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# Education 4.0: Making the Internet of Things Relevant with Arduino

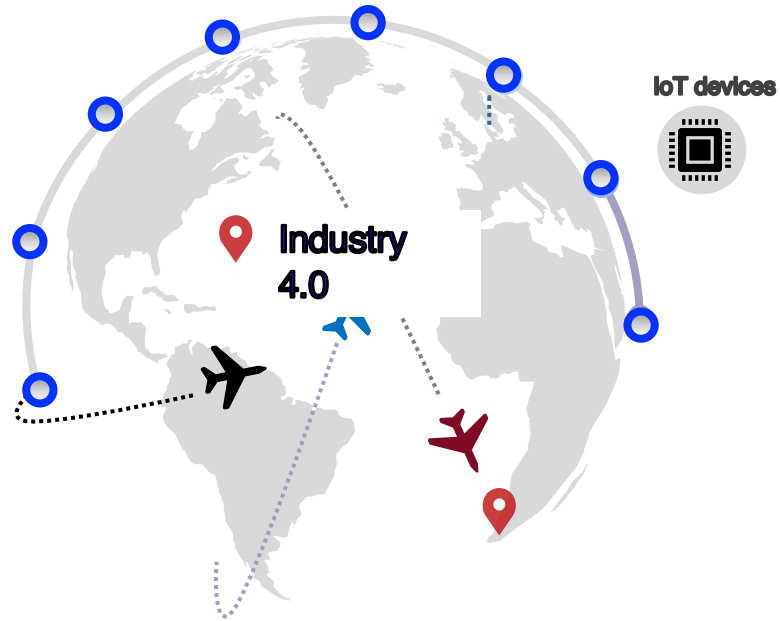
Sean Kruger

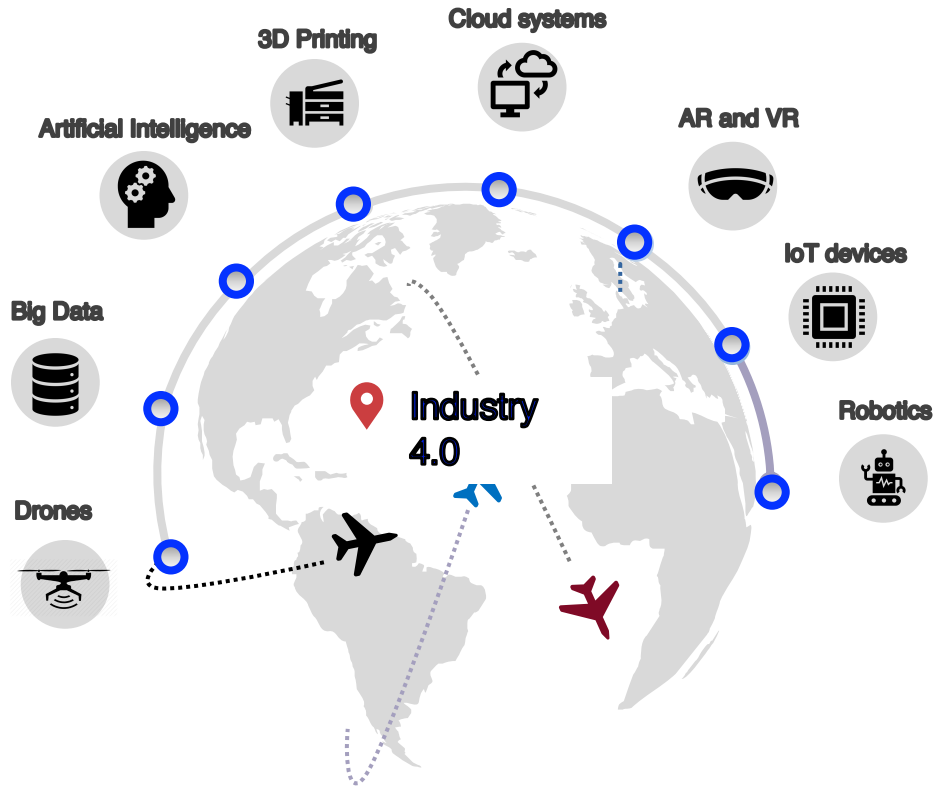


March 2019

# Overview

- 4IR and IoT
- Interlinkages and importance of innovation and education 4.0
- Applications in business, research and teaching and learning
- Using IoT technologies Digital Humanities







# The Internet of Things (IoT)

- “there is no common definition or understanding today of what the IoT actually encompasses”. (Flu“chter, 2015:221)
- The aim though is interconnectivity between devices to gather data or provide pertinent information or feedback
- This has brought challenges and opportunities including:
  - New value creating business models
  - Cybersecurity risks
  - Data storage and protocols
  - Network protocols
  - Hardware
  - Education paradigms



# The Internet of Things (IoT)

**1983:** Ethernet is standardized

**1989:** Tim Berners-Lee creates Hypertext Transfer Protocol (HTTP)

**1992:** TCP/IP allows PLCs to have connectivity

**2002:** Amazon Web Services launches, and cloud computing starts to take hold

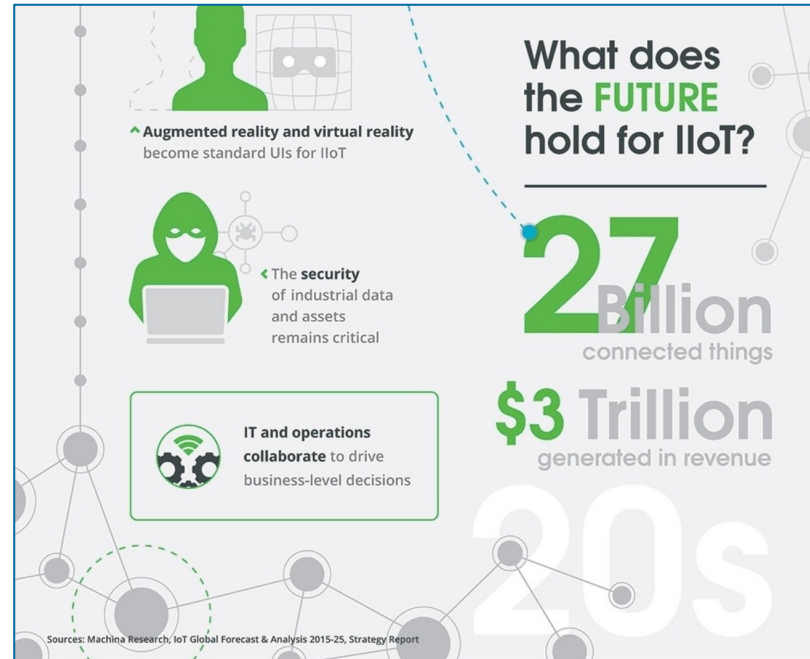
**2006:** OPC Unified Architecture (UA) enables secure communications between devices, data sources, and applications.

**2006:** Devices start getting smaller, and batteries and solar energy are becoming powerful and more economical.

**2010:** Sensors drop in price, enabling them to be put into pretty much everything



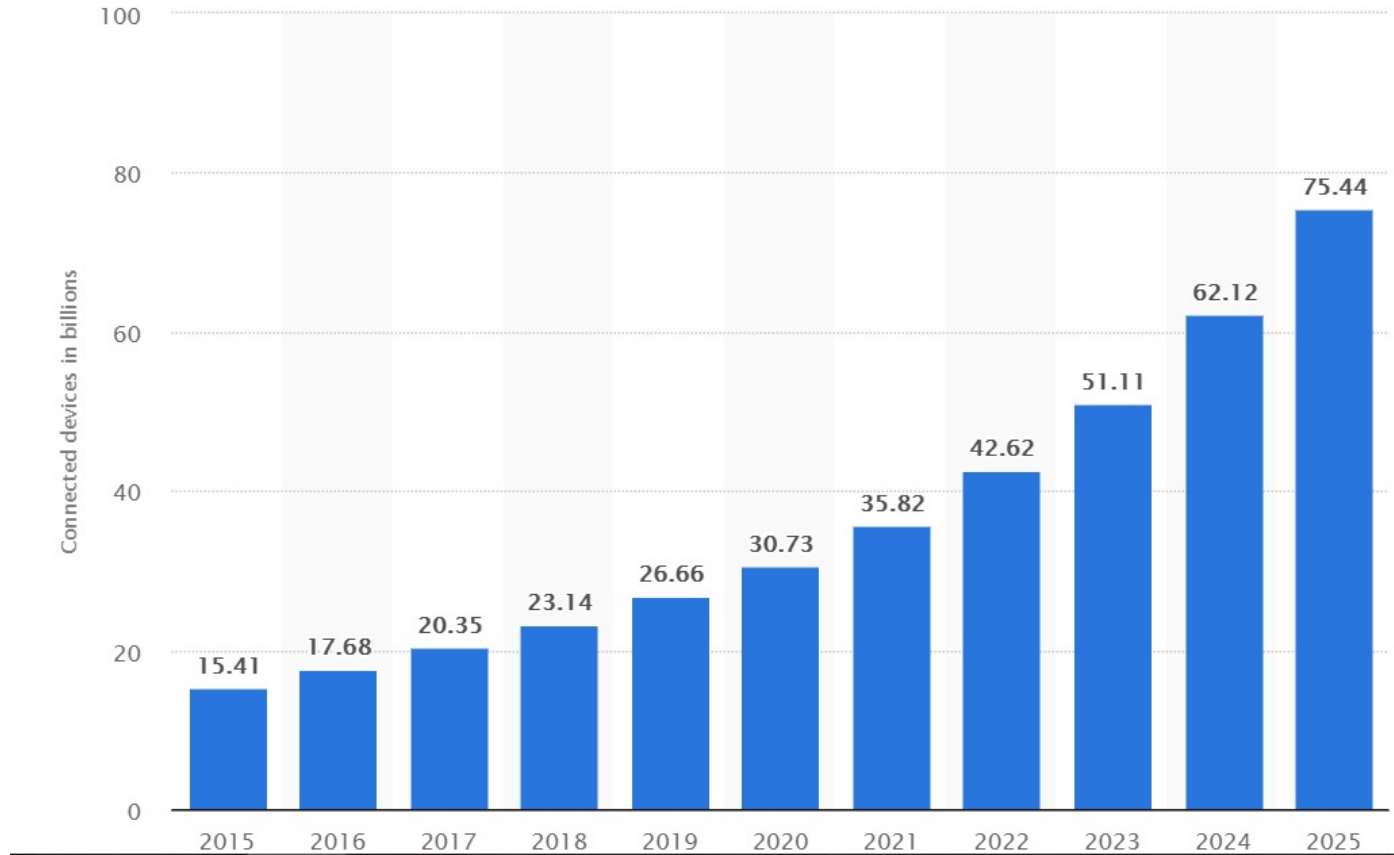
# The Internet of Things (IoT)

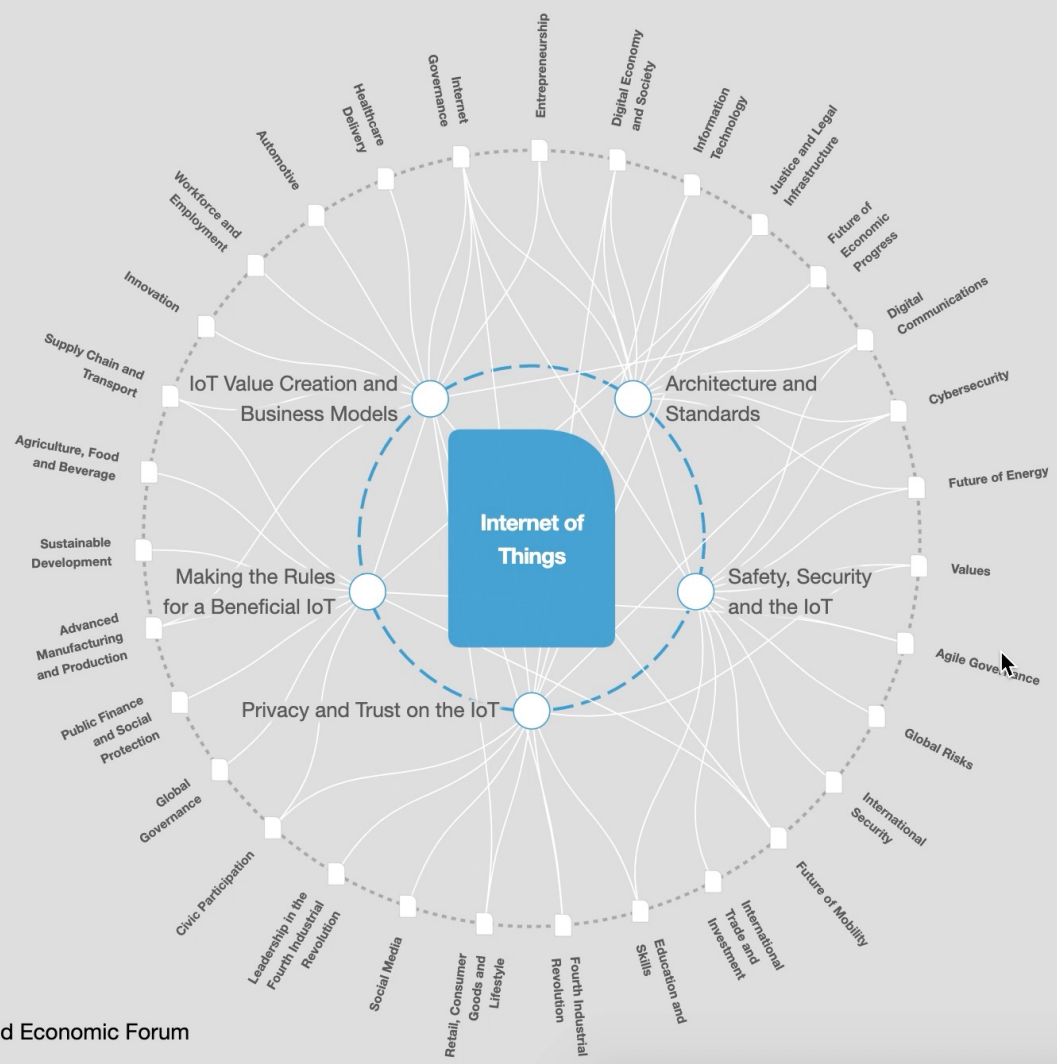


<https://www.weforum.org/agenda/2018/01/how-the-internet-of-things-has-evolved-over-the-last-50-years>



# IoT





### 75% of IoT projects focus on 5 SDGs



World economic Forum: <http://wef.ch/loT4D%0Ahttp://www3.weforum.org/docs/loTGuidelinesforSustainability.pdf>

# IoT value creation in Research

## Smart Life: Wearable devices

- Data always available
- Track human movement patterns
- Safety patterns and areas
- Geo-tracking and optimisation of traffic



# IoT value creation in Business

## Smart Health

- Real-time and accurate data,
- Remote monitoring
- Record management
  
- Reduce human based errors
- Warning signs
- Optimal medical dispensing



# Library Makerspace



- Neutral zone
- Supports cross-disciplinary research
- Expertise and consultation
- Open collaboration environment













# Arduino: Basis for IoT Teachings


- Basic circuitry
- Bring together hardware and software
- Inexpensive
- Cross-platform
- Open source code
- Open source extendable hardware
- Customised solutions




Freud's Mother
All changes saved 










 Code
 Start Simulation
 Export
 Share





Components  
Basic


Search

- 

**Resistor**  
Restricts the flow of electricity in a circuit, reducing the voltage and current as a result.
- 

**LED**  
Light-Emitting Diode that lights up when electricity passes through it in the correct direction.
- 

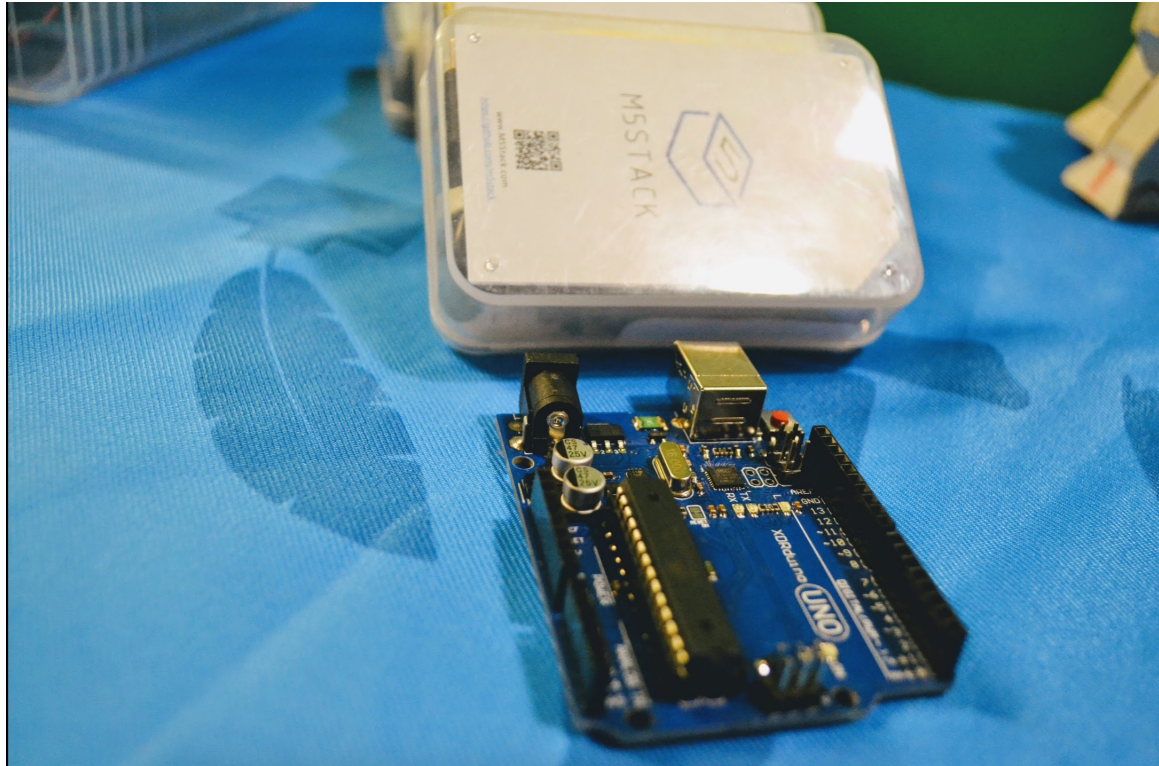
**Pushbutton**  
A switch that closes a circuit while pressed.
- 

**Potentiometer**  
A type of resistor whose resistance changes at the turn of a knob.
- 

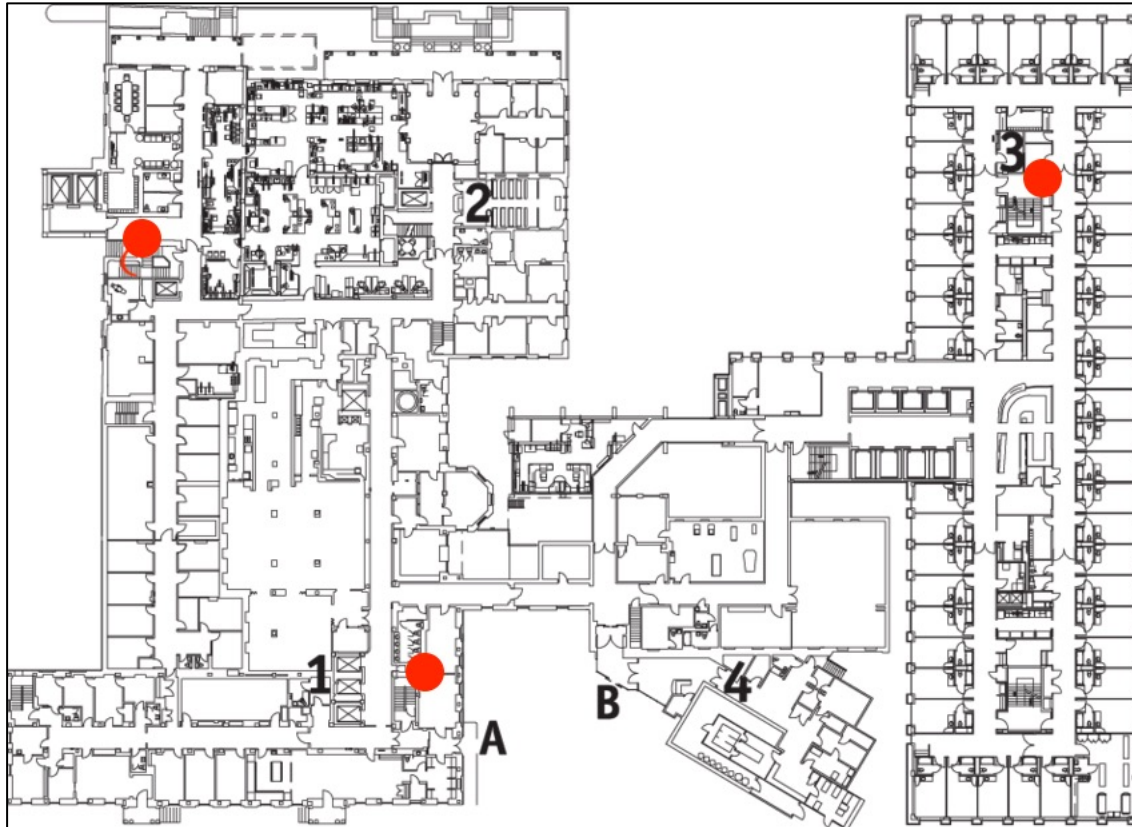
**Capacitor**  
Stores and releases...



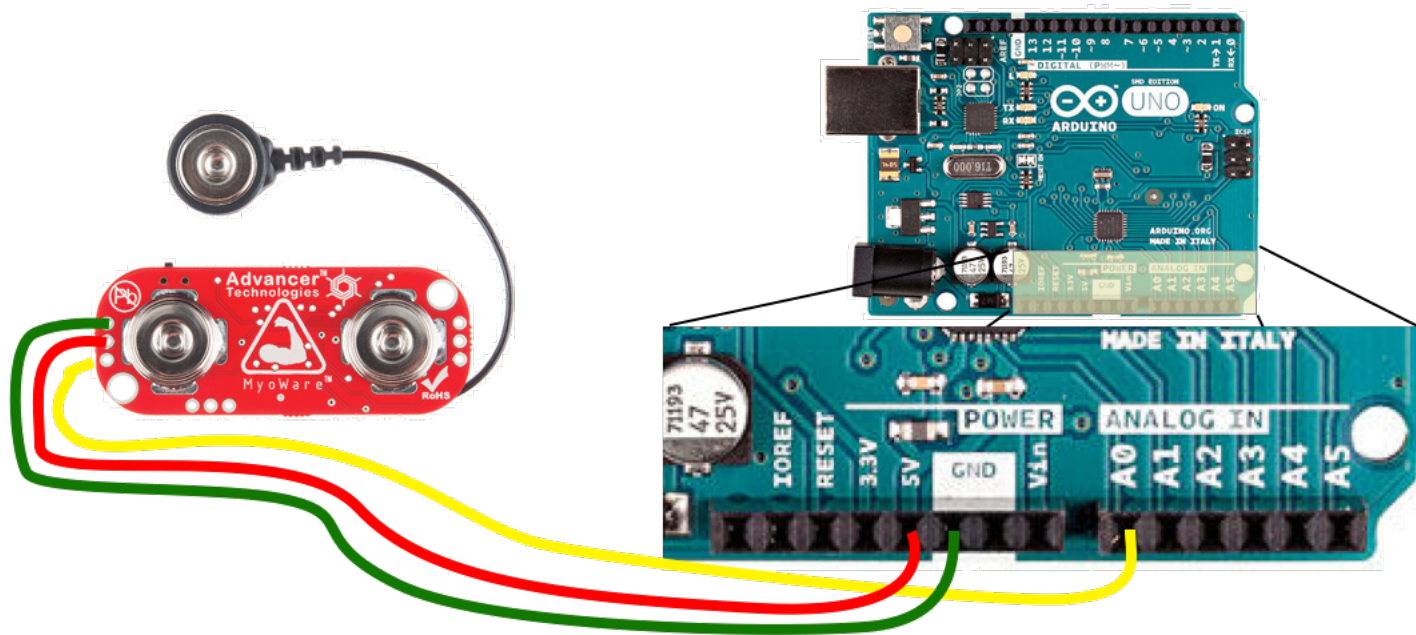
# IoT value creation in Digital Humanities Research



# IoT value creation in Digital Humanities Research



# IoT value creation in Digital Humanities Research



# IoT value creation in Digital Humanities Research

The image shows a Google Cloud Platform API Dashboard for the 'Research MIT' project. The dashboard displays 'Enabled APIs and services' and a 'Traffic' graph for the last 6 hours. The 'Traffic' graph shows a significant spike in requests per second around 20:40 on 9 Oct. Below the graph, a table lists the enabled APIs:

API	Requests	Errors	Latency	Cost	Actions
Cloud Speech API	203	14	6.9%	—	— Disable
Compute Engine API	27	0	0%	388 ms	519 ms Disable
Cloud Functions API	—	—	—	—	—

Overlaid on the dashboard is a terminal window showing the execution of a speech recognition command and its output. The command is:

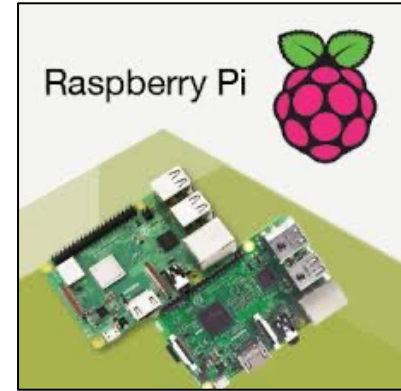
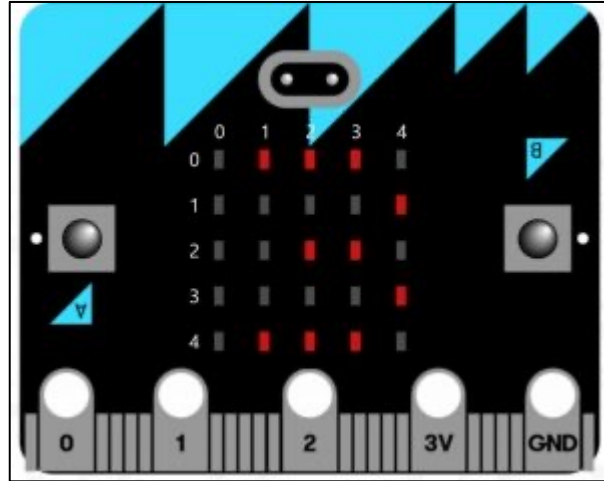
```
gs://staging.research-mit.appspot.com/User3.flac --language-code=en-GB
```

The terminal output shows the following JSON response:

```
{
  "type": "type.googleapis.com/google.cloud.speech.v1.LongRunningRecognizeResponse",
  "results": [
    {
      "alternatives": [
        {
          "confidence": 0.94688606,
          "transcript": "Rihanna and recording so this is for my purposes as described you have
consigned resist everything you understand studies at correct time now is 13:05 27th of the 8t
h is there any questions before I begin fantastic so quick question what is your experience of
the industry going to have to work in and also do you have any qualifications what are you curr
ently studying towards social care plan the pian into the diary practically"
        }
      ]
    },
    {
      "alternatives": [
        {
          "confidence": 0.9944034,
          "transcript": "between 2025 and 2531 Suzuki just use a range do you see yourself as a
n entrepreneur and what do you find most valuable capabilities for skills"
        }
      ]
    },
    {
      "alternatives": [
        {
          "confidence": 0.9197958,
          "transcript": "differently that's that's very interesting quick question so this is a
bit of achievement because your support mechanism of the support mechanisms are any other supp
ort mechanisms you are aware of and you might and that you make use of inside outside everywher
e"
        }
      ]
    },
    {
      "alternatives": [
        {
          "confidence": 0.9057523,

```

# IoT Alternatives



# IoT Alternatives



# Thank You

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