CMPUT 328 Fa19 - VISUAL RECOGNITION Combined LAB LEC Fa19

Course Information

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Visual Recognition (CMPUT 328)

Lectures: Wednesday from 5 to 8 pm at CSC B 2

Labs: Mon, Tue, Thur from 5 to 8 pm and Fri from 2 to 5 pm at CSC 167

Instructor: Nilanjan Ray

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TAs: Abhineet Singh <asingh1@ualberta.ca>, Rafsanjany Kushol <kushol@ualberta.ca>, Hager Radi <radi@ualberta.ca>

Office meeting: By email appointment with Nilanjan

TA Office Hours: In the lab.

Introduction

The goal of the course is to make students familiar with a fascinating application area of machine learning: visual recognition. In visual recognition, a machine attempts to understand scenes or world from visual cues, i.e., images and videos. The application is widespread nowadays with the availability of cameras everywhere. Successful commercial systems based on visual recognition range from entertainment to serious scientific research: face detection and recognition on personal devices, social media, etc., Kinect gaming, robot navigation on Mars, cancer research, and so on. CMPUT 328 will emphasize on the use of the deep **convolutional neural network for** visual recognition.

Prerequisites

Math 114 and Math 125 for the understanding of basic continuous math and basic linear algebra.

Stat 141 and Stat 151 or Stat 235 for a basic understanding of probability and statistics

CMPUT 115 or CMPUT 175 for knowing programming basics.

Familiarity with Python will be required. If you don't meet the above requirements exactly, but you have taken similar courses, seek permission from the instructor to enroll.

Learning outcome

At the end of the course, the students will know the basic principles behind visual recognition: how a computer learns to recognize objects from images and videos. The students will also learn to build visual recognition systems using freely available python-based toolboxes, such as PyTorch.

Course content

1. Introduction to visual recognition

2. Introduction to Images and videos

3. Hand engineered features and visual recognition.

4. Introduction to convnet

5. Backpropagation and training of convnet

6. Image classification with convnet

7. Object localization with convnet

8. Semantic segmentation with convnet

9. Autoencoders

10. Recurrent neural network

Instructional method

One three-hour lecture per week will cover instructions, some hands-on practices, and a quiz. Students are required to bring their laptops in the lecture with the required software and tools (see course materials below). Internet connections will be required in the lectures. Labs will cover programming tutorials and assignments.

Course materials

1. Textbook: There is no assigned textbook for this course. A good reference is http://cs231n.stanford.edu/syllabus.html. The instructor will post relevant course materials in eClass.

2.Required software and tools: Students will need to bring their own laptops to the class. PyTorch and python-based tools will be used in the Google colaboratory.

Assignments and evaluation

1. Ten assignments (Total 60%) based on course materials will be given. These individual student assignments will be programming tasks using PyTorch. First nine assignments will each have a weight of 9.5%, while the last assignment will have a weight of 14.5%. Marking rubric will be supplied with each assignment. Attending the labs is **mandatory**. There will be a part of the assignment (e.g., answering some questions) that you need to present to the TA in the lab. TA can ask random questions based on your code or your understanding of the problem. Please come to your designated lab section. The second part of your assignment is the code that you can submit on eClass anytime before the assignment deadline. The correctness of the code will be evaluated based on the accuracy of the output as well as run time.

Late policy for assignments: each student will get a total of 4 late days for the whole course that they can spend on the assignments according to their needs. Once these late days are used up, any submission after the due date will not be accepted.

2. In-class quizzes (10%, 10 best quizzes out of 11) will focus on the lecture materials covered on the same day. Students will need to complete their quiz and submit it by the end of the class.

3. The final exam (30%) will emphasize on theoretical aspects, such as gradient descent, back-propagation, and so on. **date: December 4, time: 5-7:30 pm. Venue: CSC B-2 (regular classroom).** You are allowed to use the internet, any type of calculator, devices, and notes. You are **not allowed** to consult with anyone in the exam room or on the internet.

Policy

Students are encouraged to take a look at the official university policy: https://www.ualberta.ca/computing-science/resources/policy-information/department-course-policies

Last modified: Friday, 8 November 2019, 1:32 PM

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