Final Project Description:

The final project is worth 30% of your final grade for the course. There are three deliverables for the final project:

1. three weekly reports (10% of your final grade);
2. an oral presentation (10% of your final grade, due Sun May 4 at 11:59pm);
3. a written report (10% of your final grade, due Mon May 5 at 11:59pm).

1 The weekly reports

You will submit three weekly reports to the Wiki, very much like you did for the assignments. Each weekly report is just one page long.

1. Weekly report 1: Description of your project (due Wed, Apr 9 at 11:59pm)
2. Weekly report 2: Screenshots from work-in-progress (due Wed, Apr 16 at 11:59pm)
3. Weekly report 3: Presentation of preliminary results (due Wed, Apr 23 at 11:59pm)

1.1 Weekly report 1 (due Wed, Apr 9 at 11:59pm)

In this first week of the final project, you must either choose to work on one of the pre-defined projects or define one of your own. First, you must pick a topic (see below). Then, create a one-page pdf document that describes what you wish to test (i.e., does a quadrupedal robot evolve to travel further than a hexapedal robot, given the same amount of evolutionary effort). Describe how you will test this idea: what will your robot (or robots) look like? (You should include a drawing or figure here.) How will you have to change the neural network and/or hillclimber.

Also, you must describe several small, incremental steps that will bring you to your goal. This is often not as easy as it seems. For example if you plan to compare quadrupeds and hexapods, you might propose to add one new object to your quadruped but not change the ANN or hillclimber. Then, after taking a screenshot of this new robot, you will add one joint, and one new motor neuron to the ANN to control the additional motor. Then, you’ll add a second object, then a second joint and additional motor neuron and so on until your quadruped has to new legs. In weekly report 2, you will include some screenshots showing you gradually changing the quadruped into a hexapod.

If you choose to perform one of the pre-defined projects:

1. Go to the course web page.
2. Click ‘edit’ at the right hand side of the page.
3. Enter the login (admin) and password (engineerisspy).
4. Put your name in brackets next to one of the pre-defined projects:
Final Project 10-1: Which evolves to walk further: a quadruped or hexapod?

becomes

Final Project 10-1: Which evolves to walk further: a quadruped or hexapod? (Josh Bongard)

5. If all the available projects are already taken, you can copy and paste a new entry for yourself:

Final Project 10-1: Which evolves to walk further: a quadruped or hexapod? (Josh Bongard)

becomes

Final Project 10-1a: Which evolves to walk further: a quadruped or hexapod? (Josh Bongard)

Final Project 10-1b: Which evolves to walk further: a quadruped or hexapod? (John Q. Public)

If you choose to formulate your own project...

1. Go to the course [web page](#).
2. Click ‘edit’ at the right hand side of the page.
3. Enter the login (admin) and password (engineerisspy).
4. At the bottom of the page, add your own project idea and your name:

Final Project 10-1a: Which evolves to walk further: a quadruped or hexapod? (other student)

becomes

Final Project 10-1a: Which evolves to walk further: a quadruped or hexapod? (other student)

Final Project 10-2: Evolving a robot that can categorize different objects. (my name)

Now, you must upload your one-page weekly report (in pdf format) to your final project page:

1. Click on the link associated with your project on the course’s Wiki page.
2. If your project page does not yet exist, you will see an empty editable page.
3. Copy and paste in the following code:

   [[http://www.uvm.edu/~ludobots/index.php/Main/ER2014|Back]]

   CS206: Evolutionary Robotics, Fall 2014
   Final project 10-2: Evolving a robot that can categorize different objects.
   Author: your name

   where http://www.yourstorage.com/report1.pdf is where you have uploaded the one-page pdf describing your project.

1.2 Weekly report 2 (due Wed Apr 16 at 11:59pm)

Create a new, one-page pdf document that includes several screenshots documenting one or more of your incremental steps described in your weekly report 1. No need to include much text, just describe each screenshot with a brief caption. Make sure to embed this second document in your final project Wiki page just under the line where you embedded your first weekly report.
1.3 Weekly report 3 (due Wed Apr 23 at 11:59pm)

Again, in this one-page pdf document, include a few screenshots that demonstrate some preliminary results. This might be a figure that shows fitness increasing over time for your new robot (or the original robot with a new ANN, new evolutionary algorithm, or new task to solve).

2 The Oral Presentation

Each student will create a four-minute, silent YouTube video showing off their final project. A link to the YouTube video should be embedded in each student’s final project Wiki page by **11:59pm, Sunday, May 4.** This will give the T.A. one day to collect all of the videos into a playlist for the presentations on Tuesday morning.

During the exam period, the YouTube playlist will play: when your video starts, you can come up and talk us through it; when your video ends and the next starts, the next student comes up and presents. **We have 33 presentations to get through in less than three hours, so this four minutes per student will be strictly enforced.**

2.1 The Oral Presentation Video

1. Create a title slide with your name and project title in PowerPoint or Google Drive Presentation.

2. With a smartphone, shoot a 10 second clip of this slide. Upload the resulting clip to YouTube.

3. Create a few slides describing how your system works.

4. With a smartphone, shoot a 50 second clip of these slides. Upload to YouTube.

5. With a smartphone, shoot a 30-second clip of a few randomly-controlled robots from your simulation. Upload to YouTube.


7. Create a few slides outlining, in bullet-point form, how you would extend your project in future, if given more time. Shoot a one-minute clip of these slides and upload to YouTube.

8. Create a slide requesting questions and/or comments from your fellow students. Shoot a one-minute clip of these slides and upload to YouTube.

10. Merge your YouTube clips together as described [here](#).

11. Embed a link to the resulting YouTube video into your final project Wiki page by the deadline.

- Practice speaking over your video as it plays, as you will not have the option to start and stop the video during your presentation.

- If you don’t have a smartphone, borrow one from a friend, and make sure you know how to pull videos shot with it off of it. Or, if you have screen capture and video editing software, you can forgo the use of a smartphone.

- **IMPORTANT:** You cannot show your presentation on your own laptop during presentation day, as there is insufficient time for changing computers. If your video is not embedded in your project Wiki page by the deadline, you forfeit your grade for the oral presentation.
2.2 Oral Presentation Schedule:

7:30am – 10:15am, Tuesday May 6

1 Beckmann, Conrad M.
2 Bergen, William H.
3 Bishop, Caitlyn A.
4 Brennan Jr., John T
5 Brochu, Hunter R.
6 Carter, Jonathan D.
7 Davenport, Fritz
8 Lindle, Jessica M.
9 Gould, Evan J.
10 Harris, Madison S.
11 Hawley, Tosha N.

10 minute break

12 Hill, Alexander N.
13 Jones, Griffin K
14 Fickes, Michael L.
15 Luther, Colin P.
16 Maslow, Jackson S.
17 Mass, Benjamin S.
18 McOmber, Brendan M.
19 Merewether, Ryan
20 Moran, Scott T
21 Morton, Aaron L.
22 Palchak, Joseph F.

10 minute break

23 Popov, Roman
24 Portalupi, Iain J.
25 Smith, Colum H.
26 Smith, Katelin J.
27 Steimke, Danielle R.
28 Topper, Lance H.
29 Totten, Mariko L.
30 Troiano, Victor J.
31 Wolf, Harrison F.
32 Young, Christopher W.
33 Zieba, Karol

3 The Written Report

The written component of your project is due 11:59pm on Monday, May 5. The written report will take the form of a tutorial that will instruct a hypothetical student in how to implement your final project, much
like the 10 tutorials you followed to implement your evolutionary robotics system. You will create your final report as follows:

- **Create a document in your favorite text editor following the flow of assignments 1-10:**

  - In a first paragraph, explain what your hypothesis is. In other words, what is that you are trying to test? For example: “In this tutorial you will create a hexapod in addition to the quadruped you have already created, and then perform several evolutionary runs to determine which of the two robots is more evolvable.” This will be followed by a summary of the steps that will be taken to prove that hypothesis. For example: “First, you will modify your C code to either simulate the quadruped or a hexapod robot. Then you will modify your python code to output a synaptic weight matrix for either the quadruped or hexapod. Then you will perform several runs of optimizing controllers for the quadruped and several for optimizing controllers for the hexapod.

- **After this summary paragraph you will provide a series of step-by-step instructions that will guide a hypothetical student through the steps necessary to test your hypothesis.**

  - As a guiding principle, you may provide partial code snippets as you have seen in assignments one through 10. The key is not to provide overly vague instructions (e.g. “Change your code to simulate a hexapod as well as quadruped robot.”), nor to make the tutorial too simple that the hypothetical student does not learn anything (e.g. “Copy and paste the following function into your code.”).

  - Your hypothesis and method for testing that hypothesis should be not be overly simple nor overly difficult: remember that you must change your own code to test the hypothesis, as well as write up a tutorial on the subject, and create an oral presentation, before semester ends.

  - As in assignments 1 through 10, you should have your hypothetical student create screen shots to demonstrate they have successfully completed your tutorial. This should include two kinds of screen shots: one of the robot in action (e.g., one screenshot of the quadruped and one of the hexapod) and another showing fitness curves (e.g. two sets of fitness curves for the quadruped and hexapod, as in assignment 1, figure 1a).

  - Your tutorial, in your word processor, should come to between four and eight pages (12 point font).

  - Once you have completed your tutorial in your word processor, you should copy and paste the text directly into the Wiki page corresponding to your project. Also, upload the screenshots and embed them in the Wiki page.

  - Your final project will be considered to be submitted on time if the ‘History’ button reports that the last edit to your Wiki page was made before the submission deadline.