

Clearly AI will makes some of us rich....Will AI (eventually) put us all out of jobs...ask an economist! (not for a while at least)



PROF. MARK WOODEN
University of Melbourne



Interlude - Face Recognition...



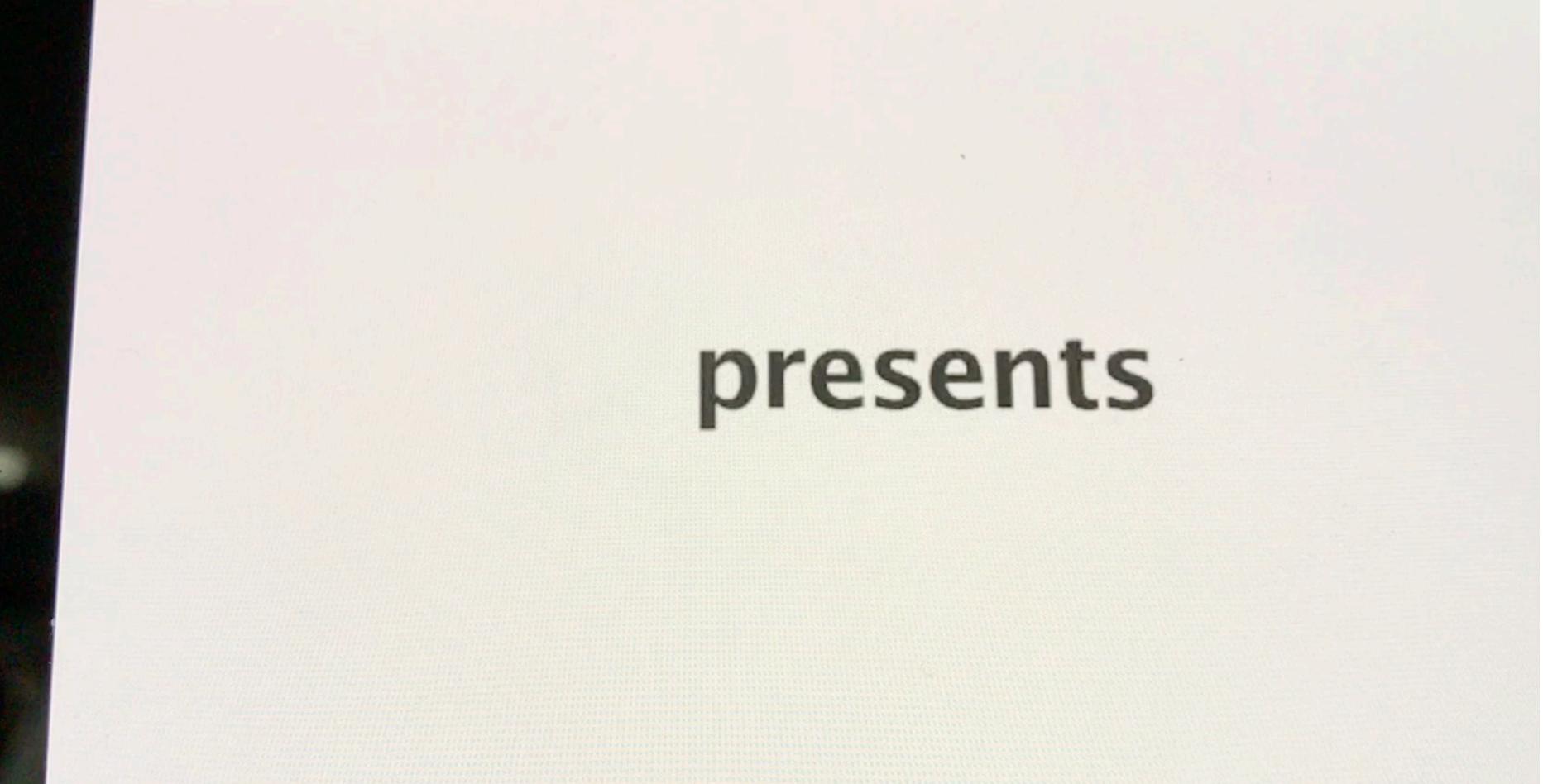
Prof Mark Wooden



...and Prof. David Suter



Kayak 4 - Rowing 4?



presents

Can create new vision capability without writing code(!)...e.g., Apple CreateML



So let's create a classifier for a task *most of you* would *not know how to do* without clues/teaching....

You know a technology has reached a level of maturity – commoditized!

Google has MLKit for machine learning (especially for android), Apple has CoreML 2; IBM, Amazon, Google have cloud based speech recognition and chatbot frameworks you can build/access in your apps...

You don't need to be an AI expert (or to some extent an “expert programmer”) to invent the next AI app/market!

racing kayak

All images



- Rights-managed (RM) Model released
 Royalty-free (RF) Property released
 Show editorial RF



New Creative Relevant

People

Location

Image

Viewpoint

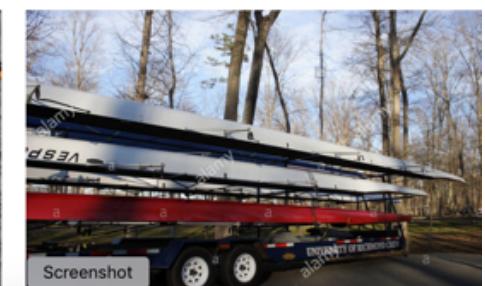
Date taken

Advanced search

Racing Kayak Stock Photos and Images (1,911)

Narrow your search: Vectors | Black & white | Cut Outs

Page 1 of 20

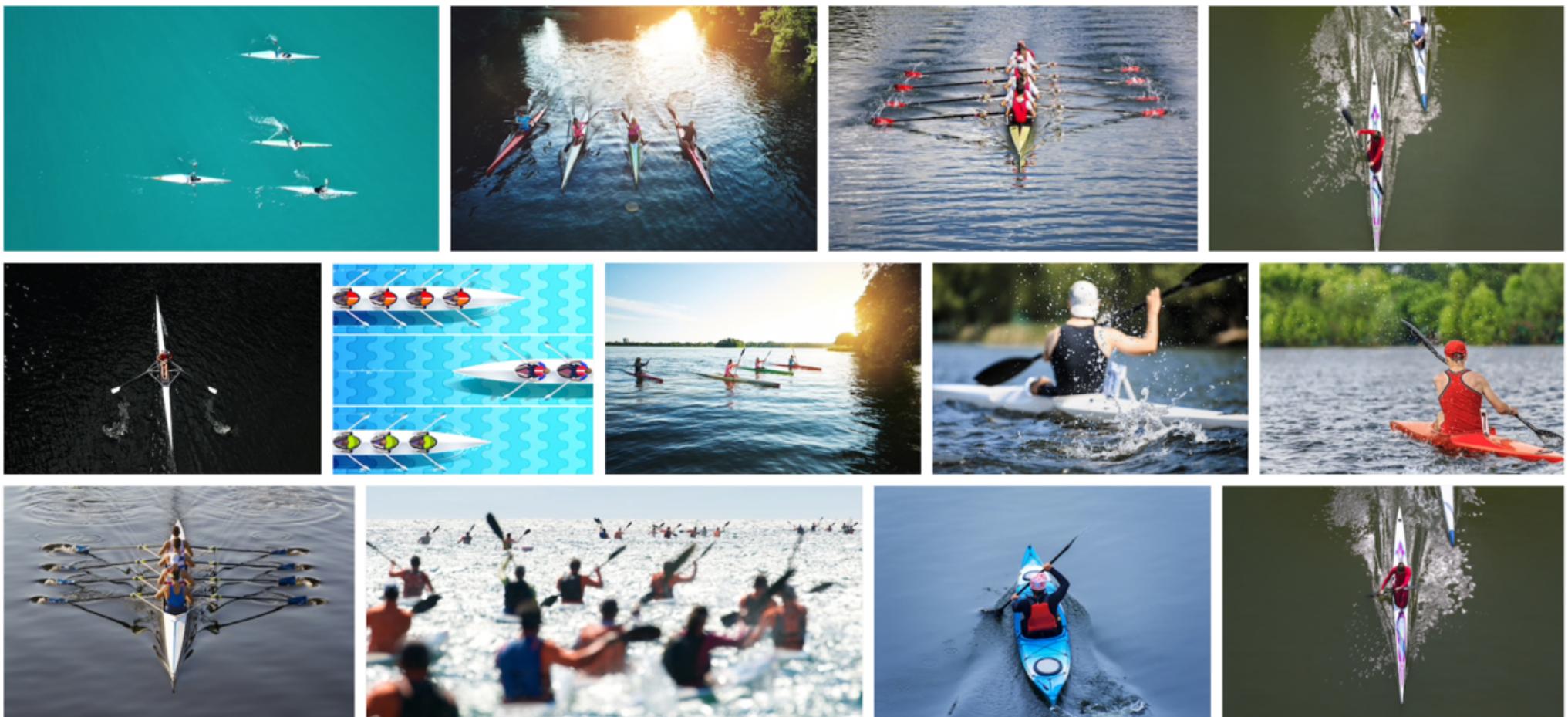


Kayak racing stock photos

5,552 Kayak racing stock photos, vectors, and illustrations are available royalty-free. See [kayak racing stock video clips](#).

« 1 » of 56

Popular New Image Type ▾ Orientation ▾ Color ▾ People ▾ More ▾



To teach my machine to distinguish “kayak race” from “rowing race”

Scrape google images for 300 of each

Curate images (remove “wrong” or “not useful” images)

Throw away some rowing images because need balanced training data

Put aside some of each for training and testing..

Around 145 of each for training

Around 30 of each for testing

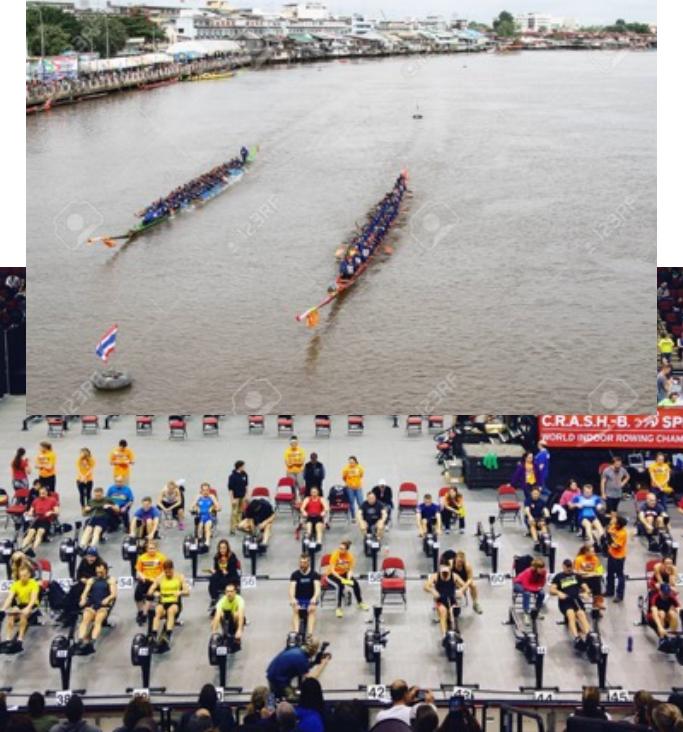
Simply doing random choice (Head and Tails coin toss), probability of getting 100% right is $(\frac{1}{2})^{60}$...i.e. 1 in around 1,152,921,504,606,850,000

And on average would expect it would get around 30 wrong...

Examples of culled Kayak Race...



Examples of culling rowing race



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vidsuter

Drop

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opbox

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wnloads

vid's MacB...

intosh HD

OTCAMP

mote Disk

View

Group

Action

Share

Add Tags

Today

research_week_2018

Previous 7 Days

coreml

Huu_papers

MLKIT

papers

scrape_google

Previous 30 Days

admin

clustering

complexQA

Deep_Expts

deep_robust

extreme_value_classifiers

Gans_for_design

how_deep_l..._to_humans

information_geometry

Intrinsic_im...m_synthetic

persistence...iag_tracking

place_recognition

road_network

scene_flow

schubert

semantic_editing

sum_of_squares

tensor_train

tracking

xcod_projects

zero_shot_learning

August

ExpressVPN Shortcuts

July

camera_models

compressed_sensing

cores...topolog...robust

Macintosh HD > Users > davidsuter > Documents > scrape_google

MyPlayground

import CreateMLUI

let builder =

MLImageClassifierBuilder()

builder.showInLiveView()

"Image Classifier Build..."

"Open Assistant Editor..."

Live View > MyPlayground.playground (Live View)

ImageClassifier

Drop Images To Begin Training

```
1 import CreateMLUI
2
3 let builder =
4     MLImageClassifierBuilder()
5 builder.showInLiveView()
```

About 1min to train to 94% accuracy on a 2014 MacbookPro Laptop (!)



But training accuracy is one thing...testing accuracy is another...

Group Action Share Add Tags

Dropbox Search

MyPlaygrou...playground (Live View)

Today

- 018 v3.pptx
- MyPlaygrou...playground
- Previous 7 Days
 - bananas
 - chrome_scrape.py
 - culled_kayak
 - rowing_culled
 - scrape
 - surplus_row
 - test
 - train
- July
 - chromedriver

Classifiers

humans

metry

synthetic

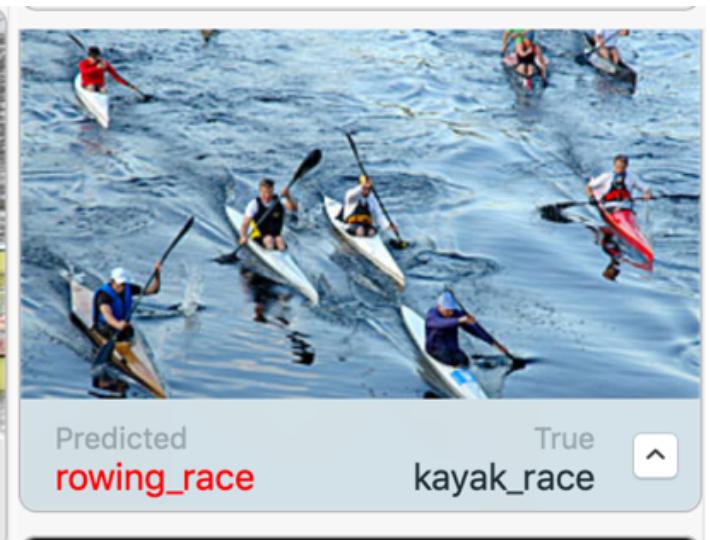
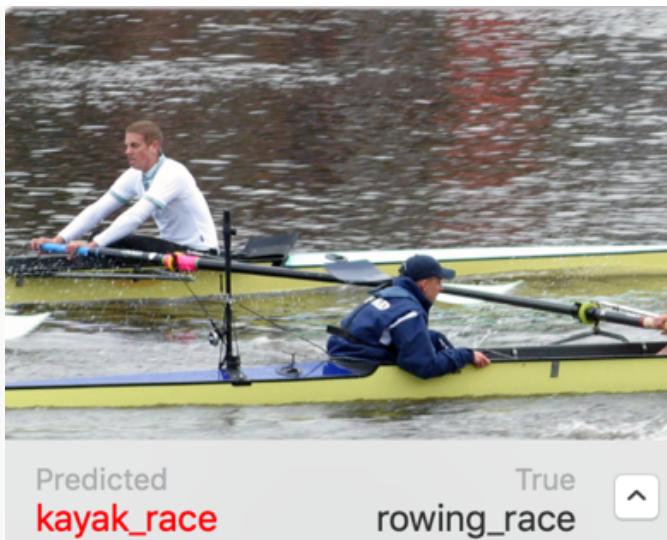
tracking

tcuts

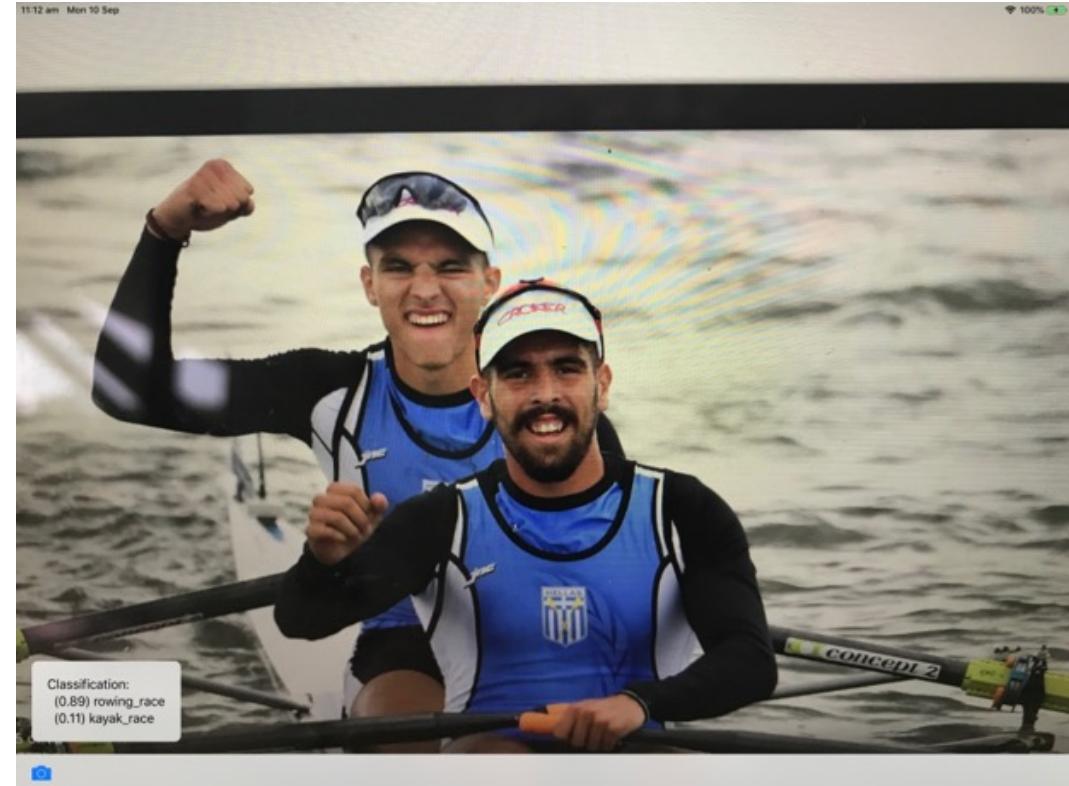
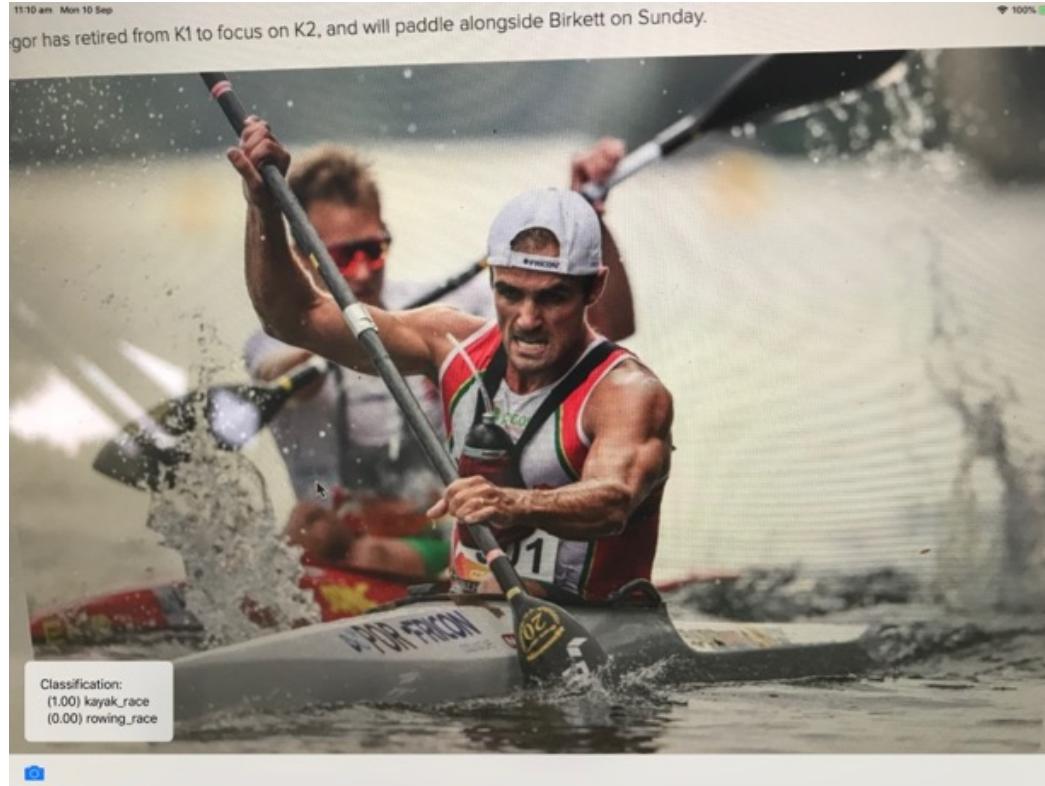
Completed (Iteration limit reached).

	0.108824	0.883212	0.785714
2	0.136350	0.883212	0.785714
3	0.162410	0.896511	0.785714
4	0.186442	0.912409	0.928571
5	0.319197	0.941606	1.000000
10			

3 images of 60, misclassified..



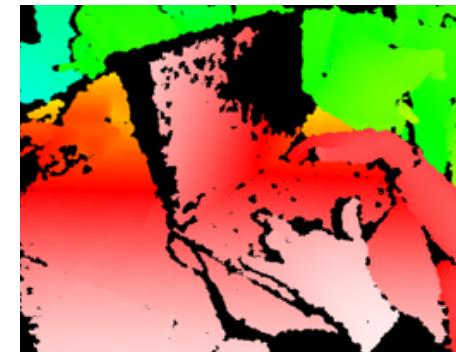
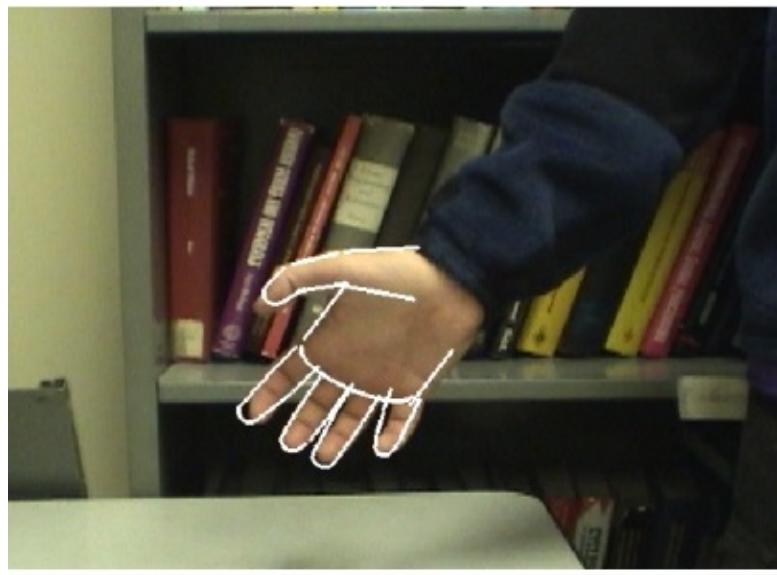
Once trained, save model, drag and drop to project for mobile device...



The world's *first* (and only...) device "capable" of telling a racing kayak from a racing row boat...you can tell your grandchildren you were around to see it! ☺ ☺

Vision (Perception)

- Object and face recognition
- Scene segmentation
- Image classification



Images from Erik Sudderth (left), wikipedia (right)

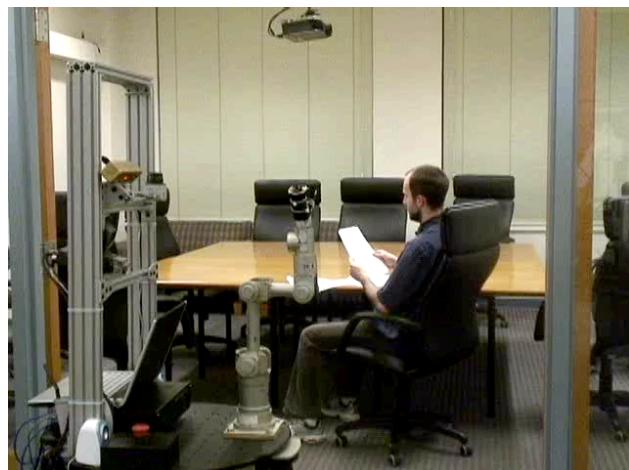
Robotics

- Robotics
 - Part mech. eng.
 - Part AI
 - Reality much harder than simulations!
- Technologies
 - Vehicles
 - Rescue
 - Soccer!
 - Lots of automation...
- In this class:
 - We ignore mechanical aspects
 - Methods for planning
 - Methods for control



Images from UC Berkeley, Boston Dynamics, RoboCup, Google

Robotics



Images from UC Berkeley, Boston Dynamics, RoboCup, Google

Logic

- Logical systems
 - Theorem provers
 - NASA fault diagnosis
 - Question answering
- Methods:
 - Deduction systems
 - Constraint satisfaction
 - Satisfiability solvers (huge advances!)

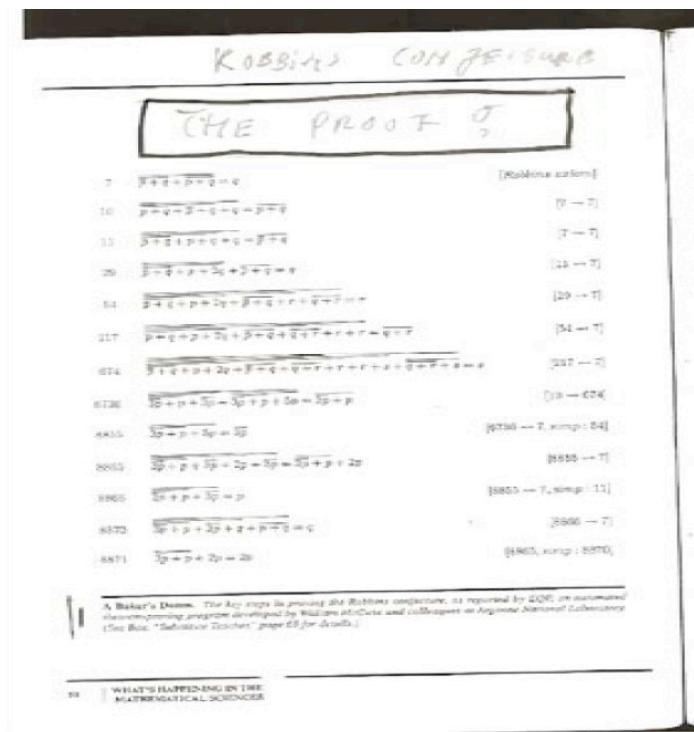


Image from Bart Selman

Game Playing

- Classic Moment: May, '97: Deep Blue vs. Kasparov
 - First match won against world champion
 - “Intelligent creative” play
 - 200 million board positions per second
 - Humans understood 99.9 of Deep Blue's moves
 - Can do about the same now with a PC cluster
- Open question:
 - How does human cognition deal with the search space explosion of chess?
 - Or: how can humans compete with computers at all??
- 1996: Kasparov Beats Deep Blue

“I could feel --- I could smell --- a new kind of intelligence across the table.”
- 1997: Deep Blue Beats Kasparov
- Huge game-playing advances recently, e.g. in Go!

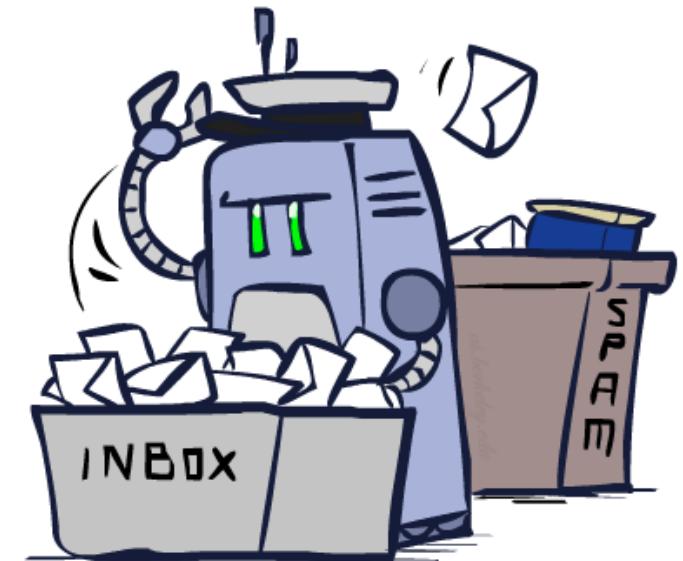


Text from Bart Selman, image from IBM's Deep Blue pages

Decision Making

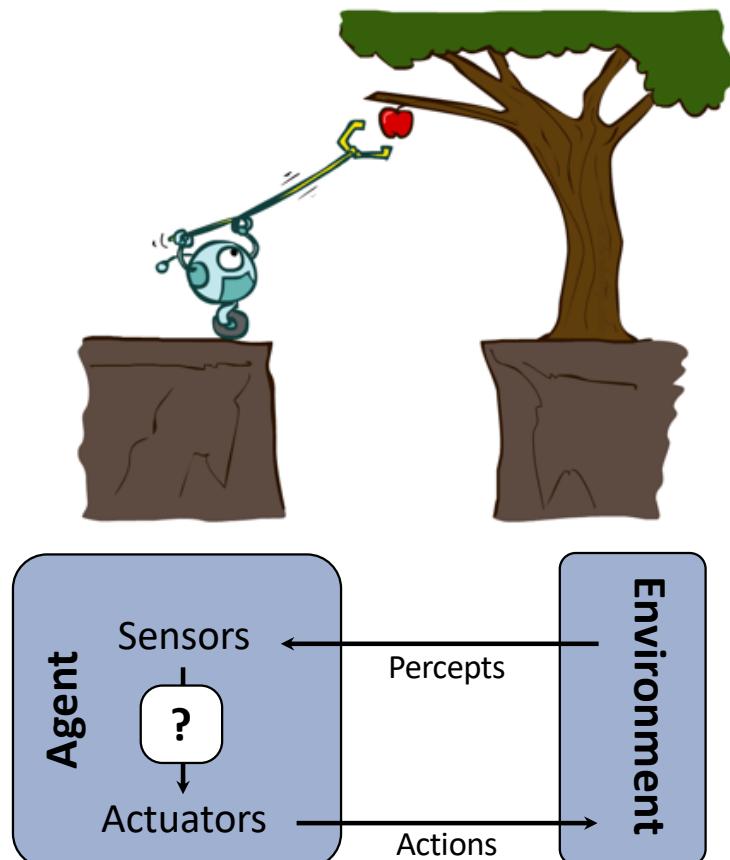
- Applied AI involves many kinds of automation

- Scheduling, e.g. airline routing, military
- Route planning, e.g. Google maps
- Medical diagnosis
- Web search engines
- Spam classifiers
- Automated help desks
- Fraud detection
- Product recommendations
- ... Lots more!

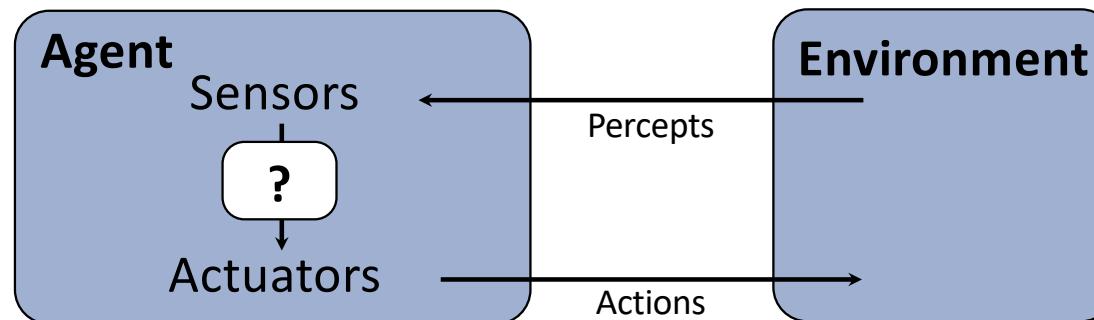
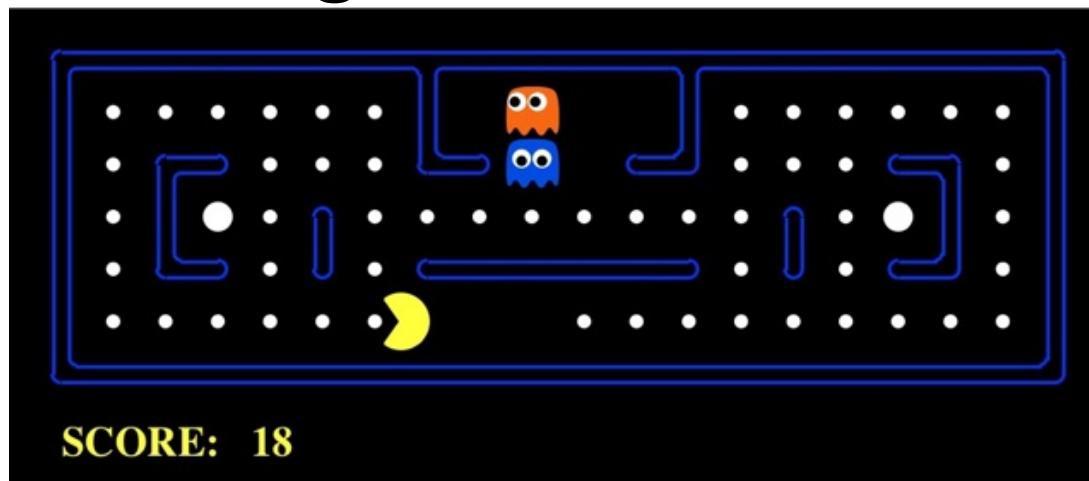


Designing Rational Agents

- An **agent** is an entity that *perceives* and *acts*.
- A **rational agent** selects actions that maximize its (expected) **utility**.
- Characteristics of the **percepts**, **environment**, and **action space** dictate techniques for selecting rational actions
- **This course** is about:
 - General AI techniques for a variety of problem types
 - Learning to recognize when and how a new problem can be solved with an existing technique



Pac-Man as an Agent



Pac-Man is a registered trademark of Namco-Bandai Games, used here for educational purposes