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Today’s outline

I. Course Logistics
II. Introduction to Deep Learning Applications
III. Examples of student projects
5 “courses”:

C1: Neural Networks and Deep Learning
C2: Improving Deep Neural Networks
C3: Strategy for Machine Learning Projects
C4: Convolutional Neural Networks
C5: Sequence Models

Example: C2M3: Course 2 Module 3

Schedule is on http://cs230.stanford.edu/syllabus/

We are going to use the Coursera Platform: www.coursera.org

The class forum is on Piazza: piazza.com/stanford/fall2019/cs230
One week in the life of a CS230 student

1 module

Watch videos on Coursera
≈1h

Solve quiz
≈20min

Complete programming assignments
≈1-2h

1 week of class ≈ 2 modules + Go to in-class lecture
≈1h20 + TA sections on Fridays
≈ 1 hour + 15min project mentorship with TA

Assignments and Quizzes are due every Tuesday at 8am
Do not follow the deadlines displayed on Coursera!!!
Grade Formula

\[ \text{Grade} = 0.02A + 0.08Q + 0.25Pa + 0.25M + 0.40Pr \]

- \( A \) = Attendance
- \( Q \) = Quizzes
- \( Pa \) = (Programming) assignments
- \( M \) = Midterm
- \( Pr \) = Final-project

Active Piazza participation = 1% bonus
Example: For next Tuesday at 8am you have to complete the following assignments:

- 2 Quizzes:
  ★ Introduction to deep learning
  ★ Neural Network Basics

- 2 Programming assignments:
  ★ Python Basics with Numpy
  ★ Logistic Regression with a neural network mindset

At 7am on Tuesday: you submit 1 quiz and the 1 PA.
At 3pm on Tuesday: you submit the second quiz.
At 2pm on Wednesday: you submit the second PA.

How many late days did you use? 3 late days
I. Course Logistics

II. Introduction to Deep Learning Applications

III. Examples of student projects
Projects: SIGN language image classification

<table>
<thead>
<tr>
<th>y = 0</th>
<th>y = 1</th>
<th>y = 2</th>
<th>y = 3</th>
<th>y = 4</th>
<th>y = 5</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="y_0.png" alt="Image" /></td>
<td><img src="y_1.png" alt="Image" /></td>
<td><img src="y_2.png" alt="Image" /></td>
<td><img src="y_3.png" alt="Image" /></td>
<td><img src="y_4.png" alt="Image" /></td>
<td><img src="y_5.png" alt="Image" /></td>
</tr>
<tr>
<td><img src="y_0_matrix.png" alt="Matrix" /></td>
<td><img src="y_1_matrix.png" alt="Matrix" /></td>
<td><img src="y_2_matrix.png" alt="Matrix" /></td>
<td><img src="y_3_matrix.png" alt="Matrix" /></td>
<td><img src="y_4_matrix.png" alt="Matrix" /></td>
<td><img src="y_5_matrix.png" alt="Matrix" /></td>
</tr>
</tbody>
</table>
Assignment: The Happy House

y = 0

can’t enter the Happy House

y = 1

can enter the Happy House!
Assignment: Object detection

[Another fun video generated with YOLOv2 by J. Redmon: https://youtu.be/VOC3huqHrss]
Projects: others

- Optimal goalkeeper shoot prediction
- Car detection
- Face recognition
- Art generation
- Music generation
- Text generation
- "I love you"
- Emojifier
- Machine translation
- Trigger word detection
- And many more…
Assignment: Car detection for autonomous driving
Projects: others

- Optimal goalkeeper shoot prediction
- Car detection
- Face recognition
- Art generation
- Music generation
- Text generation
- "I love you"
- Emojifier
- Machine translation
- Trigger word detection

And many more…
In the style of Claude Monet

In the style of Yayoi Kusama

In the style of Piet Mondrian

In the style of Pablo Picasso

[L. Gatys et al.: Image Style Transfer Using Convolutional Neural Networks, 2015]
In the style of Hilma af Klint

In the style of Jamini Roy

In the style of Eiichiro Oda

In the style of Salvador Dali

[L. Gatys et al.: Image Style Transfer Using Convolutional Neural Networks, 2015]
Projects: others

Optimal goalkeeper shoot prediction

Car detection

Face recognition

Art generation

Music generation

Text generation

“I love you”

Emojifier

Machine translation

Trigger word detection

And many more…
I. Course Logistics

II. Introduction to Deep Learning Applications

III. Examples of student projects
LeafNet: A Deep Learning Solution to Tree Species Identification

Predicting price of an object from a picture

[Steven Chen: Fall 2017]
Detect cards from real-time video of tournaments to improve viewer understanding and accessibility.

Figure 2: Predicted objects on a single frame from Dataset 1 produced by my model (left) and the YOLOv3 baseline (right).

NBA 2k19 DeepBaller: A NN-Controlled Real-Time video game AI


Kian Katanforoosh
Crop-type classification for small holder farms

Figure 5: Qualitative Performance in Germany (left) and South Sudan (right). Ground truth labels are in the top row while model predictions are in the bottom row. Each color corresponds to a different crop type.

Image-to-Image translation with Conditional-GAN

Figure 3: Generated map images of different architecture and hyperparameters. From left to right are source aerial images, baseline, U-Net, U-Net with ImageGAN, ResNet-6, ResNet-9, ResNet-50, and ground truth map images.
## Discrete reasoning in natural language processing

<table>
<thead>
<tr>
<th>Reasoning (Reasoning Percent)</th>
<th>Passage (some parts shortened)</th>
<th>Question</th>
<th>Answer</th>
<th>BiDAF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subtraction (28.8%)</td>
<td>That year, his Untitled (1981), a painting of a haloed, black-headed man with a bright red skeletal body, depicted amid the artists signature scrawls, was sold by Robert Lehrman for $16.3 million, well above its $12 million high estimate.</td>
<td>How many more dollars was the Untitled (1981) painting sold for than the 12 million dollar estimation?</td>
<td>4300000.00</td>
<td>$16.3 million</td>
</tr>
<tr>
<td>Comparison (18.2%)</td>
<td>In 1517, the seventeen-year-old King sailed to Castile. There, his Flemish court .... In May 1518, Charles traveled to Barcelona in Aragon.</td>
<td>Where did Charles travel to first, Castile or Barcelona?</td>
<td>Castile</td>
<td>Aragon</td>
</tr>
<tr>
<td>Selection (19.4%)</td>
<td>In 1970, to commemorate the 100th anniversary of the founding of Baldwin City, Baker University professor and playwright Don Mueller and Phyllis E. Braun, Business Manager, produced a musical play entitled The Ballad Of Black Jack to tell the story of the events that led up to the battle.</td>
<td>Who was the University professor that helped produce The Ballad Of Black Jack, Ivan Boyd or Don Mueller?</td>
<td>Don Mueller</td>
<td>Baker</td>
</tr>
<tr>
<td>Addition (11.7%)</td>
<td>Before the UNPROFOR fully deployed, the HV clashed with an armed force of the RSK in the village of Nos Kalik, located in a pink zone near Šibenik, and captured the village at 4:45 p.m. on 2 March 1992. The JNA formed a battlegroup to counterattack the next day.</td>
<td>What date did the JNA form a battlegroup to counterattack after the village of Nos Kalik was captured?</td>
<td>3 March 1992</td>
<td>2 March 1992</td>
</tr>
<tr>
<td>Count (16.5%) and Sort (11.7%)</td>
<td>Denver would retake the lead with kicker Matt Prater nailing a 43-yard field goal, yet Carolina answered as kicker John Kasay ties the game with a 39-yard field goal. .... Carolina closed out the half with Kasay nailing a 44-yard field goal. .... In the fourth quarter, Carolina sealed the win with Kasay’s 42-yard field goal.</td>
<td>Which kicker kicked the most field goals? John Kasay</td>
<td>Matt Prater</td>
<td></td>
</tr>
</tbody>
</table>
Predicting atom energy based on atomic-structure
Visual Question Answering
Cancer/Parkinson/Alzheimer detection
Activity recognition in video
Music genre classification / Music Compression
Accent transfer in a speech
Generating images based on a given legend
Detecting earthquake precursor signals

Check out past projects: http://cs230.stanford.edu/past-projects/
To sum up

1. You will learn about wide range of deep learning topics
2. The course is very applied, you will code these applications
3. You have access to mentorship to build an outstanding project in 10 weeks

For next Tuesday (10/01) 8am:
- Create Coursera account and join the private session using the invitation
- Finish **C1M1** & **C1M2**
- 2 Quizzes:
  * Introduction to deep learning
  * Neural Network Basics
- 2 Programming assignments:
  * Python Basics with Numpy
  * Logistic Regression with a neural network mindset
- Find project team-mates and fill-in the Google form that will be posted on Piazza.

This Friday (09/27):
- TA section “Deep Learning Applications”

Download your notebooks after you finished them!
Follow only the website deadlines!