APSC 1001 & CS 1010

Deep dive into Raspberry Pi (sense HAT) with Python

Prof. Kartik Bulusu, MAE Dept.

Playing with the [sense HAT]

Teaching Assistants:
Sara Tenaglio, BME Dept.
Catherine Karpova, BME Dept.
Zachary Stecher, CEE Dept.

Learning Assistants:
Jonathan Terry, CS Dept.
Ethan Frink, MAE Dept.
Jack Umina, CS Dept.
Olivia Legault, CS Dept.
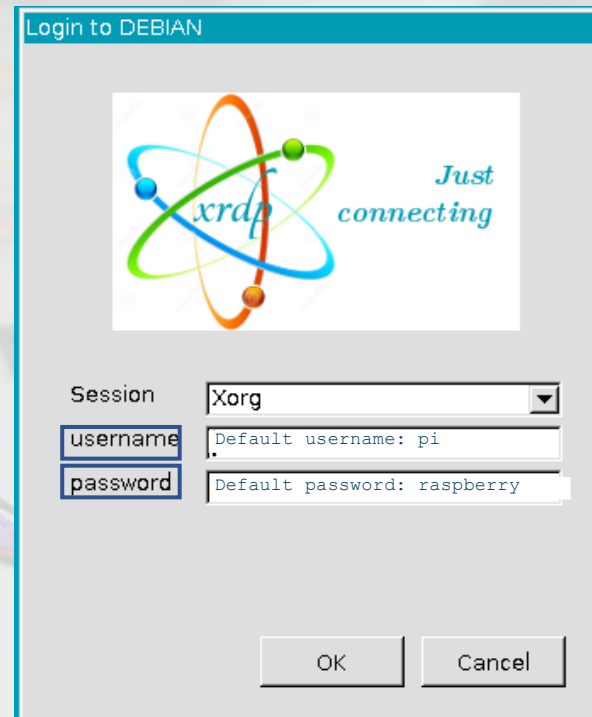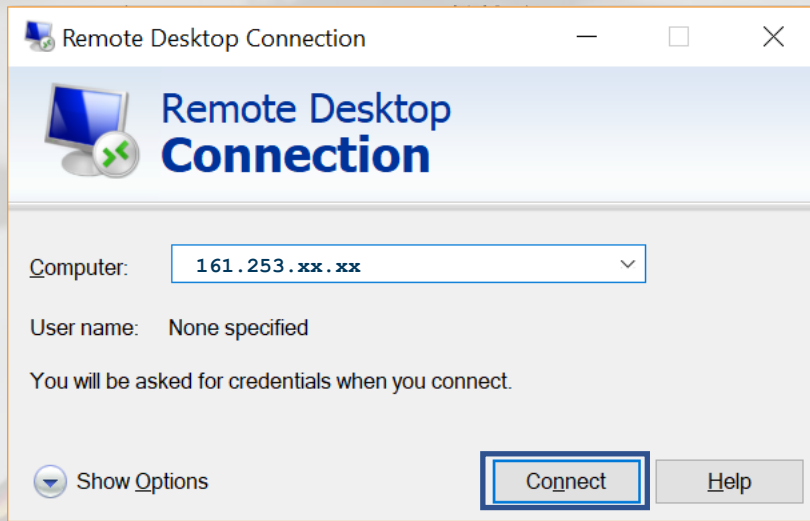Alexis Renderos, MAE Dept.

GW School of Engineering & Applied Science

THE GEORGE WASHINGTON UNIVERSITY

Fall 2021

Photo: Kartik Bulusu

Access to the RPi in the laboratory

Source: https://upload.wikimedia.org/wikipedia/commons/f/f1/XRDP_Screenshot.png

Each RPi is assigned a unique

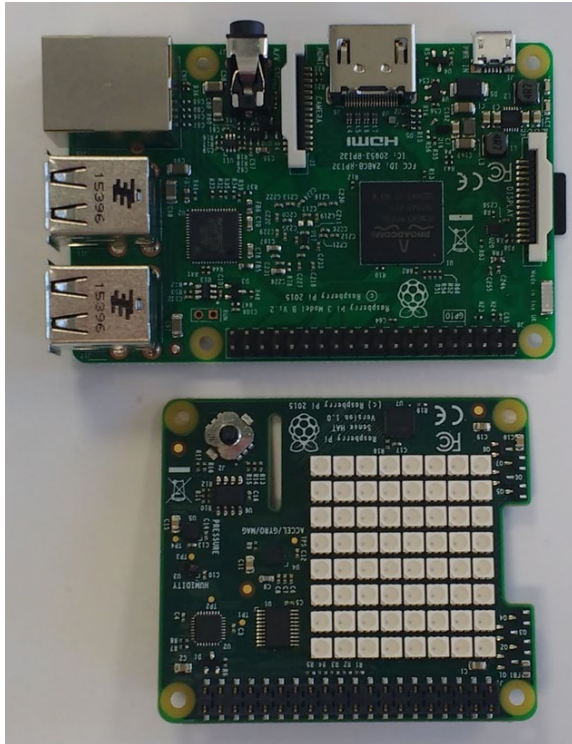- **IP address <161.253.xx.xx>**

- ***username & password***

"Put on the Sense HAT" …

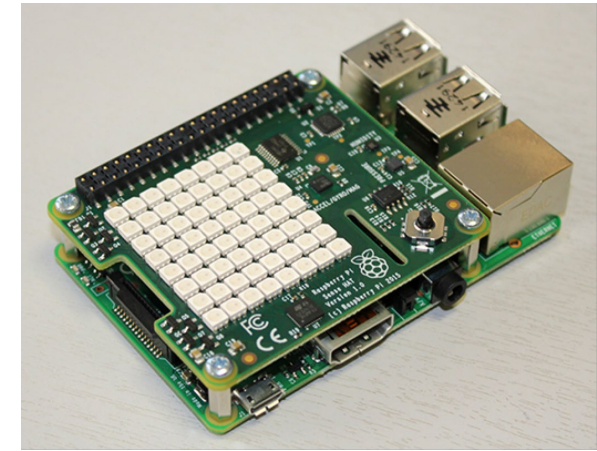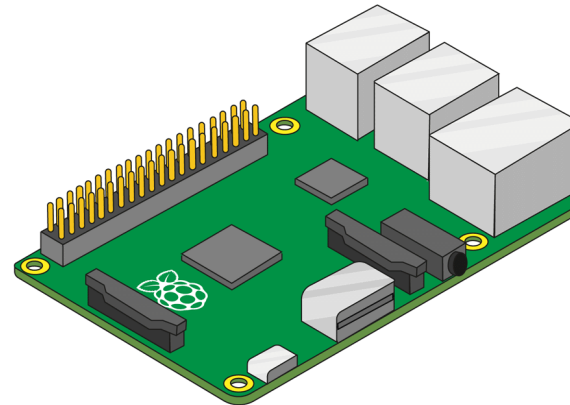Image and animation source: https://projects.raspberrypi.org/en/projects/getting-started-with-the-sense-hat/2

Image source: https://reference.wolfram.com/language/ref/device/SenseHAT.html

Image source https://youtu.be/8NwWNOMqai4

"and take a closer look" …

Prof. Kartik Bulusu, MAE Dept.   **Fall 2021**

APSC 1001   Introduction to Engineering for Undeclared Majors
CS 1010   Computer Science Orientation

School of Engineering
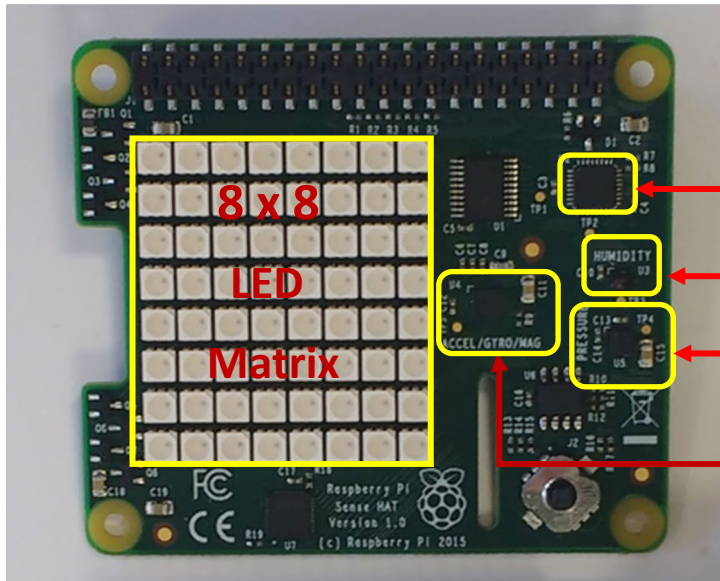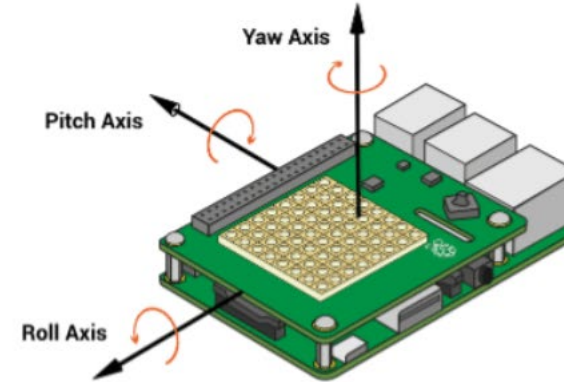& Applied Science
THE GEORGE WASHINGTON UNIVERSITY

GW

Image source: https://projects.raspberrypi.org/en/projects/getting-started-with-the-sense-hat/2

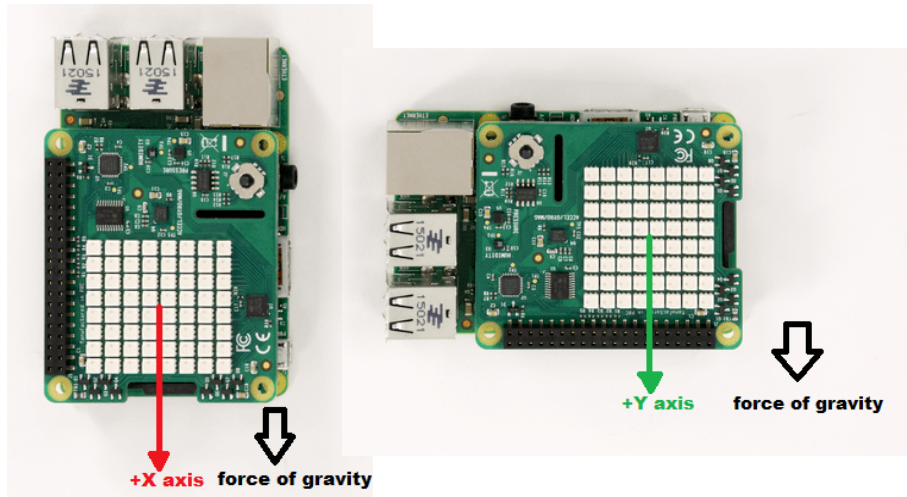- The Sense HAT has a variety of sensors that can be read from:

"Temperature"	reads temperature in degrees Celsius
"Humidity"	reads humidity in % RH
"Pressure"	reads atmospheric pressure in millibars
"Rotation"	reads gyroscopic motion in revolutions per second
"Acceleration"	reads acceleration in terms of standard accelerations due to gravity on Earth's surface
"Orientation"	reads orientation relative to magnetic north in degrees
"Magnetic Field"	reads strength and direction of a magnetic field around the sensor in microteslas

- The gyroscope, accelerometer, and magnetometer sensors return a list of three values that corresponds to $\{roll, pitch, yaw\}$, as oriented according to the following image:

Source: https://www.mathworks.com/help/supportpkg/raspberrypi/examples/auto-rotate-an-image-displayed-on-sense-hat-led-matrix.html

Source: https://reference.wolfram.com/language/ref/device/SenseHAT.html

Starting point for further exploration:
Link for "Getting started with the Sense HAT"

School of Engineering & Applied Science
THE GEORGE WASHINGTON UNIVERSITY

GW

Prof. Kartik Bulusu, MAE Dept.   Fall 2021
APSC 1001   Introduction to Engineering for Undeclared Majors
CS 1010   Computer Science Orientation

Example of who is using the sense HAT and where - Astro Pi

Source: https://youtu.be/kk_7KNuRLrk

What we will do today

- Co-work
    - Observe, ask and try in groups
- Write small program using Python
- Think about
    - Challenges, Opportunities, Gaps and Surprises

What we will learn today

- Communicate with the Sense HAT using Python
- Access the outputs of the Sense HAT
- Use the Sense HAT library to display messages and images
- Use loops to repeat behaviors