

Python Computing: Building a Sensor System


CSCI 250

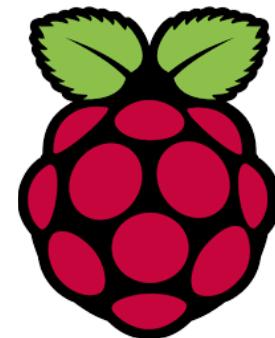
Lecture 1: Introduction, Logistics, Classroom
Norms, Equipment and Software Overview



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EARTH • ENERGY • ENVIRONMENT

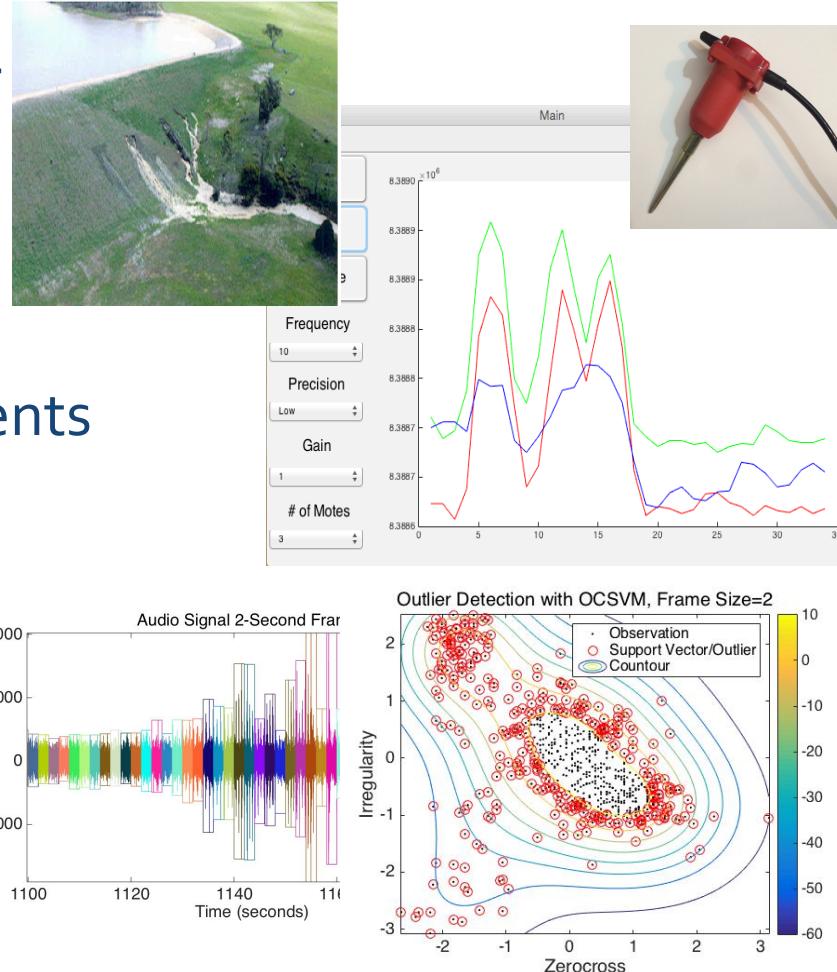
Today's Plan

- + Introduction
- + Logistics
- + Classroom Norms
- + Equipment
- + Software
 - + Raspbian OS / Linux
 - + Python
 - + IDE



Introduction

- + Wendy D. Fisher - Computer Science Alum!!
- + Applied Machine Learning
- + Detection of Anomalous Events in Earth Dams and Levee Passive Seismic Data
- + Wireless GeoPhone Data Collection (Arduino)
- + LGS and Industry



Learning Outcomes

- + By the end of this course, students will be able to:
 - + Create, navigate, and manage files and directory structures using basic Linux shell commands.
 - + **Describe the functionality and purpose of the individual components of the Raspberry Pi Hardware.**
 - + Install the Raspbian operating system onto the Raspberry Pi Hardware and setup basic configuration parameters.
 - + Download, install, and develop programs using an Integrated Development Environment (IDE) on the Raspberry Pi Hardware.
 - + Develop and run basic Python functions and programs in the Linux environment to collect data from sensors using the Raspberry Pi Hardware (e.g., optical, acoustic, acceleration, magnetic field).
 - + Plot and analyze data from the sensor system and compare to mathematical models.

Logistics

- + Syllabus
- + Communicate with me!!
 - + Office hours (W 1:00-4:00 Brown BB280D), email, etc.
- + Websites – class and reference
 - + <https://elearning.mines.edu> (update profile, display name, photo)
 - + <https://www.sparkfun.com>
 - + <https://www.raspberrypi.org>
- + Pre-Survey ... Mobile or Computer: kahoot.it

Used to determine where we are as a class and help me adjust my level of instruction as we move forward.

Classroom Norms

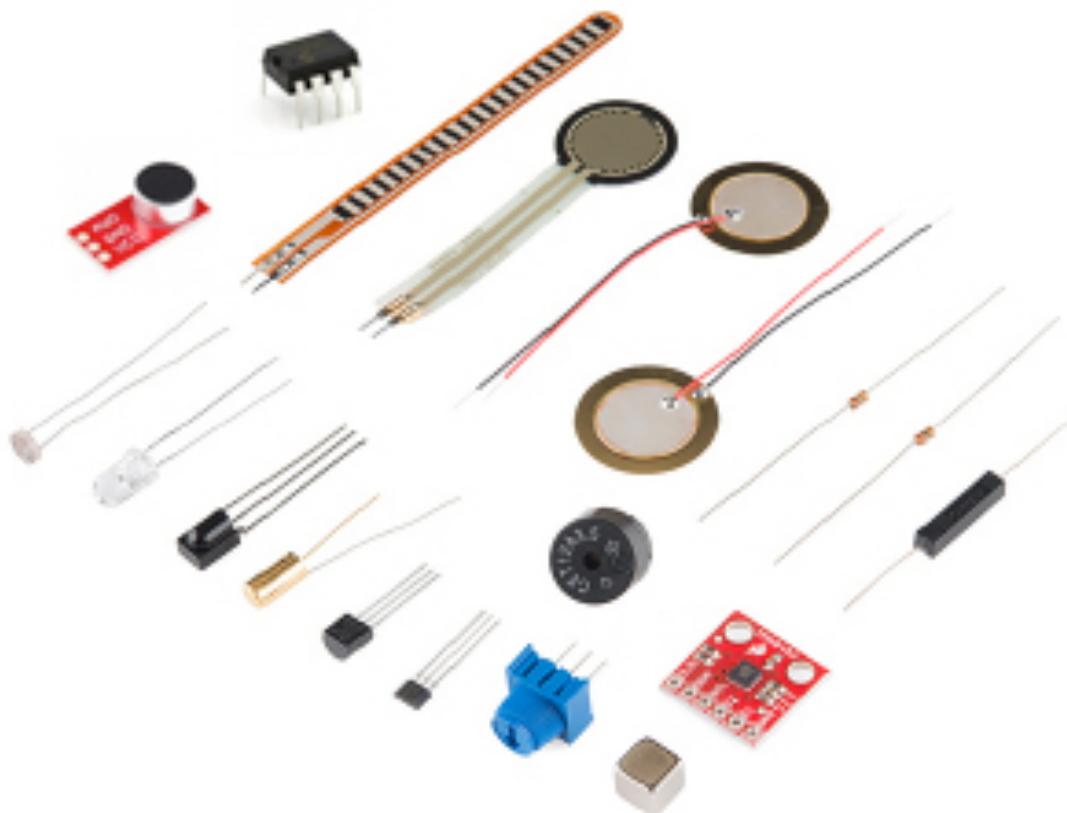
- + Attendance and Participation
- + Pairs/Groups – Individual assessment
- + Come to class prepared
 - + Setup, get busy
 - + Bring questions
 - + Judgment-free learning environment
- + Your additions?

What's in the box?



- Raspberry Pi 3
- SparkFun Pi Wedge (Preassembled)
- Breadboard - Full-Size (Bare)
- Pi Tin for the Raspberry Pi - Black
- 16GB microSD (Preloaded with OS)
- microSD USB Reader
- Red, Blue, Yellow, Green Buttons
- Red, Blue, Yellow, and Green LEDs
- Resistors 330 Ohm 1/6 Watt PTH
- GPIO Ribbon Cable - 40-pin, 6"
- Wall Adapter Power Supply
- Jumper Wires Premium 6" M/F – 10
- Jumper Wires Standard 7" M/M - 30
- HDMI Cable

What's in the box? – on sensor day!



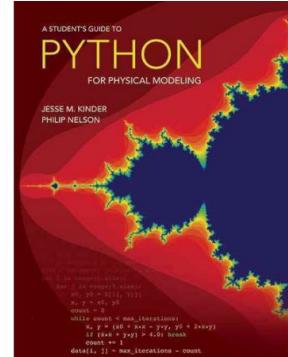
- Triple Axis Accelerometer
- Hall Effect Sensor
- Tilt Sensor
- Piezo Element
- Insulated Reed Switch
- IR Receiver Diode
- Infrared LED
- Temperature Sensor
- Trimpot 10K with Knob
- Magnet Square
- Force Sensitive Resistor
- Mini Photocell
- Flex Sensor
- Piezo Buzzer/Speaker
- Resistor 1.0M Ohm 1/6 Watt PTH
- Microphone
- ADC Chip

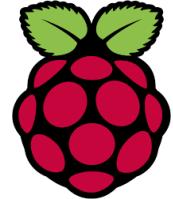
Safety

- + When starting to use sensors ...
 - + Watch input for power, overheating can ruin components
- + Also, note – when dealing with the magnets, keep them clear of the RPi ... computers and magnets don't play well.
- + Careful with the pins
 - + When inserting/pulling off the breadboard, go straight down/up – and removal of ribbon cable (use tools or leave assembled).
- + Static - it is dry, especially this semester
 - + The RPi is pretty protected when it is in its case, at least discharge yourself by touching a grounded object... or you can use a wrist strap

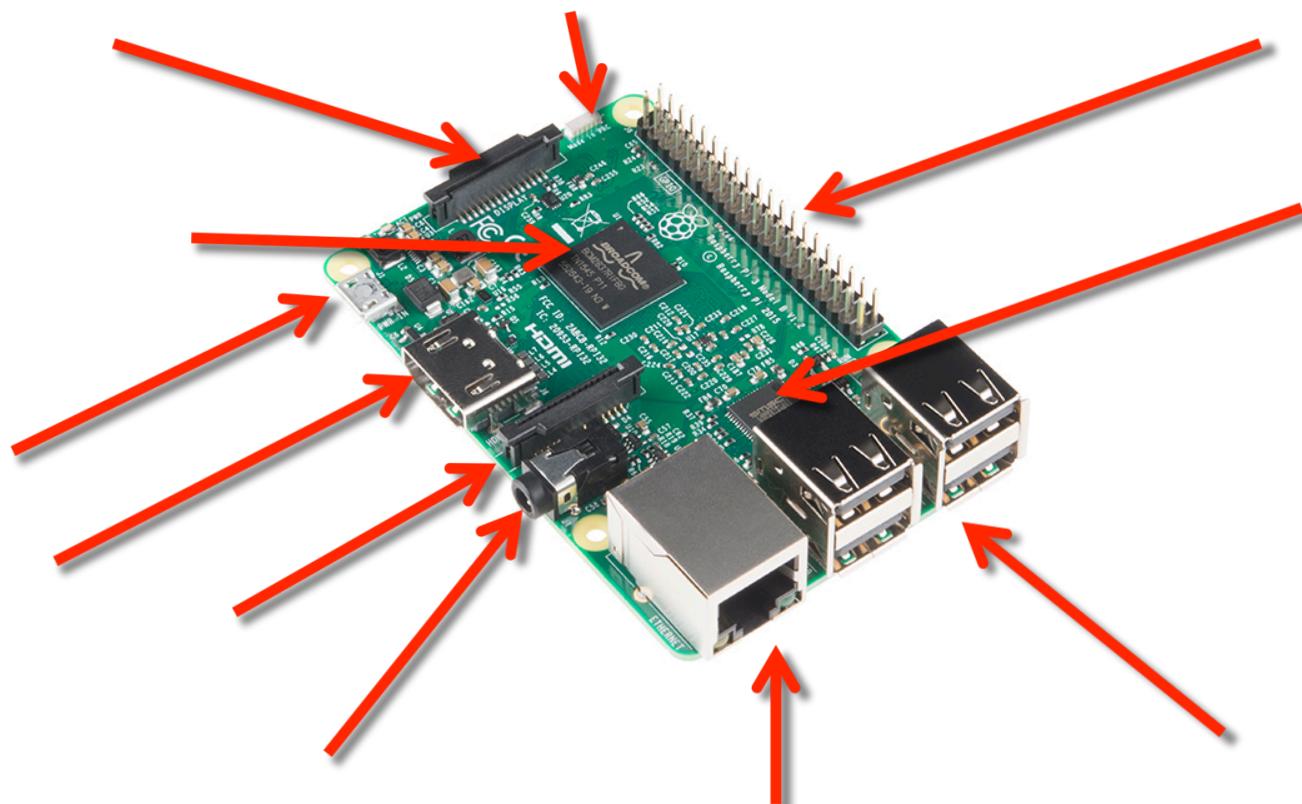
Other Supplies

- + Textbook
- + USB Keyboard and Mouse
 - + Or go headless ...
- + Carrying equipment around
 - + Make sure you don't put the open electronics in the bottom of your backpack – various choices ... a 11" x 14" x 3" plastic container with lid works well with our parts
- + Optional tools for class
 - + May need a pair of needle nose pliers OR small screwdriver for removing the GPIO Ribbon Cable from the RPi





Raspberry Pi 3 Board



Wrap Up

- + Discussion:
 - + Introduction, Logistics, Classroom Norms, Equipment Overview
- + Assignment:
 - + Canvas, read syllabus
 - + Get equipment (\$135 cash or check)
 - Details coming soon ... either my office or
 - Darren McSweeney, Brown BB317
 - Days and Times
- + Next class
 - + Setting up and configuring the Rpi



Names ... so many names!

- + You have to learn one ... maybe two ...
 - + Mine: Wendy
 - + TAs: Caleb and James

- + I get to learn 60... fun :~)
 - + Update profile photo in Canvas OR
 - + Photo time ... email me one with your name on a card/sticky
 - + Please write clearly and big!!

