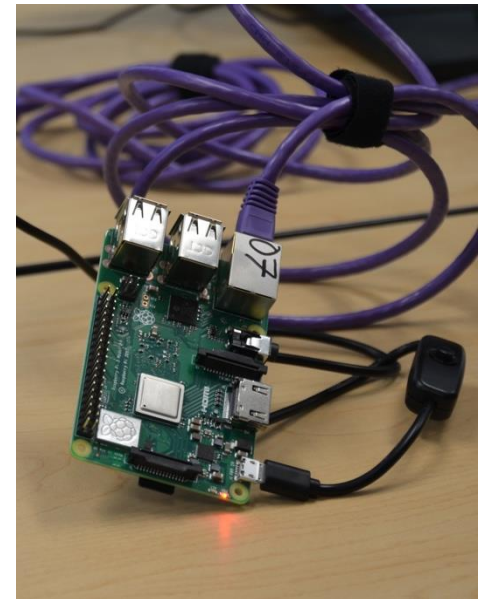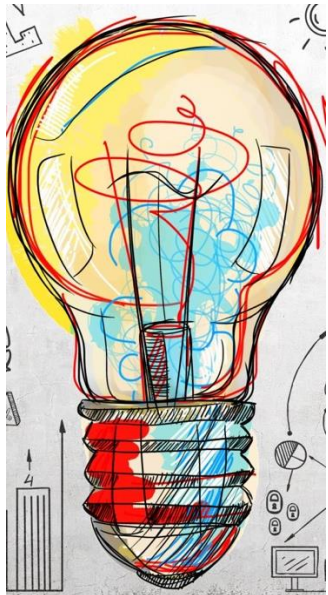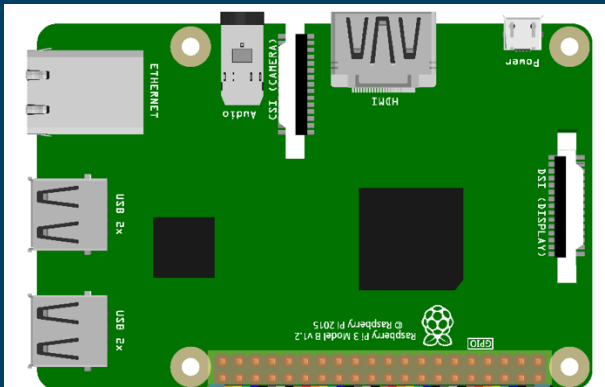# Internet-of-things
for
ages 4 and up

Kartik Bulusu, Associate Research Professor

MAE Department, GWU

I will start with a demo !

This computer will   to

1. Record my voice (in English)
2. Translate it into Spanish and
3. Send an email with relevant text and an mp3-file

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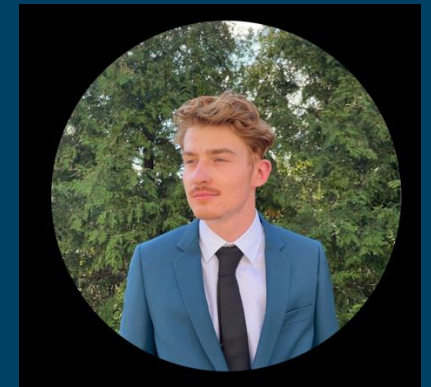
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(my) Background & (non-) Introduction

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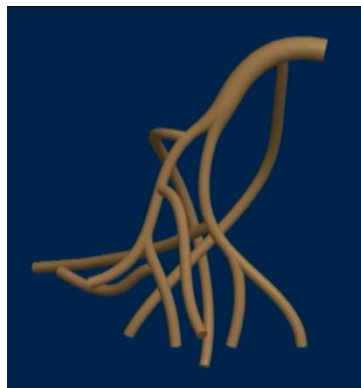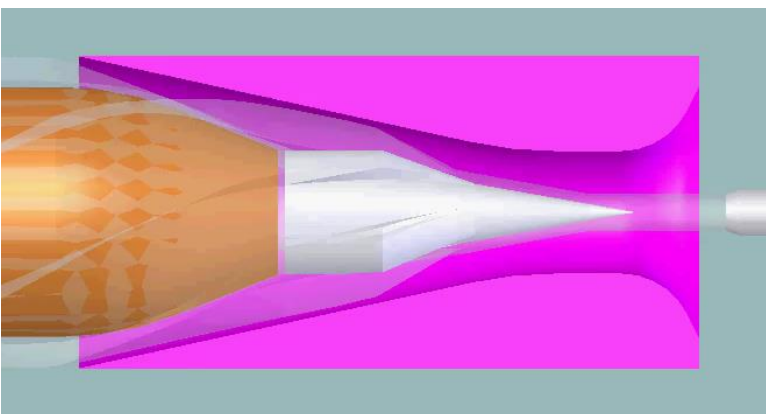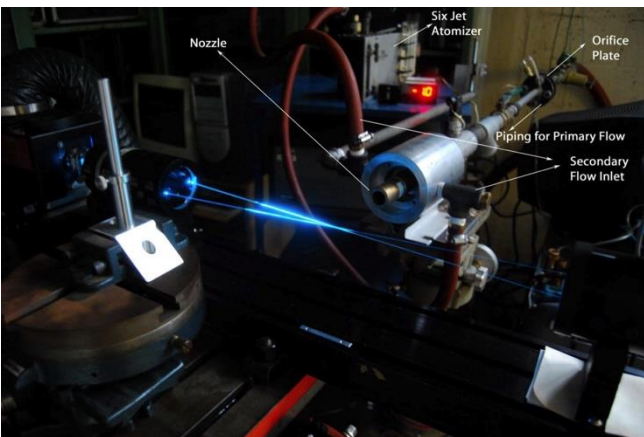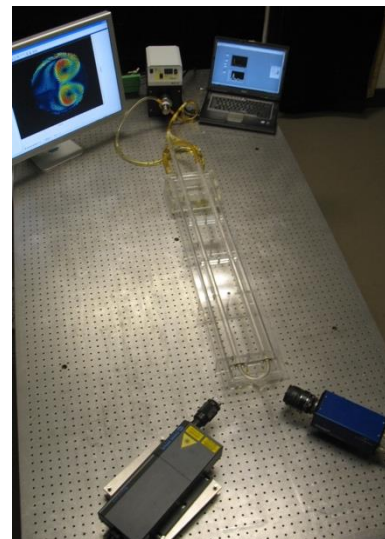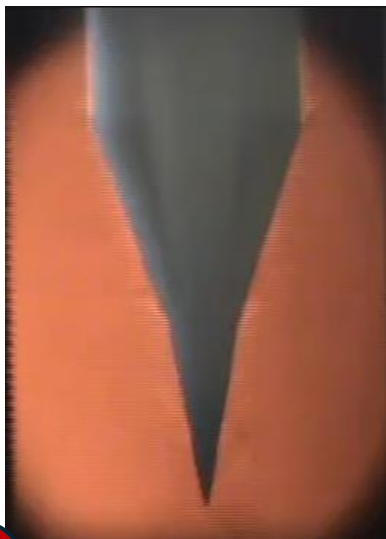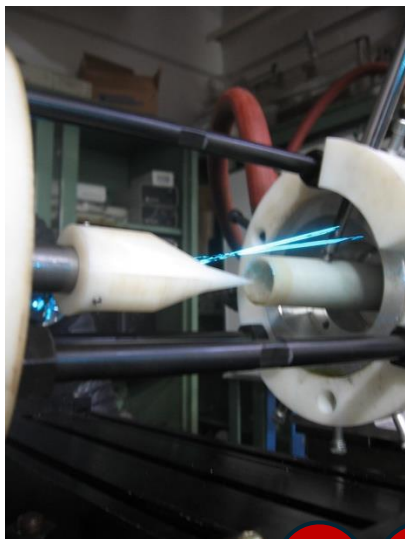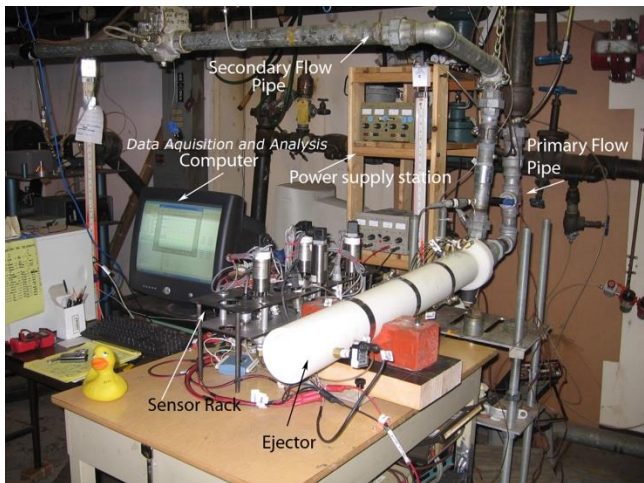
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I really 💗 fluid dynamics ... 'Nuff said !
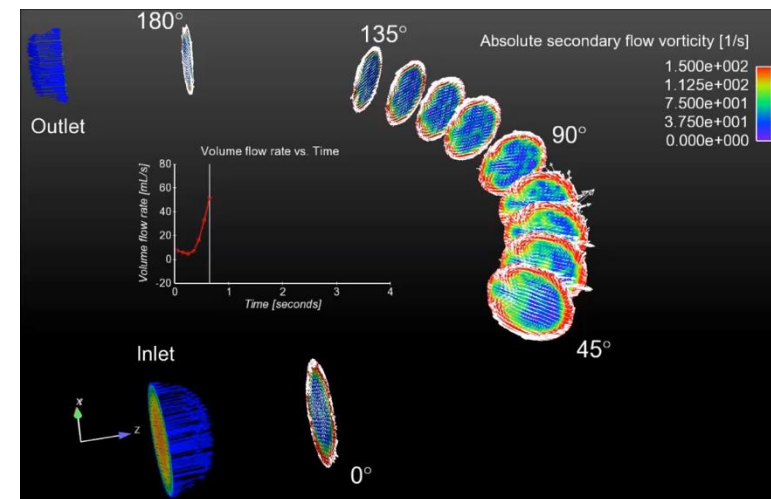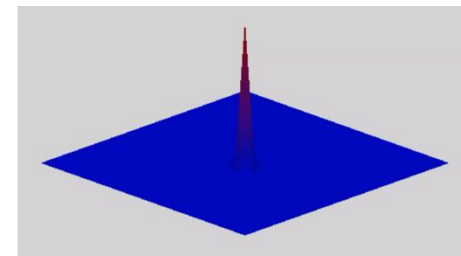
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But …

> *also*
> Research is what I'm doing when I don't know what I'm doing.
> ∧
> *- for a few years now!*
>
> **Wernher von Braun**

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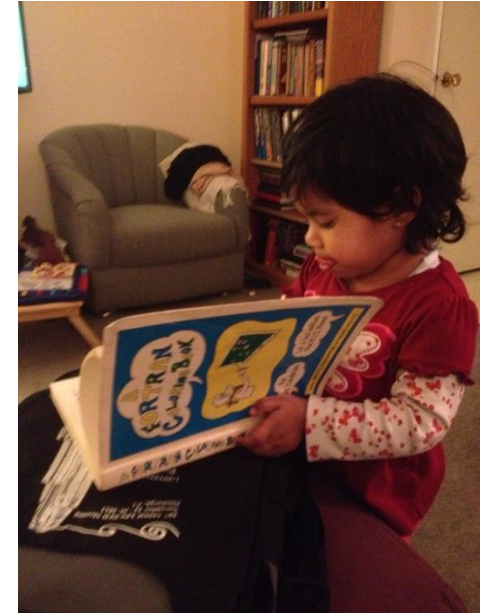
Contents of my talk today ...

Brief history

(with some reference to pizza!)

Defin... "thin...

Brief history

(with some reference to pizza!)

Learn about a small computer

Tribute to Thomas Edison

We'll take a selfie and wrap it up

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Communication hasn't been the same!

"Things" haven't been the same!

Antje Danielson
and Robin Chase
Cambridge
(circa 2000)

Telephone

1st pizzeria in the US
Lombardi's pizza opened
(circa 1905 in NYC)

Mark Zuckerberg *et al.*,
Facebook
January 4,
2004

Pizza
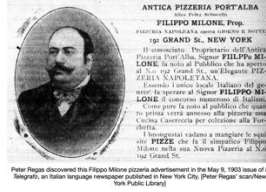
Tim Berners-Lee CERN
www-browser and HTTP
server
August 23, 1991

Zipcar

Apple
First-generation iPhone
January 9, 2007

Internet was through dial up and ethernet
cables
AOL Time Warner (2001–2003)
Amazon had yet to turn a profit
Microsoft was selling office productivity suites

Domino's and IoT:
Reinventing the Pizza Story
(circa March 2017)
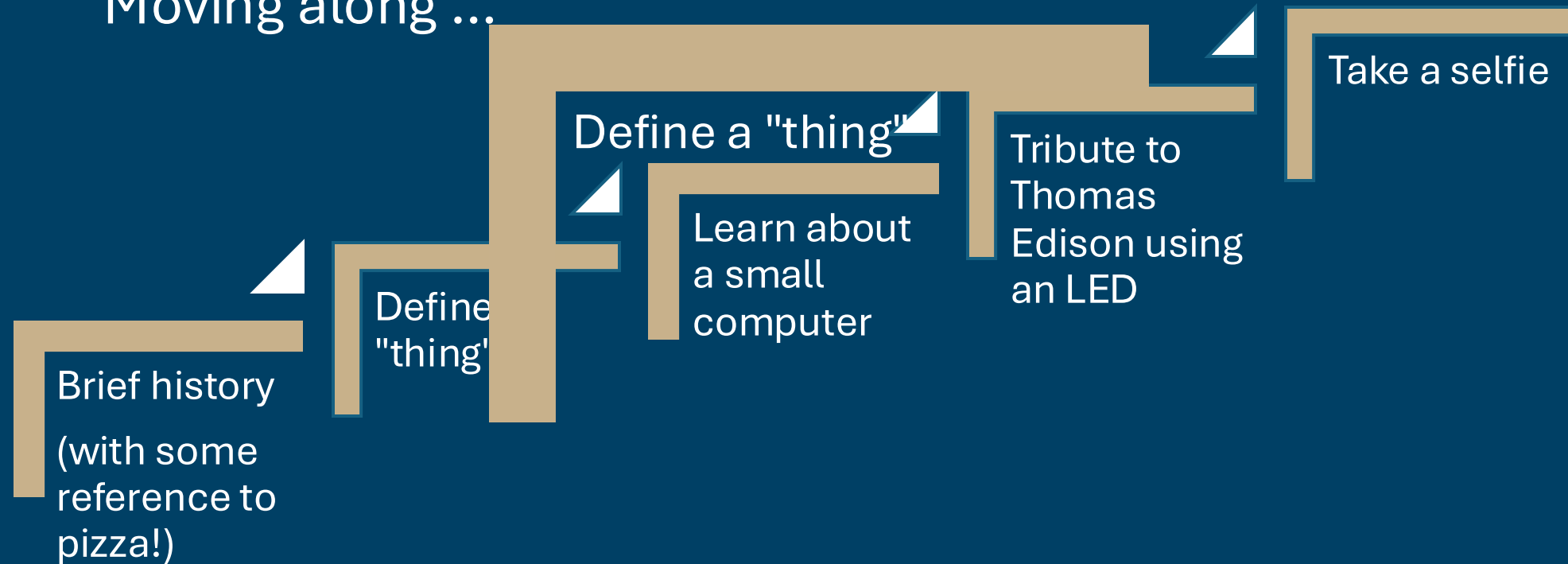
Boston
March 10, 1876

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Moving along …

Brief history (with some reference to pizza!)

Define "thing"

Define a "thing"

Learn about a small computer

Tribute to Thomas Edison using an LED

Take a selfie

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What's the "thing"?

Paradigm #1

- A **thing** is self-contained and only operates within the confines of its physical shell.
  - **Thing** carries out only those functions that its designer envisioned when it was fabricated.
- The **thing** contains a powerful computer inside but is completely hidden from the user.
- The **thing** has firmware (not called software).

Paradigm #2

+

Paradigm #3

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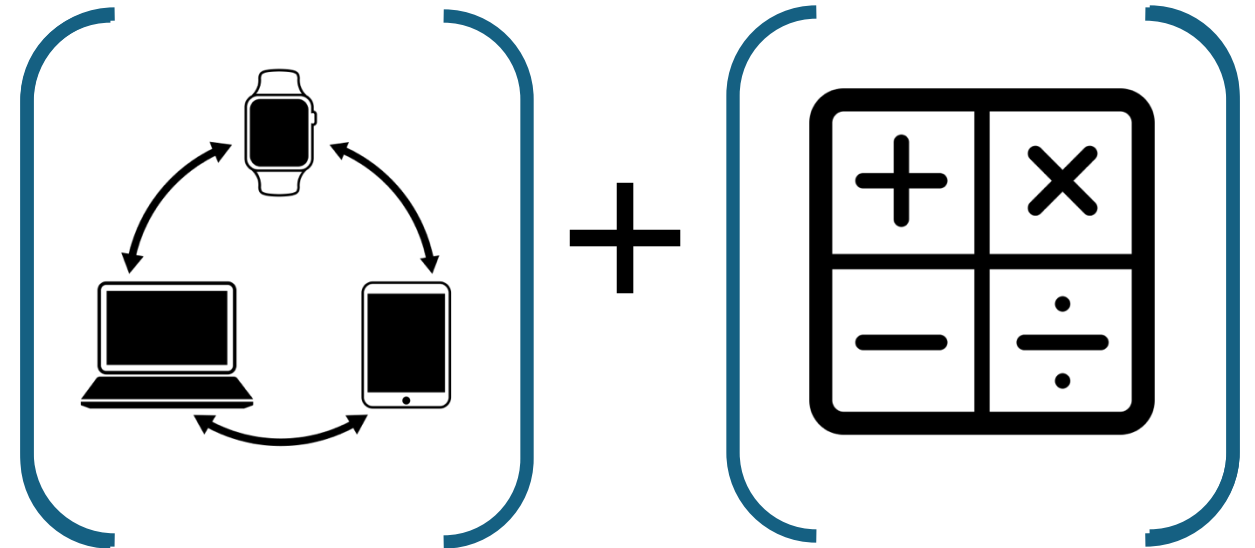
Picking up a little pace …

Brief history

(with some reference to pizza!)

Define "thing"

Let's learn about a small computer that I have really grown fond of

Learn about a small computer

Tribute to Thomas Edison using an LED

Take a selfie

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Introducing the single-board computer

Source: https://www.raspberrypi.org/help/
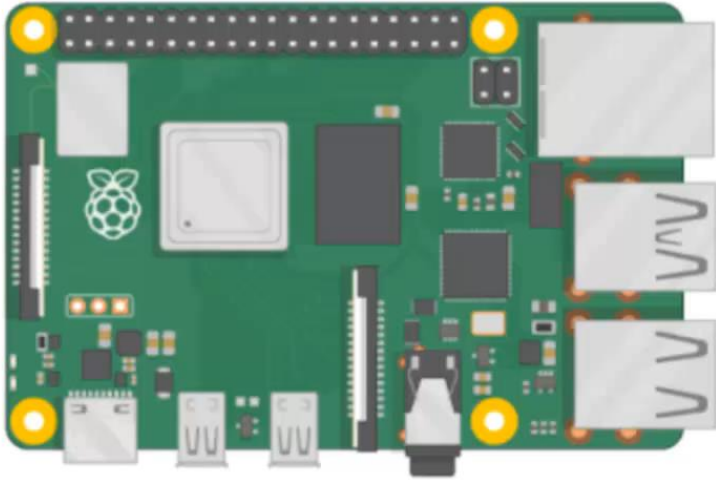
GET STARTED WITH RASPBERRY PI

python == "batteries included" programming language

CPU

1GB, 2GB, 4GB or 8GB RAM (Depending on the model)

40 pin Extended GPIO

LAN Port

USB 3.0 Ports

USB 2.0 Ports

MicroSD Card Slot

DSI Display Port

3.5mm 4-pole Composite Video and Audio Jack

5V/2.5A DC USB-C connector

Micro-HDMI Ports

CSI Camera Port
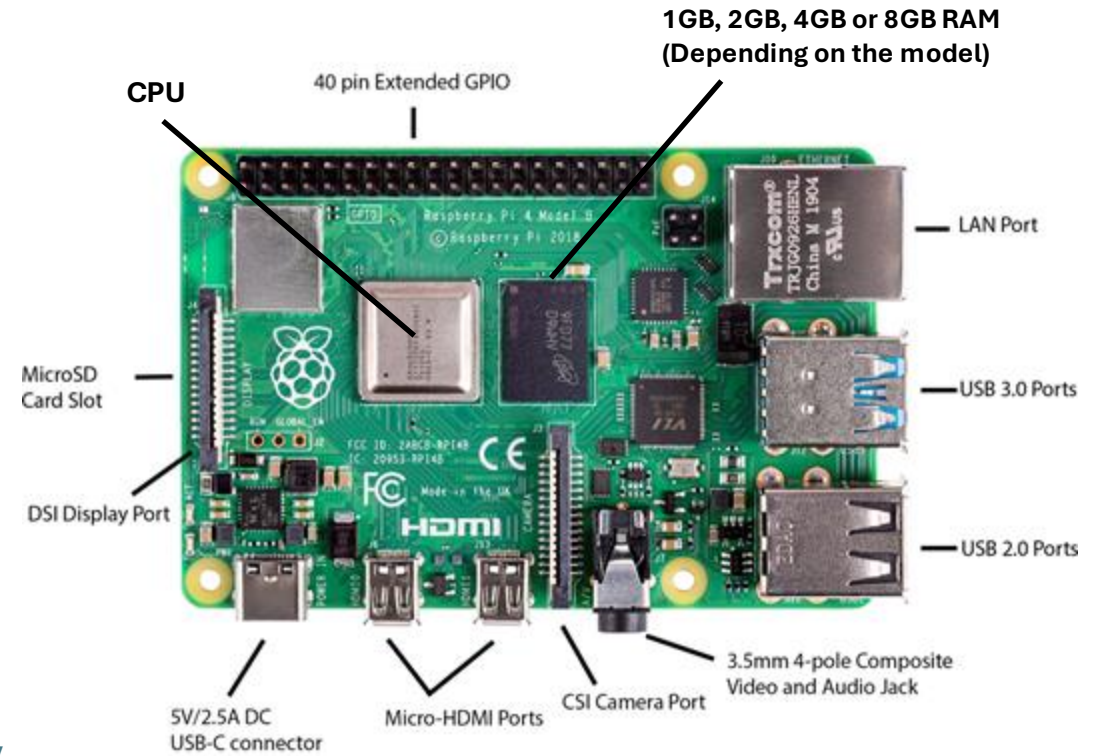
- Raspberry Pi OS (previously called Raspbian) is the recommended operating system for normal use.

- Raspberry Pi OS is a free operating system based on Debian, optimised for the Raspberry Pi hardware.

- The OS comes with over 35,000 packages: pre-compiled software bundled in a format for easy installation.

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Demo madness ...

Take a selfie

Demo: Tribute to Thomas Edison

Tribute to Thomas Edison using an LED

Learn about a small computer

Define "thing"

Brief history

(with some reference to pizza!)

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Scenario

I write some code on a computer and run it

Communicate with a physical entity to do something

Observe response from that entity

What-if-scenario

I write some code on a computer

I realize people may not really care about it. But want to use it anyway.

And curiously observe the response from that entity

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dweet.io

Created by Candy Design
from Noun Project

Thing

Client

Client

Broker

dweet to control LED

Dual-Color LED

R
G
GND

R1
R2

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LED ON

LED OFF

LED Blink

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Do we have time to take a selfie?

Take a selfie

Let's take a selfie to wrap it up!

Tribute to Thomas Edison using an LED

Learn about a small computer

Define "thing"

Brief history
(with some reference to pizza!)

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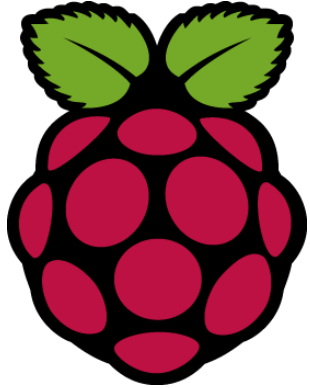
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Broad specs of the Pi NoIR Camera
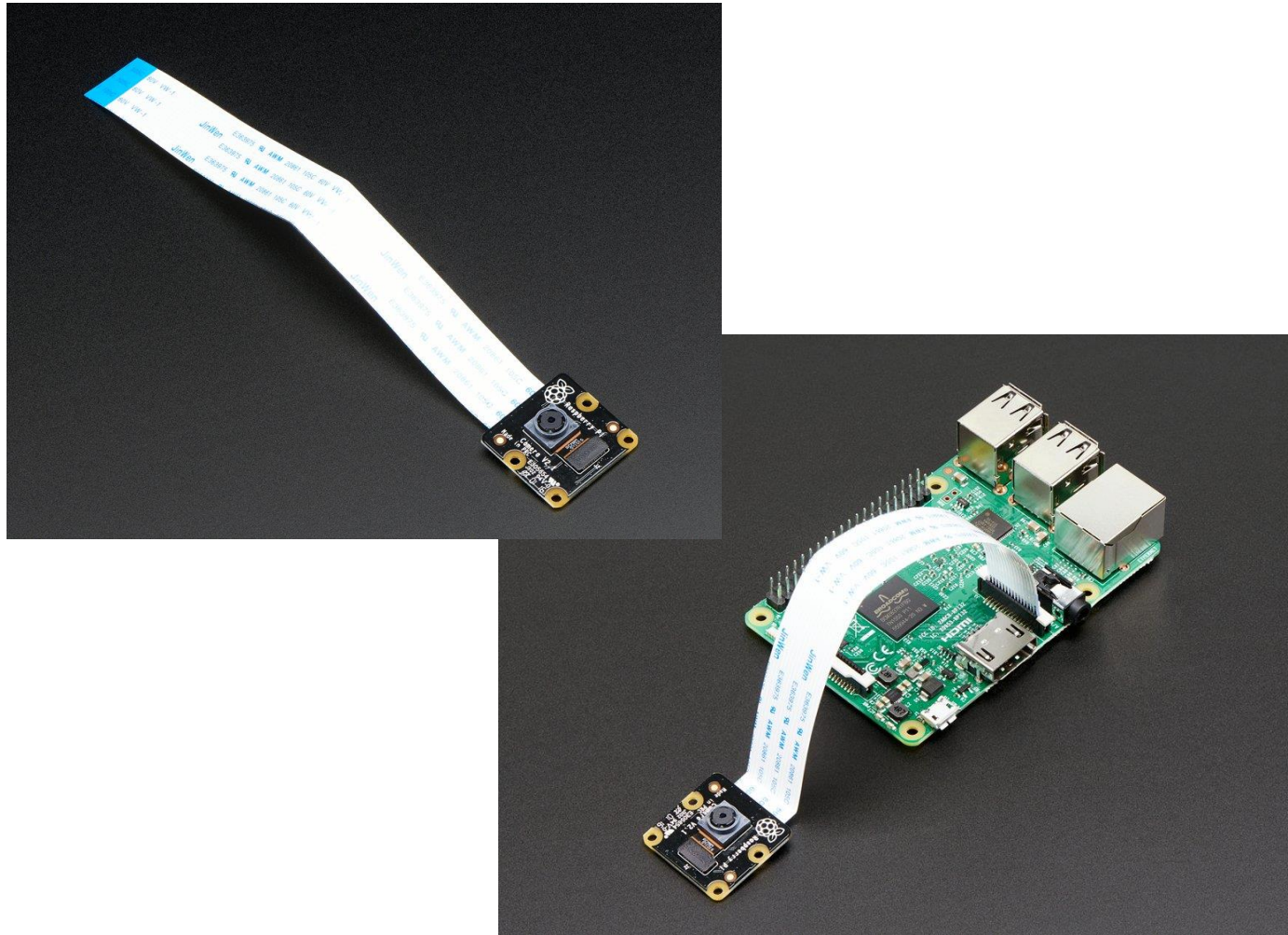
- 8 megapixel native resolution high quality Sony IMX219 image sensor

- 3280 x 2464 pixel static images

- Capture video at
  - 1920 x 1080 p30
  - 1280 x 720 p60
  - 640 x 480 p90 resolutions

- No Infrared (NoIR) filter
  - Infrared photographs or photographing objects in low light (twilight) conditions
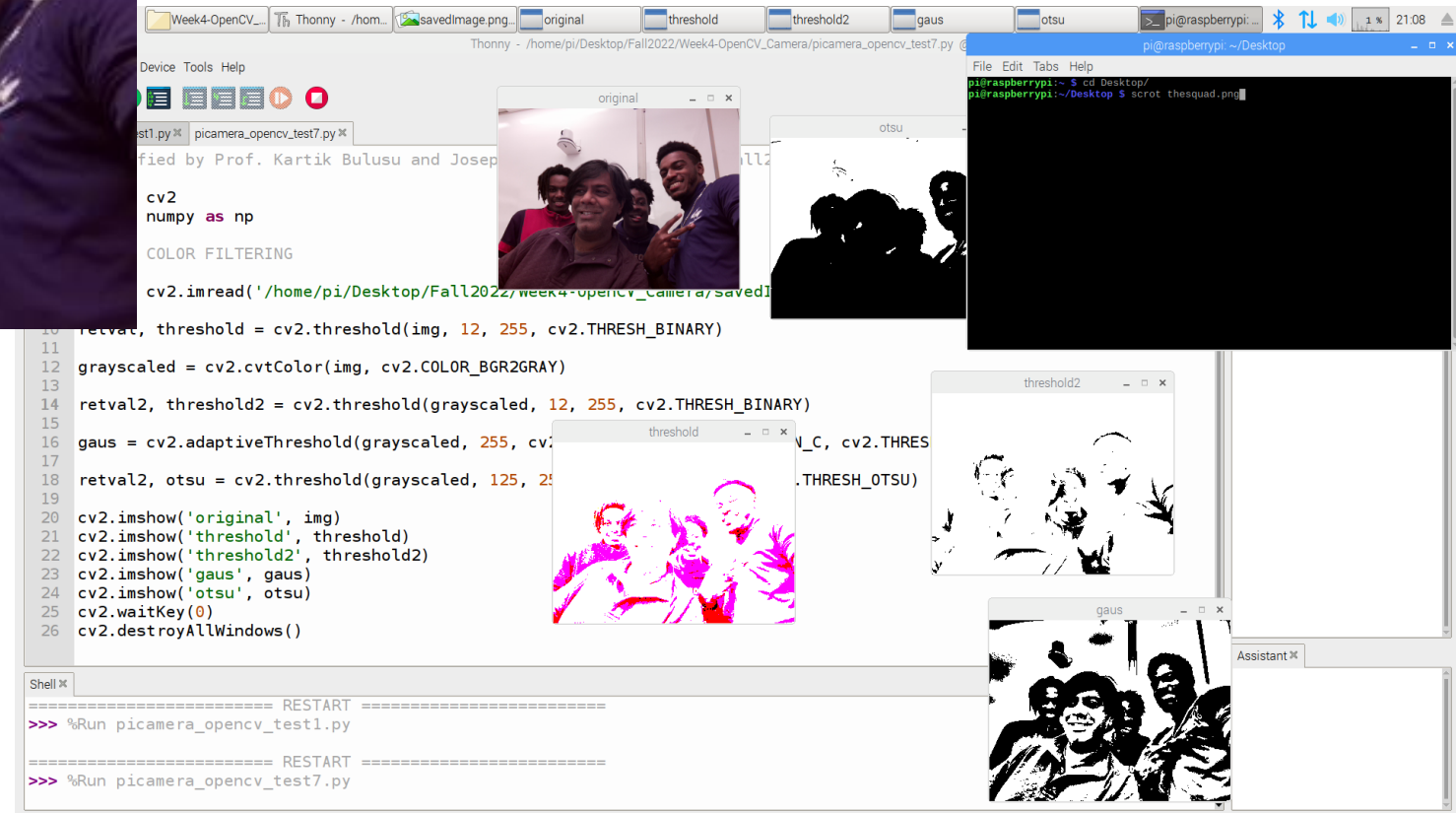
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Raspberry Pi hardware and Camera hardware interactions
Low-level image acquisition and processing

Computer vision on the Raspberry Pi

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The Evolution of Things

IoT

Internet of Things
- Devices connected to internet
- Breaking the boundaries of form

IoT

Intelligence of Things
- Devices that host software applications
- Breaking the boundaries of function

IoT

Innovation of Things
- Devices that become experiences

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