



# ELECTRO SCIENTIFIC CLUB

## GET STARTED WITH HARDWARE ENGINEERING

By: Mohamed Yanis Hiou

# Outline

## 1) Hardware

Electrical Engineering  
Electronics Engineering  
Computer Engineering  
Embedded Systems

## 3) Projects

Development platforms  
Project Management  
Resources  
Advice

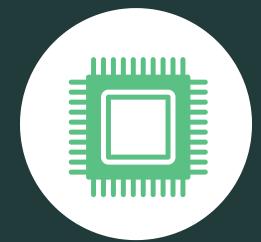
## 2) Software

Computer Science  
Software Engineering  
DevOps  
Cloud  
Security  
Data Engineering  
Artificial Intelligence



# Life's Problems

Any problem we face in our life could be solved by combining hardware engineering and software engineering



## Hardware

Design, develop, test and produce computer systems and various physical components related to computer systems.



## Software

Design and develop effective software solutions to meet their clients' requirements.

# Computer Engineering

It's the combination of EE (Electrical Engineering)  
and CS (Computer Science)

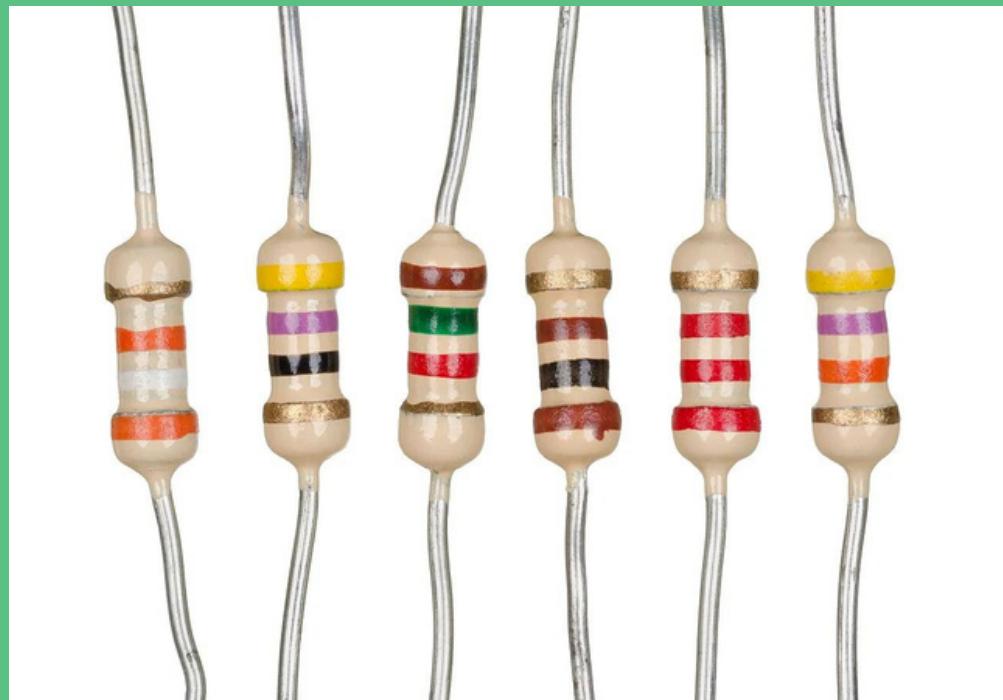


# ELECTRICAL ENG.

Basic Circuits  
Binary and Digital  
Signal Processing  
Electronics  
Tools

# ELECTRICAL ENG.

## 1) Basic Circuits



Resistors



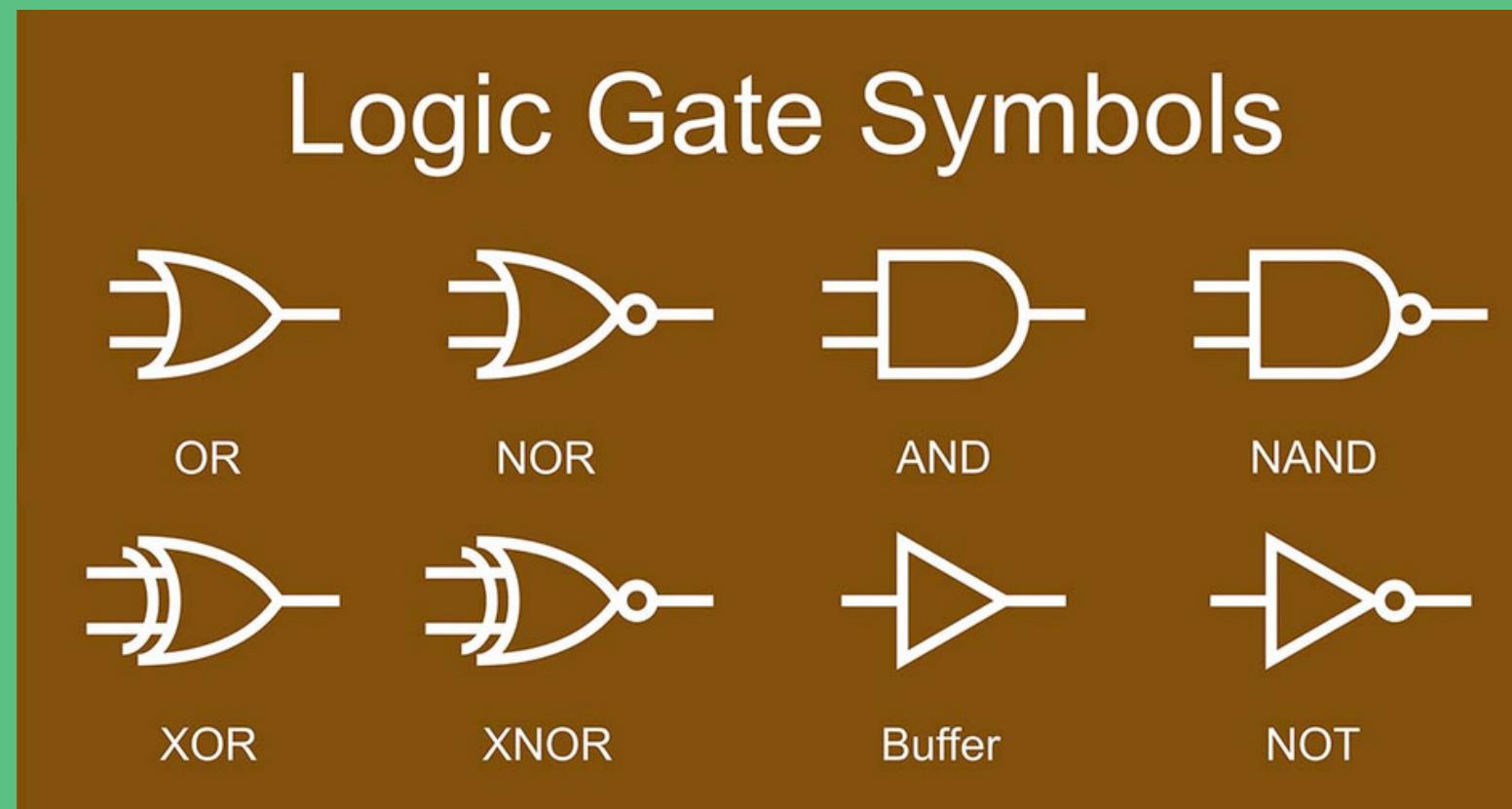
Capacitors



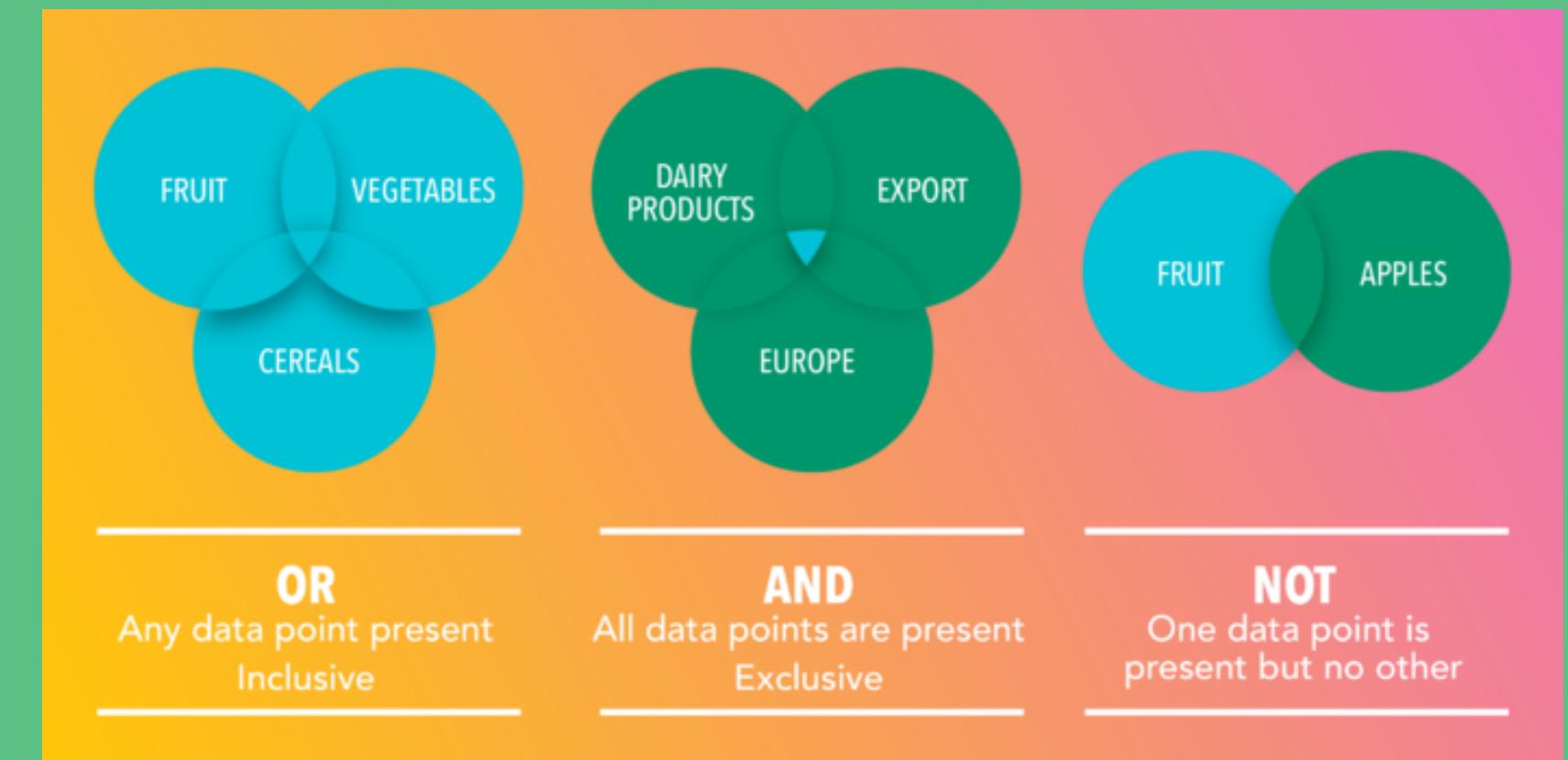
Inductors

# ELECTRICAL ENG.

## 2) Binary & Digital



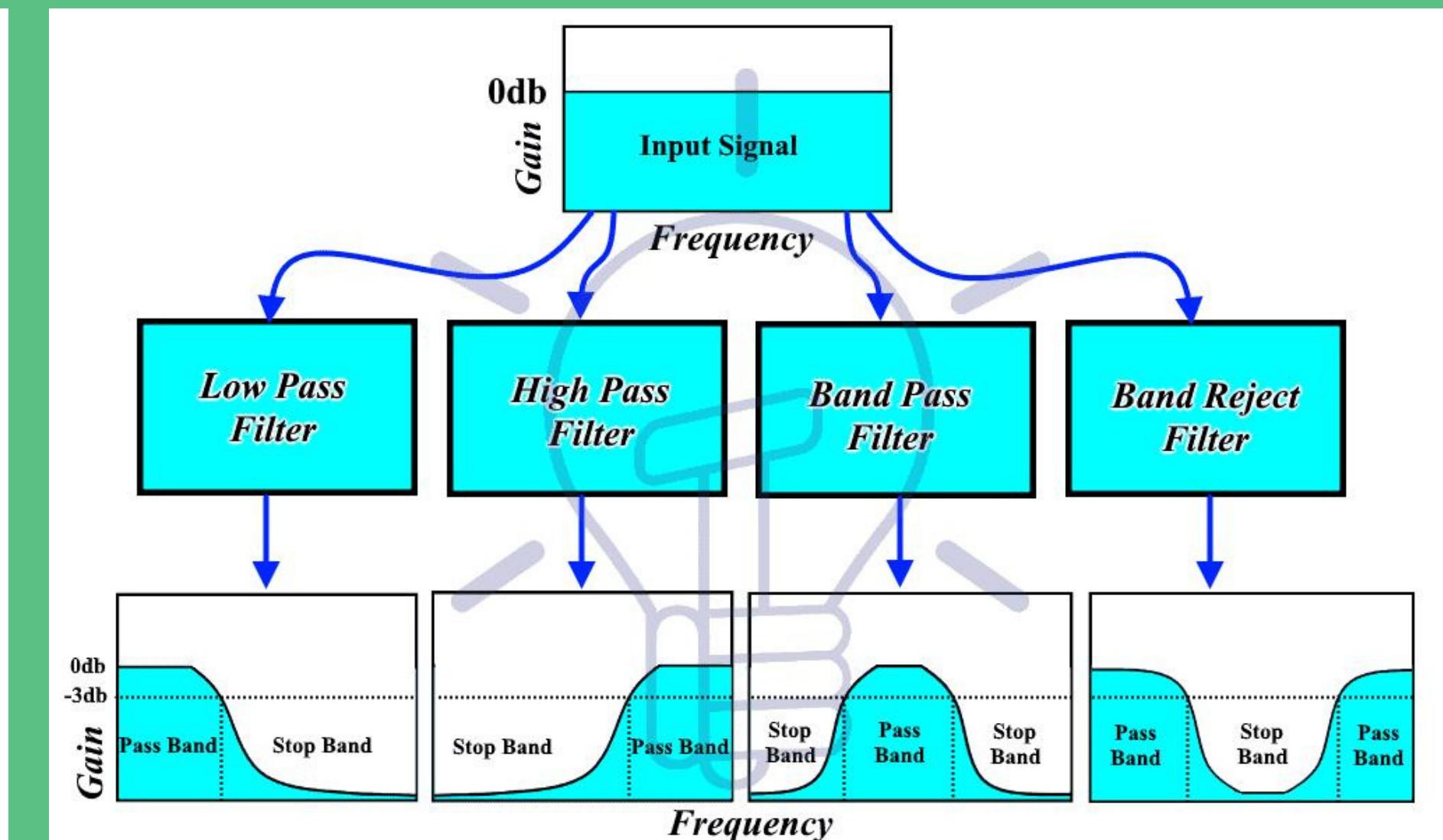
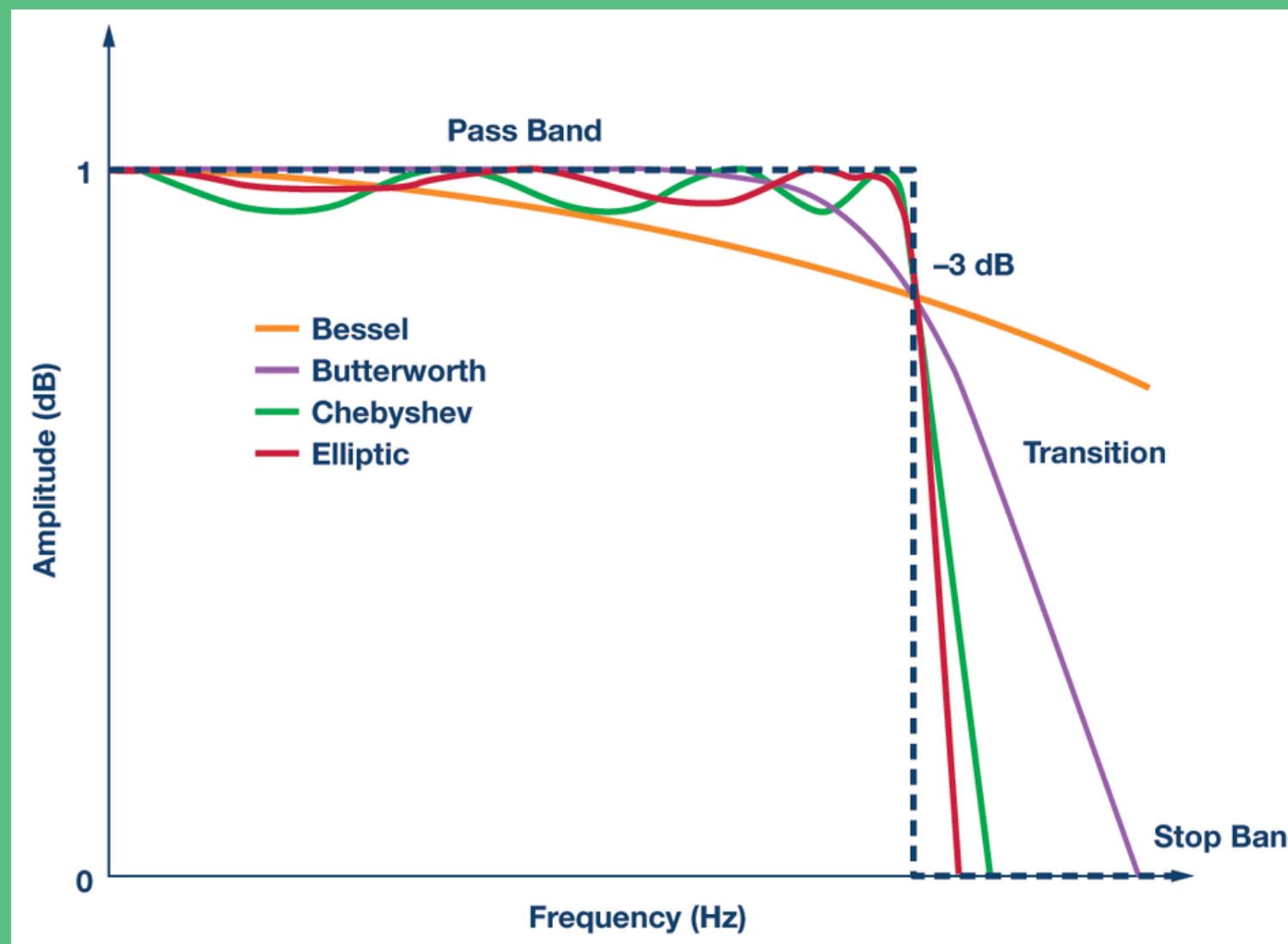
Logic Gates



Boolean Logic

# ELECTRICAL ENG.

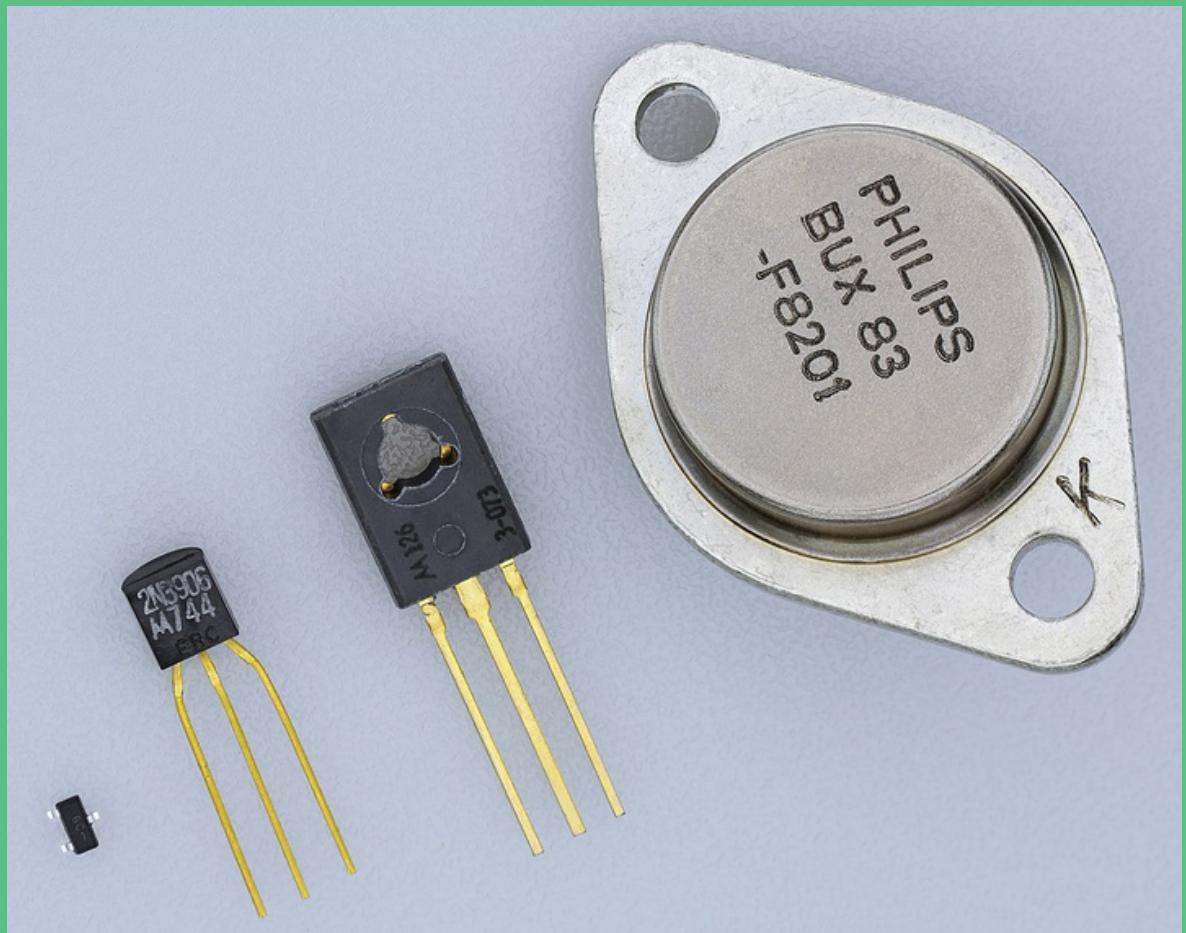
## 3) Signal Processing



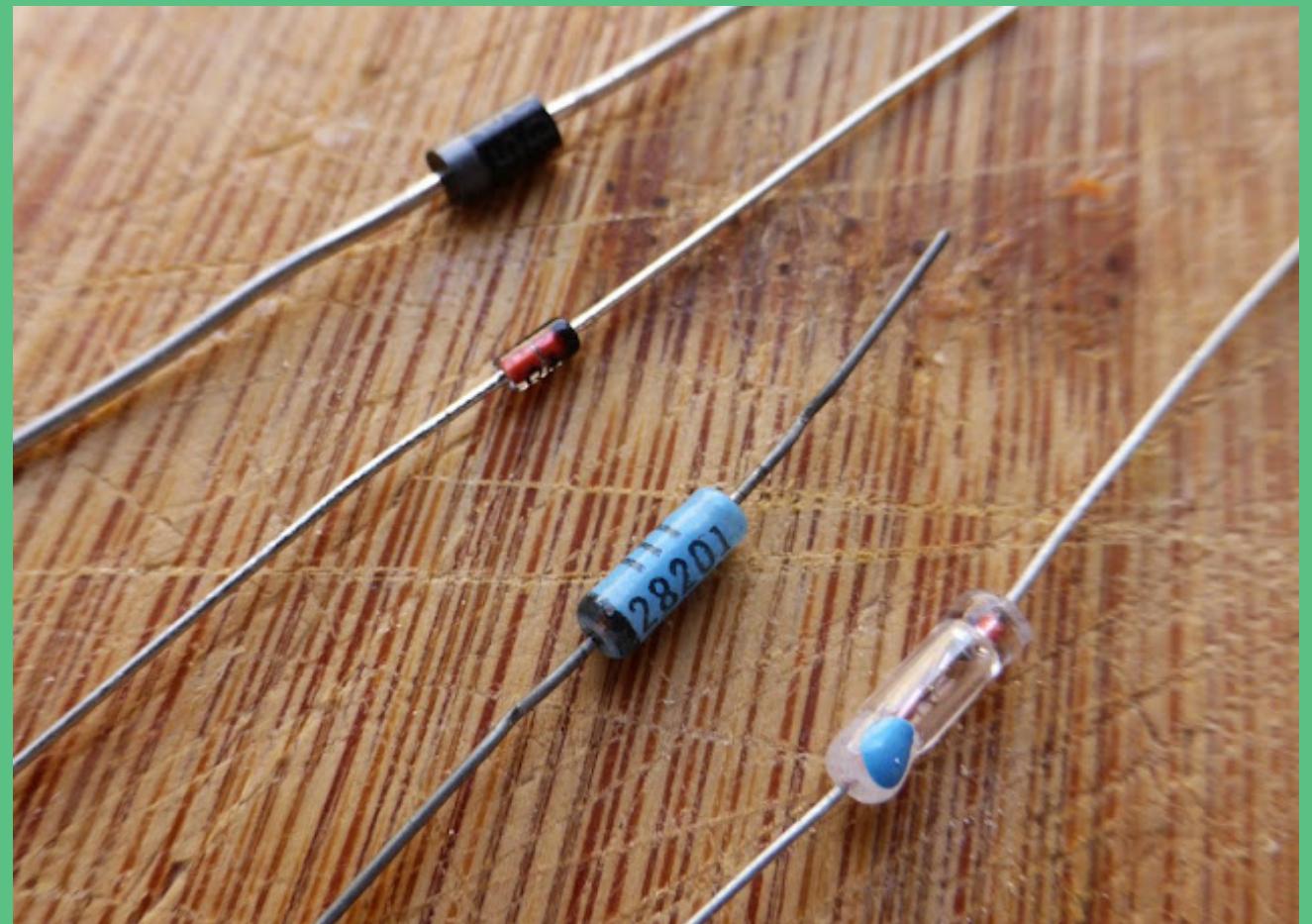
Filter Design

# ELECTRICAL ENG.

## 4) Electronics



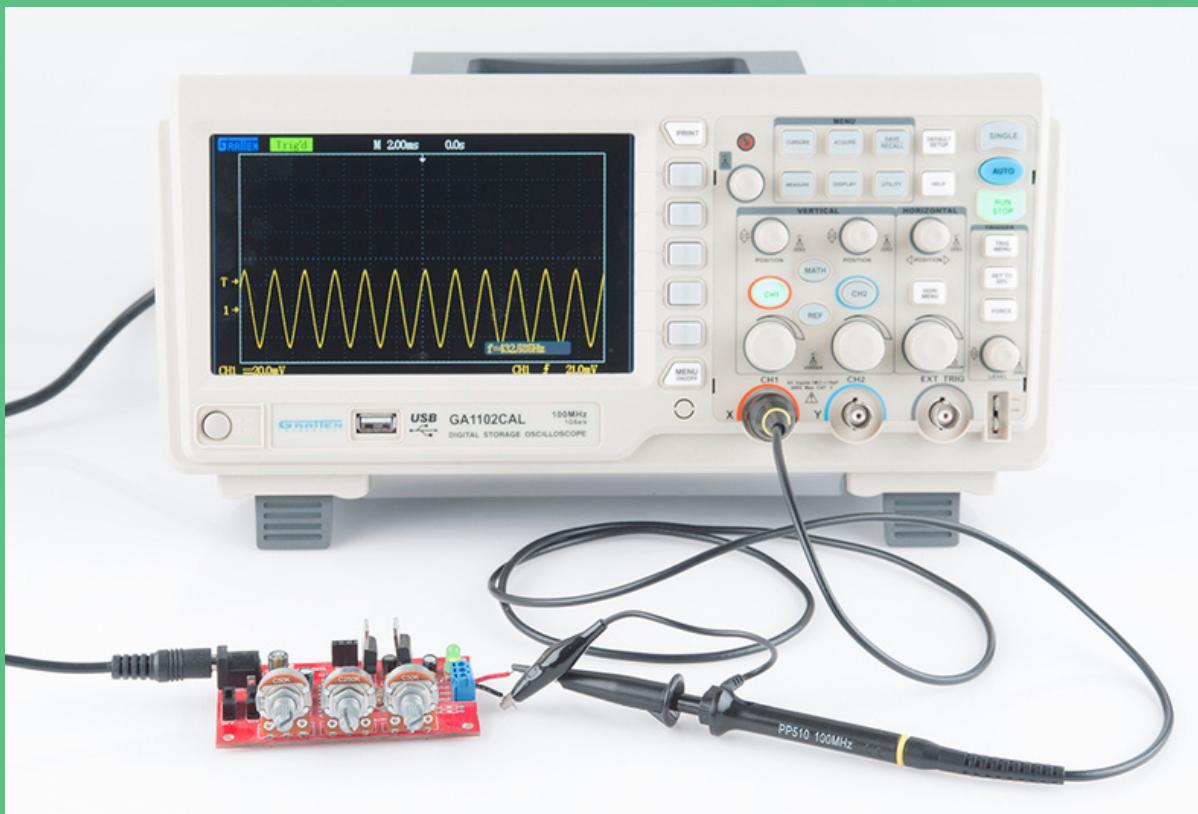
Transistors



Diodes

# ELECTRICAL ENG.

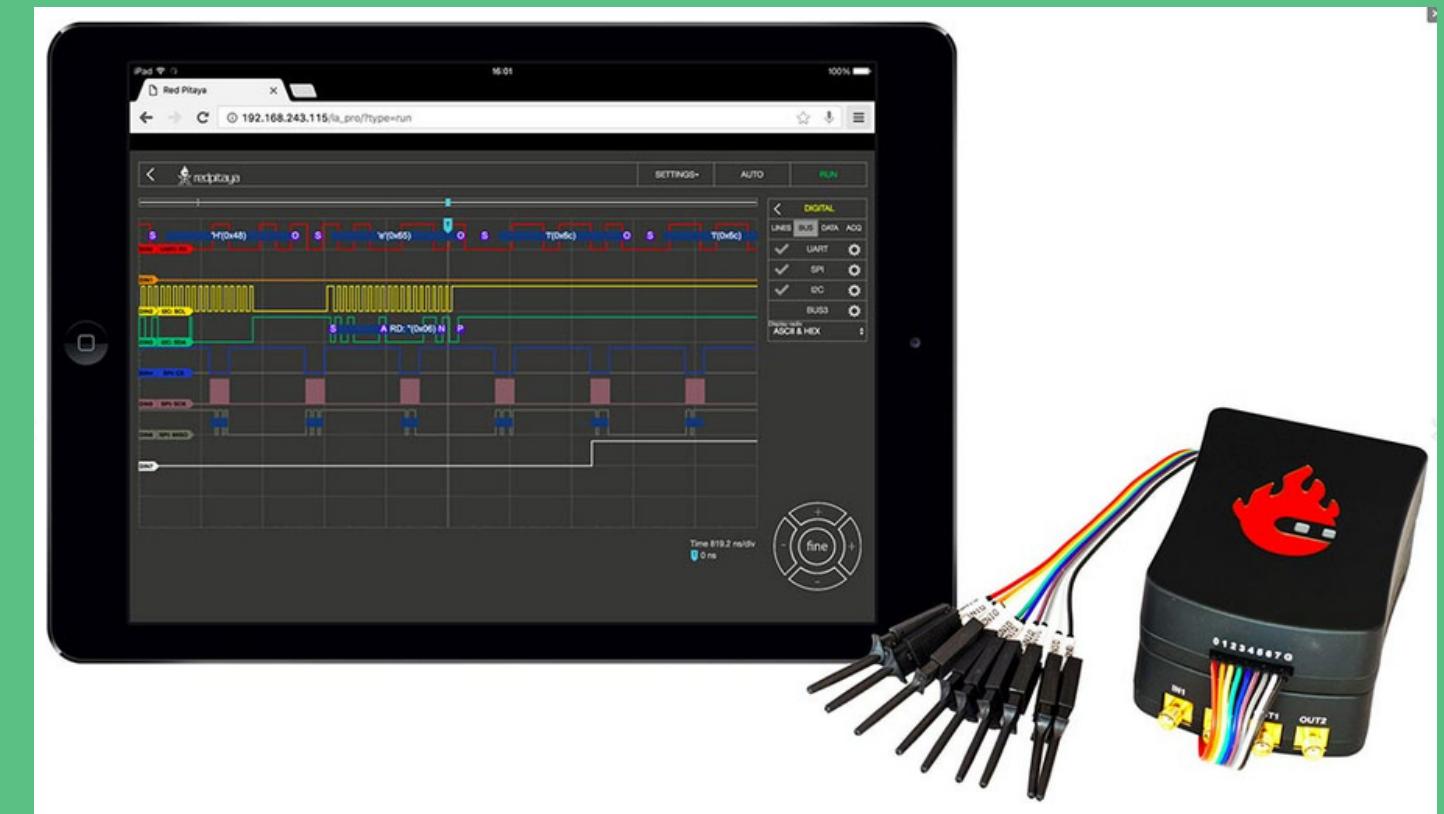
## 5) Tools



Oscilloscope



Multimeter



Logic Analyzer



# COMPUTER SCIENCE

Programming  
Algorithms

# COMPUTER SCIENCE

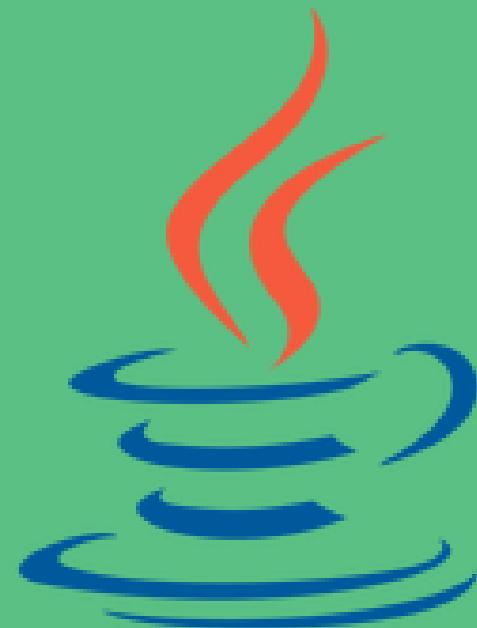
## 1) Programming



C



C++



JAVA

# COMPUTER SCIENCE

## 2) Algorithms

$\frac{\partial x}{\partial r} = \vec{e}_1 \cdot \cos(2 \cdot 3/4) = 0; \quad y' = -9 \cos^2 t; \quad y_0 = y(t_0) = -3 \sin(2 \cdot 3/4) = -3;$   
 $f_0 = y(t_0) = -3 \sin(2 \cdot 3/4) = -3; \quad x' = -8 \sin 5t; \quad z_0 = 2/t_0 = 2 \operatorname{ctg} \frac{\pi}{4} = 2; \quad \frac{\partial z}{\partial x} = e^{x^2+y^2} (x^2+y^2)$   
 $\frac{\partial z}{\partial y} = e^{x^2+y^2} (x^2+y^2); \quad y = 2y e^{x^2+y^2} \lim_{x \rightarrow \infty} x^3 + x^2 \cdot \frac{2}{x}; \quad x'(t_0) = -2 \sin\left(2 - \frac{\pi}{4}\right) = -2; \quad \operatorname{arctg}^2/x$   
 $\frac{\partial y}{\partial x} = u^4 2 \cos \varphi / -\sin \varphi = -u^4 \sin \varphi; \quad y'(t_0) = -6 \cos(2 \cdot \pi/4) = 0; \quad \frac{\partial \varphi}{\partial y} = 4u^5 \cos^2 \varphi$   
 $\frac{\partial \varphi}{\partial x} = \frac{\partial \varphi}{\partial y} + \frac{\partial \varphi}{\partial x} = \frac{1}{2} \int d\varphi \int \frac{(9-r^2)^{1/2}}{e^r} d(9-r^2) - r d\varphi x'(t_0) = \frac{-2}{\sin^2 \pi/4} = -4; \quad \frac{\partial \varphi}{\partial y} \xrightarrow{x \rightarrow 0}$   
 $f'(x_0) = \lim_{x \rightarrow x_0} \frac{f(x) - f(x_0)}{x - x_0}; \quad f'(x_0) = \lim_{x \rightarrow 0} \frac{\operatorname{tg}(x^3 + x^2 \cdot \sin \frac{2}{x})}{x_0^3 + x_0^2 \cdot \sin \frac{2}{x_0}}.$   
 $\int \int r \cdot \sqrt{9-r^2} dr d\varphi = \int \int d\varphi \int r \cdot \sqrt{9-r^2} dr = \lim_{x \rightarrow 0} \frac{x^3 + x^2 \cdot \sin \frac{2}{x}}{x_0^3 + x_0^2 \cdot \sin \frac{2}{x_0}} = -u^4 \sin \varphi;$   
 $\frac{\partial \varphi}{\partial y} = 4u^5 \cos^2 \varphi y'(t_0) = -6 \cos(2 \cdot \pi/4) = 0; \quad \int \int \frac{r}{\sqrt{R^2 - r^2}} dr dy = P = -2x + y + z - 4 = 0;$   
 $\vec{e}_1 = i \cos \varphi + j \sin \varphi; \quad \frac{\partial \varphi}{\partial y} + \frac{\partial \varphi}{\partial x} = \frac{-2x \cos 5x}{\sin^2 \pi/4 D}; \quad \int \int \frac{r}{\sqrt{R^2 - r^2}} dr dy = P = -2x + y + z - 4 = 0;$   
 $\vec{e}_2 = -i \sin \varphi + j \cos \varphi; \quad y_0 = y(t_0) = -3 \sin;$

# Math

# COMPUTER SCIENCE

## 2) Algorithms (Example)

list = [442, 482, 513, 536, 597, 601, 664, 693, 708, 712, 778]

Find the index of the number "693" !

```
for i in lst:  
    if lst[i] == 693:  
        print("The index of '693' is", i)  
        break
```

# IT Engineering

It is the branch of computer science that deals with the design, development, testing, and maintenance of software applications.



# IT ENGINEERING

Software Engineering  
DevOps  
Security  
Big Data  
Artificial Intelligence

# SOFTWARE ENG.

Software engineers develops any kind of software (web, mobile, desktop, smart tv, etc..)

## Software Eng. Sub-Fields:

Frontend: Develops the UI and visual aspects as well as the part where the user can interact.

Backend: Develops the backend of the app (server side), connect and store the database.

Full Stack: Develops the frontend and the backend.

## Field Specializations:

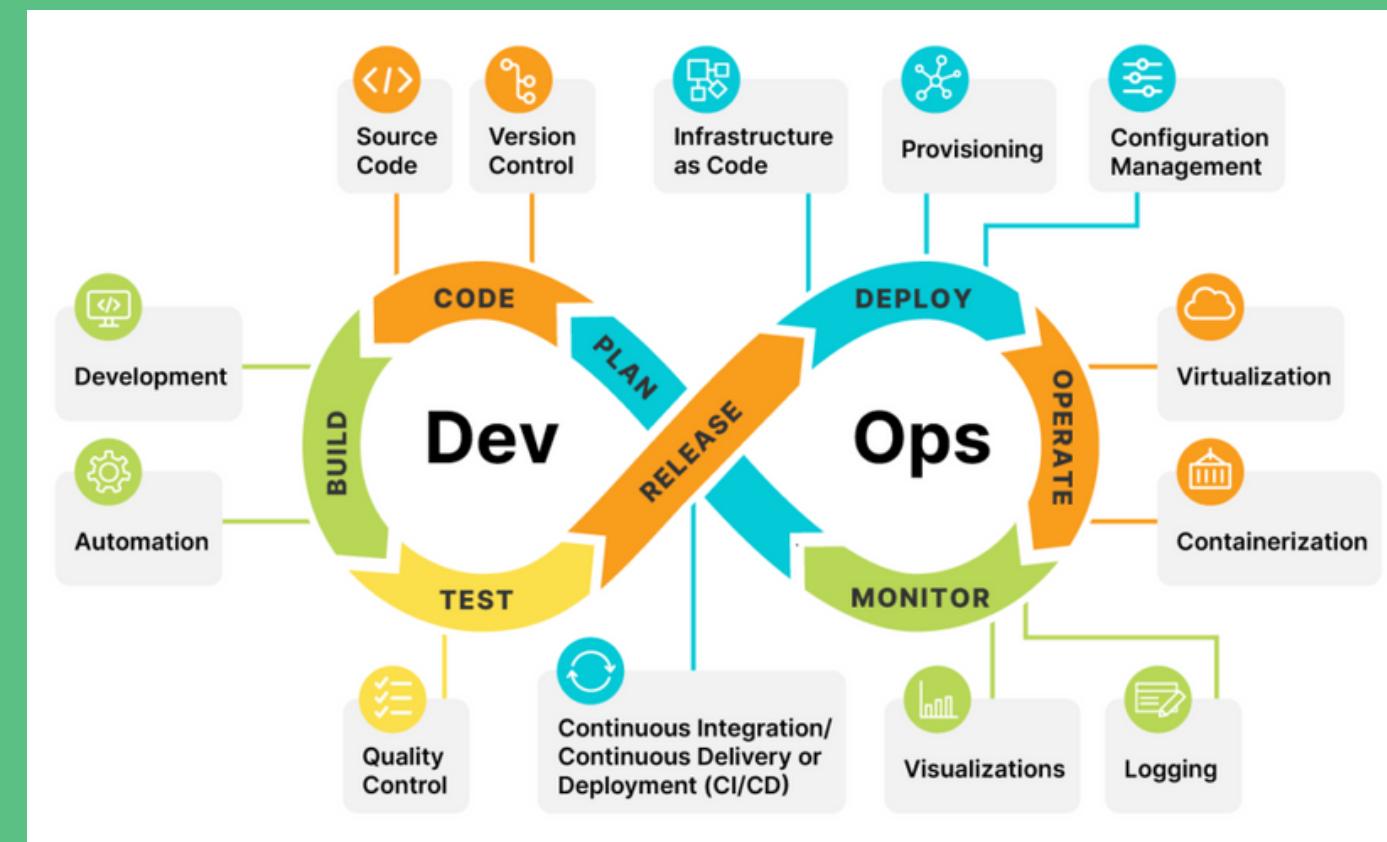
Web Dev. | Mobile Dev. | IoT Dev.

## Programming Language Specialization:

Java | Python | React | Java Script

# DevOps ENG.

DevOps integrates and automates the work of software development and IT operations as a means for improving and shortening the systems development life cycle.



AWS, Microsoft Azure, GCP, Alibaba Cloud, IBM Clous

# SECURITY

Security engineering is the process of incorporating security controls into an information system.



Servers, Networking, Cloud platforms, Frontend, Backend, etc..

# BIG DATA

Big data engineering involves designing, developing, and managing the infrastructure and tools needed to process, store, and analyze large and complex datasets.

## Data Analyst:

Analyze and intercept data to extract useful information

## Data Scientist:

Use the extracted information to predict something

## Data Engineer:

Collect and store the data in good formats

# ARTIFICIAL INTELLIGENCE

An artificial intelligence (AI) engineer is a professional who designs, develops, and deploys AI systems and technologies. They leverage machine learning algorithms, data analytics, and software engineering techniques to create intelligent systems.

## Machine Learning:

Designs, builds, and deploys machine learning models and systems to enable computers to learn from data and make predictions or decisions without explicit programming.

## Deep Learning

Designs, implements and optimizes deep neural networks for complex and large-scale machine learning tasks, such as image and speech recognition, natural language processing, and computer vision.

# IT ENGINEERING

## Software Eng.

Web dev: HTML, CSS, JavaScript

Backend: Django, Flask

Mobile Dev: Java, Dart (Flutter)

Desktop Dev: Java, C++

## DevOps Eng.

Linux, Kubernetes, docker, CI/CD

## Security Eng.

Everything!

## Big Data Eng.

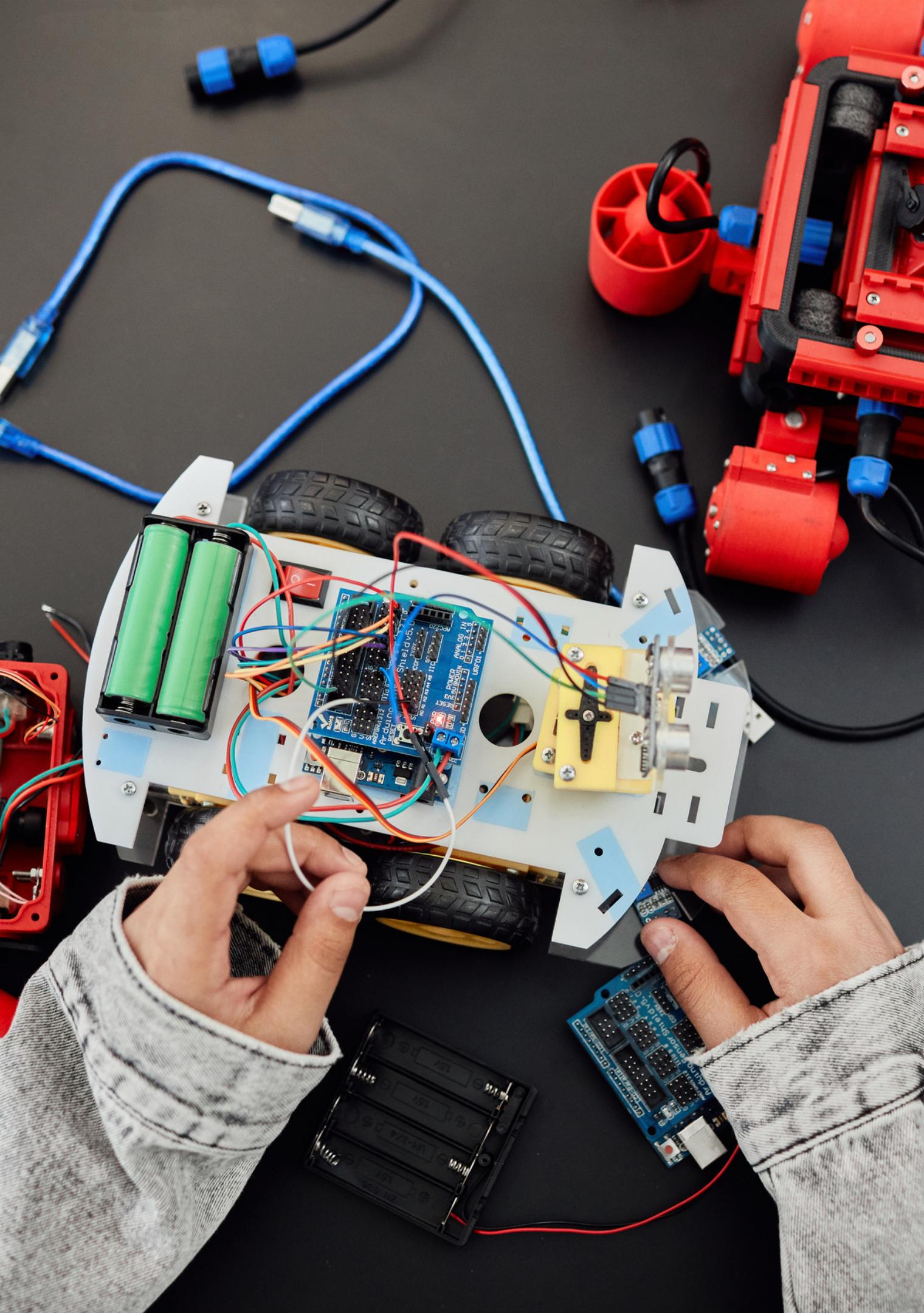
SQL, R, Python, Math, Statistics,  
Algebra

## AI Eng.

Python, Tensorflow, Pytorch,  
Sklearn, Numpy, Pandas

# Projects

It is the branch of computer science that deals with the design, development, testing, and maintenance of software applications.



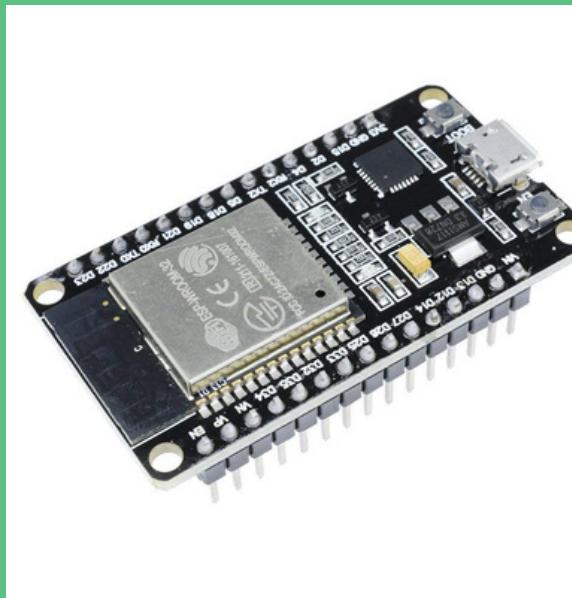
# PROJECTS

Development Platforms  
Project Management  
Resources  
Advice

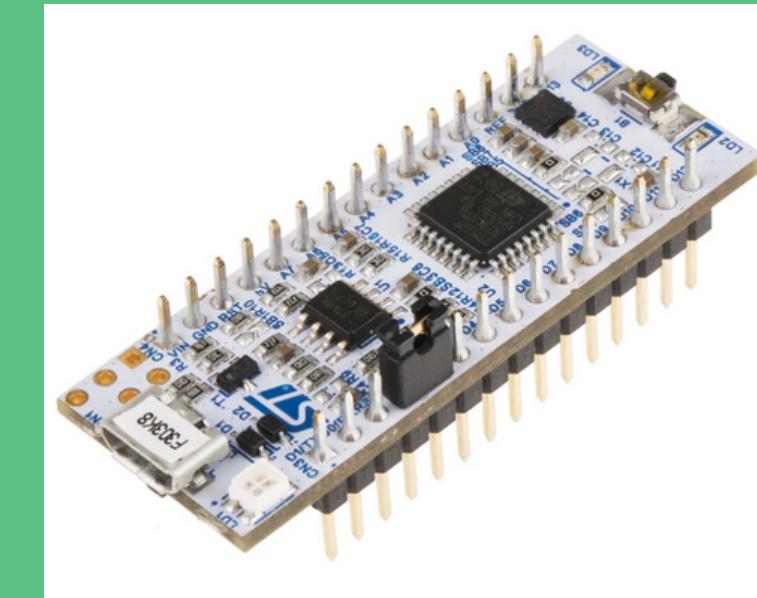
# DEVELOPMENT PLATFORMS



Arduino



ESP32



STM32



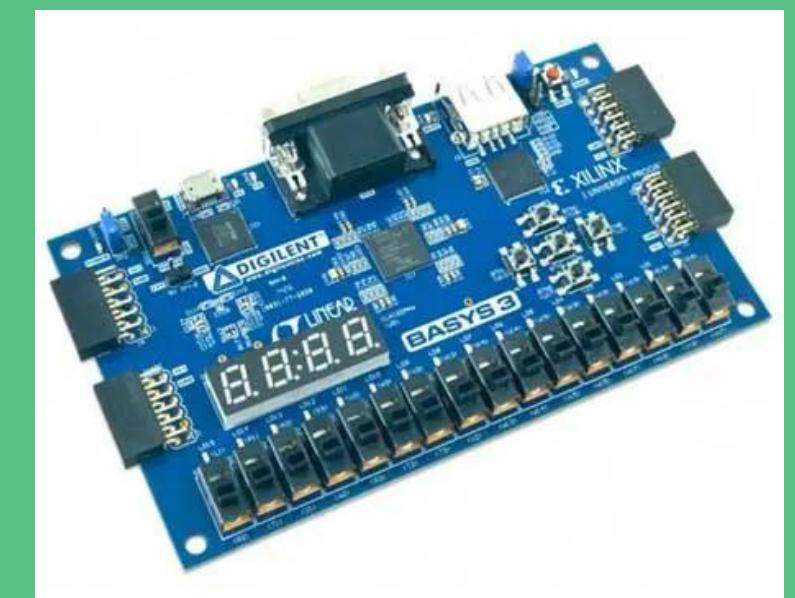
Nordic



ESP32



Jetson Nano



FPGA

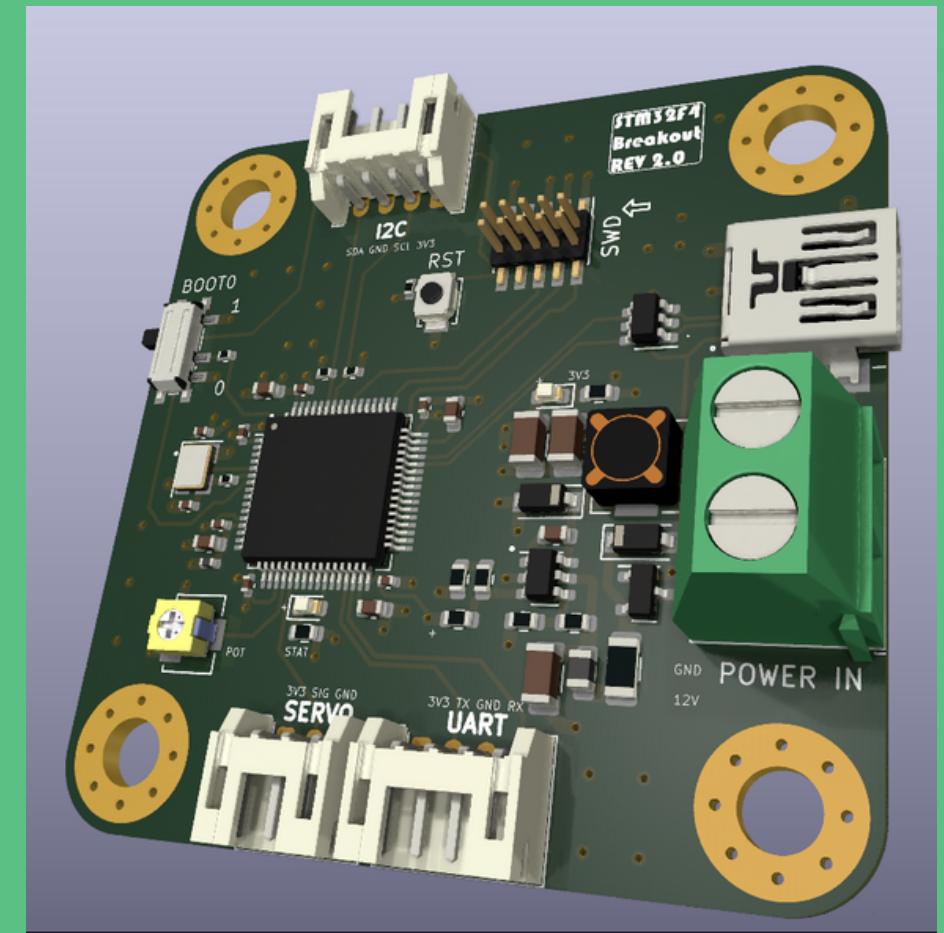
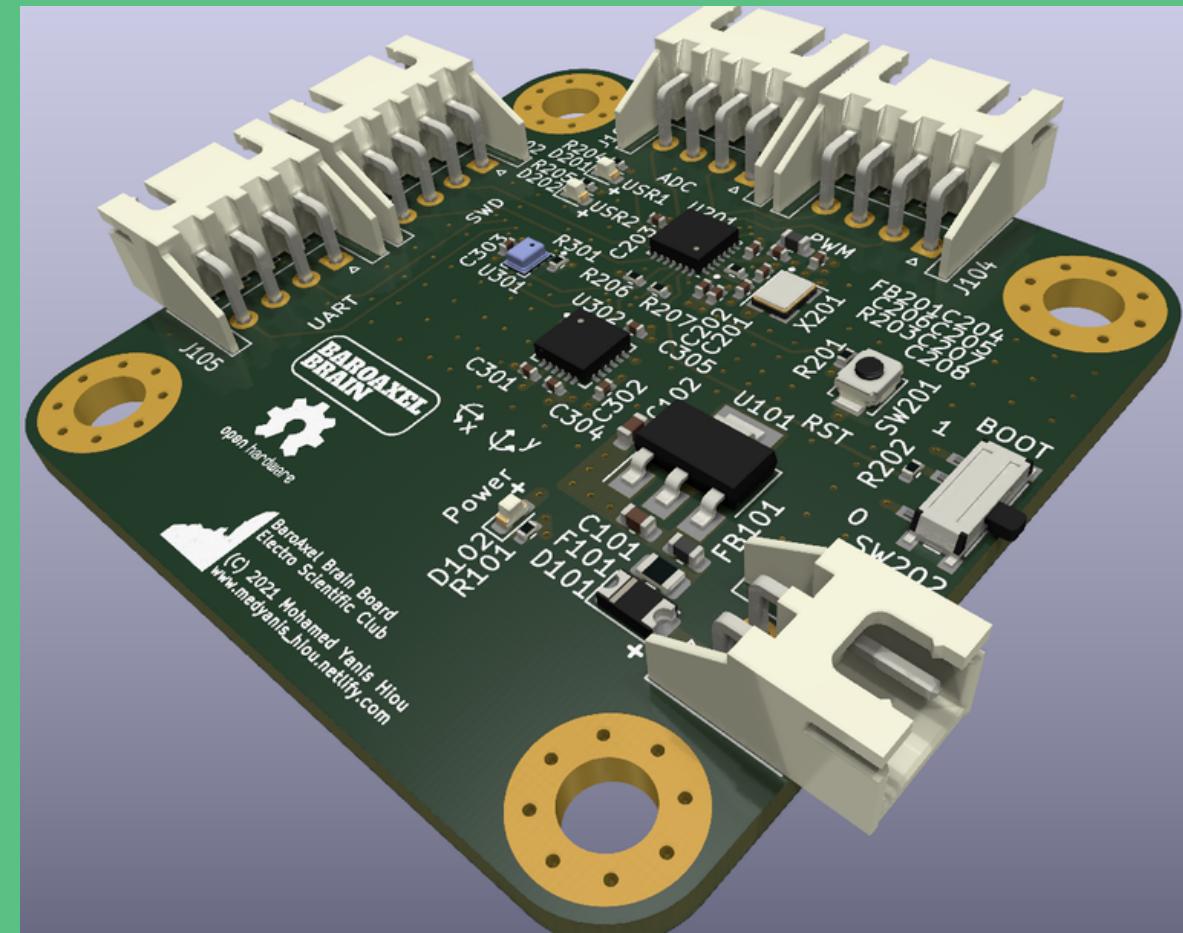
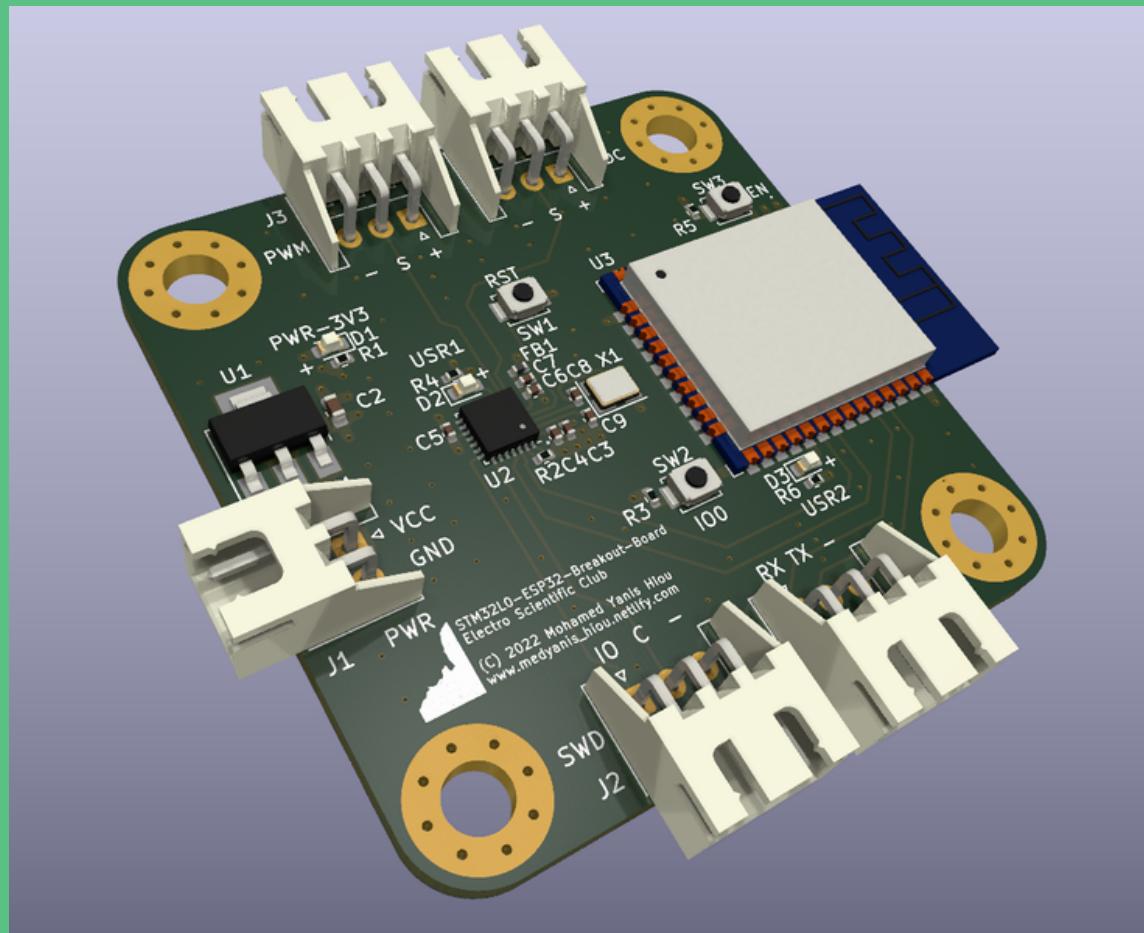
# EMBEDDED DEV

Everything a computer may have in a single Integrated Circuit (IC).

- 1) Microcontrollers
- 2) Electronics
- 3) Programming
- 1) GPIOs (General Inputs/Outputs)
- 2) Interrupts
- 3) Timers
- 4) ADCs
- 5) DACs
- 6) Serial Interfaces
- 7) Communication Protocols

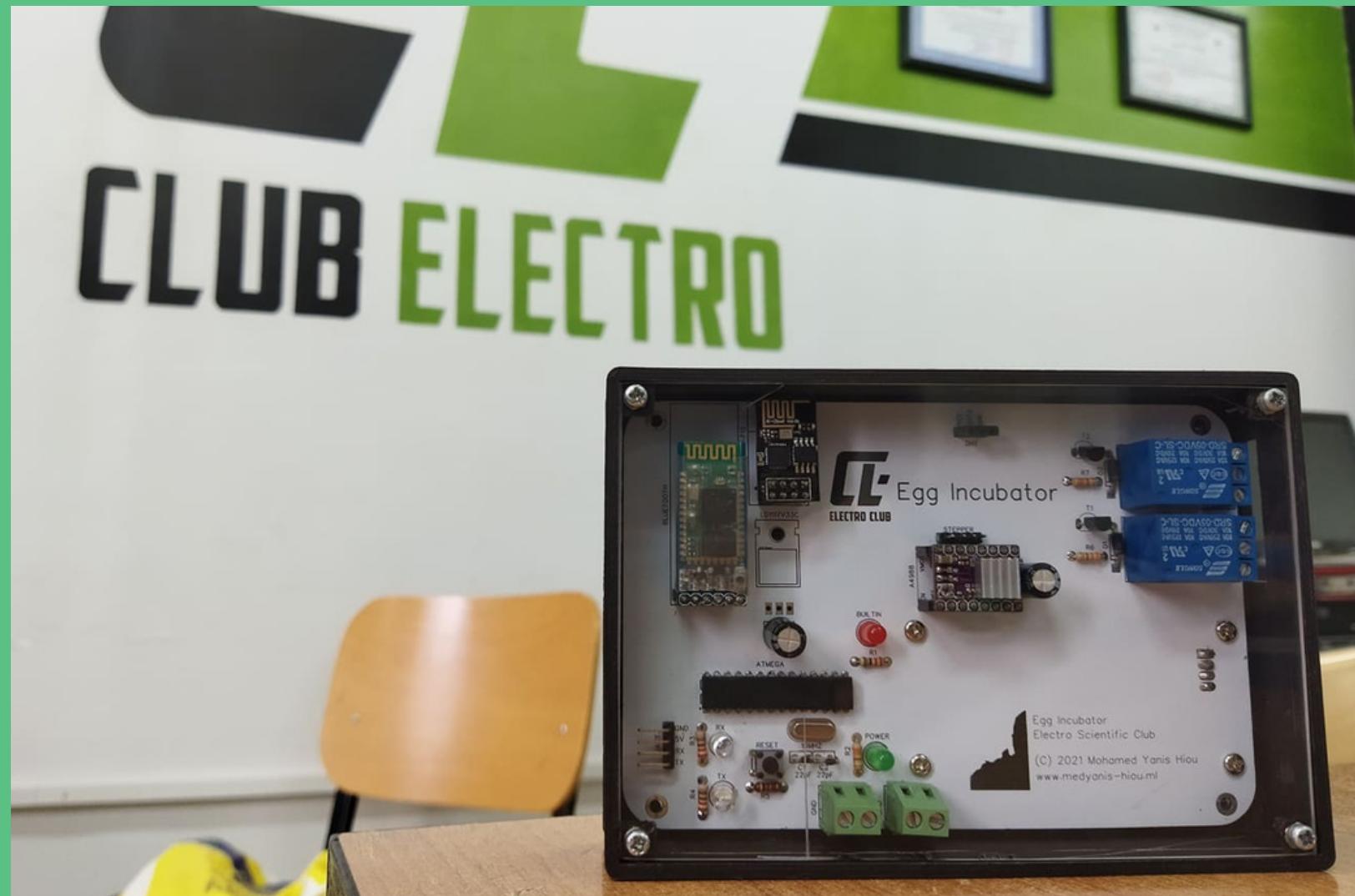
# WHAT'S NEXT?

Finish your projects with a printed circuit board (PCB) with a  
3D Printed enclosure.



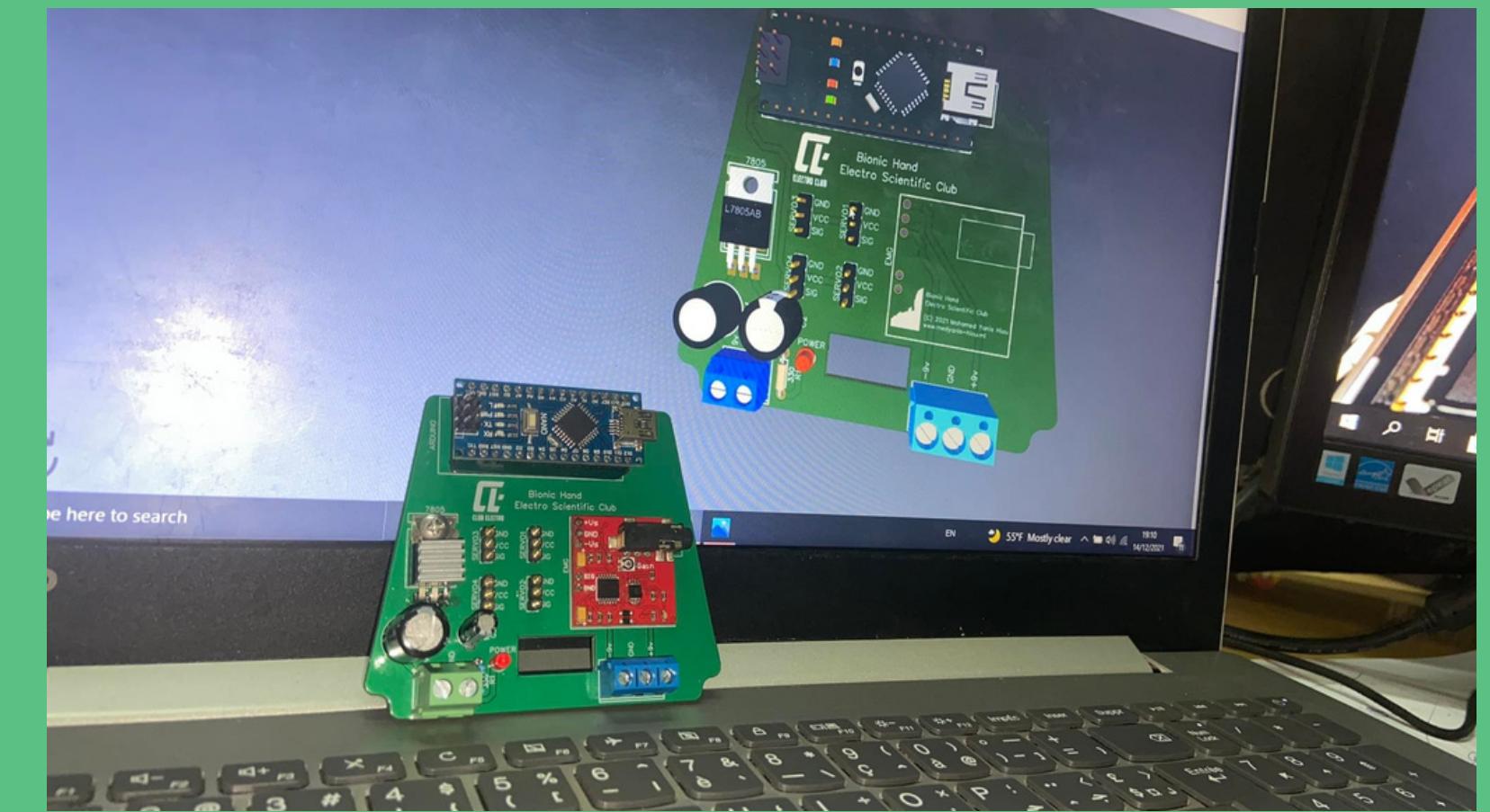
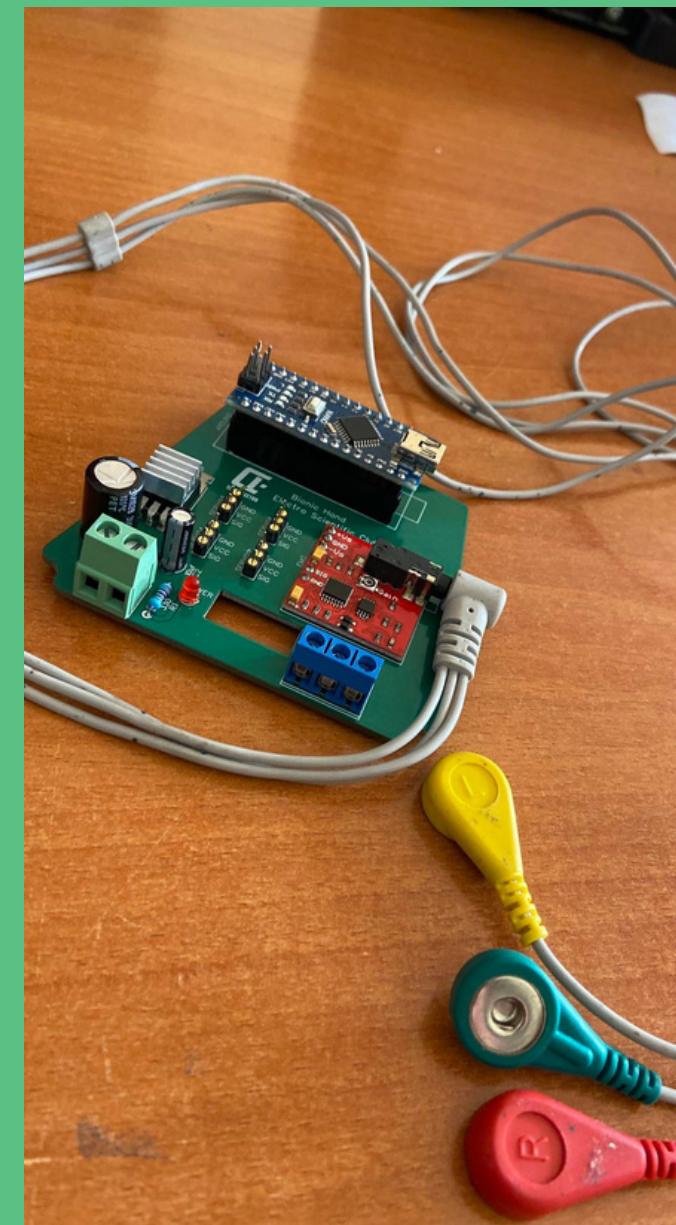
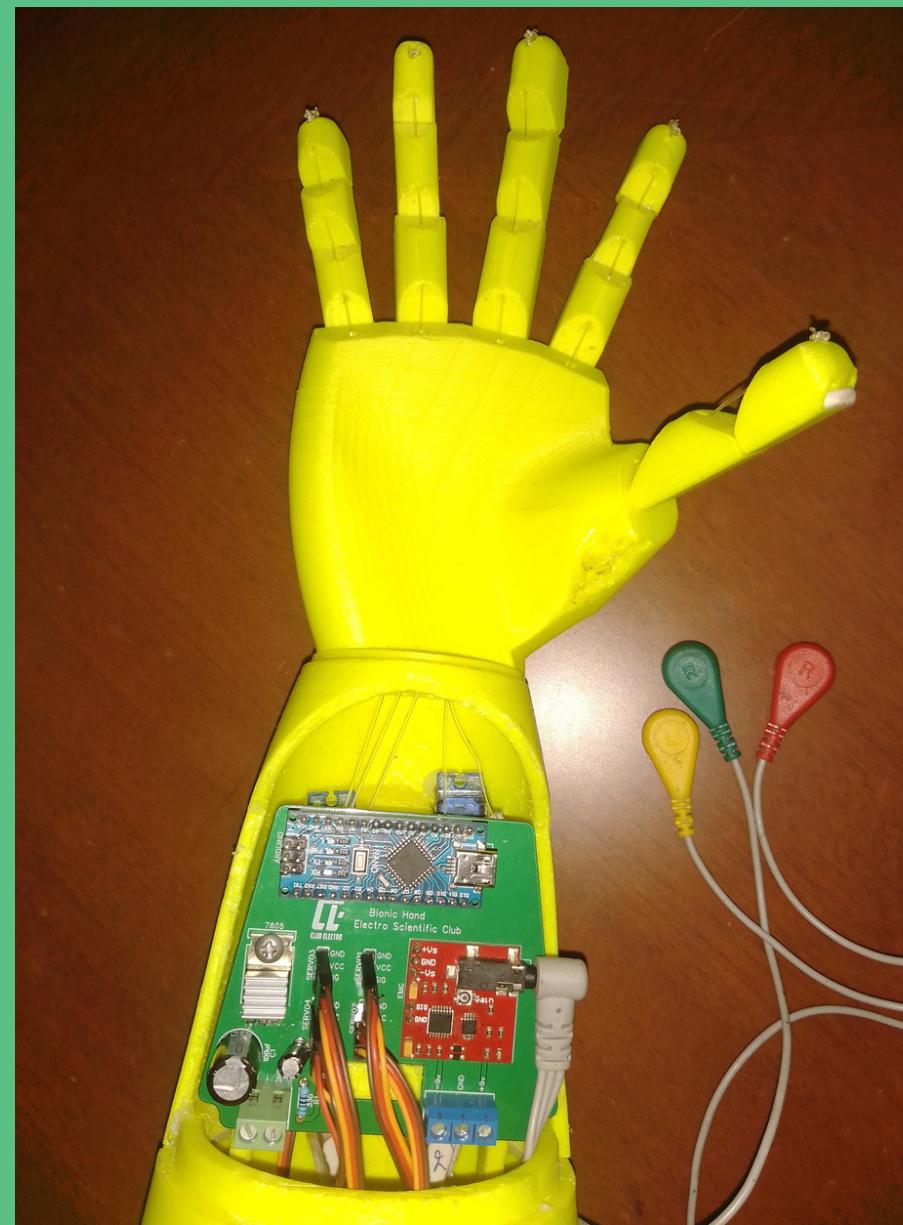
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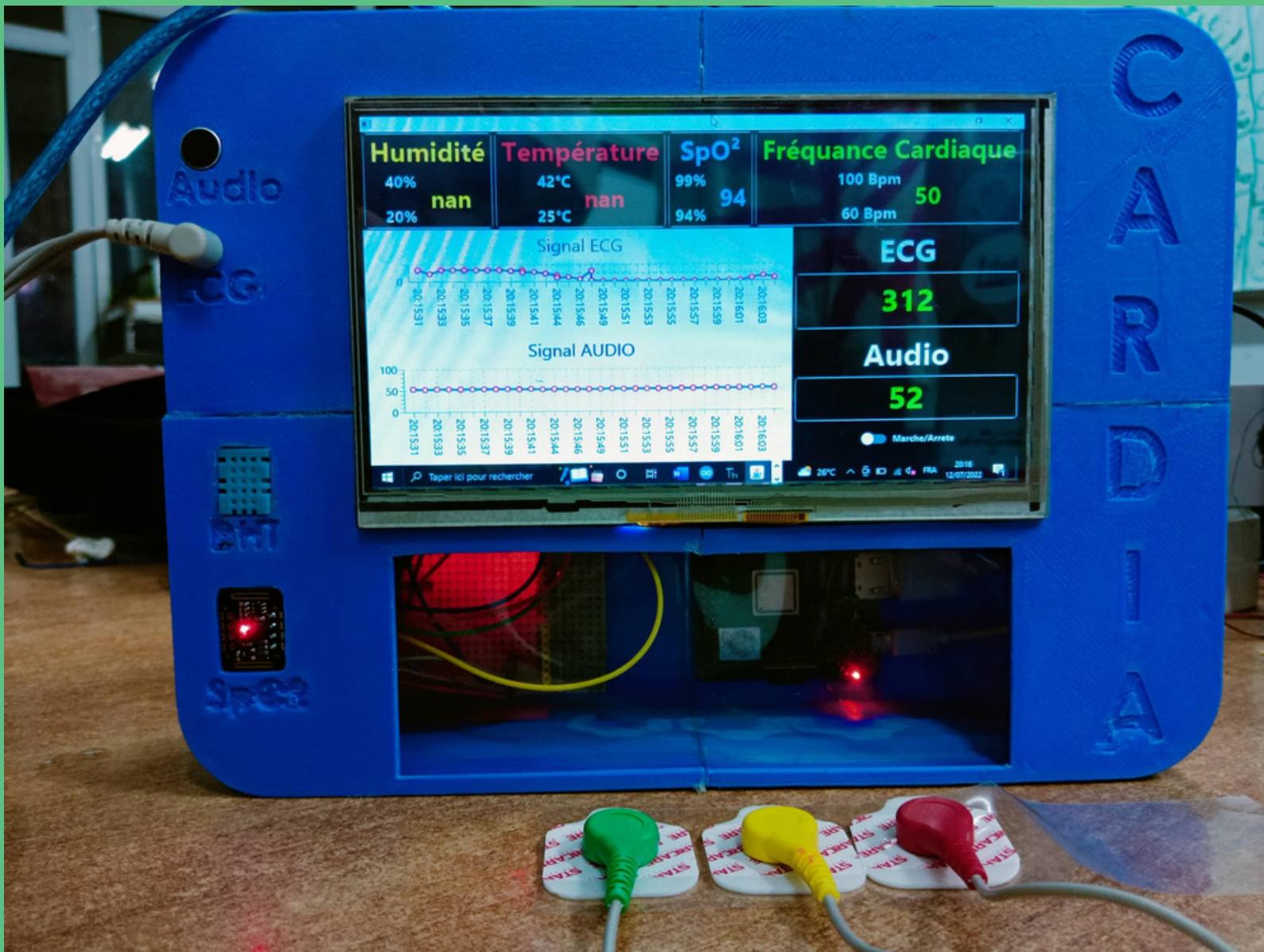
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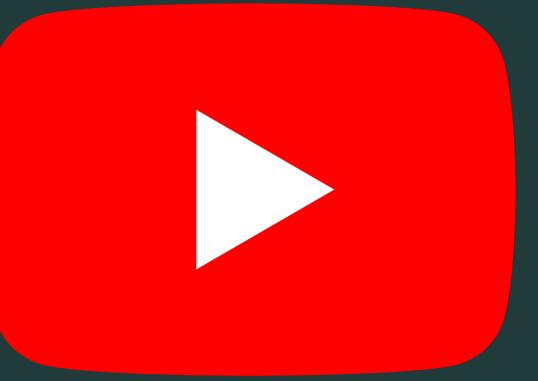


# WHAT'S NEXT?

Finish your projects with a printed circuit board (PCB) with a 3D Printed enclosure.



# Resources



دورة الالكترونيات  
العملية  
وليد عيسى

# Resources



**C++ Programming  
Course**  
**FreeCodeCamp**

# Resources



## New Arduino Tutorials

Paul McWhorter

# ADVICE!

Being self-taught isn't the easier route by any means!

# ADVICE!

Stop overthinking stuff, it doesn't matter where you start learning.

# ADVICE!

C++ developer  
learning Python



Python developer  
learning C++



# ADVICE!

NETWORK, NETWORK, NETWOOOOOOOR !!!!

# ADVICE!

Don't be afraid to dive to the deep end.  
Remember, Tomorrow means... NEVER!

# ADVICE!

Keep it real for yourself, is self-taught for you??

# ADVICE!

IT'S ALL UP TO YOU AND YOU NEED TO KICK YOUR A\*\* !!

# ADVICE!

All they have education beyond just a degree !

# ADVICE!

The more you learn, the less you know !

# **ADVICE!**

**( FOR MAN )**

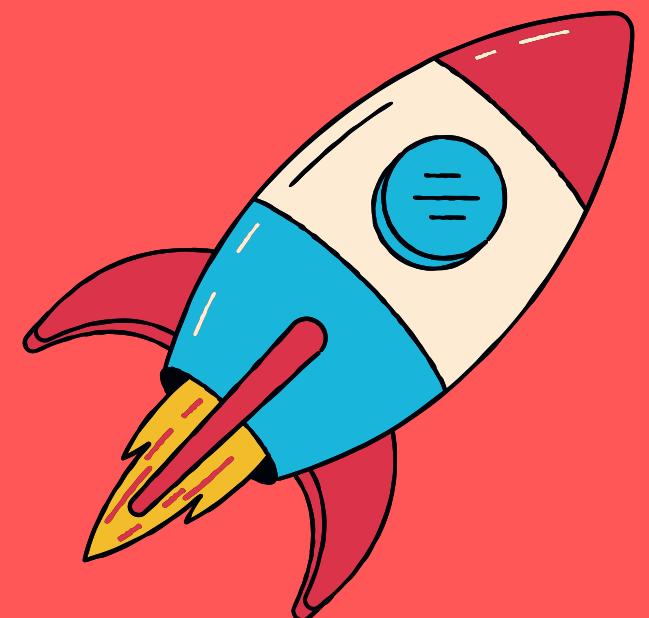
Always stay a SIGMA mate!

# Links:



<https://tinyurl.com/mbed-roadmap>

<https://tinyurl.com/yanis-embedded-resources>





# THANKS!



Mohamed Yanis Hiou  
Copy of Tarek Kalkal

[www.medyanis-hiou.netlify.com](http://www.medyanis-hiou.netlify.com)