
Assignments	3	15%	15	
Term Tests	2	30%	30	
Final Examination	1	50%	50	
TOTAL			100	

GRADE SCALE:

LETTER	MARK	LETTER	MARK	LETTER	MARK	LETTER	MARK
A+	95-100	B+	80-84	C+	65-69	D	45-54
A	85-94	B	70-79	C	55-64	F	<45

INSTRUCTOR INFO:

Name:..... James F. Peters
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Office Hours: By appointment

VOLUNTARY WITHDRAW:

Wednesday, March 22, 2023

REQUIREMENTS/REGULATIONS

Student Responsibilities: It is the responsibility of each student to contact the instructor if he/she is uncertain about his/her standing in the course and his/her potential for receiving a failing grade. Students should also familiarize themselves with Sections 4 and 6 of the Regulations dealing with, among others, incomplete term work, deferred examinations, attendance and withdrawal, etc..

Lectures: Attendance at lectures is essential for successful completion of this course. Students must satisfy each evaluation component in the course.

ACADEMIC INTEGRITY

Students are expected to conduct themselves in accordance with the highest ethical standards of the Profession of Engineering and evince academic integrity in all their pursuits and activities at the university. As such, in accordance with the General Academic Regulations and Requirements of the University of Manitoba, Section 7.1, students are reminded that plagiarism* or any other form of cheating is subject to serious academic penalty (e.g. suspension or expulsion from the faculty or university) regardless of media

- examinations
- assignments
- laboratory reports
- term exams

A student found guilty of contributing to cheating in examinations or term assignments is also subject to serious academic penalty

Please refer any questions regarding Academic Integrity to your course instructor.

***Plagiarism:** to steal and pass off (the ideas or words of another) as one's own; use (another's production) without crediting the source