Introduction to Sensors - Practical

Industry 4.0 with Human Touch, Technology course

By Fjodor van Slooten

CONTENT

Introduction to Sensors - Practical

- Introduction to prototyping with Arduino
- Practical (Thursday morning)

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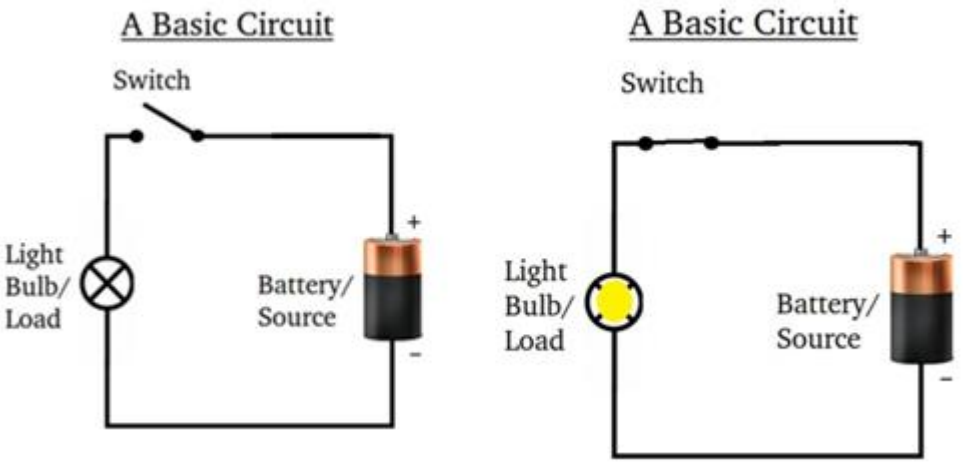
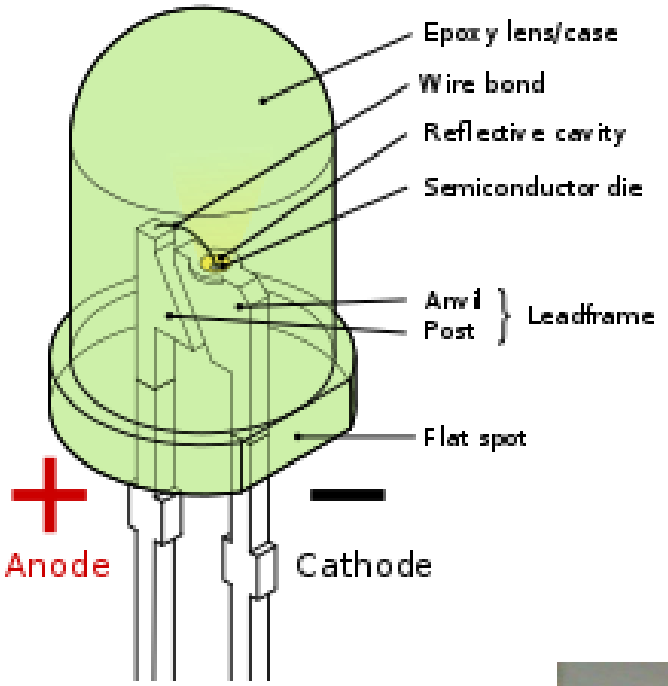
This presentation & tutorials available at: vanslooten.com/i40 or via Canvas

Electronics 101

Current flows from + to – when a circuit is complete

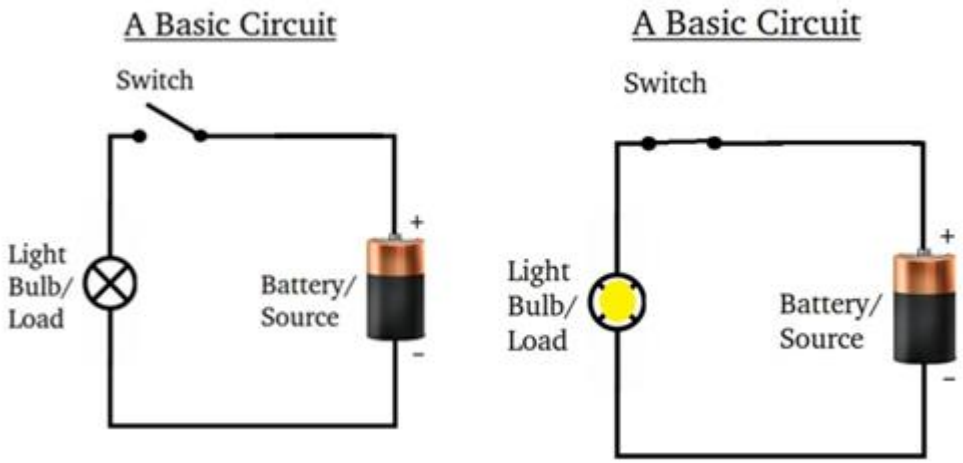


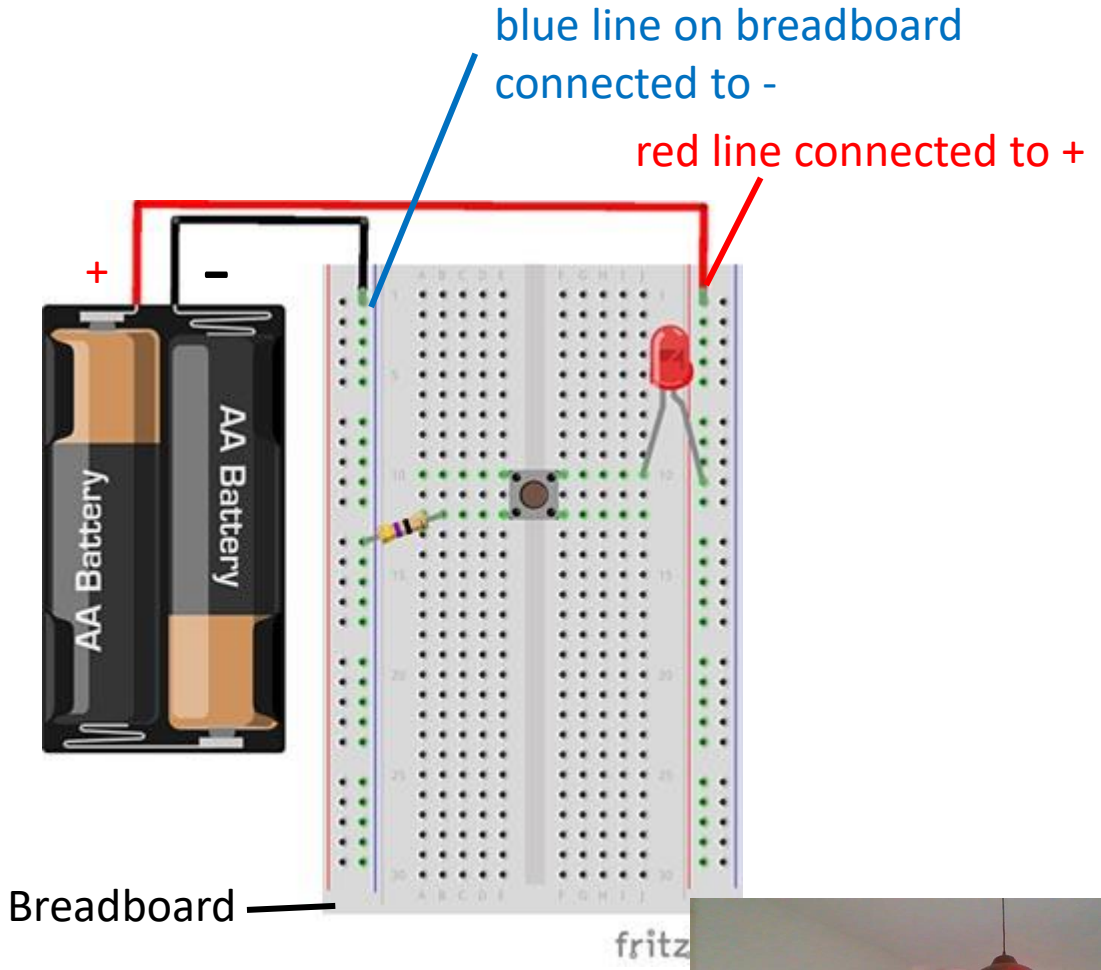


LED
Breaks if to much current goes through.
We use a resistor to limit the current.

Electronics 101

Current flows from + to – when a circuit is complete





LED

Breaks if to much current goes through.

We use a resistor to limit the current.

Electronics 101: Breadboard power

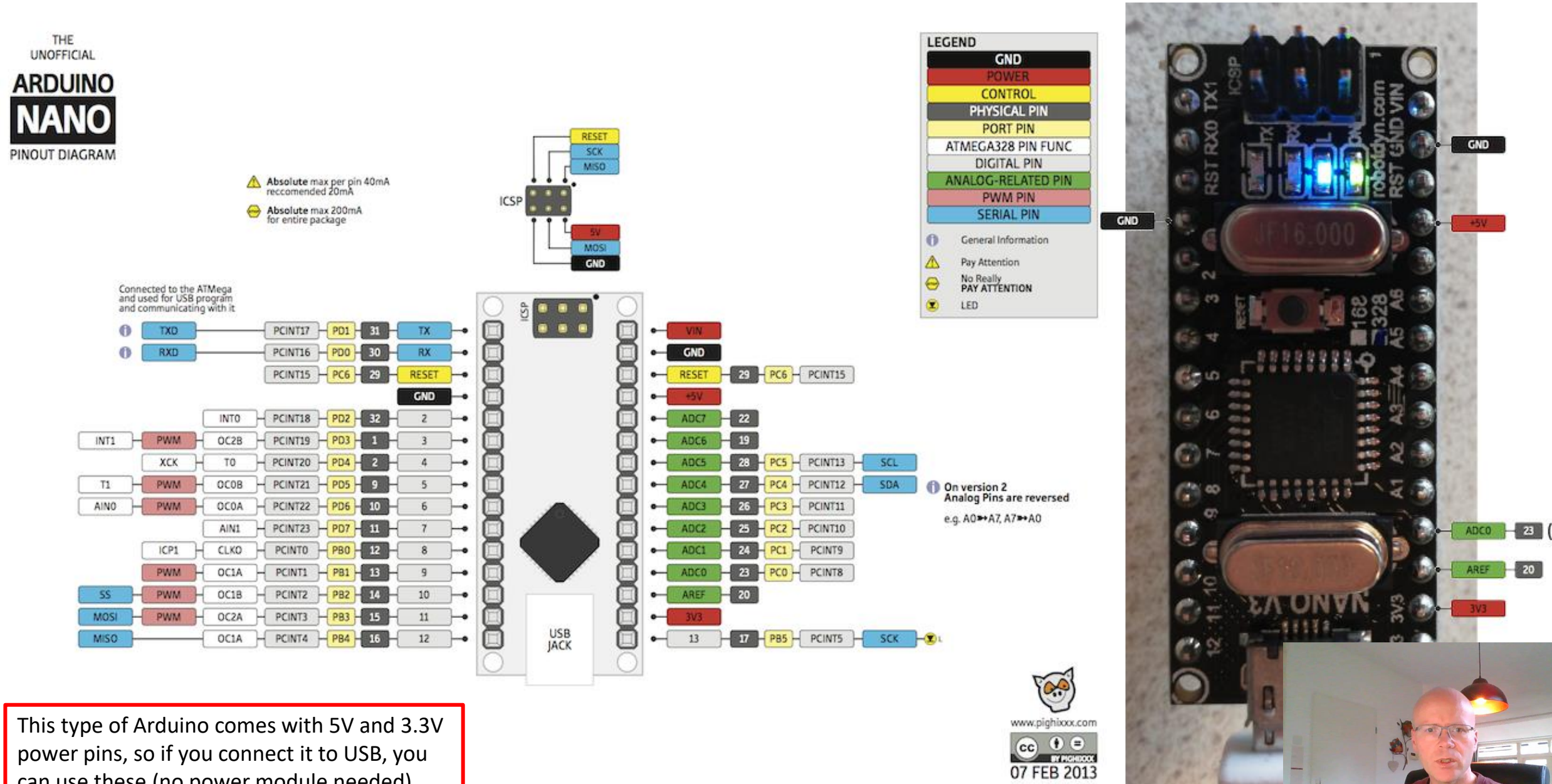
If you are going to use the ESP module, you need a power module
If using Arduino Nano, you do not need this

Connect a power source after you have finished building the prototype and verified all connections!

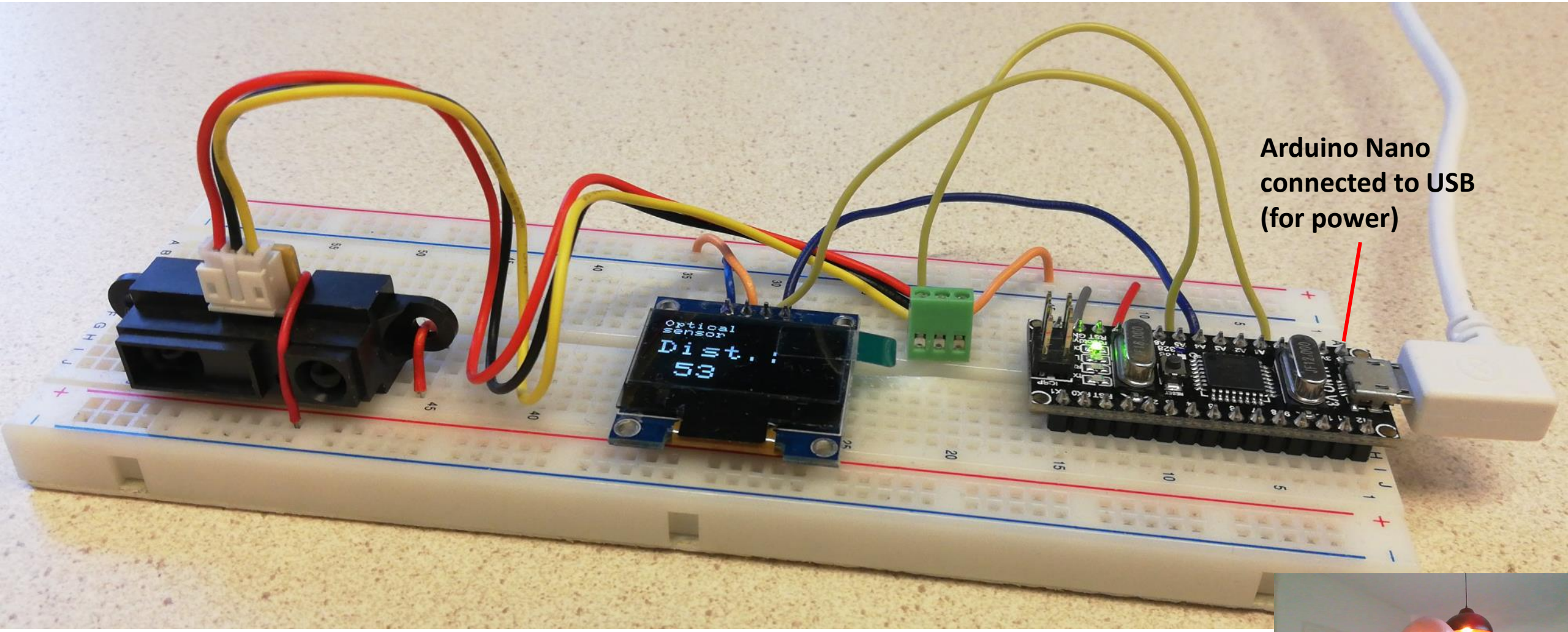
blue line connected to -

red line connected to +

If you need 5V and 3.3V power:
set 1 switch to 5V
and the other to 3.3V



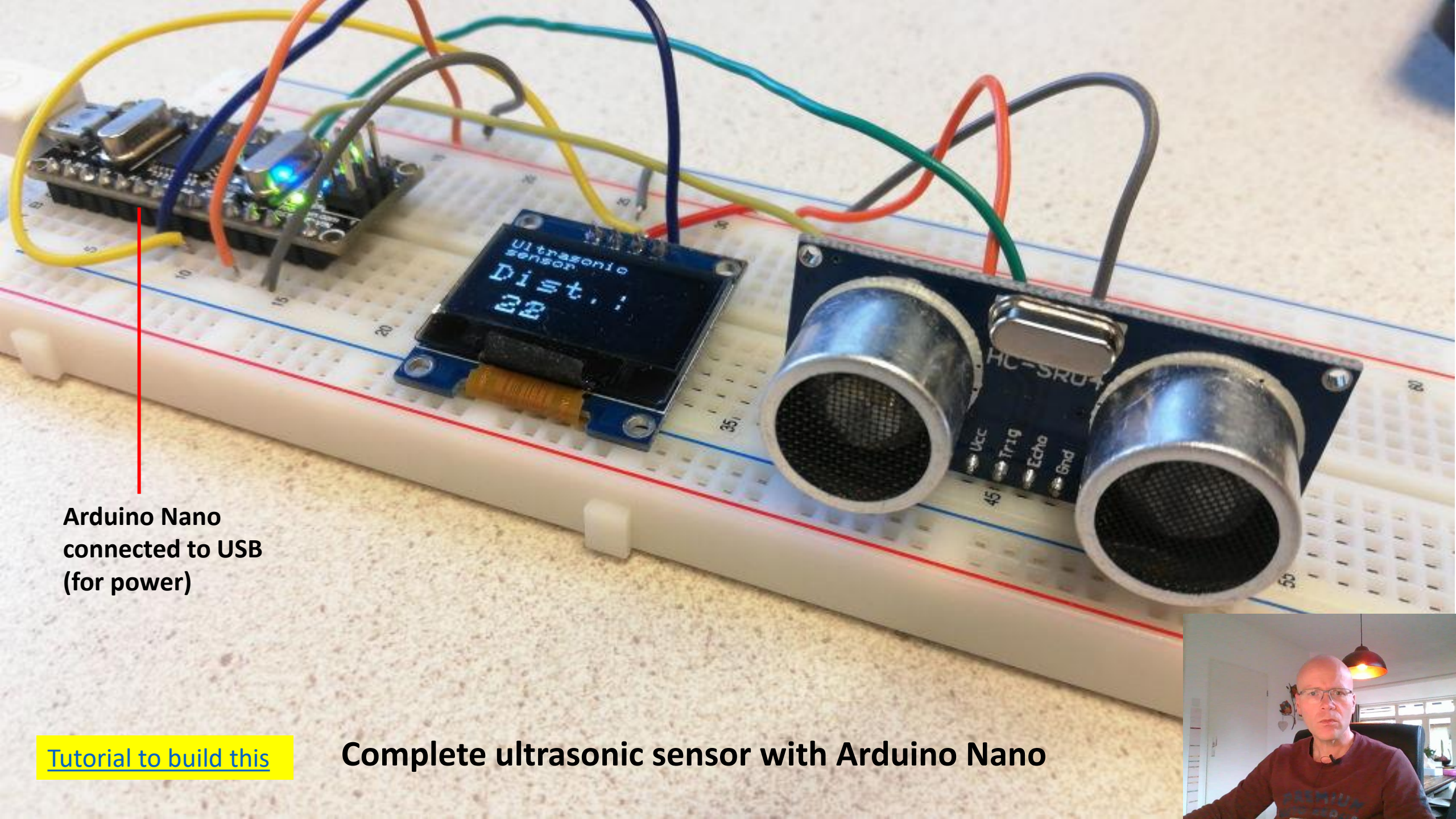
This type of Arduino comes with 5V and 3.3V power pins, so if you connect it to USB, you can use these (no power module needed),
you may also use this Arduino as a power module if you do not have one at hand ;-)



Arduino Nano
connected to USB
(for power)

[Tutorial to build this]

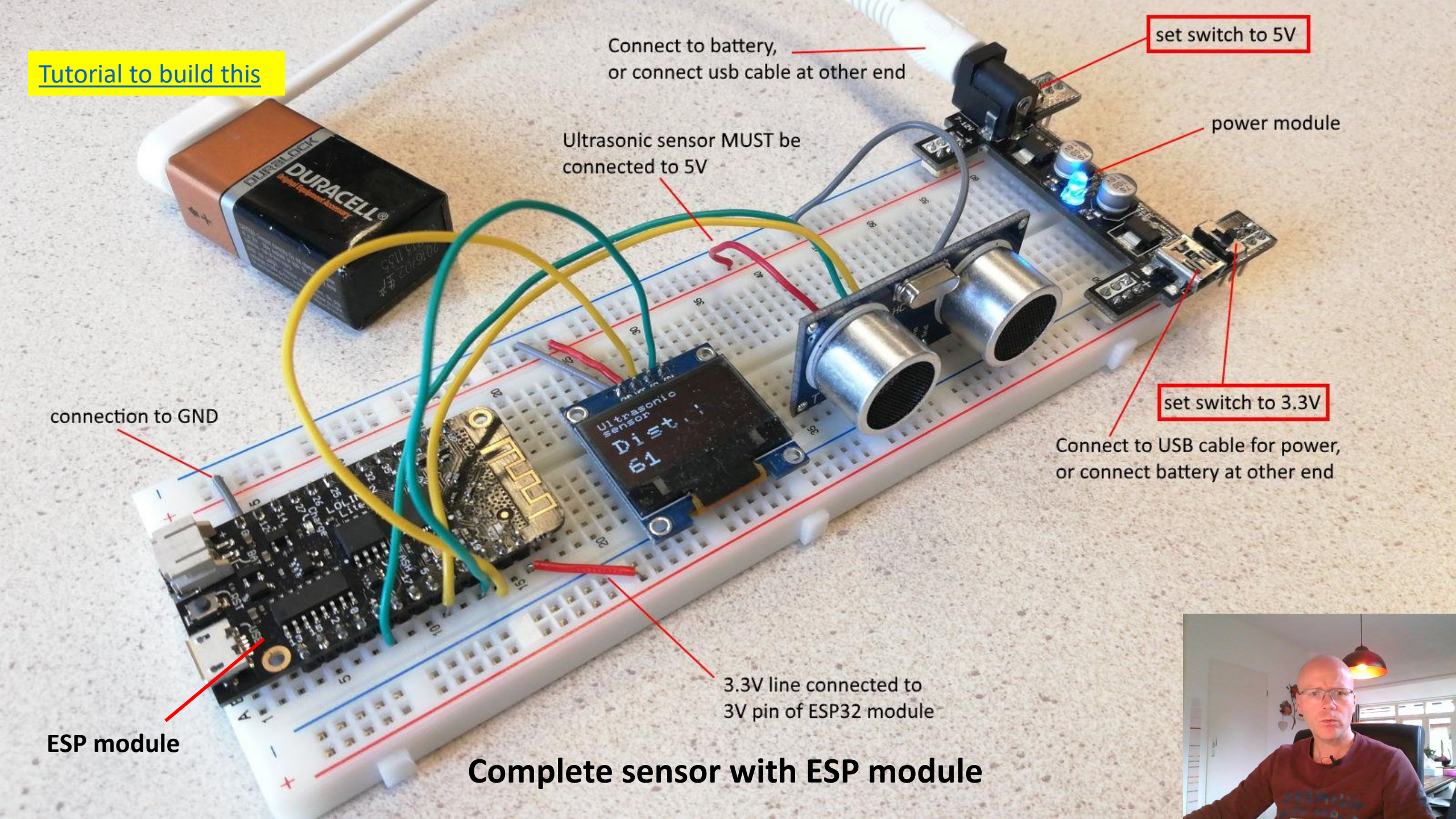
Complete optical sensor with Arduino Nano



Arduino Nano
connected to USB
(for power)

[Tutorial to build this]

Complete ultrasonic sensor with Arduino Nano



Complete sensor with ESP module

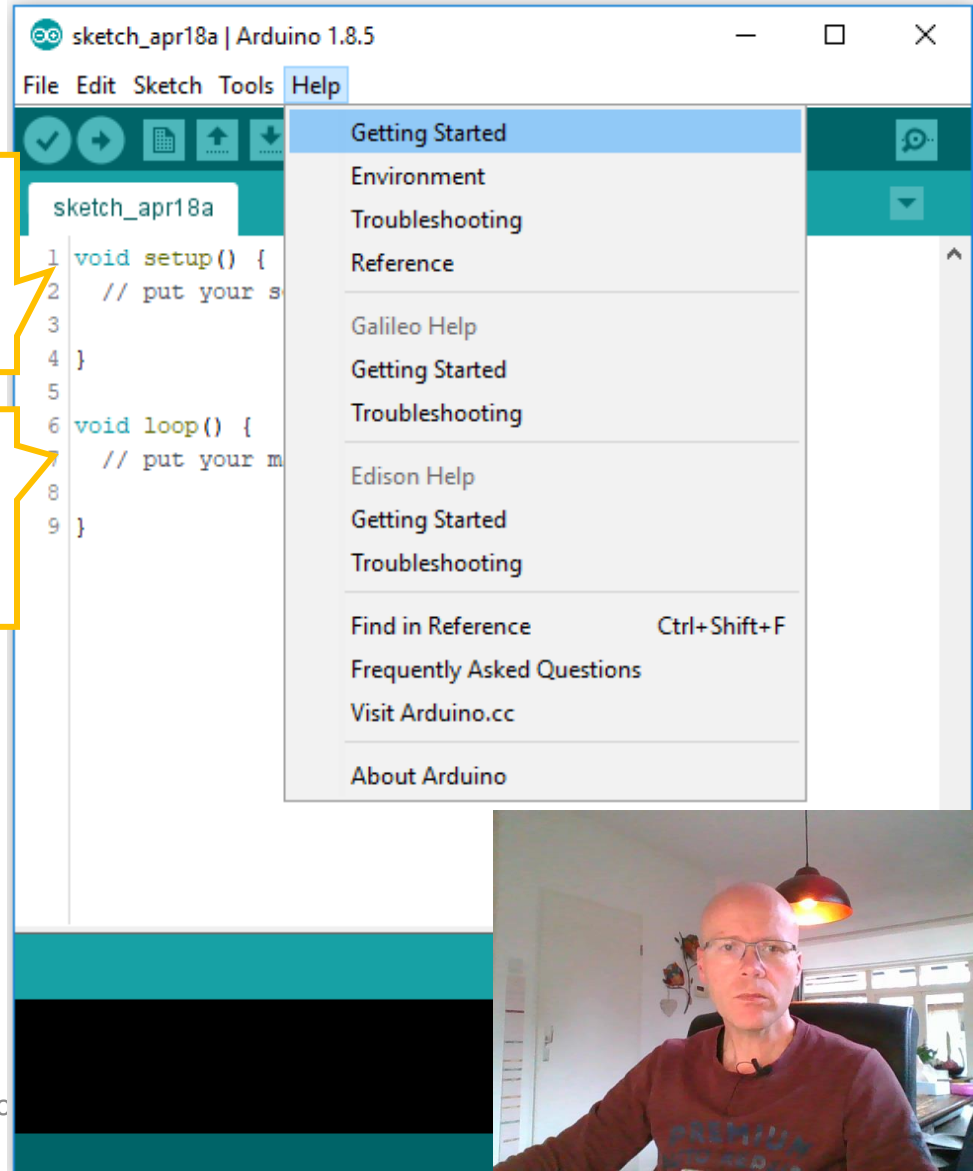
Arduino programming

- Arduino program also called: ***sketch***
- Language: C++ (similar to Java)

- Download & install Arduino Desktop IDE @ arduino.cc/en/Guide
- Start with Examples: arduino.cc/en/Tutorial/BuiltInExamples
- ... or use examples from practical

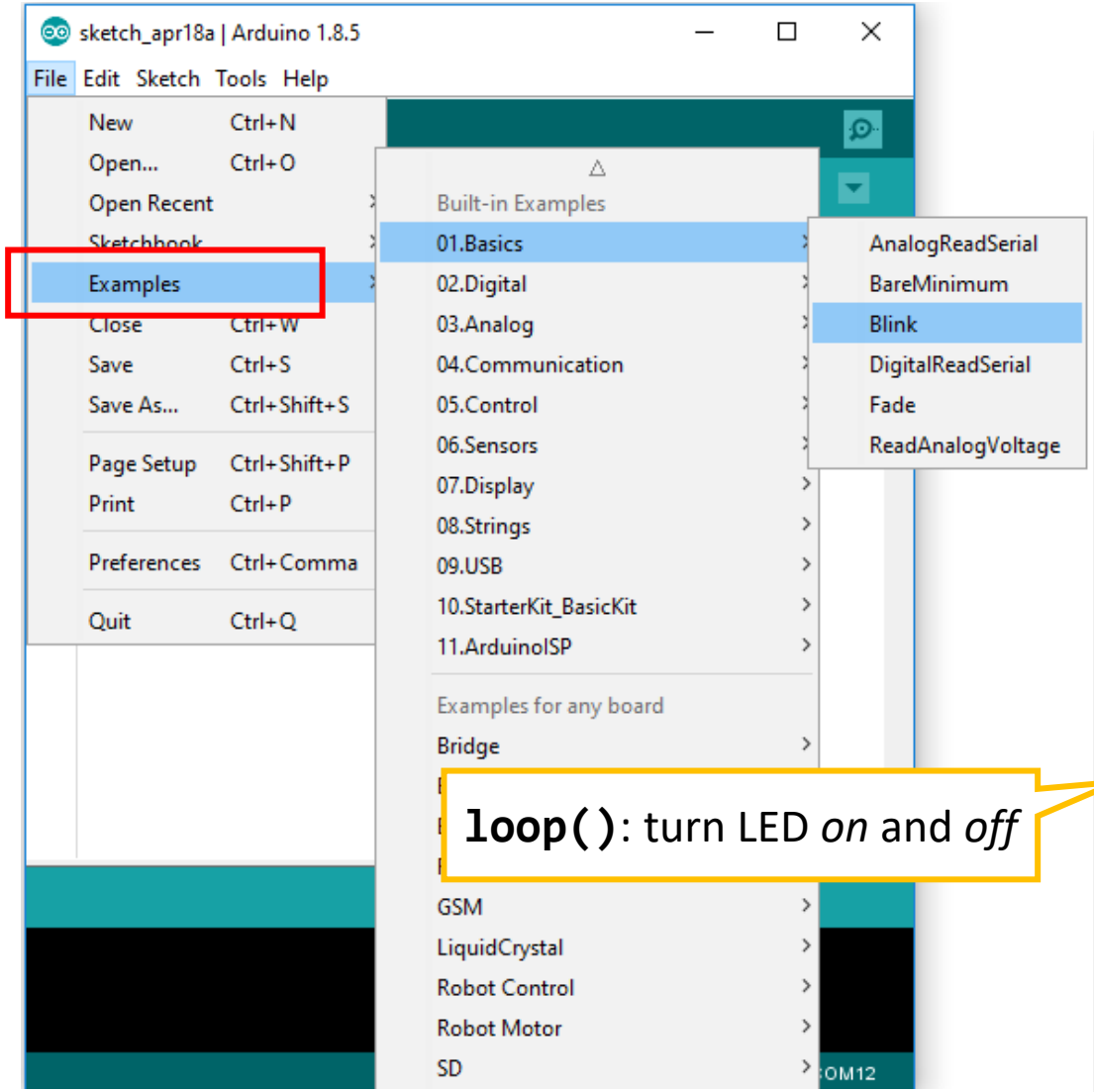
`setup()`: start of program, runs once

`loop()`: runs continuously after setup()

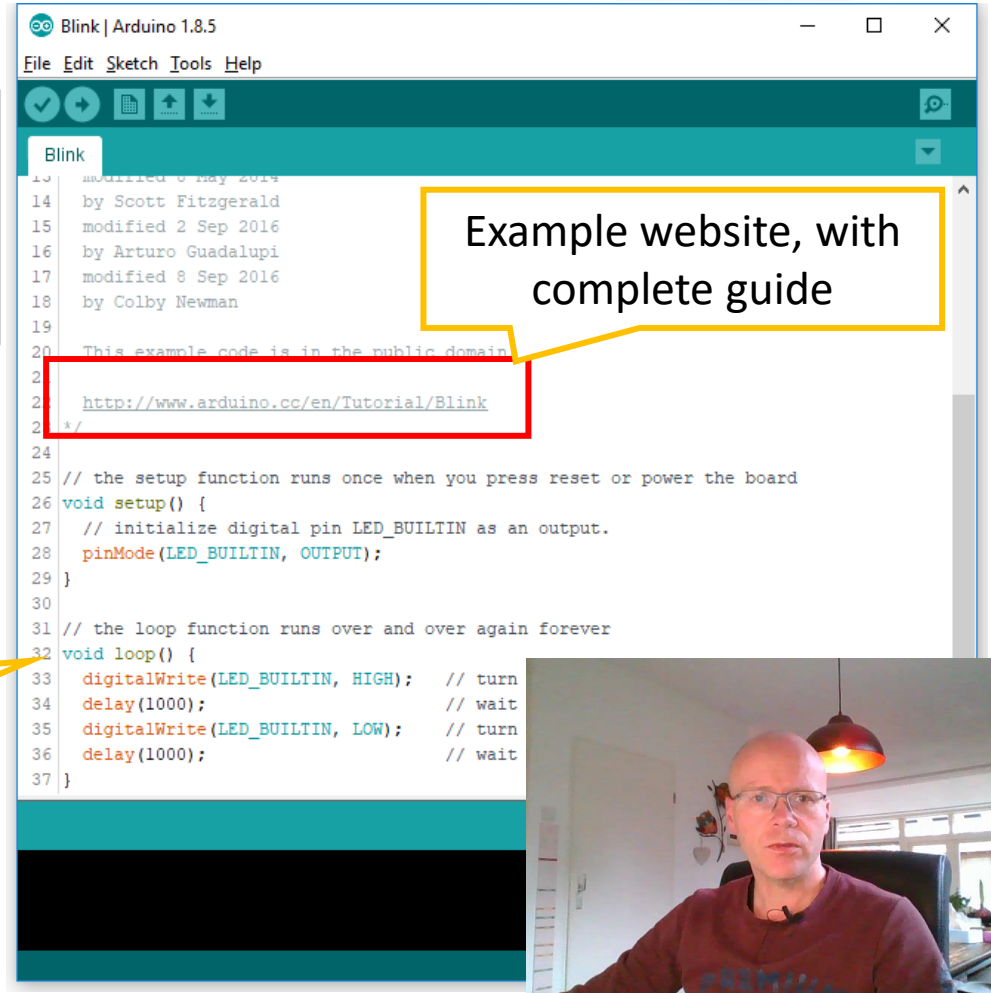


Learn from examples

`LED_BUILTIN` is the LED on the board



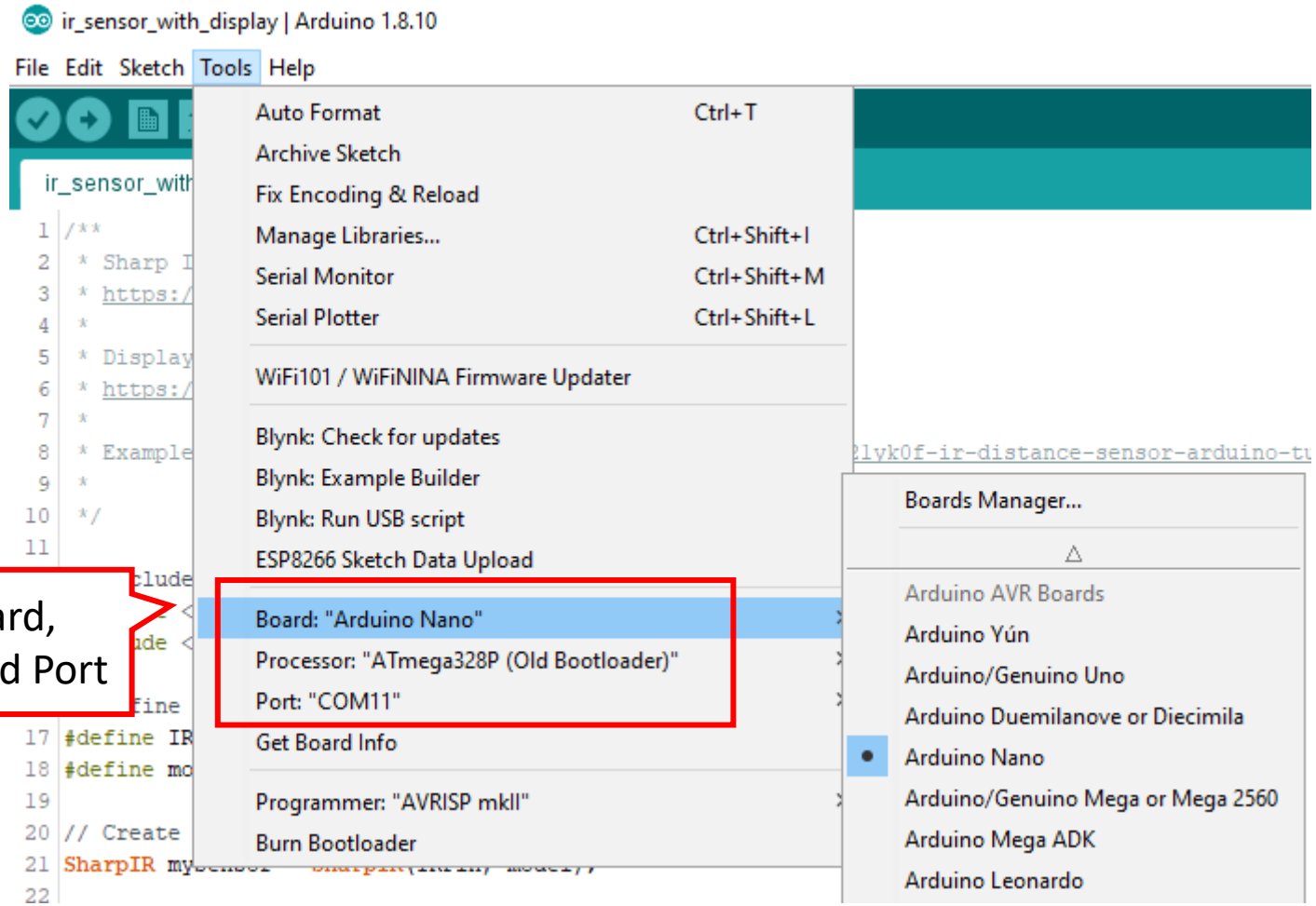
`loop()`: turn LED *on* and *off*



Example website, with complete guide

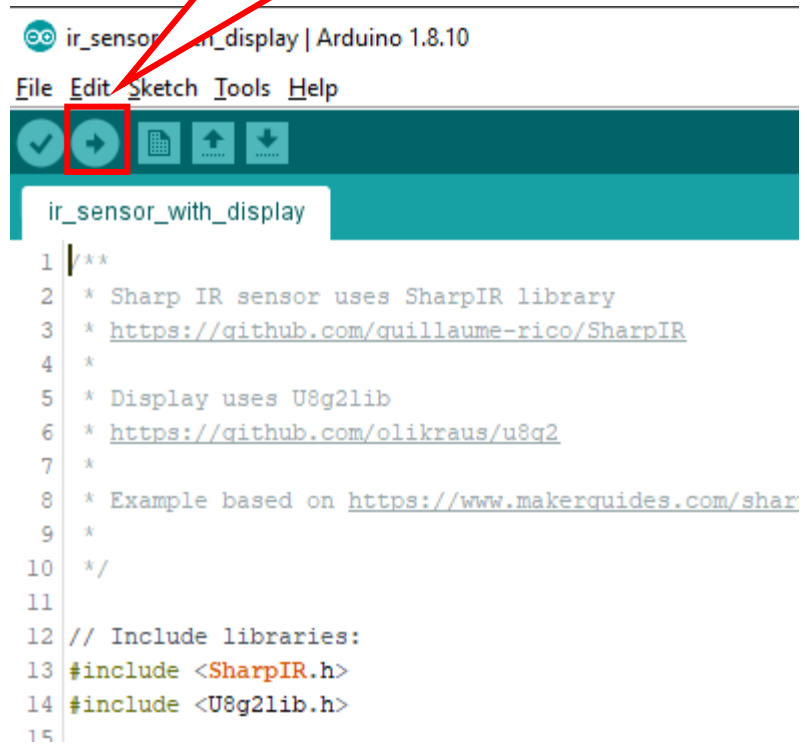
Run a program

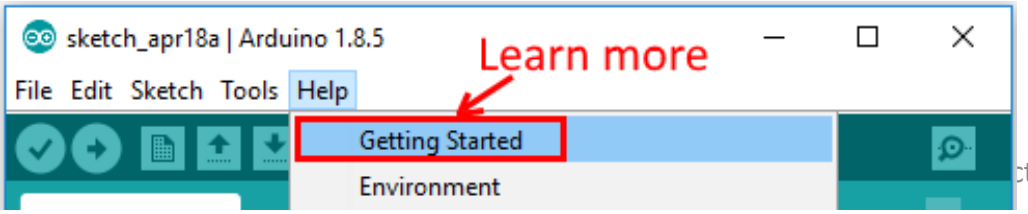
Connect USB cable first!



Select Board, Processor and Port

Click Upload





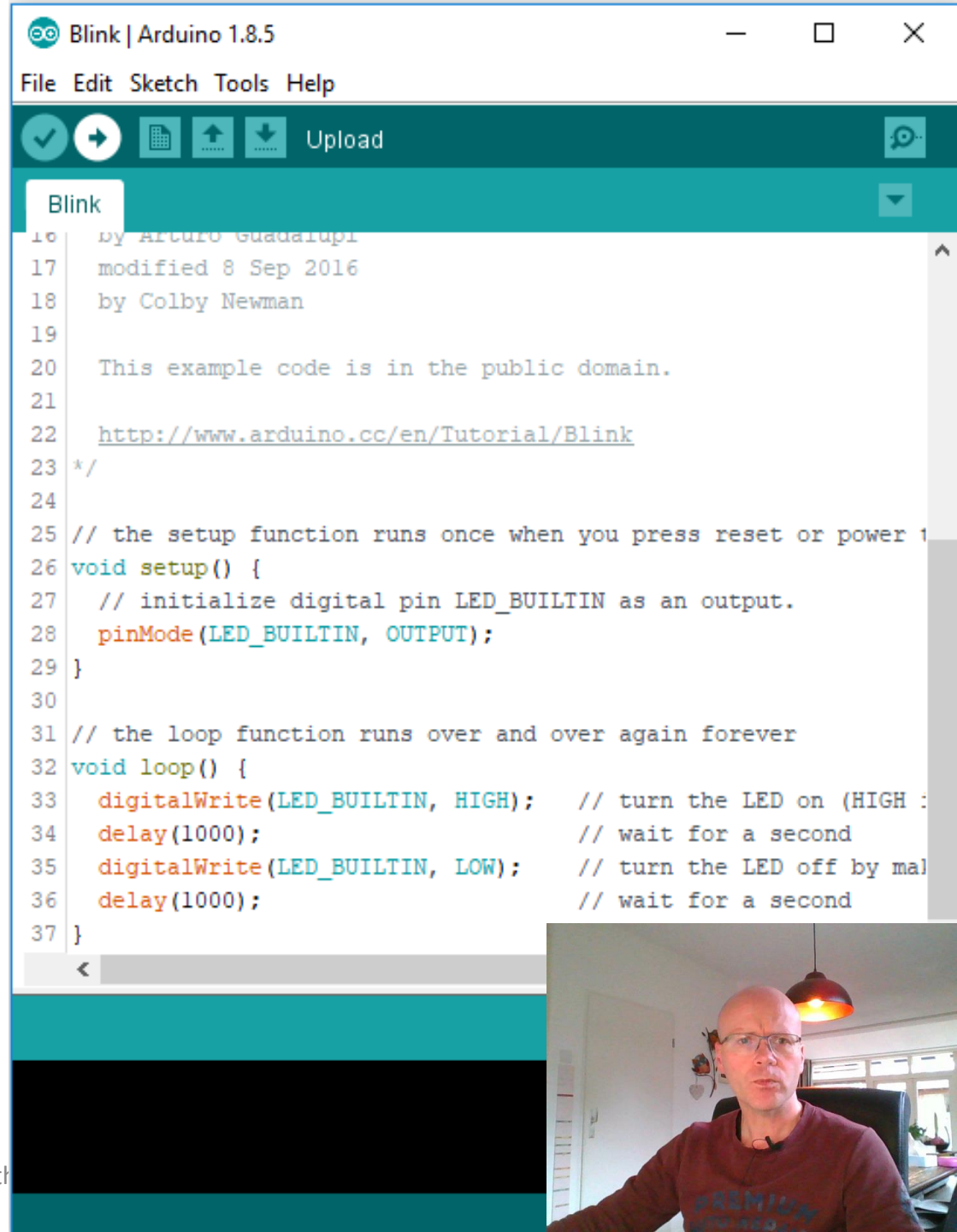
Programming

Initialize LED_BUILTIN pin as an output pin with:

```
pinMode(LED_BUILTIN, OUTPUT);
```

In the main loop, you turn the LED on with:

```
digitalWrite(LED_BUILTIN, HIGH);
```



Practical session

Get a ‘sense’ of what is involved in selecting, implementing and testing sensors

Build a sensor, test it, do some measurements (determine accuracy, validity, reliability)

Evaluate/reflect

Apply what you learned to project assignment:
- What kind of questions can be formulated regarding sensors/sensing in the quick scan?
- What can be used to improve the “Educational quick scan Industry 4.0”? (e.g. the Measurement questions)
- What can be used from this lecture/practical to create and advise on how to achieve a greater industry 4.0 maturity (future state)?

Goto **vanslooten.com/i40/sensor-practical** to do the practical

QUESTIONS?

vanslooten.com/i40

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