University of Toronto

PMU199Y1Y: Can We Make a Robot See Like a Human? (Section L0161)

Course Information Sheet

Brief Description

We've all seen movies of robots whose intelligence rivals our own. Such intelligence is a long way off, in part because we've been largely unsuccessful in building robot vision systems that rival the human vision system. Unlike HAL or the Terminator, which can recognize objects and activities as effectively as humans do, today's robots lack the capacity to recognize your dog if she's wearing a Leafs jersey or that a six-wheeled car is still a car. This multidisciplinary course explores the challenge of enabling a robot to see more like a human. Students will learn some of the basic mechanisms of human vision, and learn how to use basic techniques in computational thinking to model these mechanisms in a machine. A glimpse into the challenges facing human and robot vision provides a lens through which we can better understand what today's robots are capable of, how they're evolving, and what their impact on our society will be.

Lecturer

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Office Hours:	Tuesday, 2:00-4:00pm	

TA

David Szeto

Course Web Page

`http://www.cs.toronto.edu/~sven/PMU199Y`

Lectures

Lectures:	Wednesday	2:00pm – 4:00pm	RL (Robarts) 14081
except:	Wed, Oct 5	2:00pm – 4:00pm	BA (Bahen) 3175
	Wed, Oct 26	2:00pm – 4:00pm	BA (Bahen) 3175
	Wed, Nov 30	2:00pm – 4:00pm	BA (Bahen) 3175
	Wed, Jan 25	2:00pm – 4:00pm	BA (Bahen) 2220

Textbook, References, and Lecture Notes

I will be drawing considerable material from the textbook *Seeing, The Computational Approach to Biological Vision*, Second Edition, John P. Frisby and James V. Stone, MIT Press, 2010. The library has secured electronic access to the relevant chapters, so that purchasing the text is not required. For those wishing to purchase a copy, it's available in paperback from Amazon for approximately Can$80. Pointers to additional resources will be posted on the course website under "Readings." The lecture slides will be available in PDF form on the website under "Lectures." Note that the lecture slides and readings are available only to students registered in the class. The password to access these files will be made available in class.

Course Prerequisites

There are no course prerequisites. This is not a math course or a CS course, but rather an interdisciplinary course on vision that is intended to be assessible to anyone from any discipline. Understanding some concepts in human or computer vision will, on occasion, require some basic computational thinking skills, but these will be covered in class. Any underlying mathematical concepts will be limited to basic arithmeatic (addition and multiplication).

Course Notices

You are responsible for announcements made in lectures/tutorials and posted on the course website, and for reading the on-line CDF course (CSC199Y1: Can We Make a Robot See Like a Human?) discussion board. The newsgroup is a very good place for discussion with other students in the class.

How to Get Help

There are a number of sources of help available to you:

1. instructor's office hours: for questions about assignments, laboratories, and projects and any discussion/lecture material covered in class.

2. course bulletin board: the tutor and the instructor will monitor the bulletin board and contribute where appropriate, e.g., answer questions about projects, clarify misunderstandings, etc.

3. email questions may be sent to the instructor, who will attempt to respond to them typically within one business day. Alternatively, the instructor may pass the email on to the tutor to respond, depending on the nature of the question. The subject of your email message should be "199 inquiry". Email should not be used to request clarification on material you may have missed during class or tutorial, nor can it be used to engage in a private tutor session. Rather, it should be administrative in nature. If you have a technical question about your project, please come to the instructor's office hours, bring it to the next class, or post it to the bulletin board.

Course Schedule and Evaluation

Fall Semester

Week	Date	Class Agenda	Assignment	Due Date	Weight
1	Sep 14	Introduction and Course Overview	Assignment 1	Sep 21	2.5%
2	Sep 21	Imaging the World: The Eye vs the Camera **Assignment 1 due**	Assignment 2	Sep 28	2.5%
3	Sep 28	Carving up an Image into Objects **Assignment 2 due**			
4	Oct 5	Laboratory 1 (BA3175)	Lab Report 1	Oct 19	5%
5	Oct 12	Describing Objects	Assignment 3	Oct 19	2.5%
6	Oct 19	Recognizing Objects **Lab Report 1 due**			
7	Oct 26	Laboratory 2 (BA3175) **Assignment 3 due**	Lab Report 2	Nov 2	5%
8	Nov 2	What Objects Can Robots Recognize Now? **Lab Report 2 due**	Assignment 4	Nov 9	2.5%
9	Nov 9	Guest Lecture: Object Recognition in Industry **Assignment 4 due**	Project Proposal	Nov 10	2.5%
10	Nov 16	The Ethics of Robotic Object Recognition	Assignment 5	Nov 30	2.5%
11	Nov 23	Carving up a Video into Moving Objects **Project Proposal due**	Progress Report	Jan 25	7.5%
12	Nov 30	Laboratory 3 (BA3175) **Assignment 5 due**	Lab Report 3	Jan 11	5%

Winter Semester

Week	Date	Class Agenda	Assignment	Due Date	Weight
13	Jan 11	Describing Moving Objects as Activities **Lab Report 3 due**	Assignment 6	Jan 18	2.5%
14	Jan 18	Recognizing Activities **Assignment 6 due**			
15	Jan 25	Laboratory 4 (BA2220) **Progress Report due**	Lab Report 4	Feb 1	5%
16	Feb 1	What Activities Can Robots Recognize Now? **Lab Report 4 due**	Assignment 7	Feb 8	2.5%
17	Feb 8	The Ethics of Robotic Activity Recognition **Assignment 7 due**	Assignment 8	Feb 15	2.5%
18	Feb 15	What Makes a Good Project **Assignment 8 due**	Project Presentation and Report	Mar 1-Apr 5 Apr 5	10% 20%
	Feb 22	Reading Week (no lecture)			
19	Mar 1	Student Presentations			
20	Mar 8	Student Presentations			
21	Mar 15	Student Presentations			
22	Mar 22	Student Presentations			
23	Mar 29	Student Presentations			
24	Apr 5	Student Presentations **Project Report due**			
			Class Participation	over semester	20%
			Total	over semester	100%

Projects, Oral Presentations, and Class Participation

All assignments, laboratory reports, progress reports, and projects must be electronically submitted **by the beginning of class (the e-timestamp must read 2:10pm or earlier)**; quarter past the hour is late. You will lose 10% of the submission's value for each day that it is late (i.e., 2:15pm submission on the due date will cost you 10% of the assignment).

Each student begins the term with 3 grace days with which to avoid late penalties. An assignment handed in by 2:15 pm on the due date uses up one grace day; handing it in on 2:15pm the following day uses up two grace days. The grace days are intended for use in emergencies, e.g., your laptop/printer failed, or the TTC broke down. Do not use them to buy an extension because of a busy week or you will be out of luck in a true emergency.

Class participation (20%) will include attendance (which will be taken), class engagement (e.g., in response to reading assignments), classroom discussion (e.g., when issues are debated), and feedback to other students during their project presentations.

Illness

In the event of an illness or other catastrophe, get proper documentation (e.g., medical certificate).