COMPUTER SCIENCE PREREQUISITES BY COMPUTING CLUSTER

The information in this document is provided to help you in your cluster selection. We expect that you are interested in learning (more) about coding and its applications, and we have several clusters that relate to this exciting field. While some clusters expect some prior coding background, others are open to absolute beginners. No matter what your prior experience level is, it is important that you select a cluster where you will be challenged in terms of acquiring new coding skills, while also appropriately building on top of what you already know. We hope that you will find all the cluster topics below interesting (we believe they are), and would encourage you to select a topic that you are not only curious about but also fits with your goals in terms of coding skills.

It is important for your success and the success of your classmates that you apply to clusters suited to your background. If you haven't programmed before, don't apply to clusters that require programming experience. Likewise, if you have extensive experience programming, don't apply to clusters that are geared toward students without a programming background.

C1

Computers in Everyday Life

Prerequisite Courses (or equivalent)
Algebra II or Integrated Math II

Expected Incoming Understanding of Computing
No prior programming experience or at most a few lessons on programming in class

Cluster Timeline
Students will be formally taught basic programming for the first 2 weeks and then transition into programming in new environments.

C7

R4US - Robots for Undersea Science

Prerequisite Courses (or equivalent)
Algebra II or Integrated Math II
Programming experience highly desirable

Expected Incoming Understanding of Computing
Highly desirable - basic programming experience in Python or C/C++

Cluster Timeline
Students will use CBT/e-book for introduction to embedded Linux and Python. Students will get lectures and hands-on labs on Embedded Linux and Python during the first two weeks.

C10

Robot Inventors

Prerequisite Courses (or equivalent)
Algebra II or Integrated Math II
Programming experience is expected

Expected Incoming Understanding of Computing
It is required that students have a basic background in programming (any language, such as Java, C, Python, C++, JavaScript, etc ...).

Cluster Timeline
The cluster will start with a 1.5h introduction to Python, which discusses how constructs like loops, conditionals and functions are written. No prior knowledge of Python is expected, but familiarity with these concepts from other programming languages is essential. Example code will be provided, with some more advanced language constructs, to serve as a basis for the projects.

C11

Introduction to Autonomous Vehicles

Prerequisite Courses (or equivalent)
Algebra II or Integrated Math II
Programming experience highly desirable

Expected Incoming Understanding of Computing
Highly desirable - basic programming experience in Python or C/C++

Cluster Timeline
Students will use CBT/e-book for introduction to embedded Linux and Python. Students will get lectures and hands-on labs on Embedded Linux and Python during the first two weeks.

C12

Machine Learning: Can we Teach a Computer to Think?

Prerequisite Courses (or equivalent)
Algebra II or Integrated Math II. At most one computing course (e.g., AP CS Principles) or equivalent

Expected Incoming Understanding of Computing
No prior programming experience or at most one course in computing (or equivalent)

Cluster Timeline
The first two days of the program are dedicated to the basics of programming and the Python programming language. This will introduce foundational concepts such as assignments, variables, operations, functions, parameters, return statements, loops and conditionals. Having already a basic understanding of some of these concepts, e.g., from experience with Scratch or AppInventor, is helpful as the pace is reasonably fast. Additional concepts, such as slicing, and Python modules will be introduced throughout the remaining weeks.

C13

Game Programming

Prerequisite Courses (or equivalent)
Algebra II or Integrated Math II. AP CS Principles or equivalent

Expected Incoming Understanding of Computing
Basic Programming experience in any language (e.g., Python, Java, C, or C++). This should include understanding variables, conditionals (if/else), loops (for/while), and functions

Cluster Timeline
Students should enter the cluster with basic programming experience. We will begin with teaching C# and Unity assuming students are already familiar with loops, conditionals, and functions in some language. Early lectures will focus on differences in programming in Unity/C# and higher level game design.