

## **Challenges in Human Health: Problem Solving and Design with Computer Science**

### **Broad Learning Goals**

1. Students will consider computer science as a potential problem solving approach to include when facing engineering design problems.
2. Students will value using computational approaches to contribute to solutions for challenges in human health.
3. Students will have increased interest in taking an introductory computer science class that includes programming.
4. Students will have increased confidence in their ability to succeed in an introductory computer science class that includes programming.

**Day 3 Tuesday, November 18, 2014**

**Day 4 Thursday, November 20, 2014**

### ***Specific performance goals*** (continued from Day 1 and 2)

9. Students will be able to appropriately comment the programs that they write.
10. Students will be able to start to “debug” a computer program that they write.
11. Students will be able to work with a partner to write and debug a computer program.
12. Students will be able to use computer programming documentation and the internet to find information about writing a piece of a computer program.

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This week in class, you will be working with a partner to design a piece of computer code that relates to addressing a need in human health.

Choose any partner, and any need in human health. The need can be related to your final project, or it can be completely different. In class the next two days, you will work with your partner to design, write, and debug a small piece of code that could be incorporated as part of a computational approach to the need that you identify.

On Thursday, we will informally present your work in class, without slides (Note – this is a change from a previous description of the assignment). Specifically, each partner will *briefly* (1-2 minutes) describe their chosen need and approach to the whole class. Both partners are expected to participate in talking about what you are doing. Each set of partners will then match with another set of partners, and the two teams will demonstrate their code to each other, explaining how they designed the code, and how it works.

## **Delivered product**

By Tuesday, November 25, by 10 PM, submit the following, as partners. It is quite possible that you will be able to submit this assignment by the end of class on Thursday, Nov 20.

Grading: This assignment is being graded on a pass/resubmit scale. You will have the opportunity to incorporate feedback and resubmit the assignment so that I can fully understand the need and your approach, and so I can follow the code section you submit. I expect most partners will submit a description and code that meets these expectations on the first submission, and want to provide everyone the opportunity to reach pass criteria through the resubmission approach.

### **1. One paragraph describing the need in human health, and an overview of the your approach that includes computer science as a problem solving tool.**

We are using computer science as an available option in our space of design solutions. Frame the need that you are addressing, and describe your overall approach using computer science problem solving.

### **2. Submit \*well-commented code\* that you as partners wrote to address a part of the need.**

I (and any one else you are collaborating with or who is incorporating your code into their work in the future) need to be able to understand what your code is doing, and why. Submit your MatLab file (with the .m file extension) with clear comments throughout to help me read and follow your code. Submit documentation that captures that your code is working as you intend – for example, you could copy and save the input and output in the Command Window if your code uses Command Window input and output. Submit any data files that you read in or read out as part of developing, testing, and demonstrating your code. Include any other documentation or files I would need to understand what you are submitting.

## **Example topics**

Please keep your solution within the scope of the intent of this assignment – do not be stressed that you need to do a project that could take an entire semester. The main goal here is for you to choose a human health need, and get practice with writing your own code, as part of an overall solution to the need.

You can choose any topic related to human health. A few ideas to seed your thinking:

- Extensions of developing a vaccine database and communication system to increase the coverage of children who receive recommended vaccines.
- Needs in epidemiology, such as tracking the spread of a diseases (flu, HIV, Ebola, neglected tropical diseases, malaria).
- “Contact tracing” – This topic has been in the news lately with the Ebola outbreak, and refers to determining which other people may have been infected by a recently identified patient, based on who that patient came in contact with (and who those people came in contact with, and who those people came in contact with...).

- An “ap” to use on a smart phone for remote health applications.
- An “ap” for a medical care provider to use to help with patient diagnosis.
- Code incorporated into the design of a medical diagnostic, such as interpreting the data or providing a useful output.
- Graphical representation of trends of diseases to help answer and communicate questions such as “What cancer types are increasing or decreasing?” and “What is the prevalence of neurodegenerative disease in different countries?” Clear communication of data such as this can help inform policy decisions and research directions. There are many readily available data sources online if you want to work with published data. Searches such as “cancer statistics” or “Alzheimer’s statistics” can help get you there.

### **Additional computer programming tools that may be useful**

There is a lot that you can do with the programming tools you have already seen. A few additional tools you can learn about if they are useful to your design:

#### Loops:

Loops allow you to repeat a set of code lines many times, such as reading the data at each location in an array. Two common types of loops are “for loops” and “while loops.” This link will get you started learning about these loops:

[http://www.mathworks.com/help/matlab/matlab\\_prog/loop-control-statements.html?refresh=true](http://www.mathworks.com/help/matlab/matlab_prog/loop-control-statements.html?refresh=true)

#### File input and output:

You may also want to access data from a computer file, or write output to a computer file, rather than having all input and output go through the Command Window. You can learn about file input and output in MatLab here:

<http://www.mathworks.com/help/matlab/data-import-and-export.html>