

# **CS230: Deep Learning**

# Course Staff

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Instructor



Kian Katanforoosh

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Head TA

## Course Assistants



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Shahab Mousavi



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## Today's outline

I. Course Logistics

II. Overview of CS230 Programming Assignments

III. Examples of student projects

## Course Logistics

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

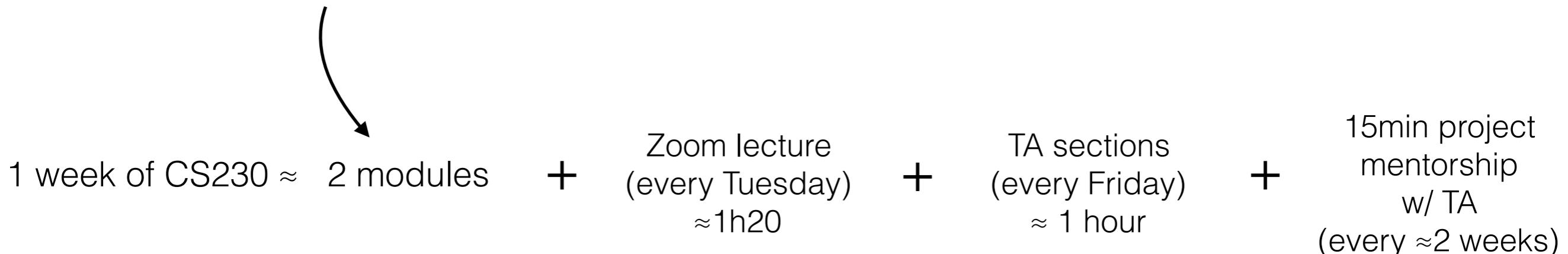
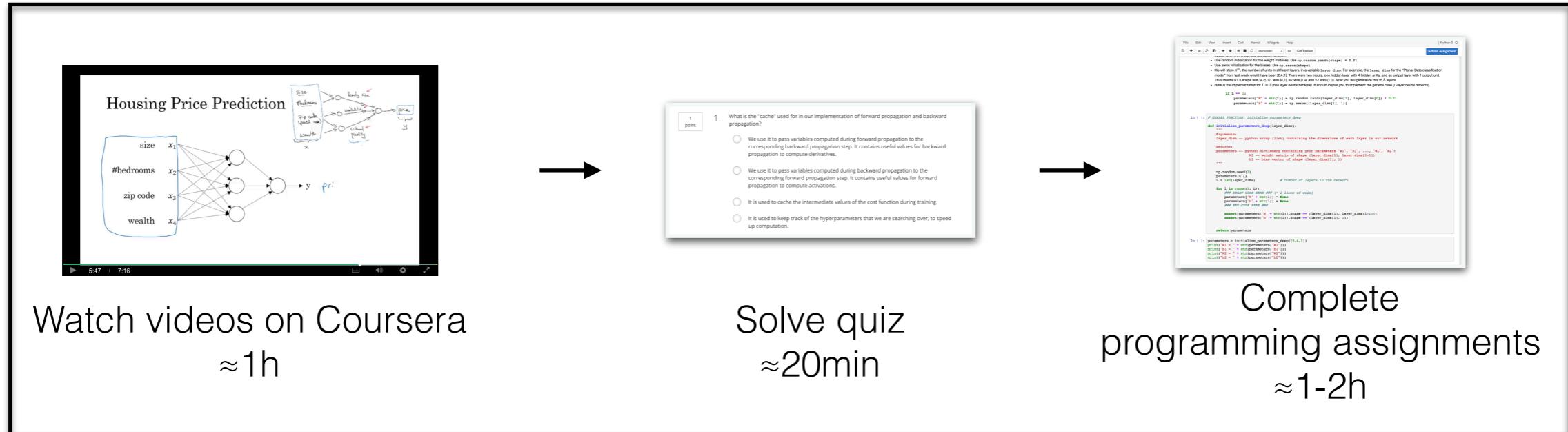
Schedule is on <http://cs230.stanford.edu/syllabus/>

We use Coursera: [www.coursera.org](https://www.coursera.org)

The class forum is on Piazza: [piazza.com/stanford/spring2020/cs230](https://piazza.com/stanford/spring2020/cs230)

# One week in the life of a CS230 student

1 module



Assignments and Quizzes are due every Tuesday at 9am

## Grading Formula

$$Grade = 0.15Q + 0.35Pa + 0.50Pr$$

Q = Quizzes

Pa = Programming assignments

Pr = Project

*Active Piazza participation = 1% bonus*

## Late days

Example: For next Tuesday at 9am 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

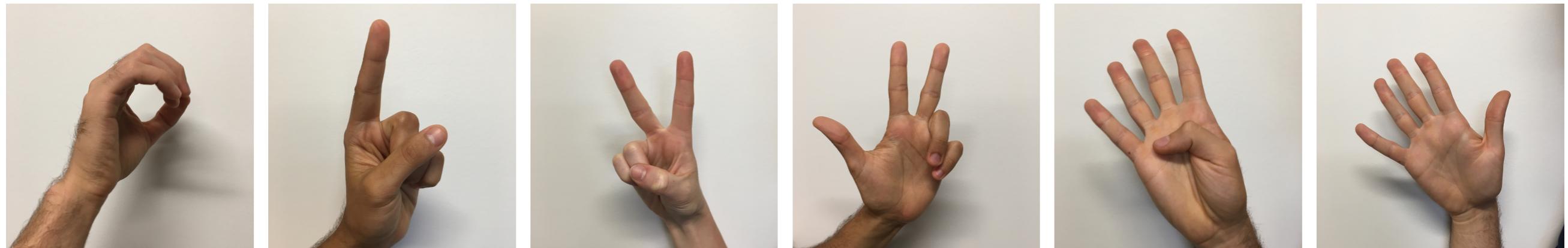
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**II. Overview of CS230 Programming Assignments**

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## Projects: SIGN language image classification



$$y = 0$$

$$\begin{bmatrix} 1 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \end{bmatrix}$$

$$y = 1$$

$$\begin{bmatrix} 0 \\ 1 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \end{bmatrix}$$

$$y = 2$$

$$\begin{bmatrix} 0 \\ 0 \\ 1 \\ 0 \\ 0 \\ 0 \\ 0 \end{bmatrix}$$

$$y = 3$$

$$\begin{bmatrix} 0 \\ 0 \\ 0 \\ 1 \\ 0 \\ 0 \\ 0 \end{bmatrix}$$

$$y = 4$$

$$\begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 1 \\ 0 \\ 0 \end{bmatrix}$$

$$y = 5$$

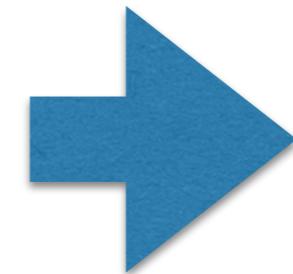
$$\begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 1 \end{bmatrix}$$

## Assignment: The Happy House

$y = 0$



$y = 0$

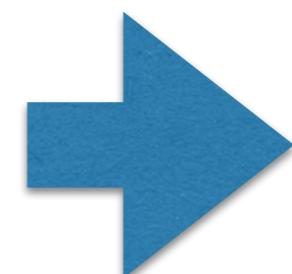


can't enter  
the Happy House

$y = 1$

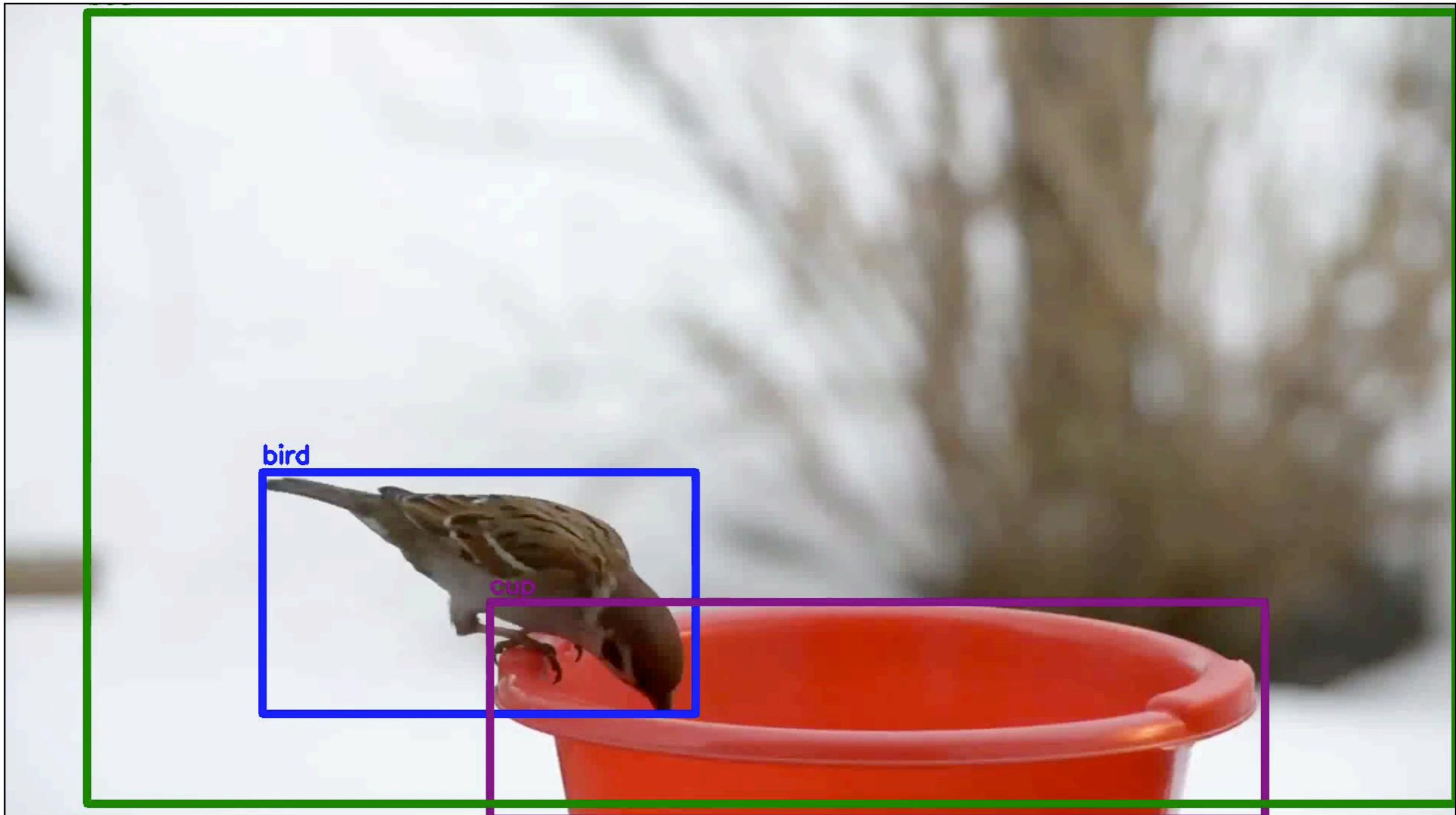


$y = 1$



can enter  
the Happy House!

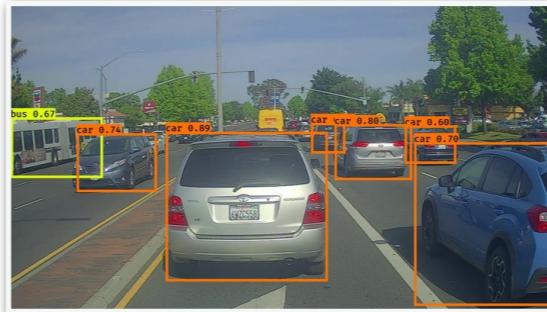
## Assignment: Object detection



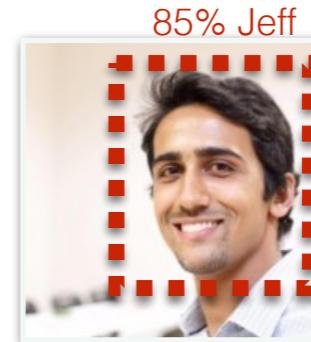
## Projects: others



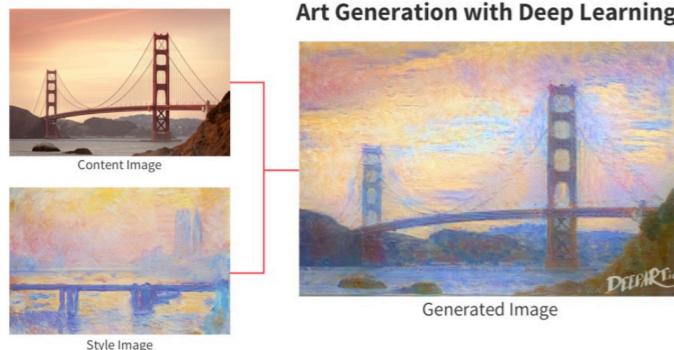
Optimal goalkeeper shoot prediction



Car detection



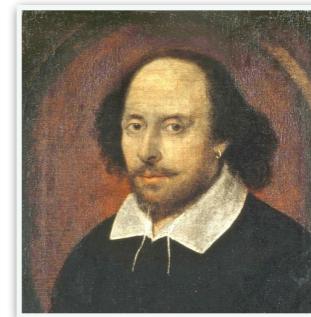
Face recognition



Art generation



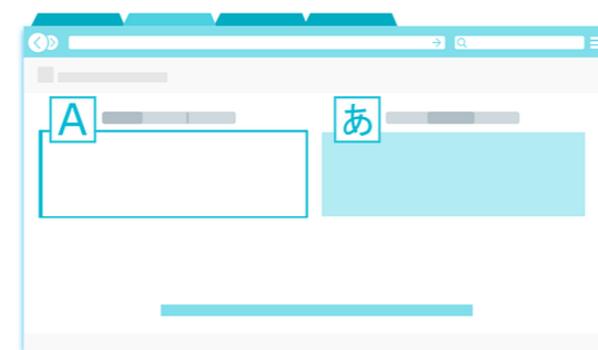
Music generation



Text generation

“I love you”  
↓

Emojifier



Machine translation



Trigger word detection

And many more...

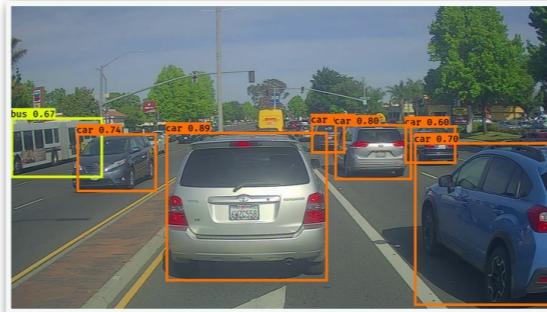
## Assignment: Car detection for autonomous driving



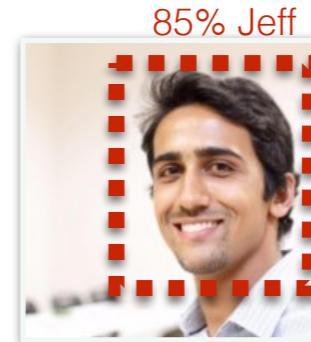
## Projects: others



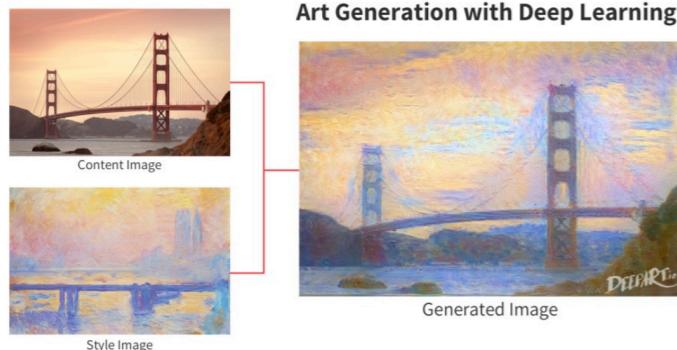
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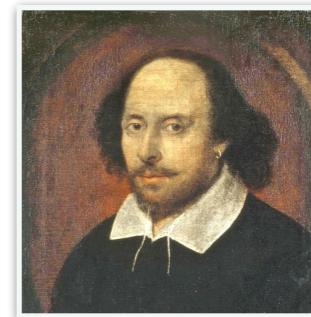
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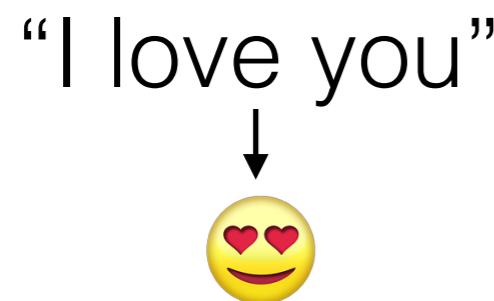
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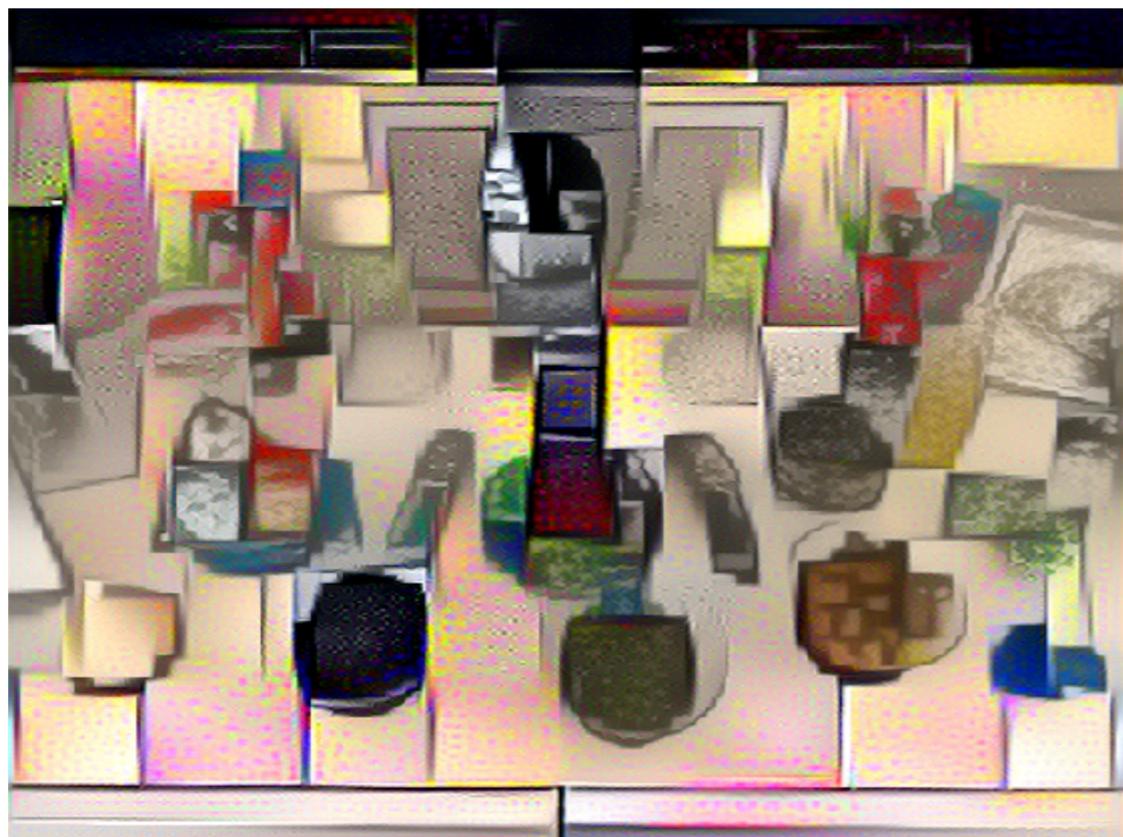




**In the style of Claude Monet**



**In the style of Yayoi Kusama**



**In the style of Piet Mondrian**



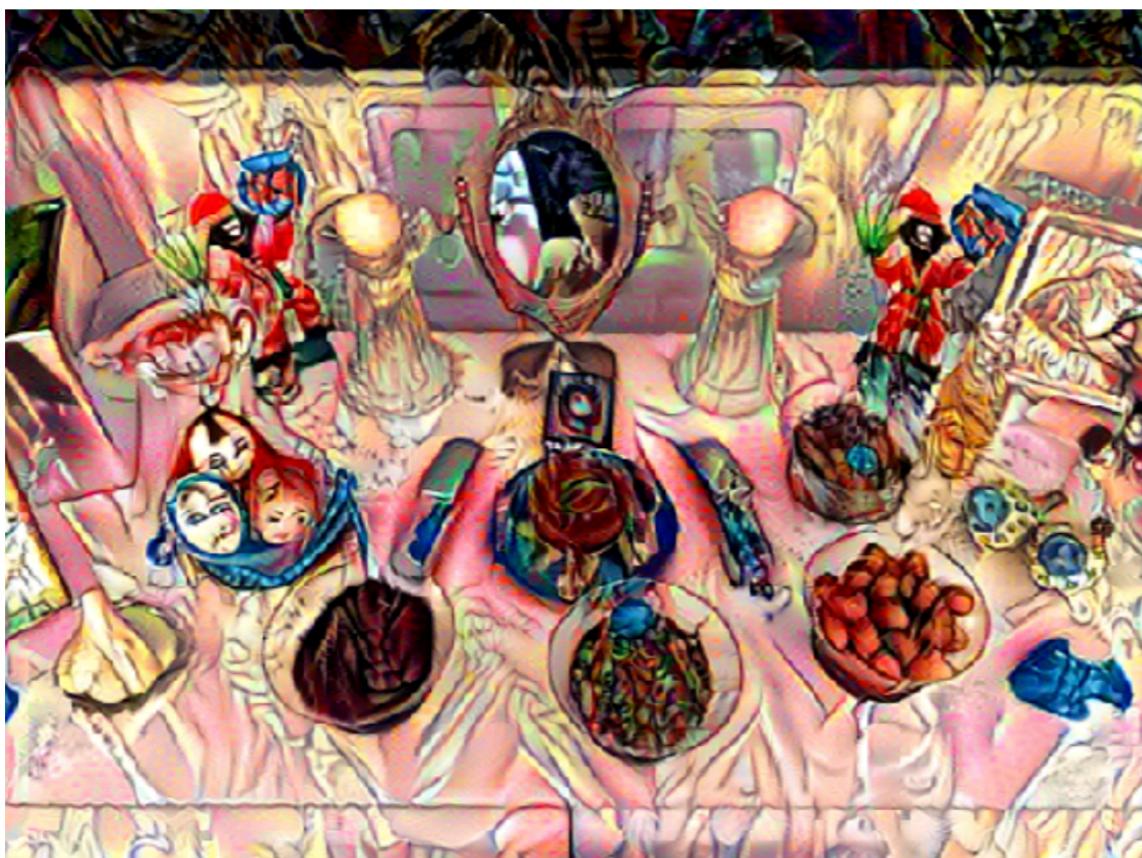
**In the style of Pablo Picasso**



**In the style of Hilma af Klint**



**In the style of Jamini Roy**



**In the style of Eiichiro Oda**

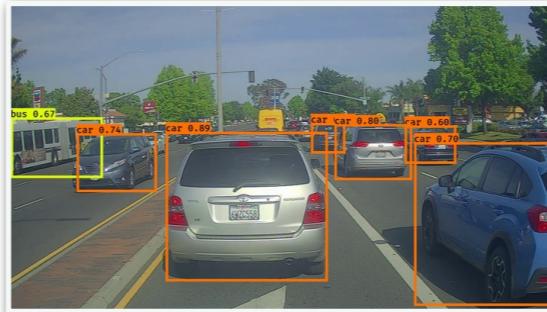


**In the style of Salvador Dali**

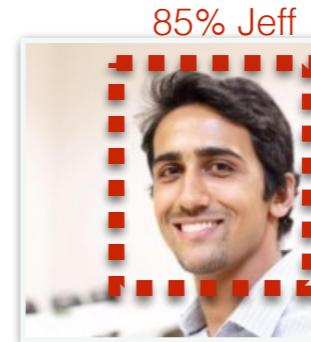
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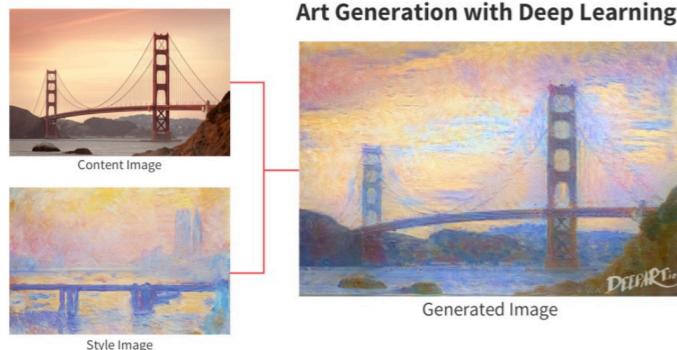
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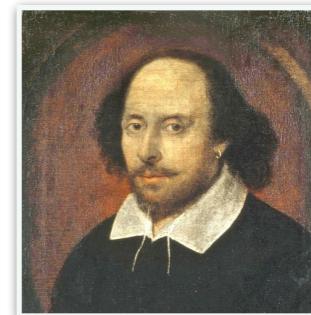
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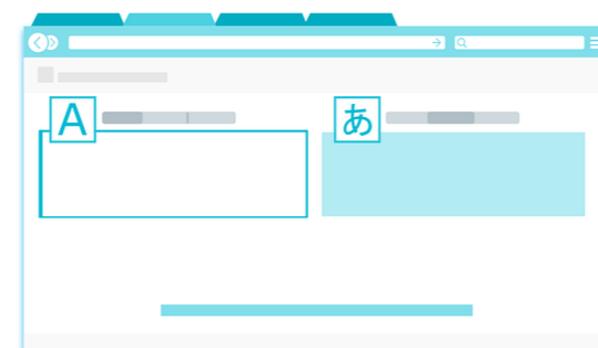
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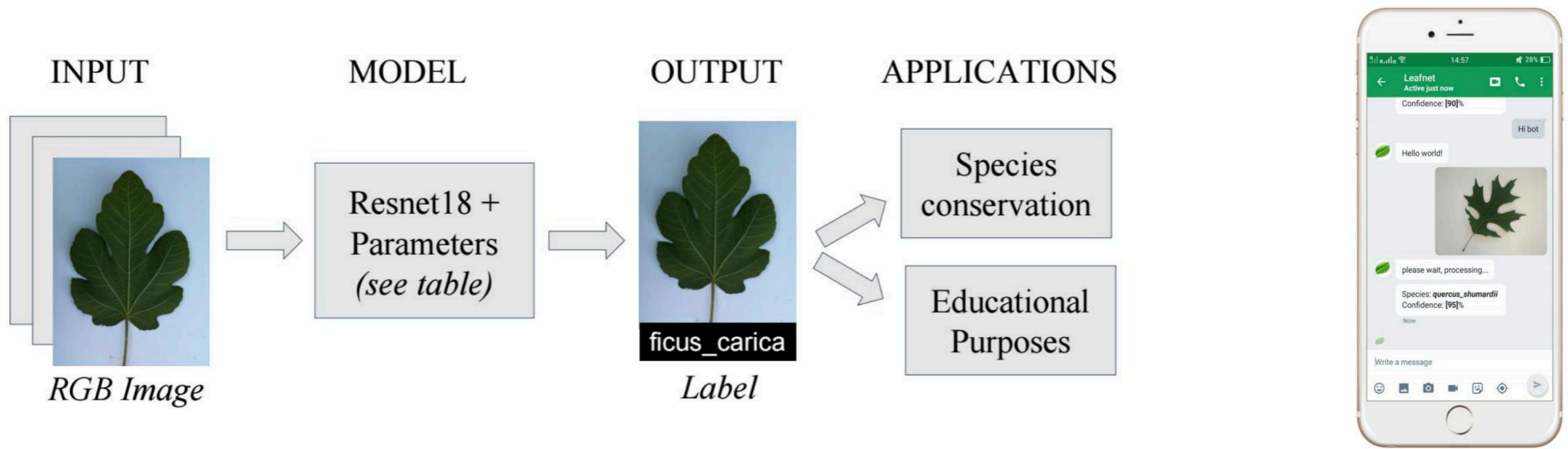
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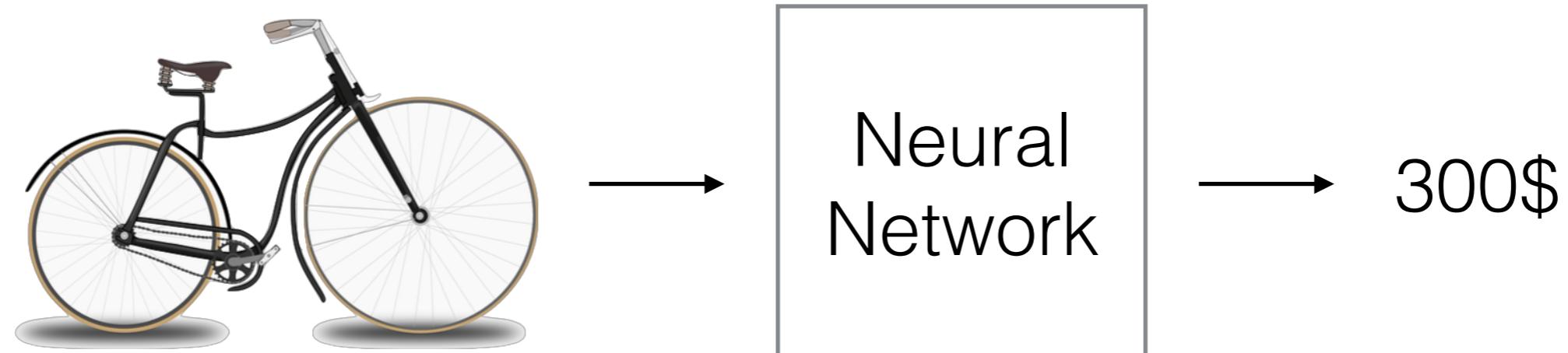
**III. Examples of student projects**

## Projects: others

# LeafNet: A Deep Learning Solution to Tree Species Identification



Predicting price of an object from a picture



## Projects: others

Detect cards from real-time video of tournaments to improve viewer understanding and accessibility

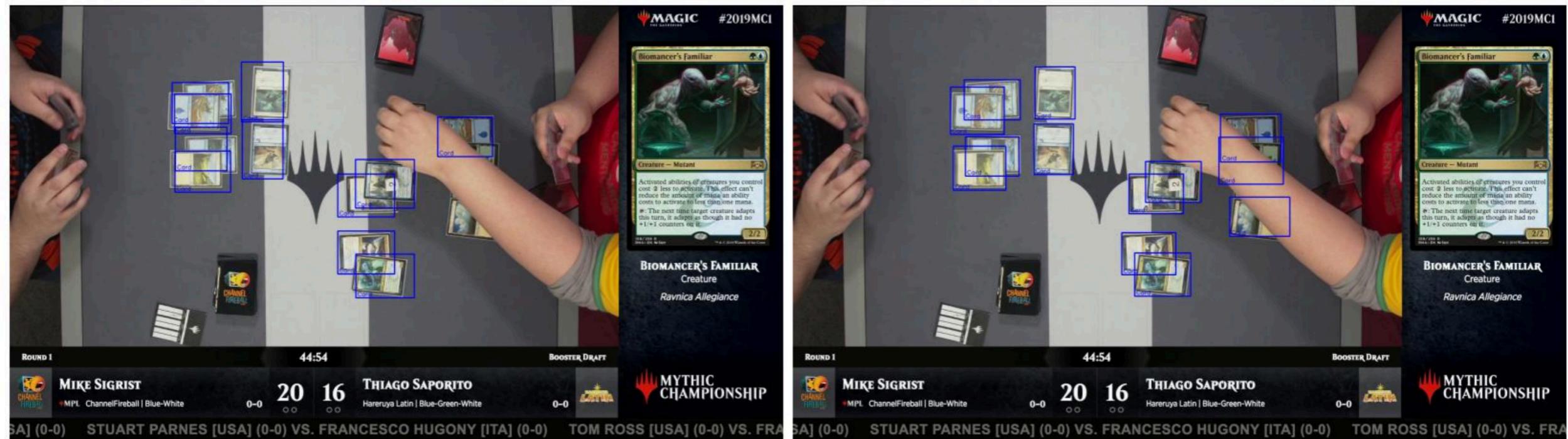
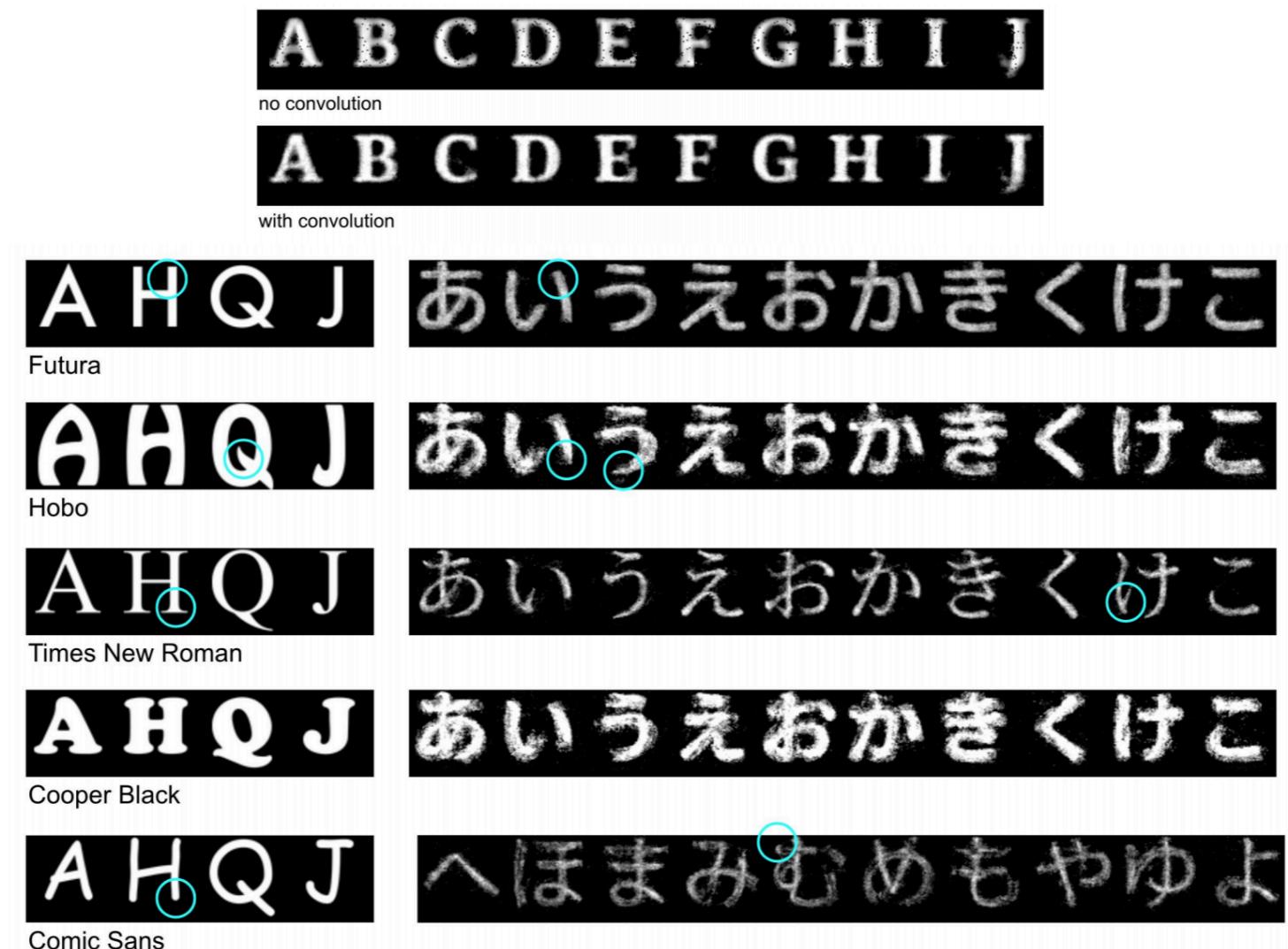


Figure 2: Predicted objects on a single frame from Dataset 1 produced by my model (left) and the YOLOv3 baseline (right).

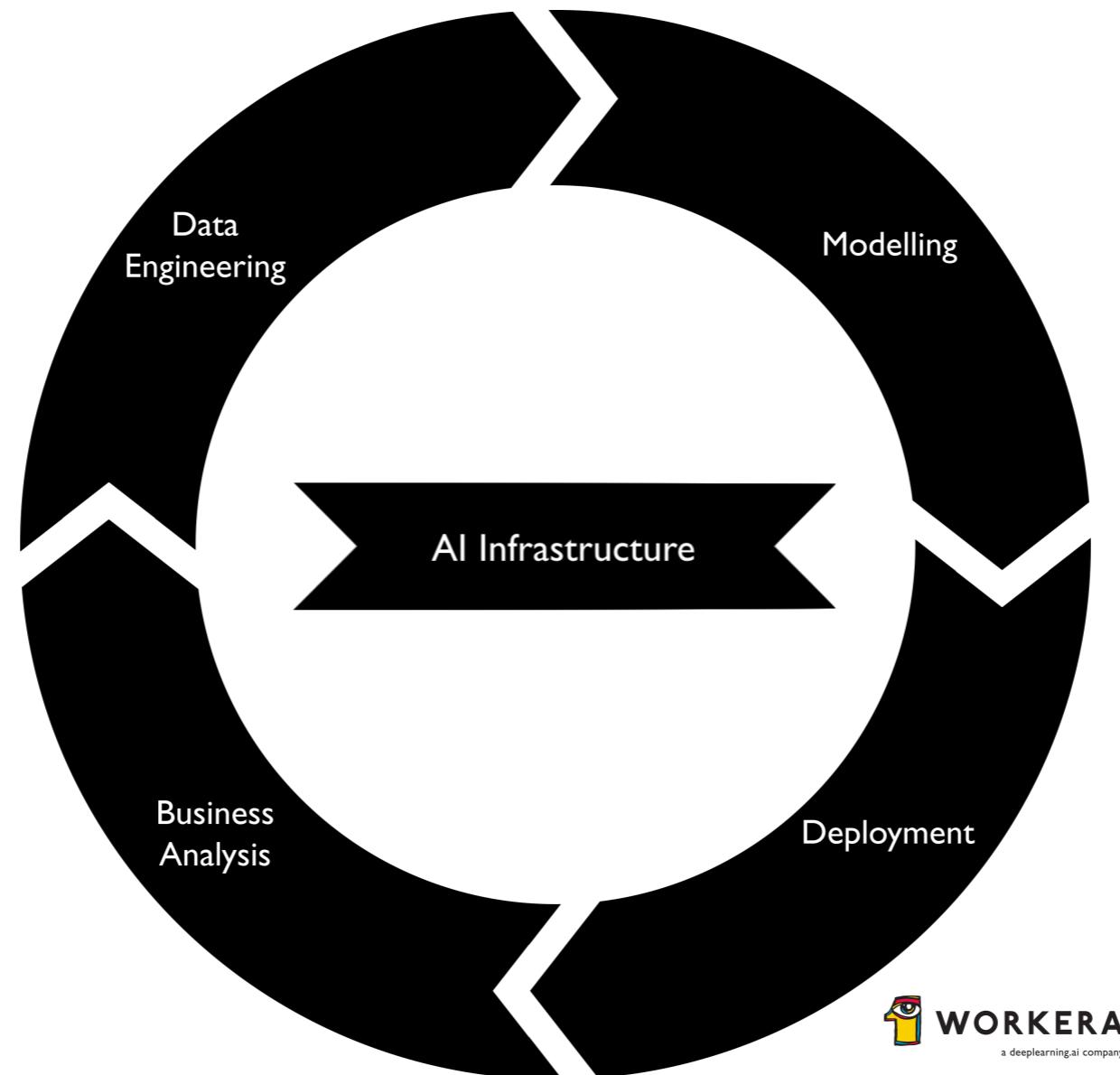
## Projects: others

**font-gen:** Deep Models for Inferring Alternate Language Sets from Fonts



**Figures 5-6:** Convolution; predicting Japanese sets.

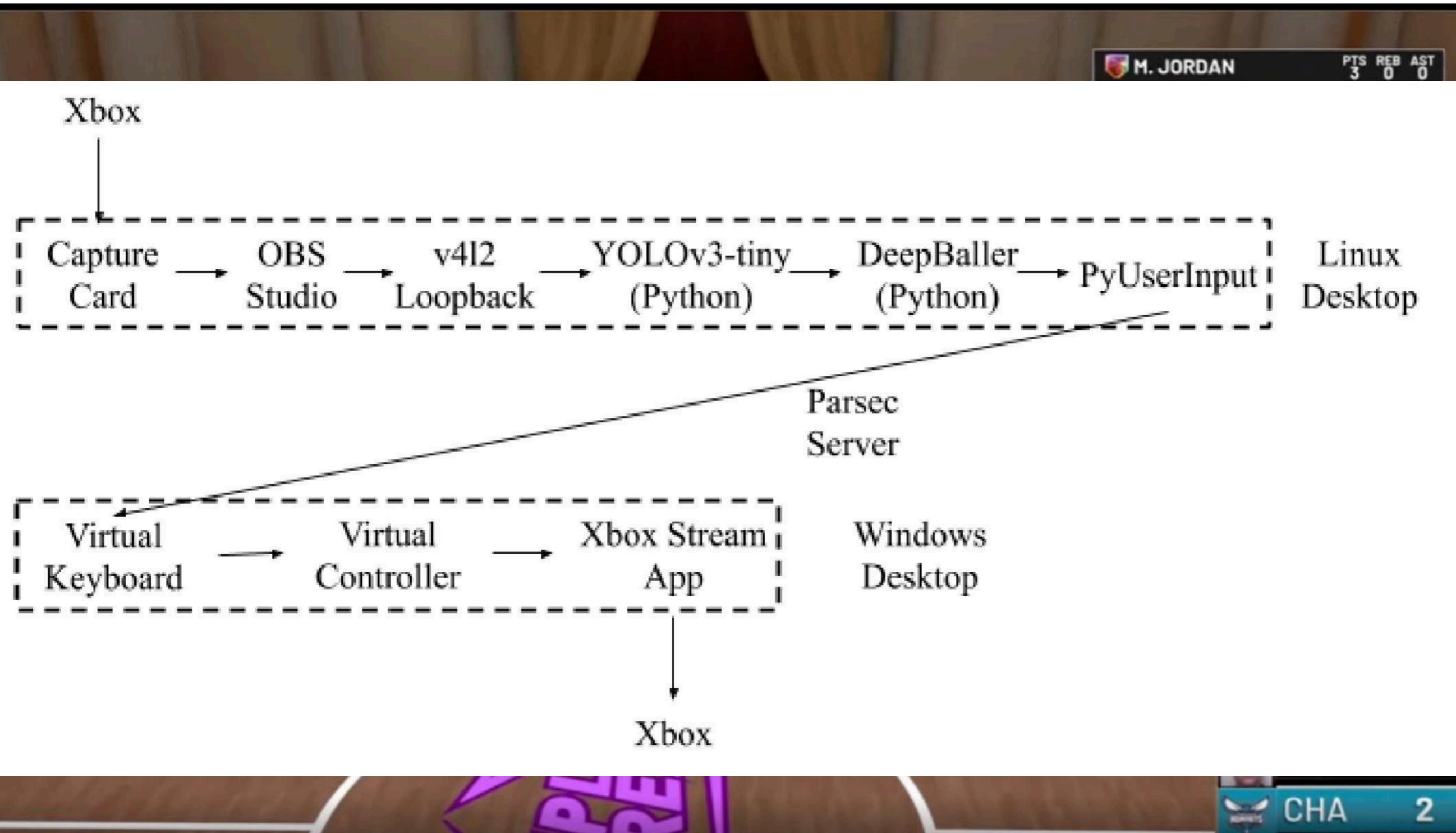
## Projects: others



 **WORKERA**  
a deeplearning.ai company

## Projects: others

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



## Projects: others

### Crop-type classification for small holder farms

Visualization of the objective:  
Use temporal satellite imagery to map crop type from space.

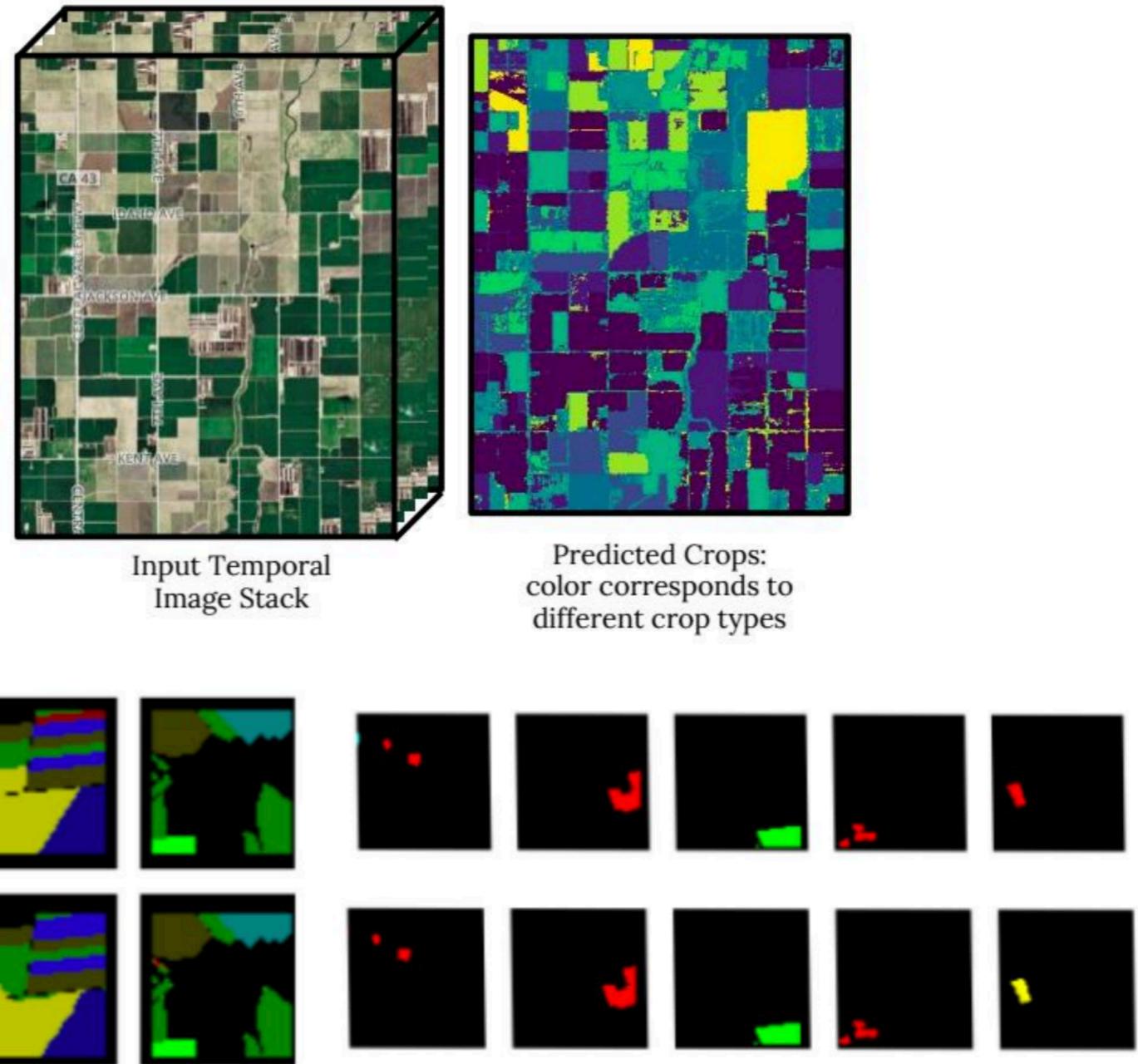


Figure 5: Qualitative Performance in Germany (left) and South Sudan (right). Ground truth labels are in the top row while model predictions are in the bottom row. Each color corresponds to a different crop type.

# Image-to-Image translation with Conditional-GAN

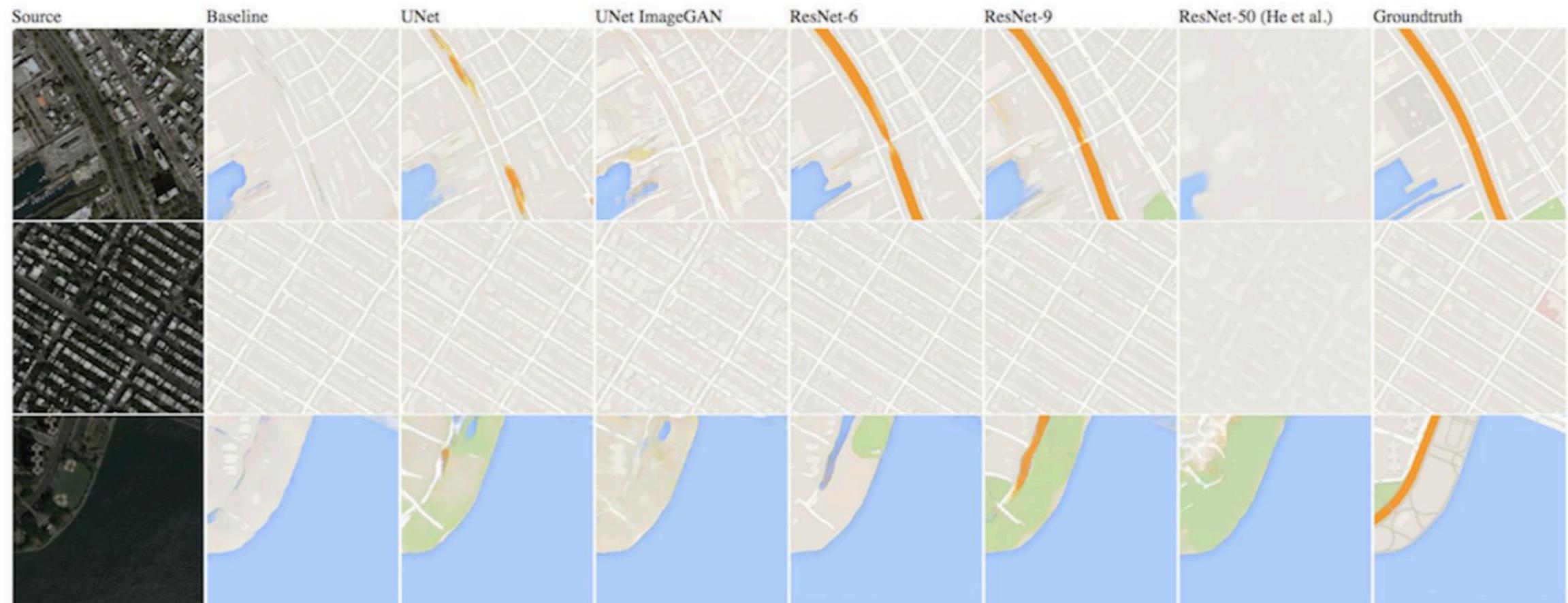


Figure 3: Generated map images of different architecture and hyperparameters. From left to right are source aerial images, baseline, U-Net, U-Net with ImageGAN, ResNet-6, ResNet-9, ResNet-50, and ground truth map images

## Projects: others

# Discrete reasoning in natural language processing

<b>Reasoning</b>	<b>Passage</b> (some parts shortened)	<b>Question</b>	<b>Answer</b>	<b>BiDAF</b>
Subtraction (28.8%)	That year, his <b>Untitled (1981)</b> , a painting of a haloed, black-headed man with a bright red skeletal body, depicted amid the artists signature scrawls, was <b>sold by Robert Lehrman for \$16.3 million, well above its \$12 million high estimate.</b>	How many more dollars was the Untitled (1981) painting sold for than the 12 million dollar estimation?	4300000	\$16.3 million
Comparison (18.2%)	In <b>1517, the seventeen-year-old King sailed to Castile</b> . There, his Flemish court .... <b>In May 1518, Charles traveled to Barcelona in Aragon.</b>	Where did Charles travel to first, Castile or Barcelona?	Castile	Aragon
Selection (19.4%)	In 1970, to commemorate the 100th anniversary of the founding of Baldwin City, <b>Baker University professor and playwright Don Mueller and Phyllis E. Braun, Business Manager, produced a musical play entitled The Ballad Of Black Jack</b> to tell the story of the events that led up to the battle.	Who was the University professor that helped produce The Ballad Of Black Jack, Ivan Boyd or Don Mueller?	Don Mueller	Baker
Addition (11.7%)	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 <b>2 March 1992</b> . The JNA formed a battlegroup to counterattack the <b>next day</b> .	What date did the JNA form a battlegroup to counterattack after the village of Nos Kalik was captured?	3 March 1992	2 March 1992
Count (16.5%) and Sort (11.7%)	Denver would retake the lead with kicker <b>Matt Prater nailing a 43-yard field goal</b> , yet Carolina answered as kicker <b>John Kasay ties the game with a 39-yard field goal</b> . ... Carolina closed out the half with <b>Kasay nailing a 44-yard field goal</b> . ... In the fourth quarter, Carolina sealed the win with <b>Kasay's 42-yard field goal</b> .	Which kicker kicked the most field goals?	John Kasay	Matt Prater

**And many more...**

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 (04/14) 9am:

- 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.
- Fill out the CS 230 Section Preference Form to choose your section:  
<https://forms.gle/eXSWZW2KJNY2nG5h9> (This will be posted on Piazza too!)

### This Friday (04/10):

- TA section “Getting Started with Your Project”

Download your notebooks after you finished them!

You can find all deadlines on the website Syllabus