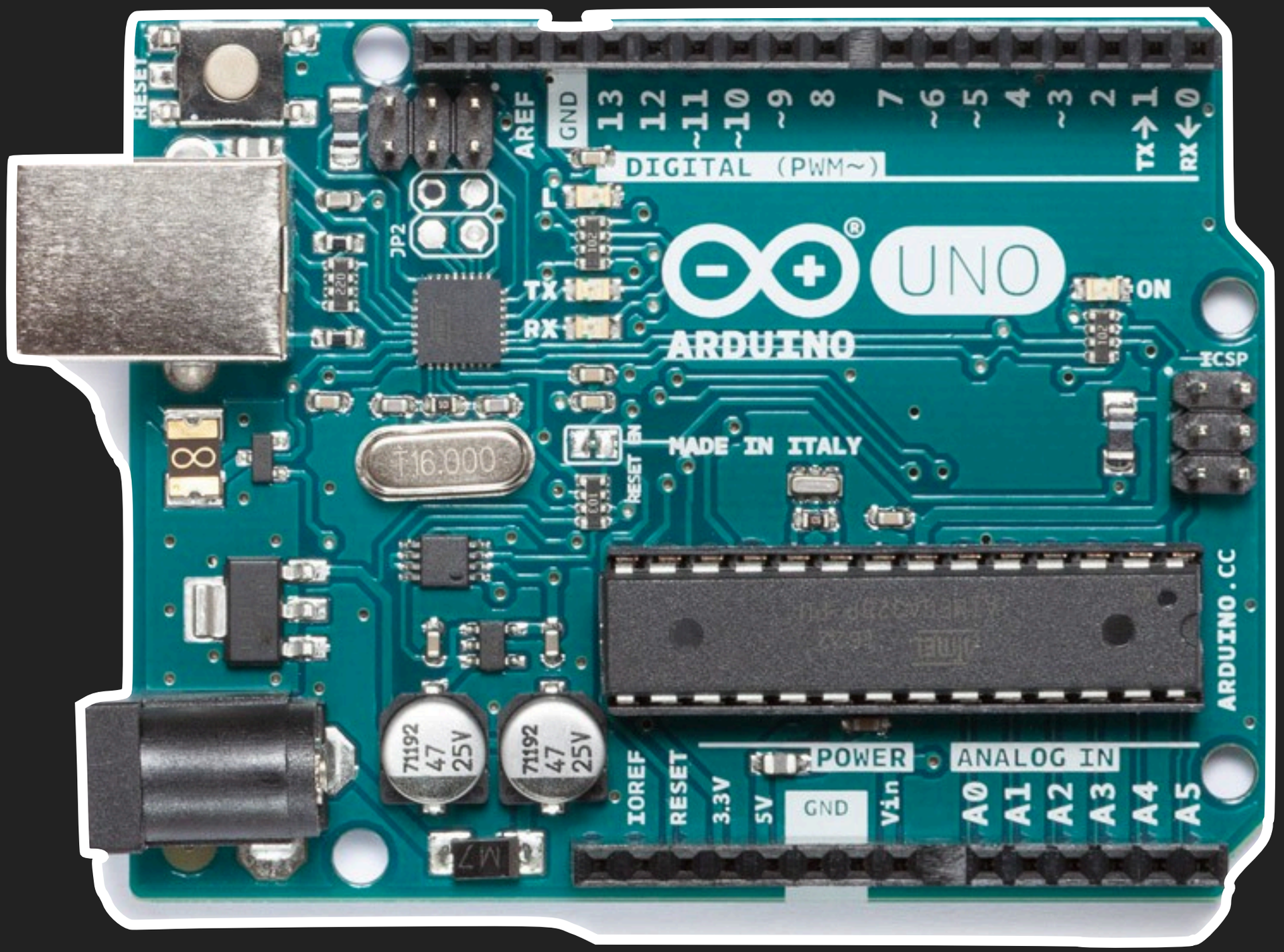
GETTING STARTED: A HANDS ON LOOK (PART 1)

ARDUINO

WHAT IS ARDUINO

- Open Source electronics platform.
- Easy to use
  - hardware
  - software
- C based programming language
- Simple for beginners; flexible for advanced
- Inexpensive

A CLOSER LOOK



WHY ARDUINO

- Simple for beginners; flexible for advanced
- Inexpensive
- Easy to interact with the real world
  - So many sensors
    - SparkFun: 237 different sensors
    - Adafruit: 176 different sensors
    - Build your own…
  - So many effectors:
    - SparkFun and Adafruit: over 500 each
- Walk on the shoulders of others

GETTING STARTED

- IDE vs Simulator
  - For start, use simulator
  - need to know both
- Sign up at http://www.tinkercad.com
- Download IDE or use new Web based IDE from www.arduino.cc

ARDUINO PROGRAMMING 101

- Based on C
- Programs referred to as sketches
- Global variables are your frenemy
  - advanced projects consider Structs and Classes
- remember your ;
- Built in functions (https://www.arduino.cc/reference/en/)
- Can use interrupts

TWO TRUTHS

- void setup() { }
- void loop() { }

COMMON METHODS AND VARIABLES

- pinMode(PIN_NUMBER, MODE)
  - INPUT, OUTPUT, INPUT_PULLUP
- HIGH, LOW
- Serial.begin(9600);
- Serial.println();
- delay
- digitalRead, digitalWrite
- analogRead, analogWrite

ANATOMY OF A SKETCH

- import libraries and define any global variables
- setup function
  - set pin modes appropriately
  - turn on serial debugging if desired
  - execute some code once and only once
- loop
  - main body of work

HELLO WORLD

- Blinky -> arduino version of HelloWorld
  - Turn on internal led for 1 second; turn off for 1second
- In Tinkercad, Create a new circuit
- add an arduino
- click on “Code” to see solution
- click Run Simulation

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HELLO WORLD 2

- Modify Blinky from before to power an external LED
- Add a bread board
- Add a LED (Anode is +, Cathode is -)
- Add a resistor
  - What value?
- Wire them together

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FIZZBUZZ THE ARDUINO EDITION

- Lets get used to arduino a little more
- Create a new circuit
  - Arduino, breadboard, resistor, led
- Edit code to turn led:
  - % 3 on for 1 second
  - % 5 blink 2 times in a second
  - %3 and %5 both

DIMMING A LED

- a little more advanced
- How do you dim a LED?
  - Increase resistance
  - Fake it
- Lets try both ways

DIMMING A LED

- Build a simple LED circuit with and Arduino and resistor and turn LED on all the time
- Try to increase resistance of LED from 330 ohms to larger values

DIMMING A LED

- Build a simple LED circuit with and Arduino and resistor and turn LED on all the time
- LEDs can be pulsed to simulate dimming
- Lets try this in the loop

```
digitalWrite(LED_PIN, HIGH);
delay(100);
digitalWrite(LED_PIN, LOW);
delay(100);
```

- Try changing the delay to have difference times?

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- What was wrong with doing your own PWM?
- Built in PWM on certain pins (~)
- use analogWrite on a digital pin

PWM EXAMPLES

- analogWrite(LED_PIN, 255);
- analogWrite(LED_PIN, 50);
- Color LEDs
- Create a simple function

```
void showColor(byte r, byte g, byte b) {

 analogWrite(led_1, r);

 analogWrite(led_2, g);

 analogWrite(led_3, b);

}
```

- Now call showColor to control

SLIGHT SIDE TRACK (NOTHING ARDUINO HERE)

- Check this out for later:
  - https://www.tinkercad.com/bricks

THINGS OF NOTE

- http://www.arduino.cc
- http://tinkercad.com
- https://create.arduino.cc/projecthub/hwhardsoft/crazy-arduino-hose-display-7ba425