Homework #3: Homebrew computer vision

1) Download the zip file below. Look at some of the images, noting that there are 50 classes in 4244 images (e.g. "goldfish", “llama”, “speed-boat”, ...).

http://astro.berkeley.edu/~cklein/50_categories.zip

2) Write a set of methods that takes as input one of these images, and then computes real-numbered **features** as the return.

note: you should produce **at least** 15 features. Some of them can be dumb, like the image array size and the average of the red-channel colors but some should be interesting in that they capture some of the richness of these images, like cross-correlations between the R, G, B channels, some based on edge-detection and image segmentation, etc.

3) Based on the feature set for each image, build a **random forest classifier** (`scikits.learn`). Produce metrics on your estimated error rates using cross-validation. How much better is this than the expectation with random guessing? What are the 3 most important features?

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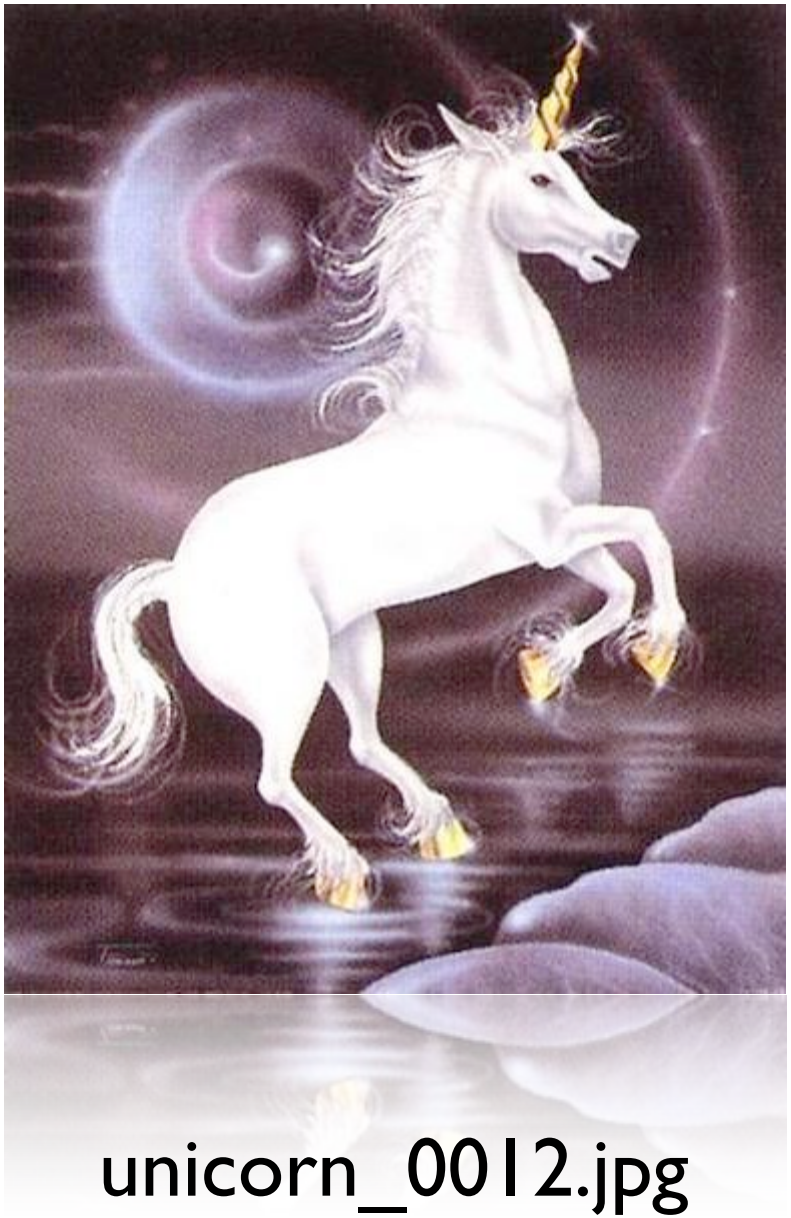
4) Make sure your final **classifier** can run on a directory of different images, where a call like:
run_final_classifier("/new/directory/path/")
on directory that contains files like:
validation1.jpg
validation2.jpg
....
will produce an output file that looks like:

filename	predicted_class
validation1.jpg	unicorn
validation2.jpg	camel
....	

We will have a **validation set** to test how good your classifier is. The best classifier among those submitted will earn it's writer a perfect score on this homework and we will bump your score on one previous homework to half the distance from what you go to perfect. How's that for an incentive?!

Hints: you might want to read about computer vision (CV) to get a sense of what good image features are (e.g., http://opencv.itseez.com/). If you've got great features but they take awhile to calculate, you could experiment with multiprocessing (http://docs.python.org/library/multiprocessing.html) for speed ups.

Good luck!



unicorn_0012.jpg