

# Assemble, Program, and Play Mini Game System

Presentation URL: <http://goo.gl/jFK3vv>



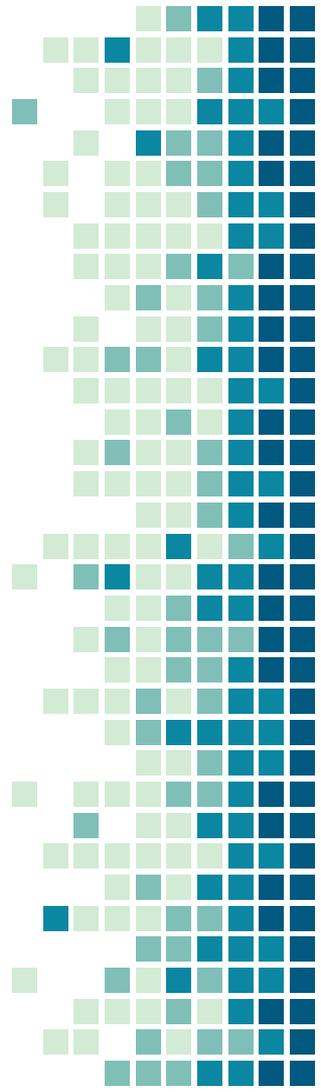


# HELLO!

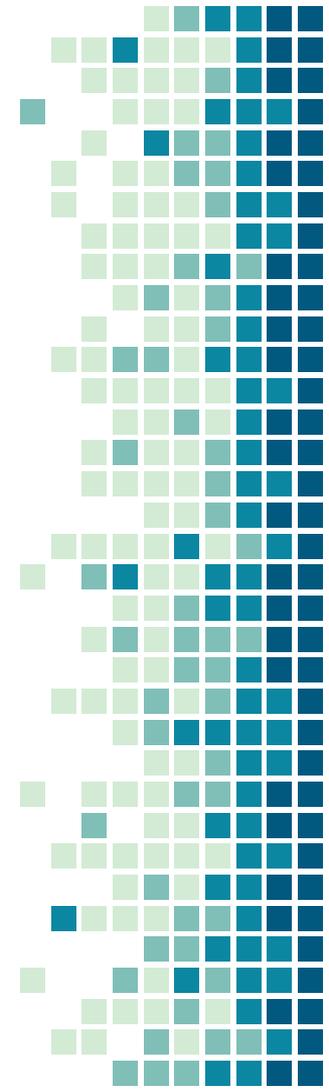
**I am Jesse Campbell...**

You can find me at

<http://www.jbcse.com>



# STEPS



1.

# Introduction

What is Arduino and Arduboy?

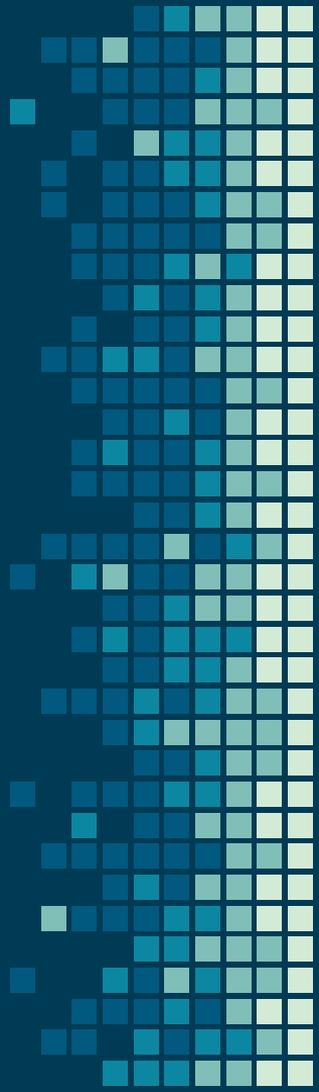




# Arduino is...

Type of small, embedded computer.

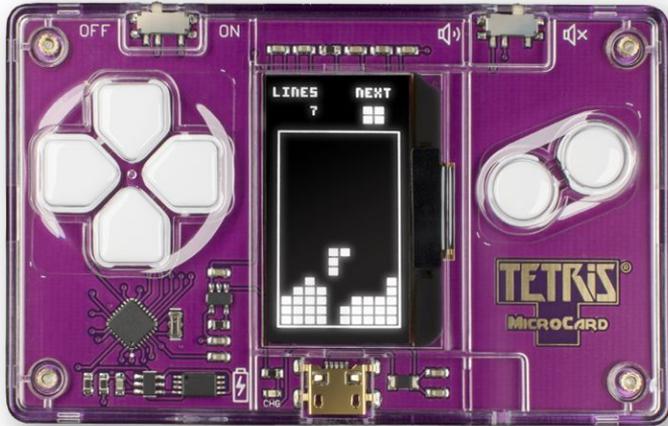
Fast enough to play basic games.





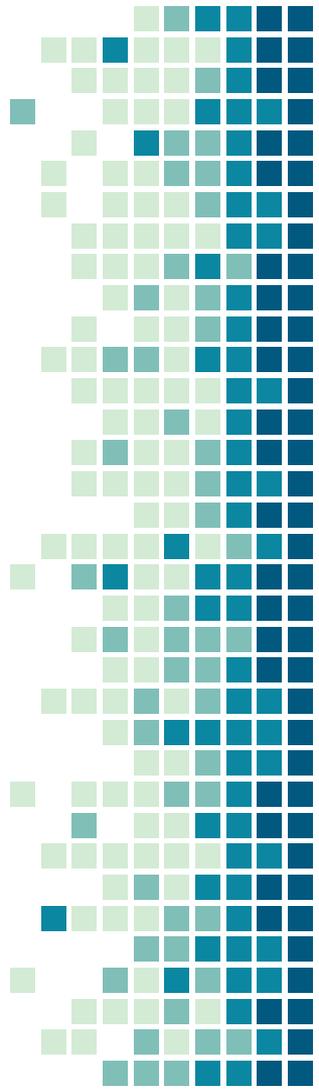
# Aruboy

- Arduino-based game platform
- Games are written in C++
- Has about 100 games
- No cartridge slot
- Sold commercially for ~\$50
- Common commodity hardware



# Tetris Microcard

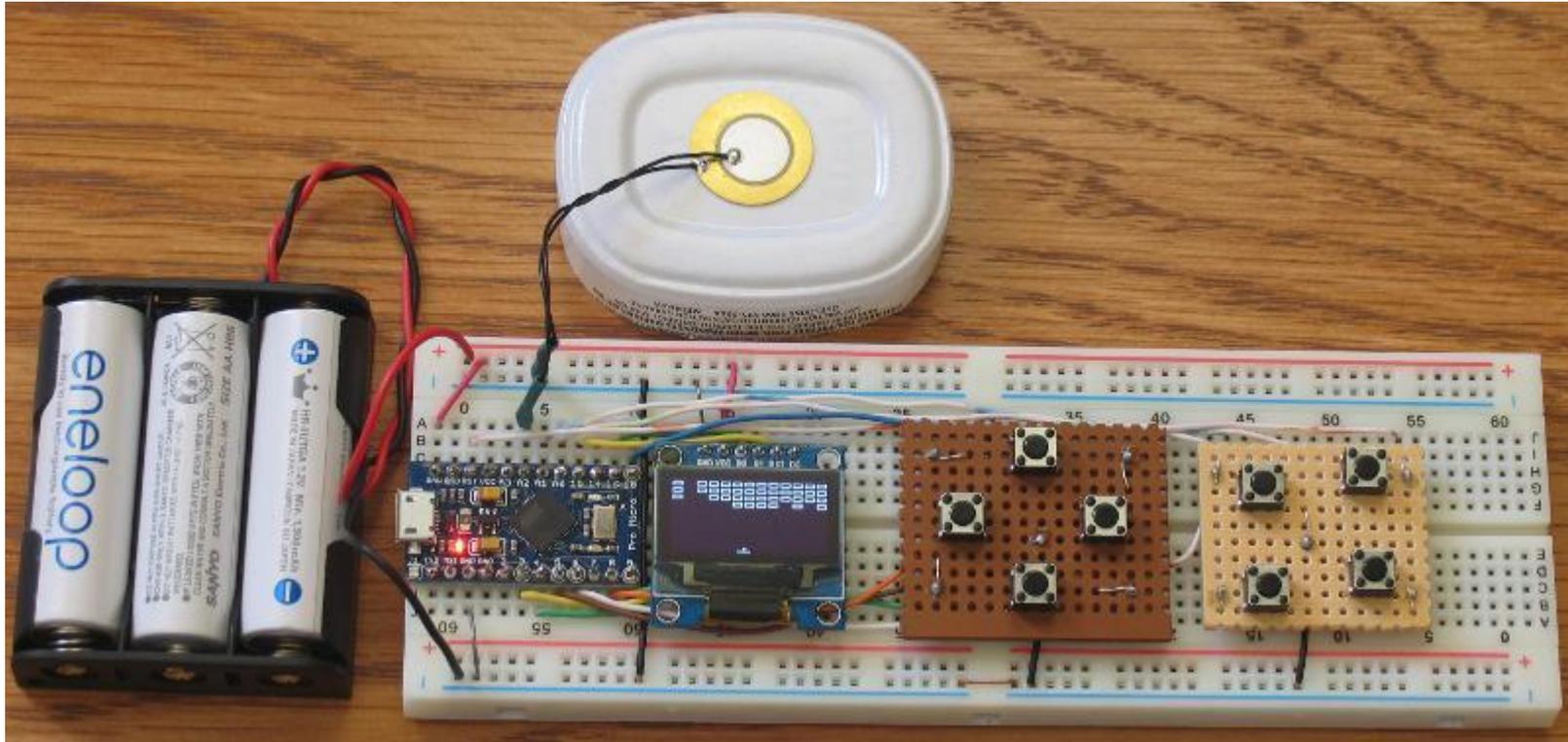
- Variation of Arduboy
- Only plays Tetris
- Closed source
- Licensed by Tetris LTD



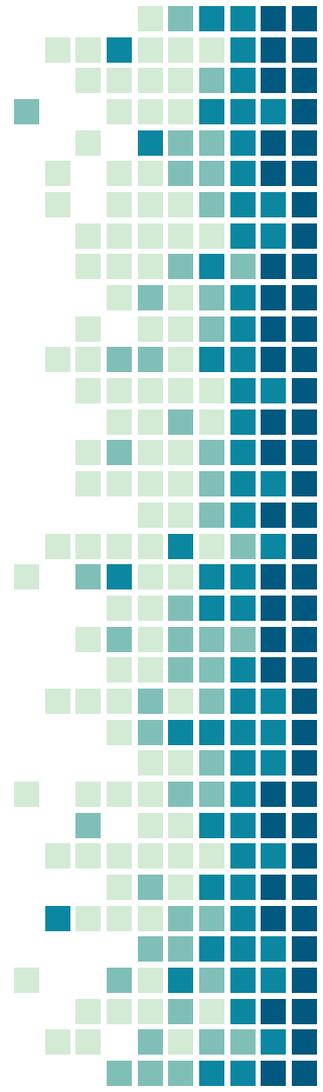
# Arduboy Compatible Clones



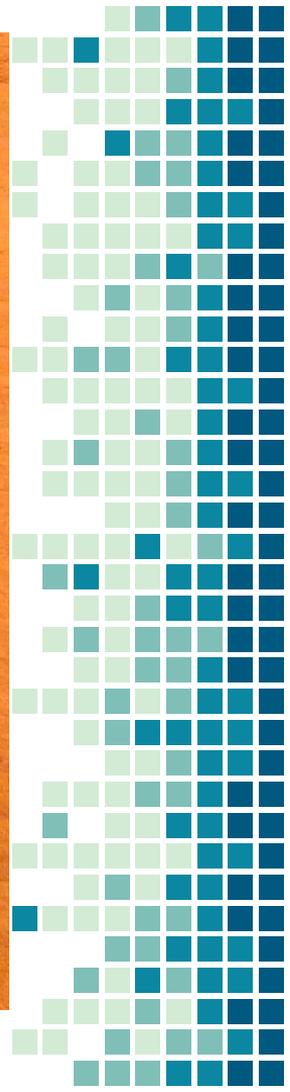
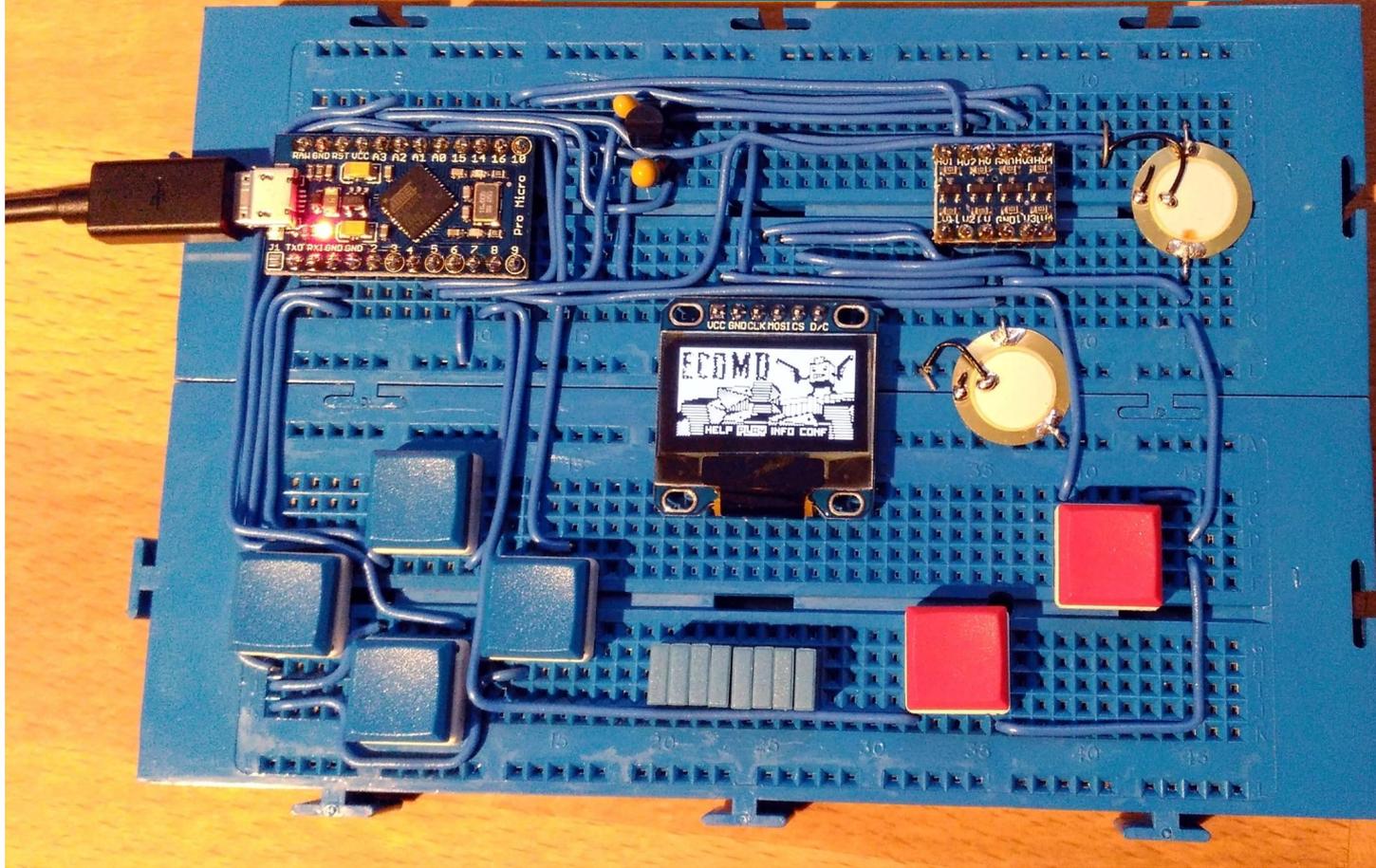
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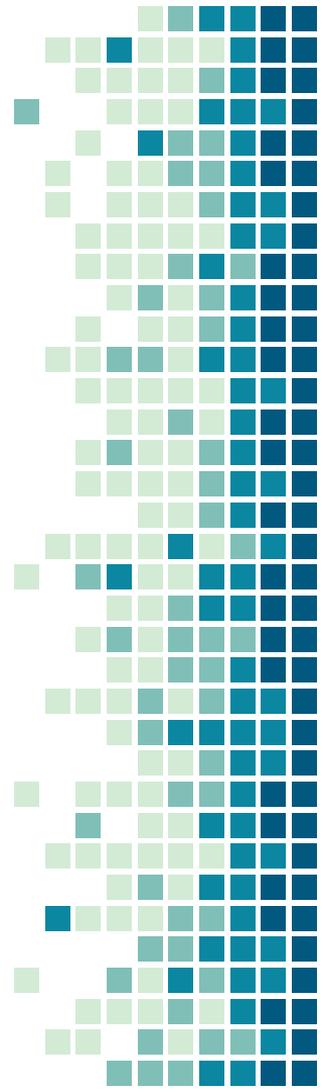
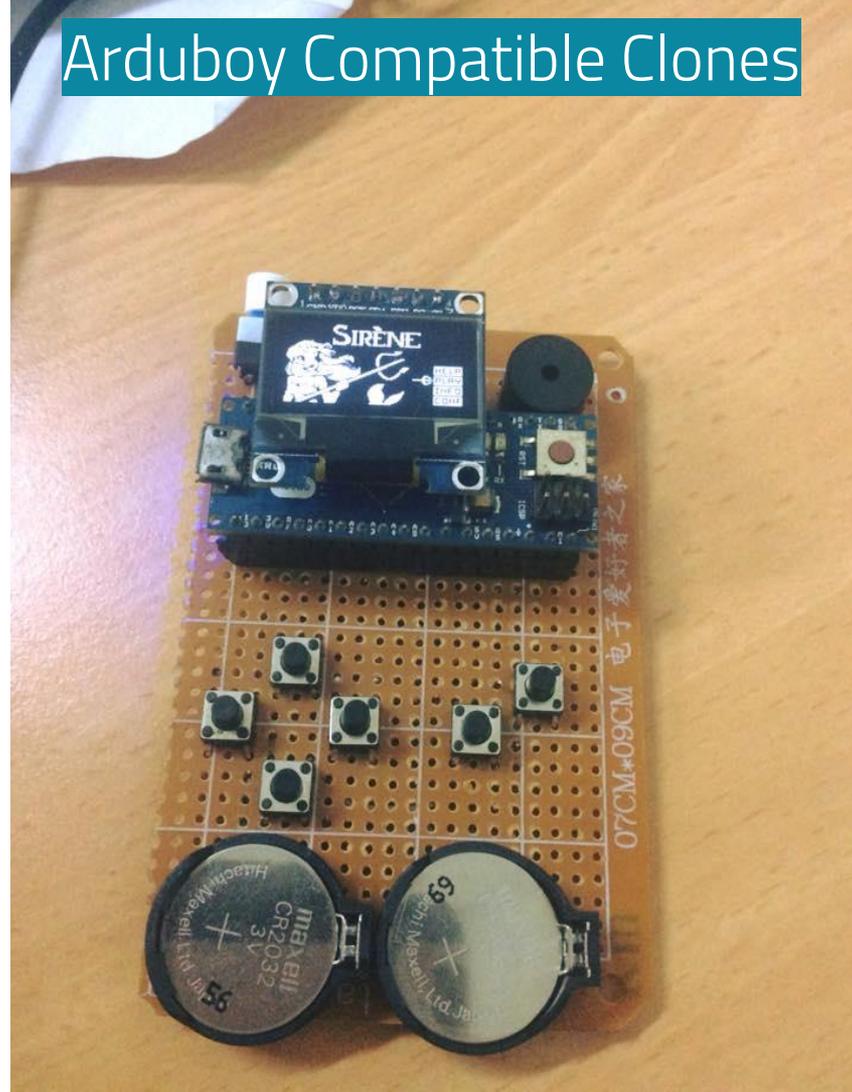
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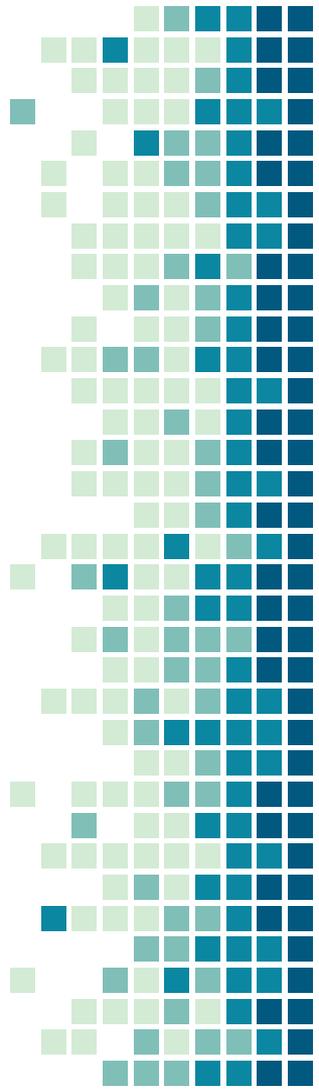
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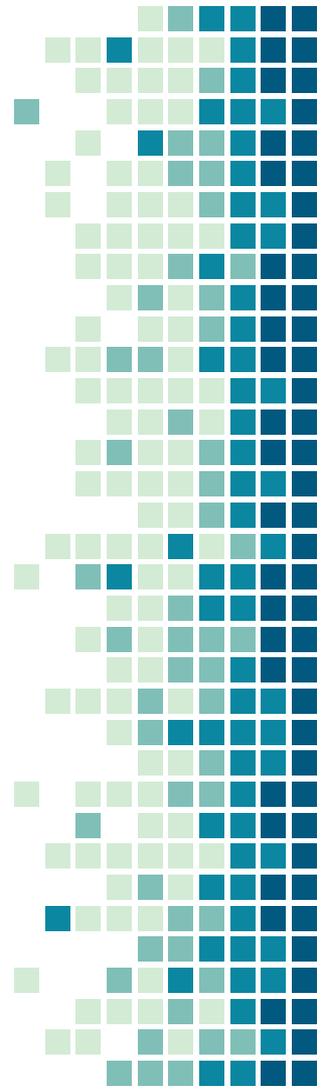
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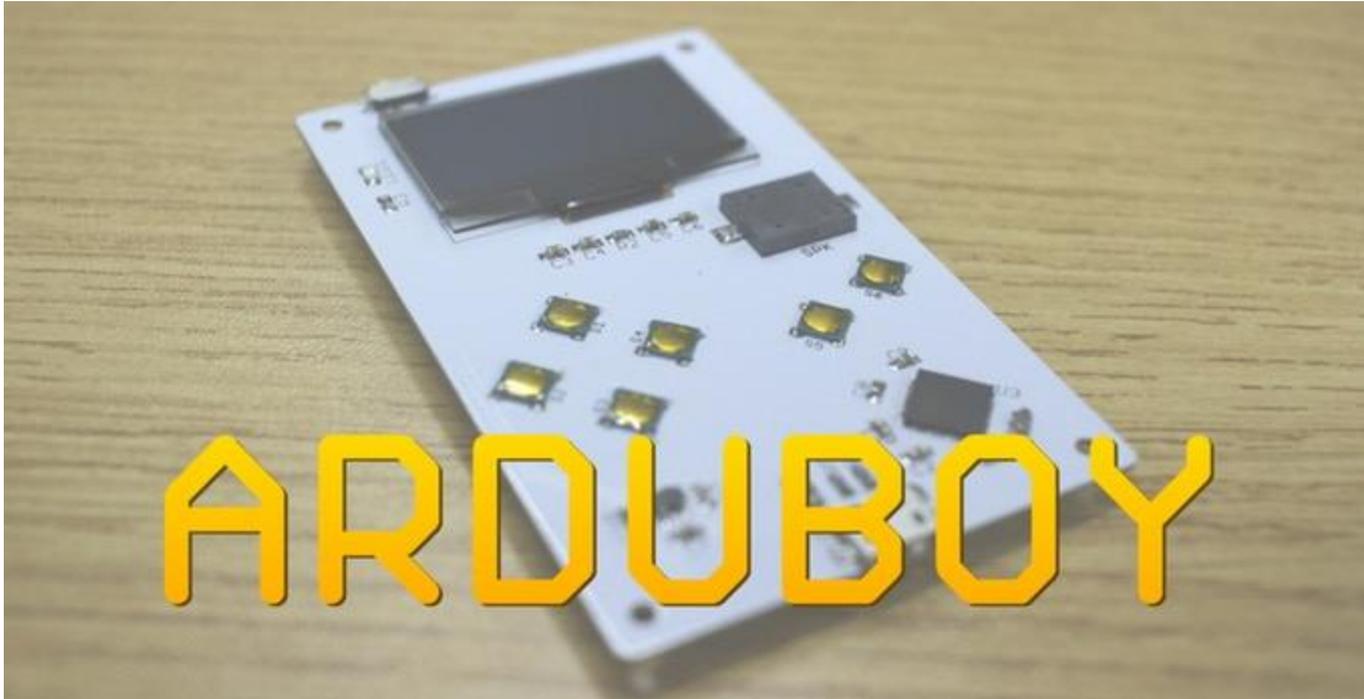
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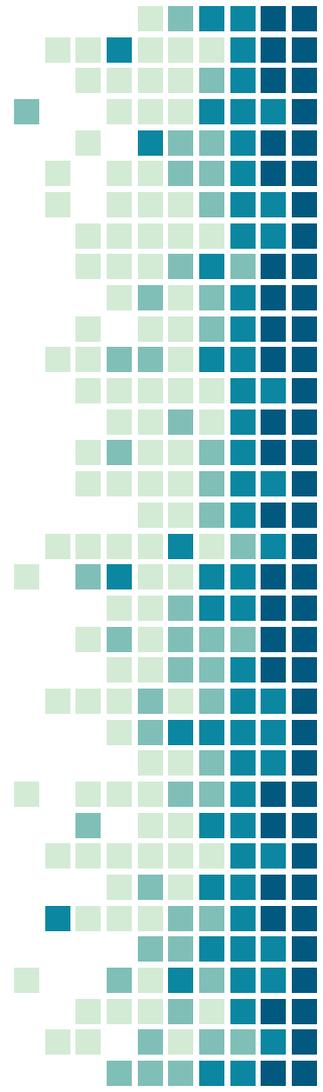
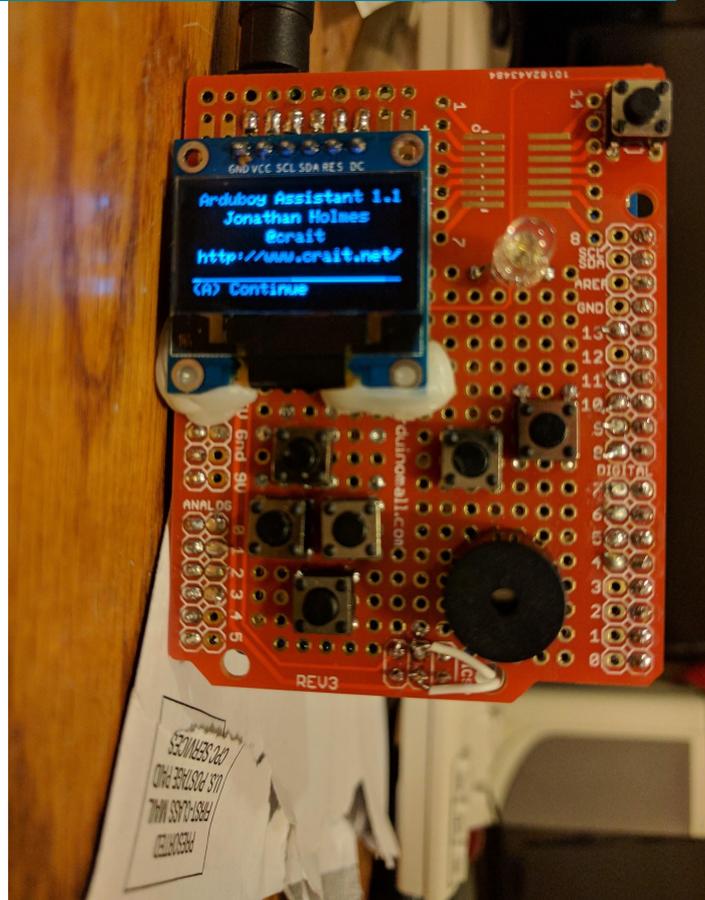
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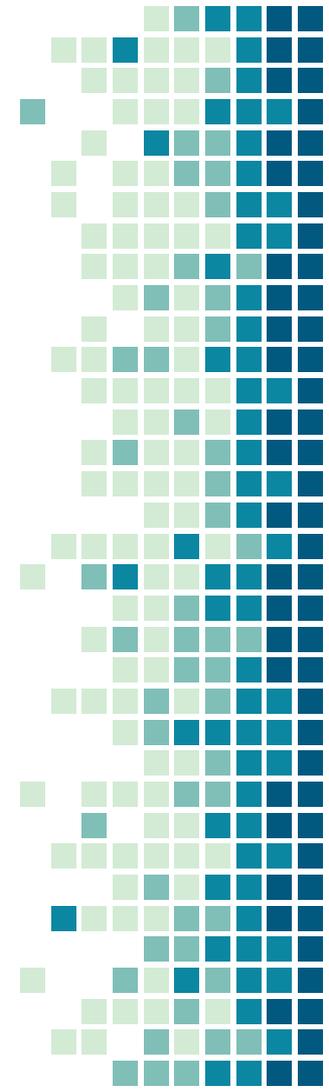
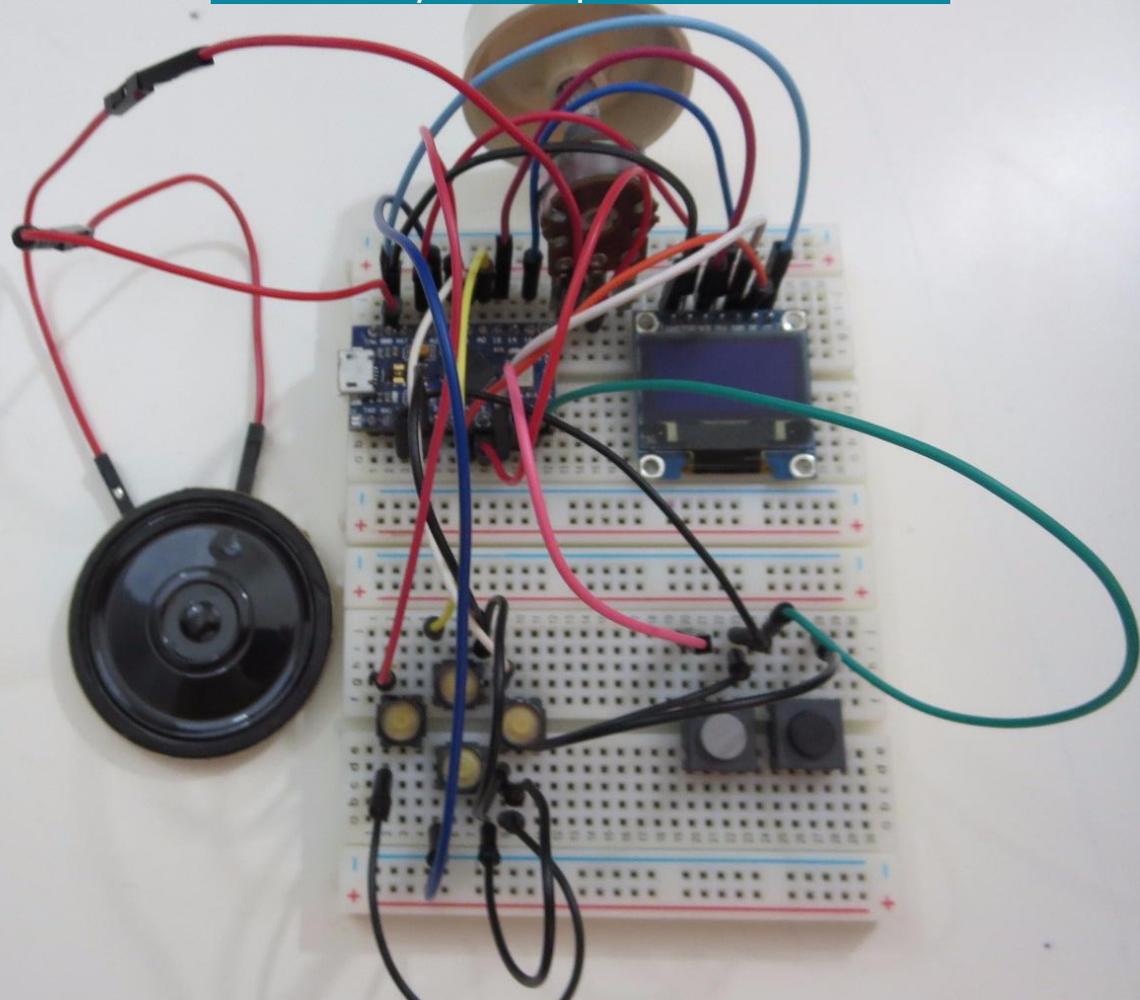
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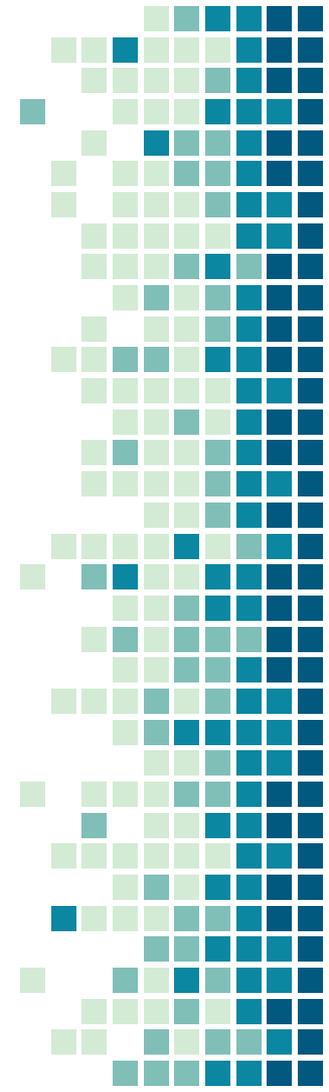
# Arduboy Compatible Clones



# Arduboy Compatible Clones



# Arduboy Compatible Clones



# PCB Design

- Wiring Table

Display Pin	Pro Micro Pin
Data	16
Clk	15
DC	4
Rst	6
CS	GND
3v3	(not connected)
Vin	VCC
Gnd	GND

Buttons - Tie one pin of each button to GND and the other pin to:

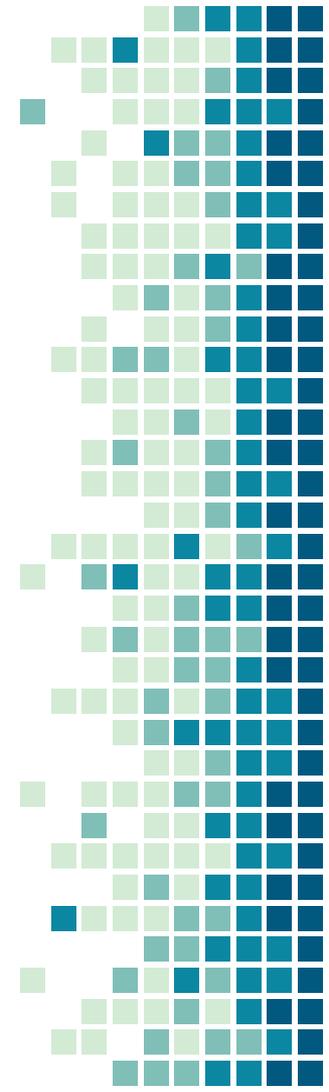
Button	Pro Micro Pin
A	7
B	8
UP	A0
RIGHT	A1
LEFT	A2
DOWN	A3

Plezo Speaker:

Speaker Wire	Pro Micro Pin
1	5
2	GND

RGB LED - Tie the anode to VCC. The cathode of each LED should go to an appropriate dropping resistor and the other side of the resistor should go to:

Resistor for Color:	Pro Micro Pin
Blue	9
Red	10
Green	3 (with custom library)

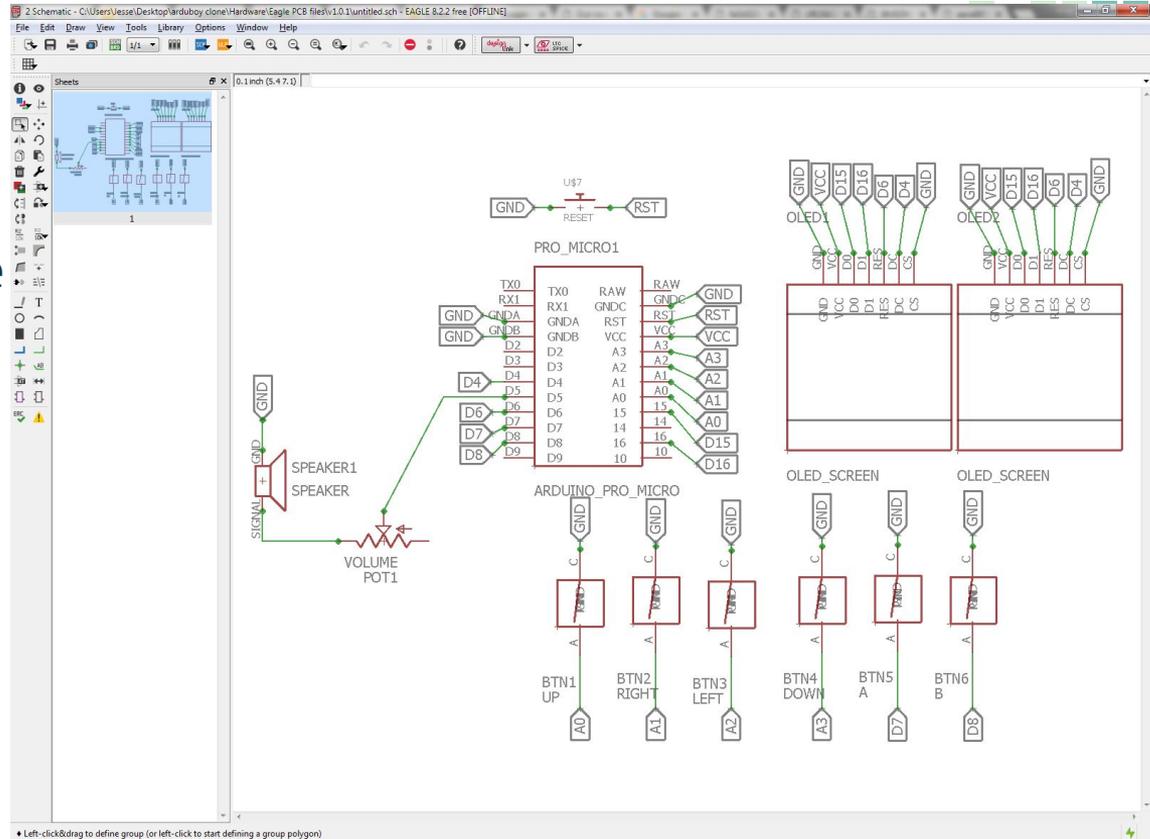


# PCB Design

Created in Autodesk Eagle

Eagle is free for small 2-sided boards.

Boards ordered from [Seed Fusion](https://www.seeedstudio.com/)

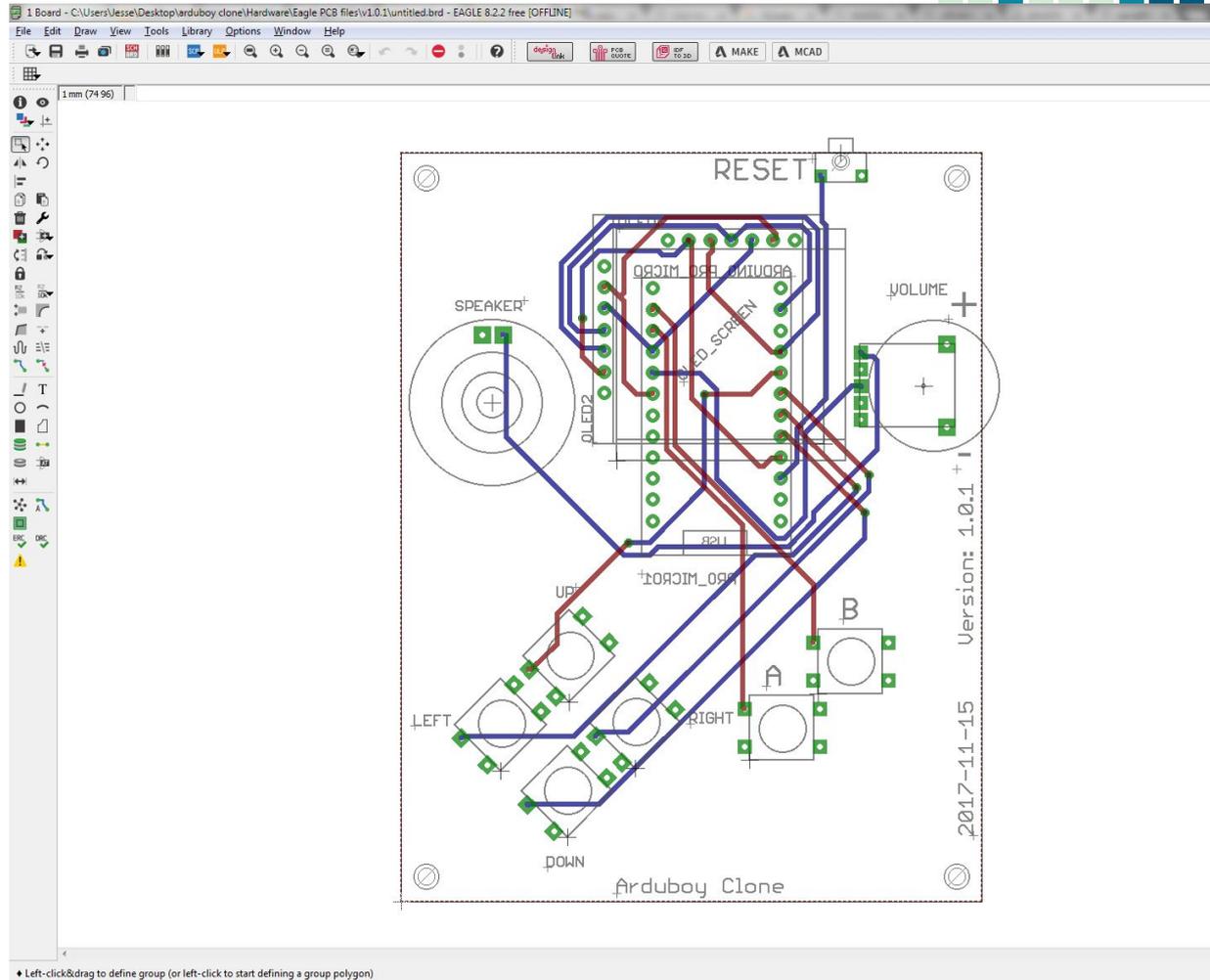


# PCB Design

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2.

# Assembly

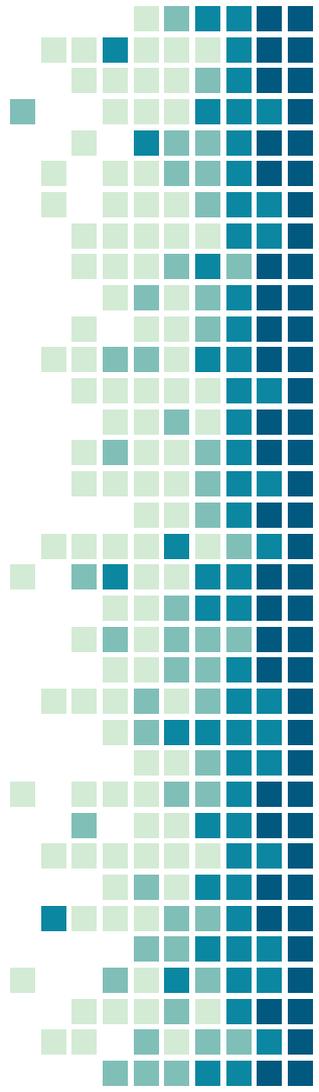
Assemble according to instructions



# Assembly Materials

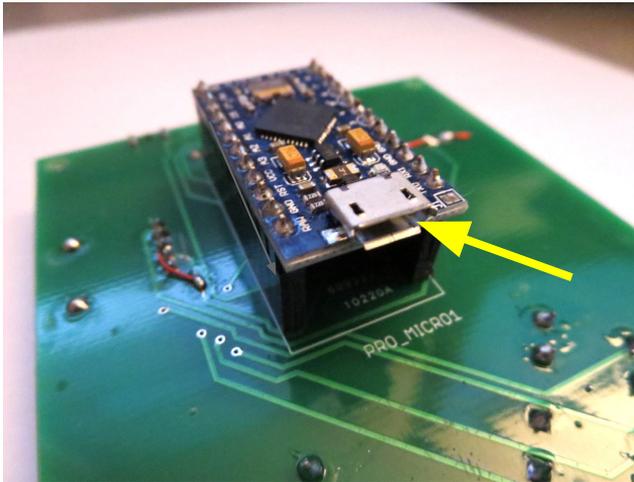
- [Arduino Micro clone](#) (without reset button)
- [OLED display 0.96"](#) SSD1306 128x64 resolution
  - **Blue** or **White** available
- [Buttons](#), [speaker](#), [knob](#), [headers](#), [reset btn](#), etc.
- Printed Circuit Board (PCB) - Gerber files avail.

These items are available on eBay and Aliexpress.  
Part cost to produce 10 is about **\$10/each**.



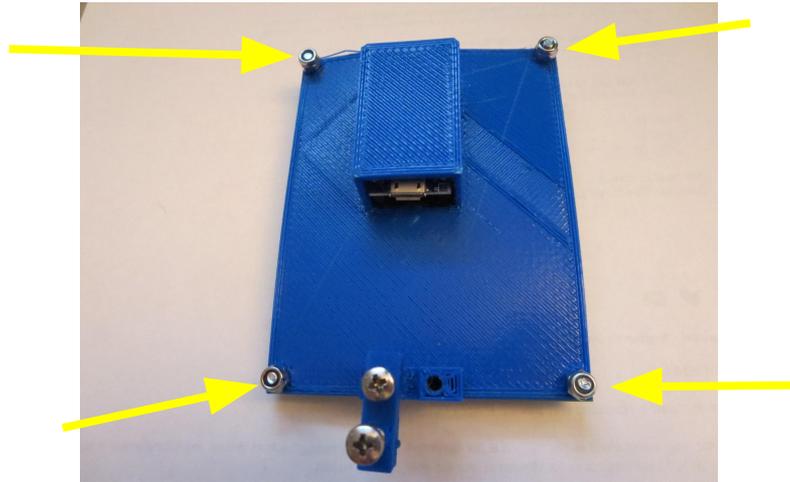
# Assembly

1. Attach Arduino Pro Micro to back of printed circuit board (PCB) with USB facing PRO\_MICRO1



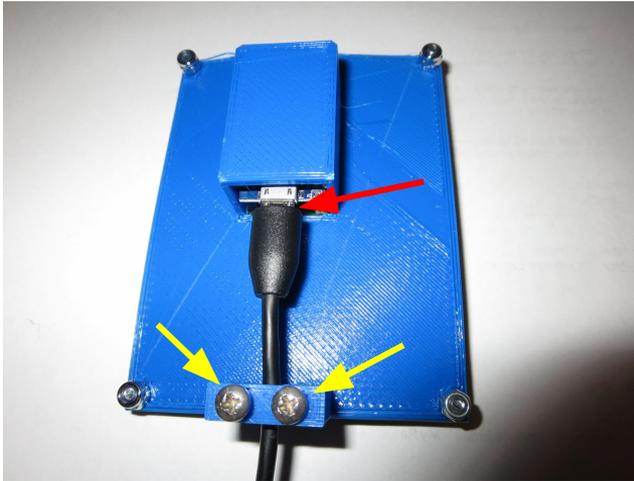
# Assembly

2. Attach plate to back using screws and lock nuts. Make sure the screw reaches the plastic inside nut.



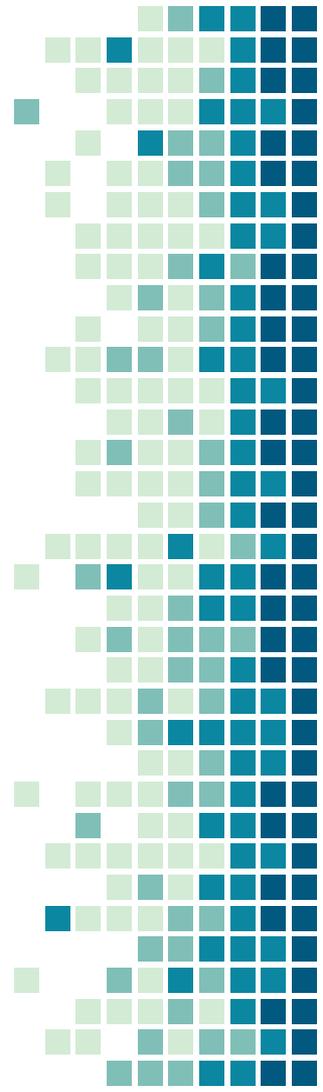
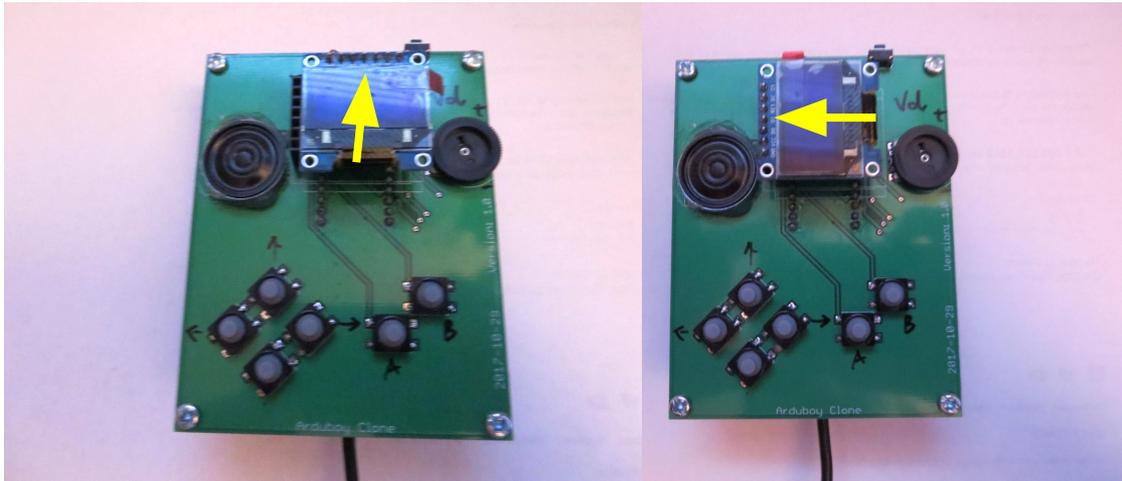
# Assembly

3. Plug in USB cable. Close strain relief onto cable.  
*Be careful with the fragile micro USB port.*



# Assembly

4. Plug in the screen horizontally. It can be mounted vertically. Plug in only these two ways

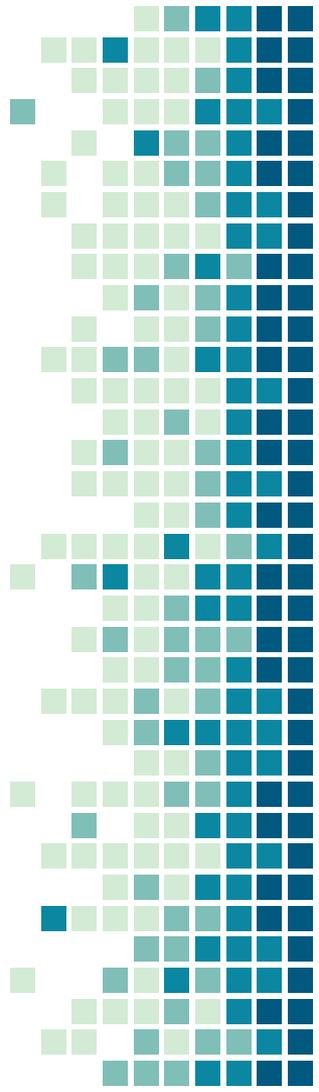


# Programming



# Programming

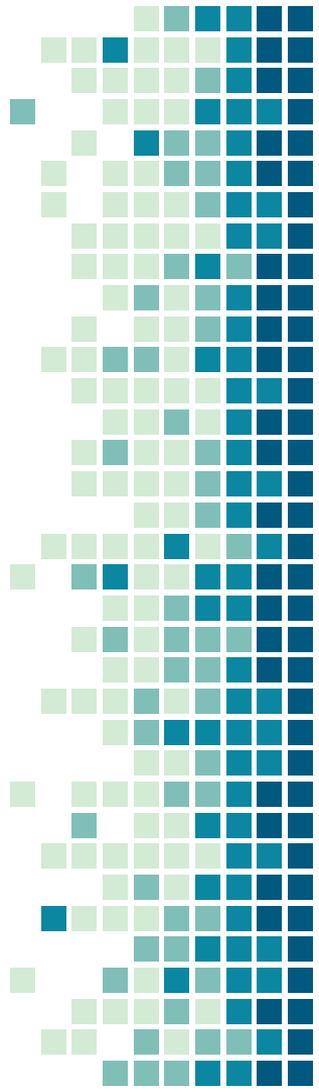
1. Install [Arduino Integrated Development Environment \(IDE\)](#)
  - a. Enable Verbose messages
2. Install Arduboy libraries, [1](#) and [2](#)
3. Run example sketch, "Hello World"
  - a. Compile
  - b. Upload (Press Reset when you see PORTS...)
4. Change "Hello World" to your name then upload



# Programming

Install Arduino Integrated Development Environment (IDE)

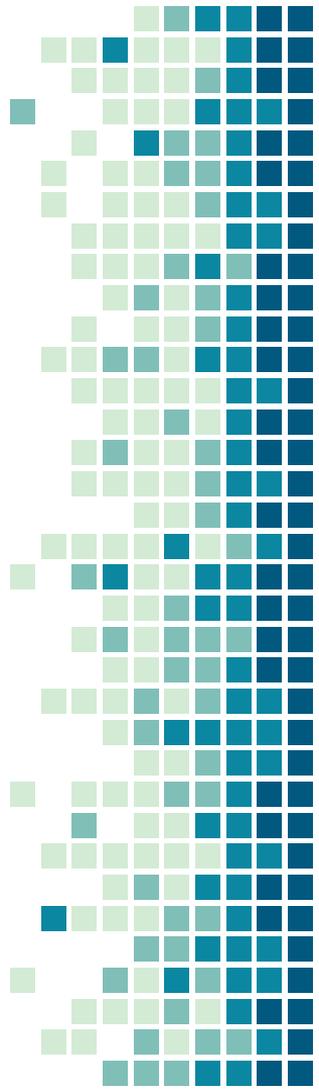
<https://www.arduino.cc/en/Main/Software>



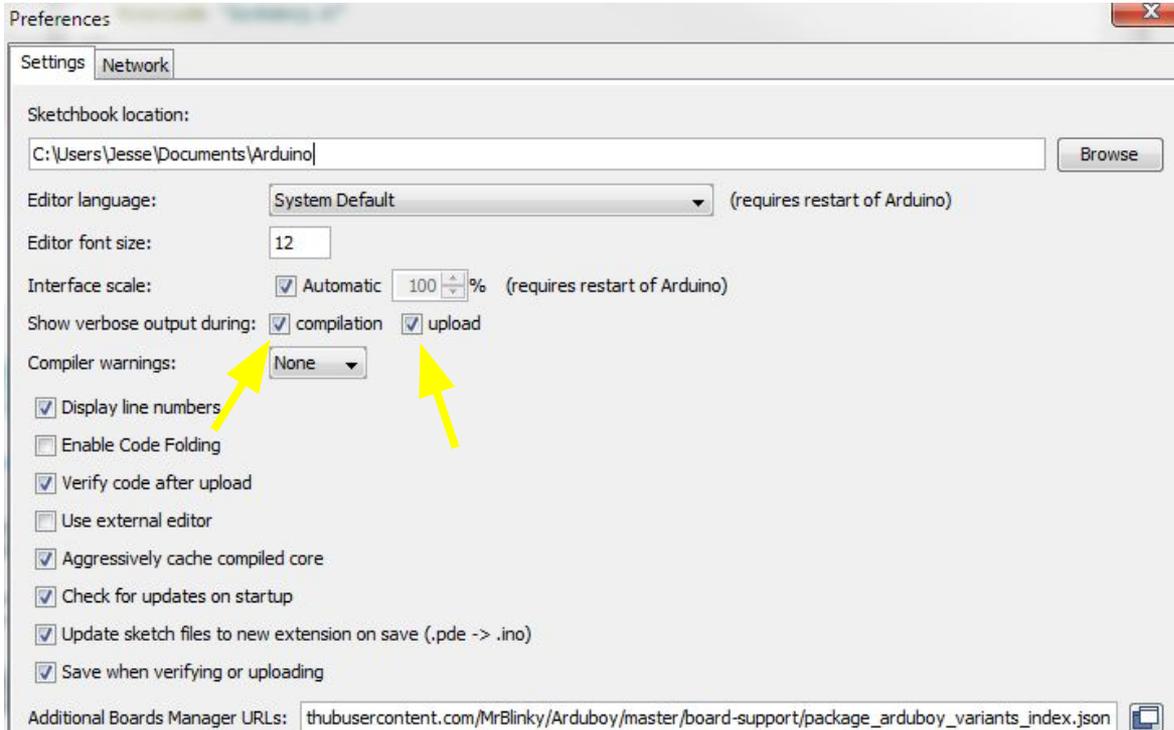
# Programming

## Enable Verbose messages

- File -> Preferences -> "Show verbose output during:"
  - Check "compilation" and "upload"



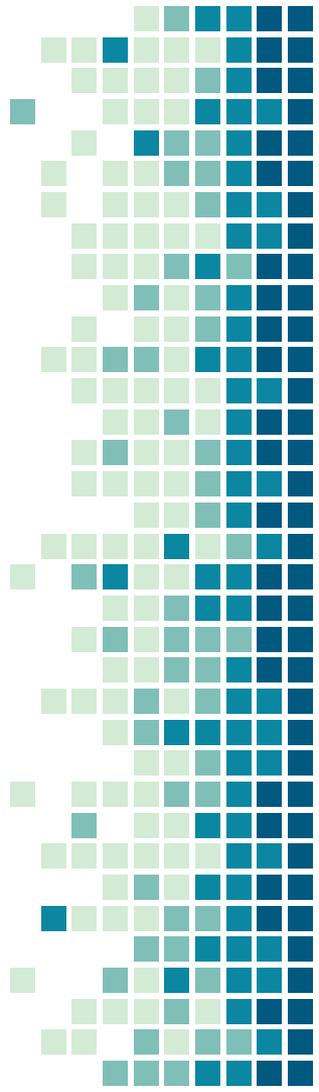
# Programming



# Programming

Install Arduboy libraries,

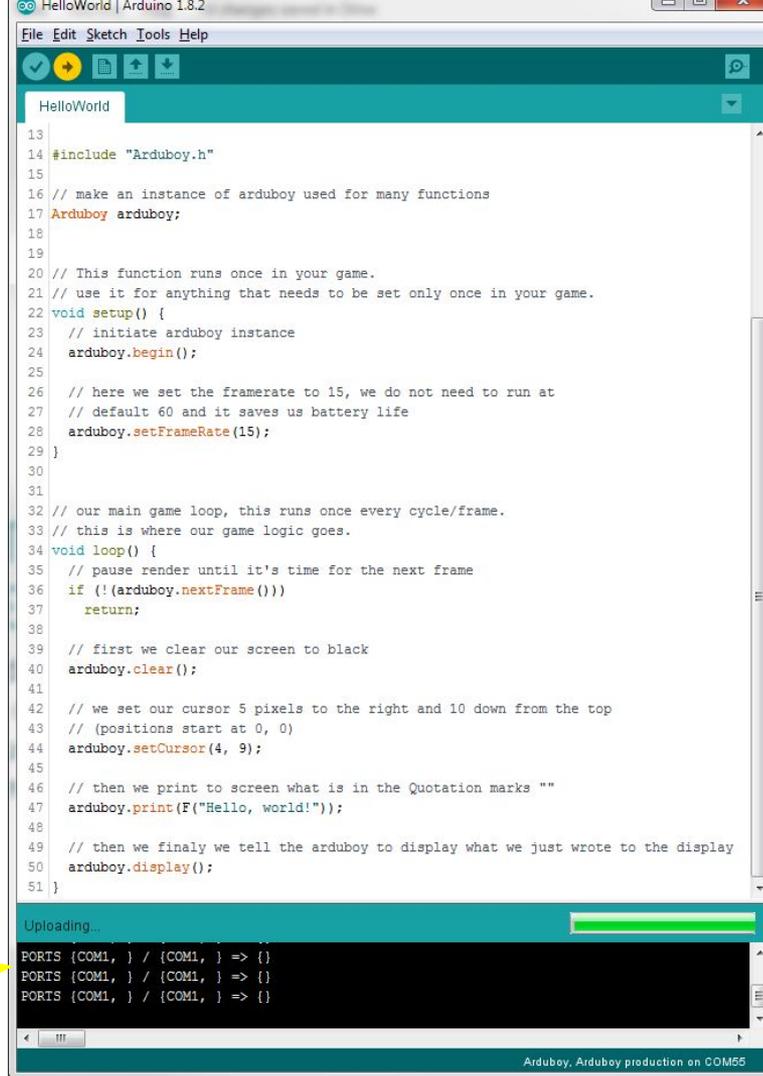
1. <https://github.com/Arduboy/Arduboy#installing-the-arduboy-library>
2. <https://github.com/MrBlinky/Arduboy/tree/master/board-support>



# Try out this example

- File -> Examples -> Arduboy2 -> HelloWorld

Press Reset or  
Change COM Port



```
File Edit Sketch Tools Help
HelloWorld
13
14 #include "Arduboy.h"
15
16 // make an instance of arduboy used for many functions
17 Arduboy arduboy;
18
19
20 // This function runs once in your game.
21 // use it for anything that needs to be set only once in your game.
22 void setup() {
23   // initiate arduboy instance
24   arduboy.begin();
25
26   // here we set the framerate to 15, we do not need to run at
27   // default 60 and it saves us battery life
28   arduboy.setFrameRate(15);
29 }
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31
32 // our main game loop, this runs once every cycle/frame.
33 // this is where our game logic goes.
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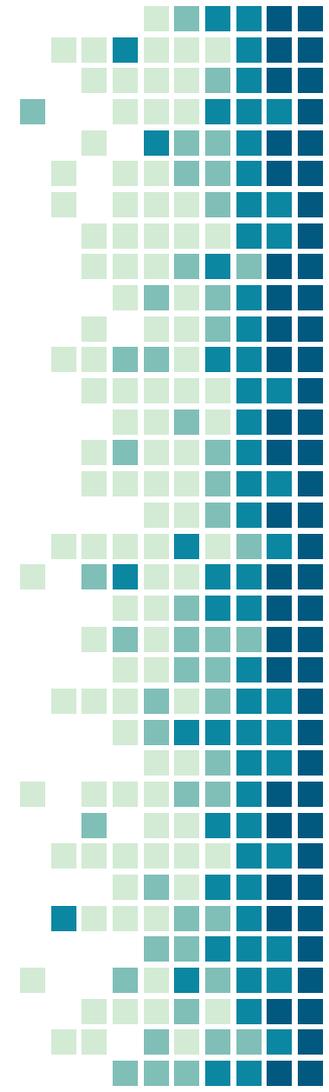
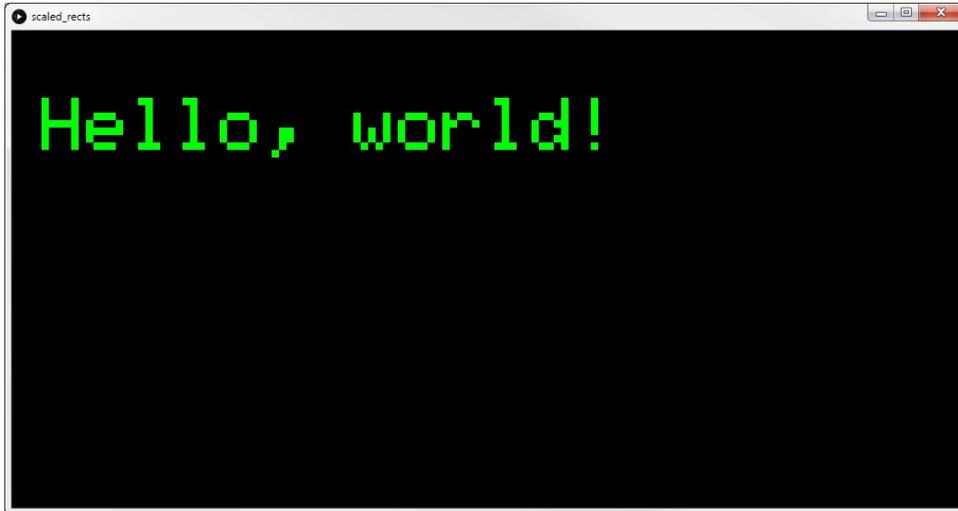
Uploading...

PORTS {COM1, } / {COM1, } => {}  
PORTS {COM1, } / {COM1, } => {}  
PORTS {COM1, } / {COM1, } => {}

Arduboy, Arduboy production on COM65

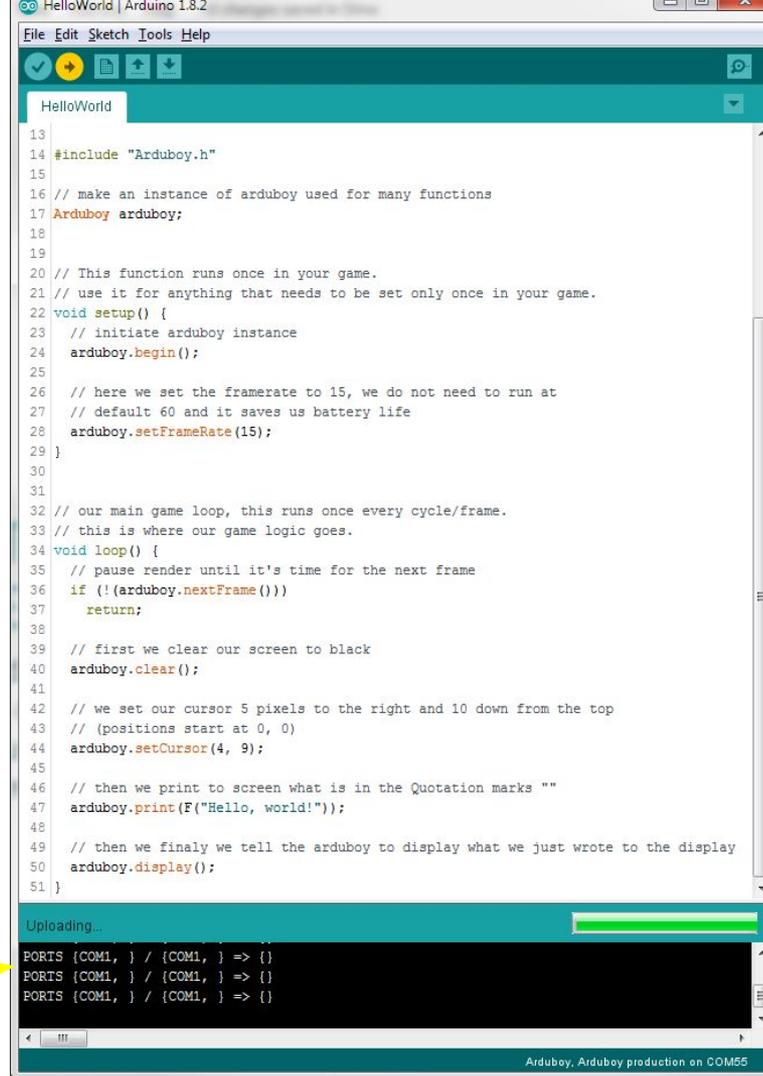
# Example Programs

- Hello, world!



# Edit this example

- Change Line 47 to say "Hello, [your name]!"



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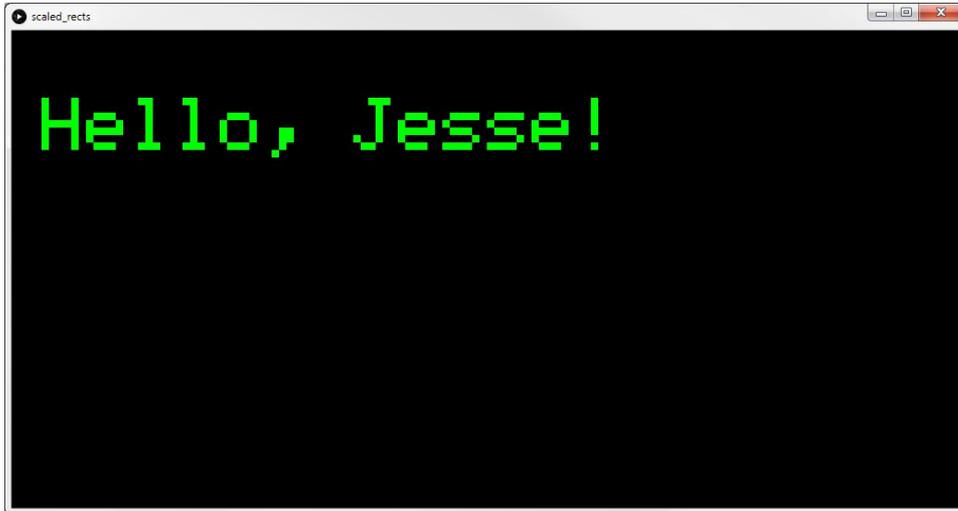
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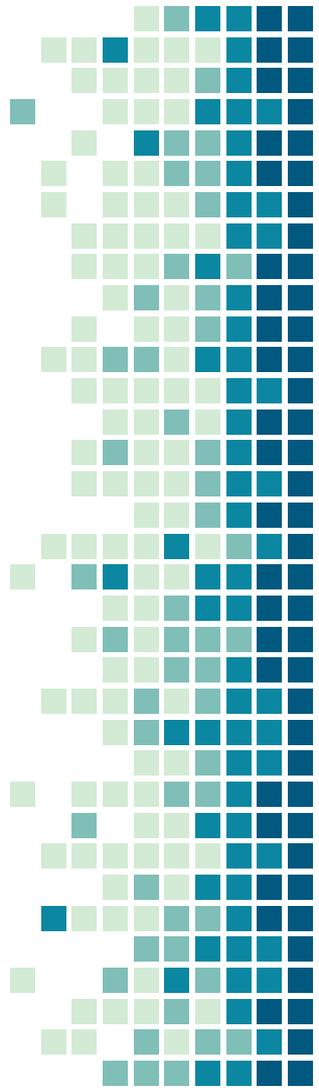
Press Reset or  
Change COM Port

# Example Programs

- Hello, [your name]!

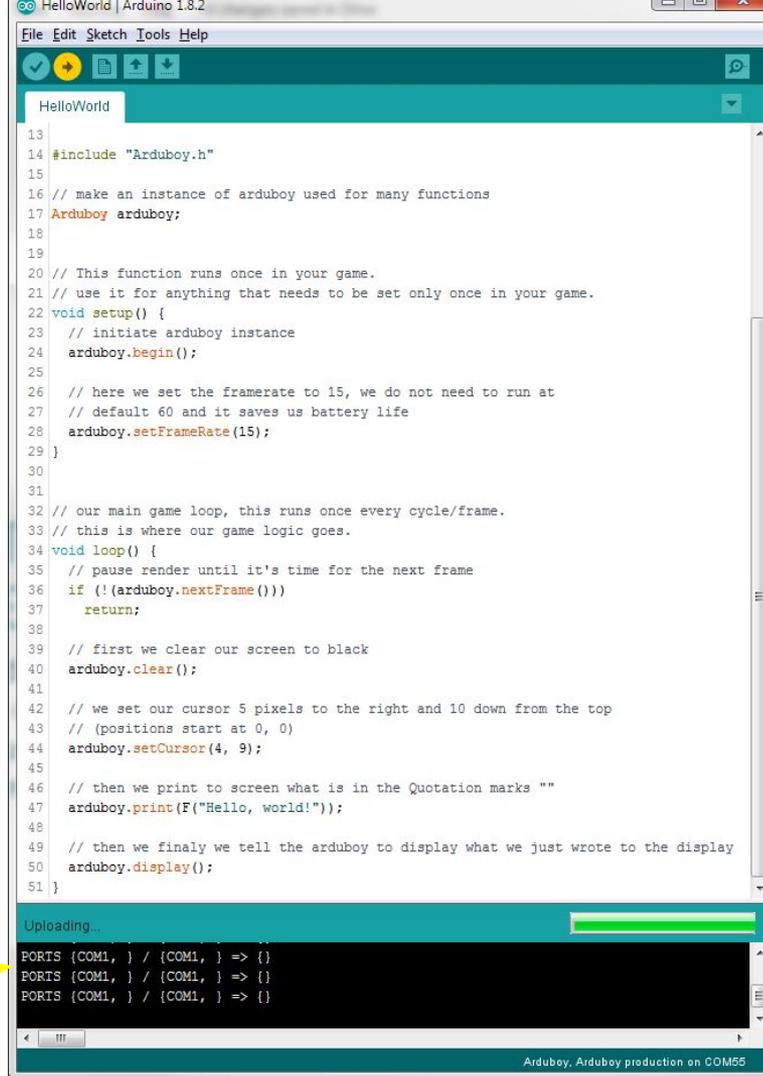


```
scaled_rects
Hello, Jesse!
```



# Try out this example

- File -> Examples -> Arduboy2 -> PlayTune
- Turn up volume using volume wheel



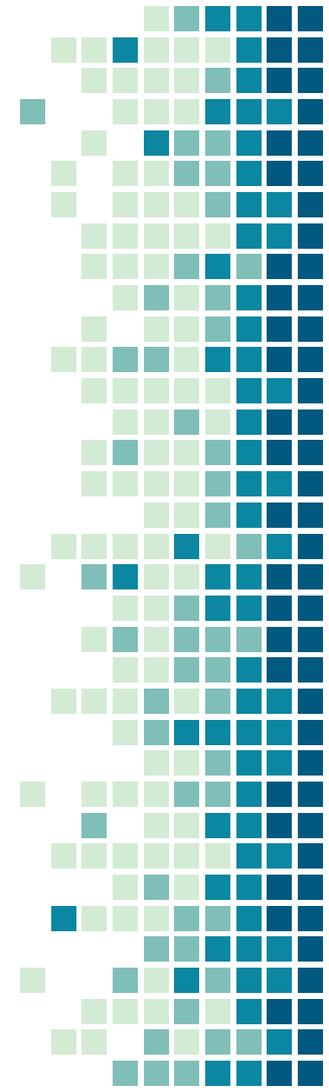
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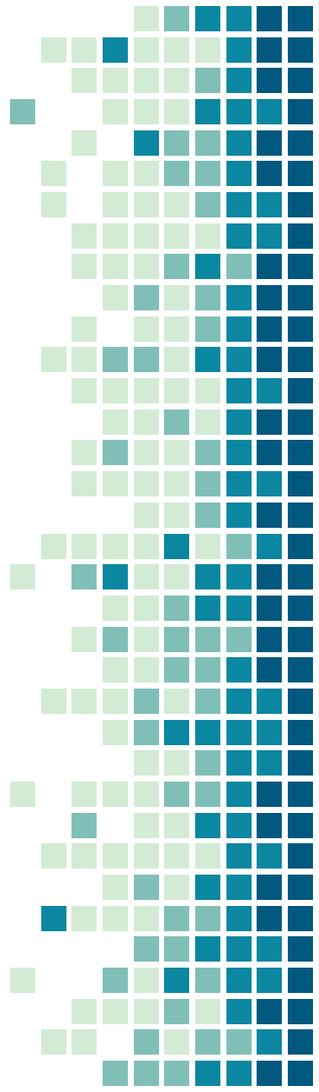
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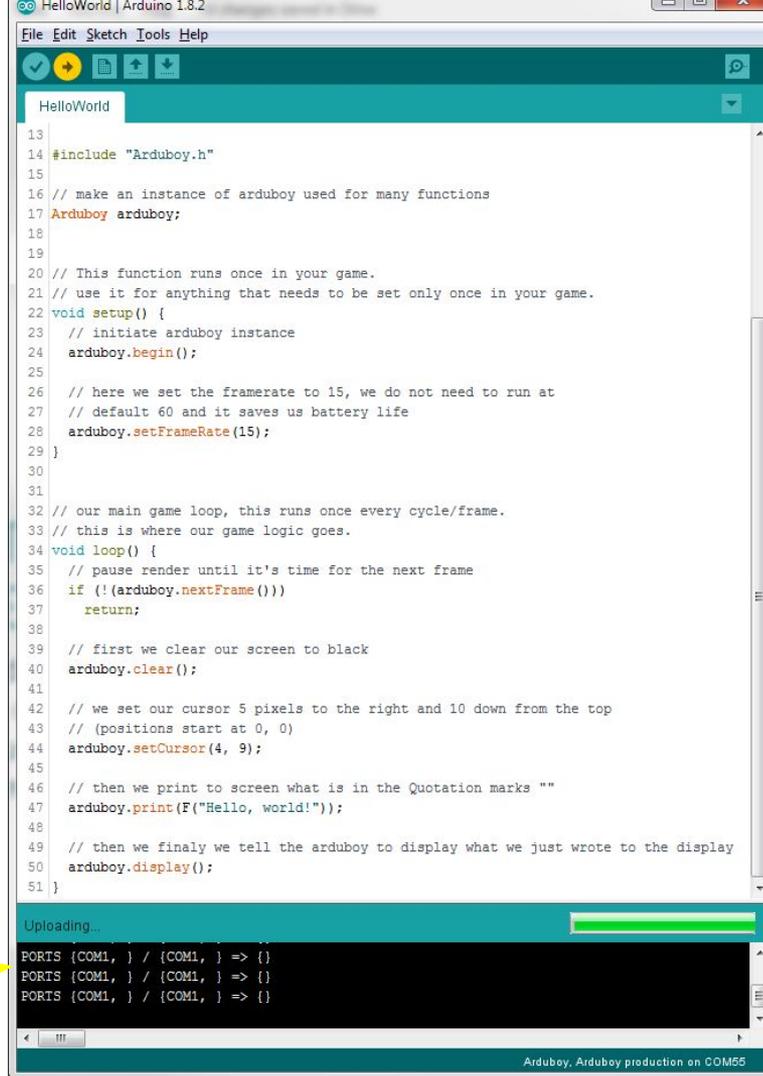
# Example Programs

- Music Demo. Mute (A), Unmute (B)



# Try out this example

- File -> Examples -> Arduboy2 -> Buttons



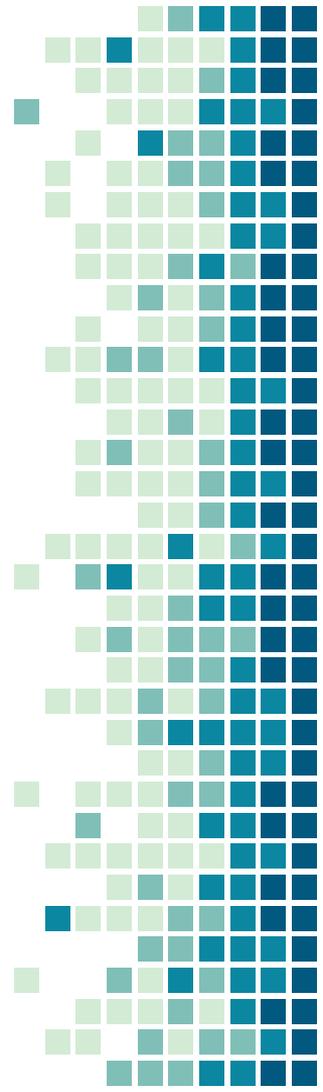
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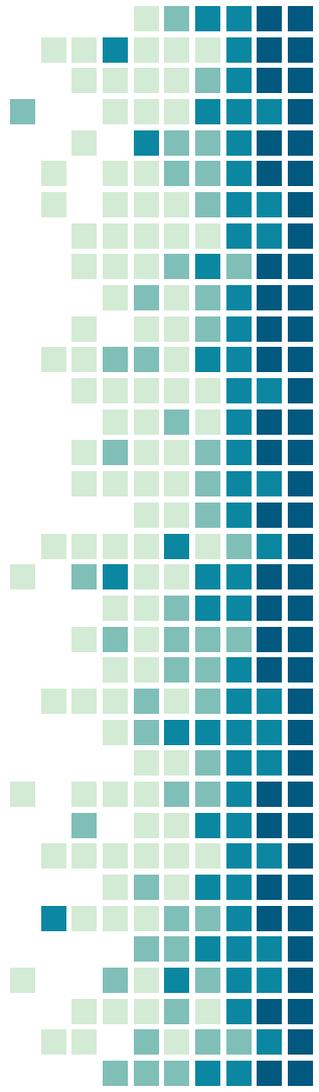
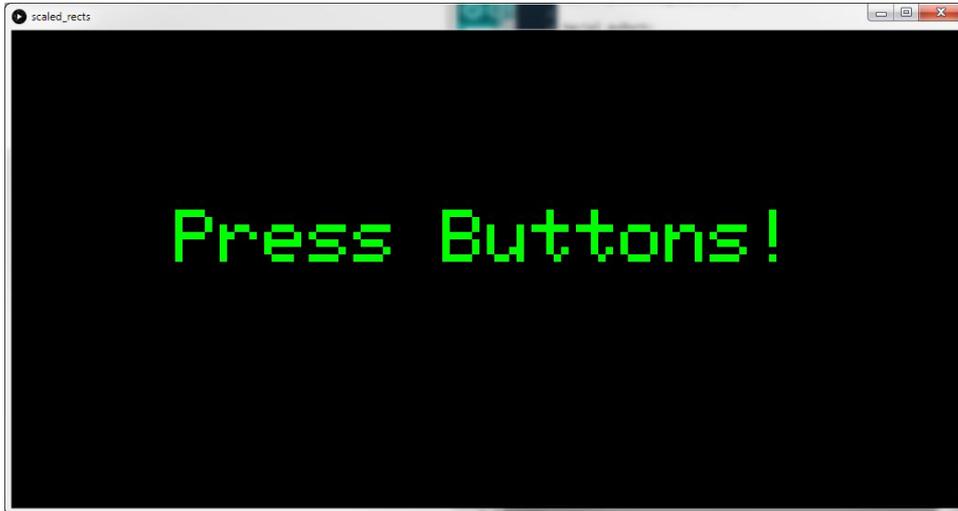
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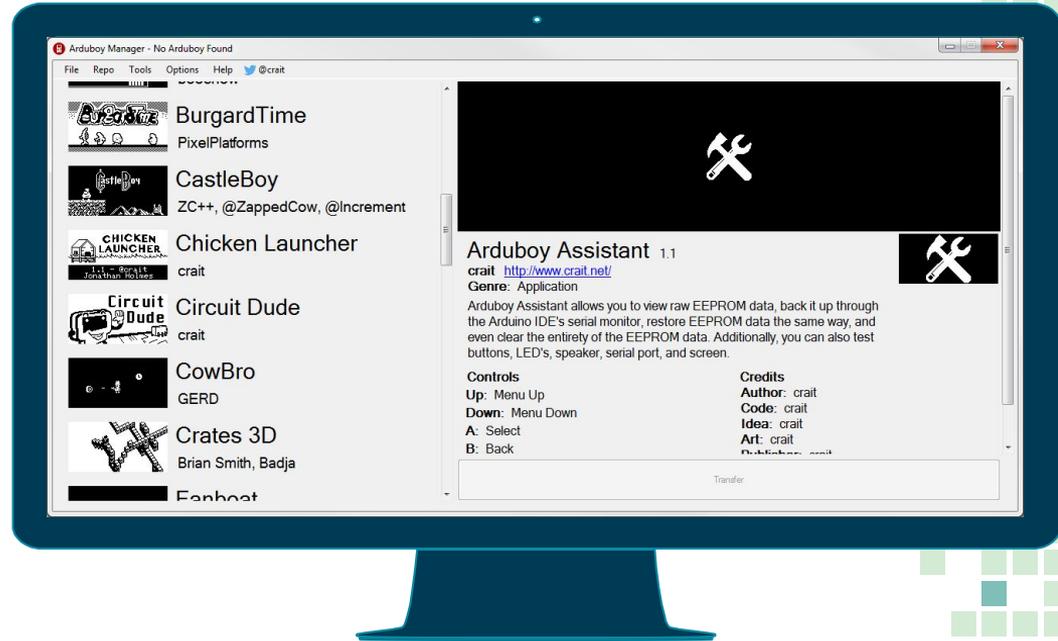
# Example Programs

- Press Buttons Demo



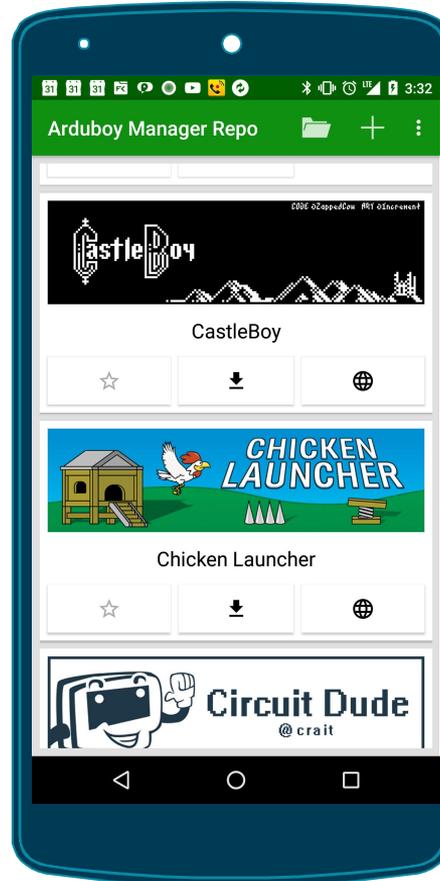
# Arduboy Manager for PC

- Load games from library. Screen Mirroring. Upload .arduboy file or .hex file.
- [Download](#)



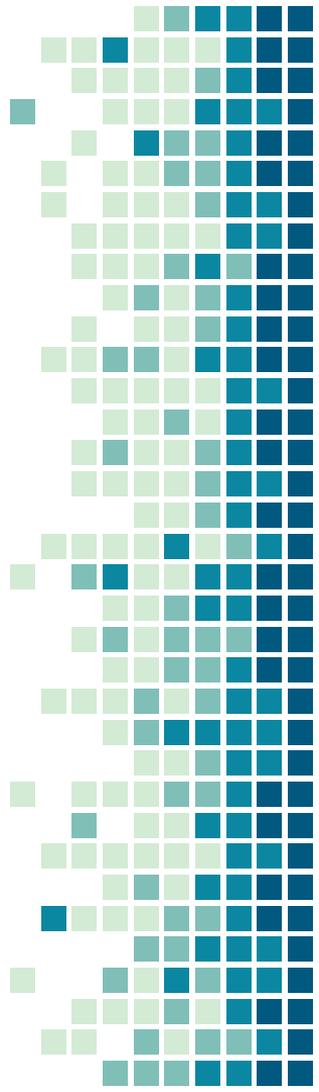
# Arduboy Mate:

- Load games and power from Android
- Requires USB On-the-Go cable
  - [Micro](#)
  - [Type C](#)
- Free app in [Google Play Store](#)

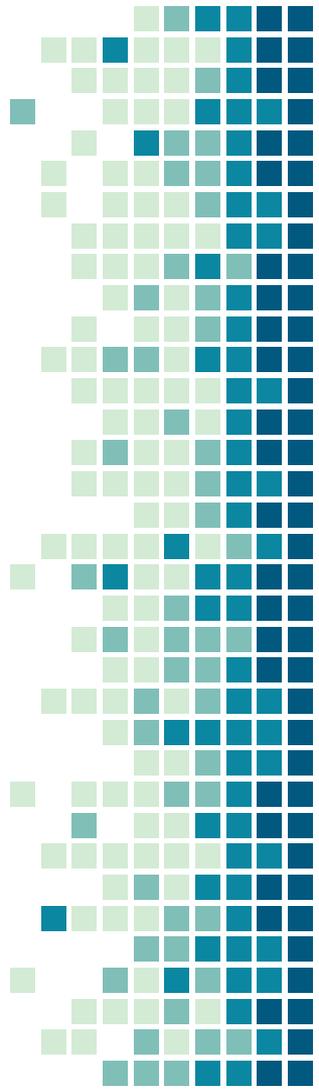
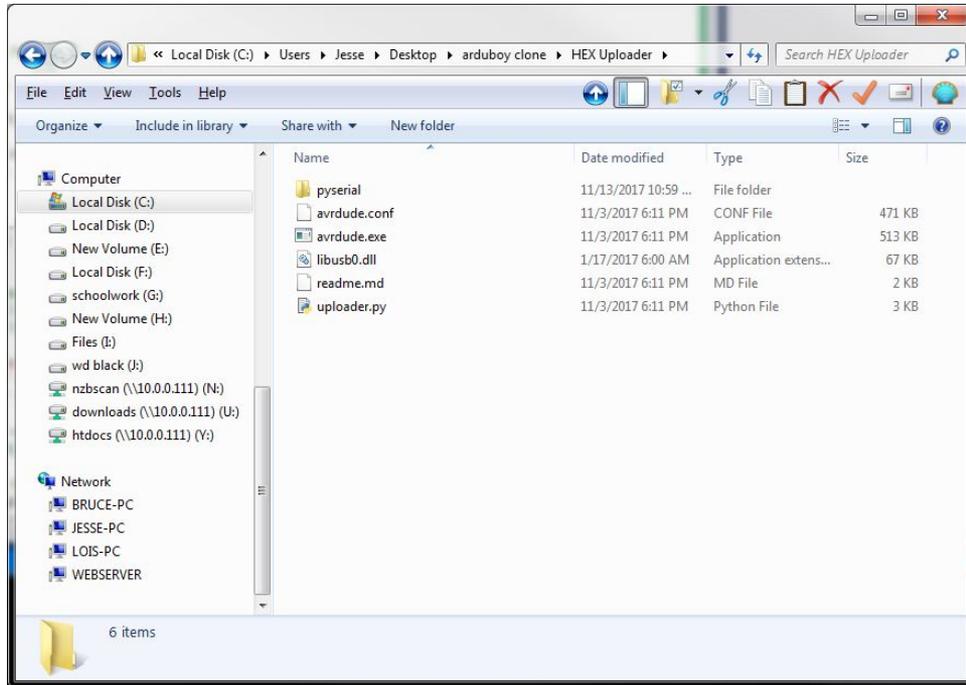


# Upload HEX Files

1. HEX files are pre-compiled games that you can upload without using the Arduino IDE
2. Requires Python 2.7 and PySerial
3. Drag .HEX file to upload.py



# Upload HEX Files



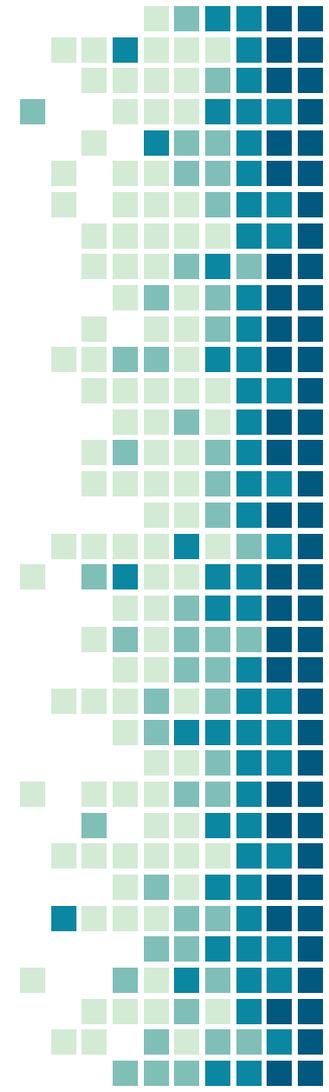
# Upload HEX Files

> [Path to python2.7] [Path to upload.py] [path to .HEX file]

> C:\Python27\python.exe

"\HEX Uploader\uploader.py"

"\Games\tiny\_asteroids\test.hex"



# Upload HEX Files

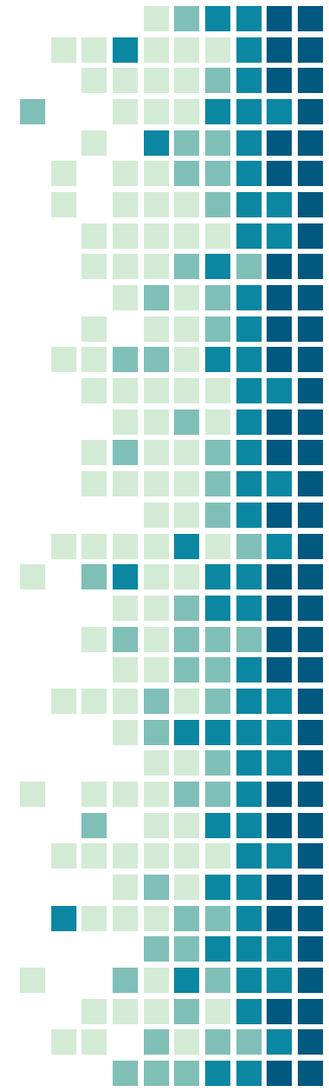
```
Administrator: C:\Windows\system32\cmd.exe

C:\Users\Jesse\Desktop\arduboy clone\HEX Uploader>C:\Python27\python.exe "C:\Users\Jesse\Desktop\arduboy clone\HEX Uploader\uploader.py" "C:\Users\Jesse\Desktop\arduboy clone\Games\tiny_asteroids\test.hex"
found Arduino Leonardo (COM55) at port COM55
Selecting bootloader mode...
found Arduino Leonardo bootloader (COM56) at port COM56

avrdude.exe: Version 6.3, compiled on Jan 17 2017 at 12:00:53
Copyright (c) 2000-2005 Brian Dean, http://www.bdmicro.com/
Copyright (c) 2007-2014 Joerg Wunsch

System wide configuration file is "C:\Users\Jesse\Desktop\arduboy clone\HEX Uploader\avrdude.conf"

Using Port                : COM56
Using Programmer          : avr109
Overriding Baud Rate     : 57600
AUR Part                  : ATmega32U4
Chip Erase delay         : 9000 us
PAGEL                    : PD7
BS2                       : PA0
RESET disposition        : dedicated
RETRY pulse              : SCK
serial program mode      : yes
parallel program mode    : yes
Timeout                  : 200
StabDelay                 : 100
CmdexeDelay              : 25
SyncLoops                : 32
```



# Upload HEX Files

```
Administrator: C:\Windows\system32\cmd.exe
avrdude.exe: safemode: hfuse reads as D8
avrdude.exe: safemode: efuse reads as CB
avrdude.exe: reading input file "C:\Users\Jesse\Desktop\arduboy clone\Games\tiny_asteroids\test.hex"
avrdude.exe: writing flash (16254 bytes):

Writing | ##### | 100% 1.66s

avrdude.exe: 16254 bytes of flash written
avrdude.exe: verifying flash memory against C:\Users\Jesse\Desktop\arduboy clone\Games\tiny_asteroids\test.hex:
avrdude.exe: load data flash data from input file C:\Users\Jesse\Desktop\arduboy clone\Games\tiny_asteroids\test.hex:
avrdude.exe: input file C:\Users\Jesse\Desktop\arduboy clone\Games\tiny_asteroids\test.hex contains 16254 bytes
avrdude.exe: reading on-chip flash data:

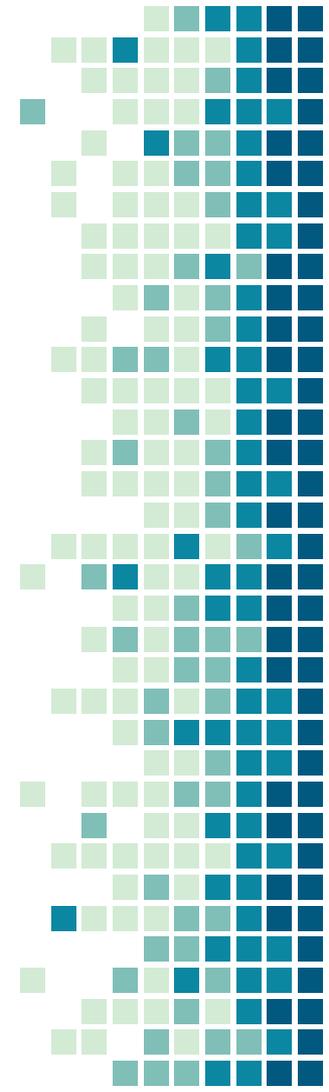
Reading | ##### | 100% 0.65s

avrdude.exe: verifying ...
avrdude.exe: 16254 bytes of flash verified

avrdude.exe: safemode: hfuse reads as D8
avrdude.exe: safemode: efuse reads as CB
avrdude.exe: safemode: Fuses OK (E:CB, H:D8, L:FF)

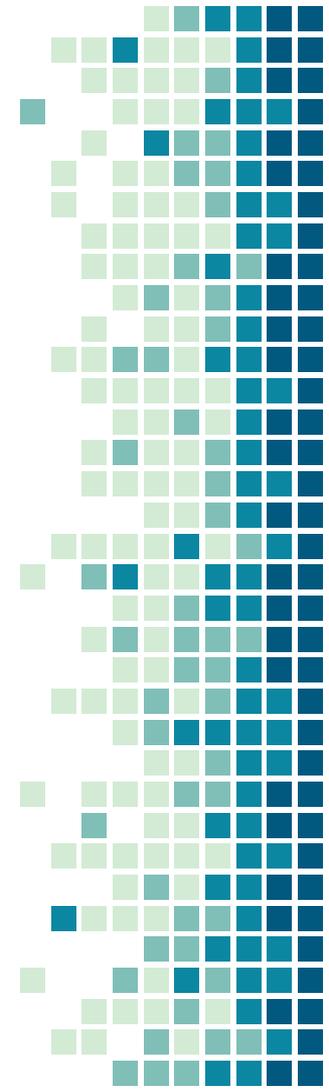
avrdude.exe done. Thank you.

C:\Users\Jesse\Desktop\arduboy clone\HEX Uploader>
```



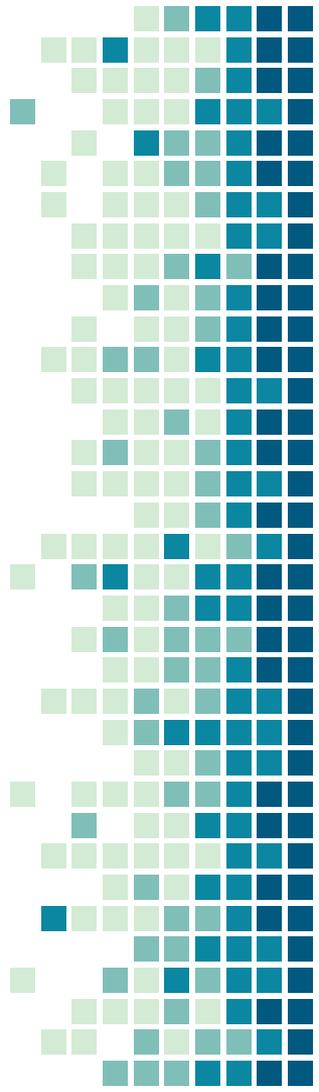
# Example Programs

- Matrix animation with midi music
- Bouncing balls demo
- Tetris clone with midi music



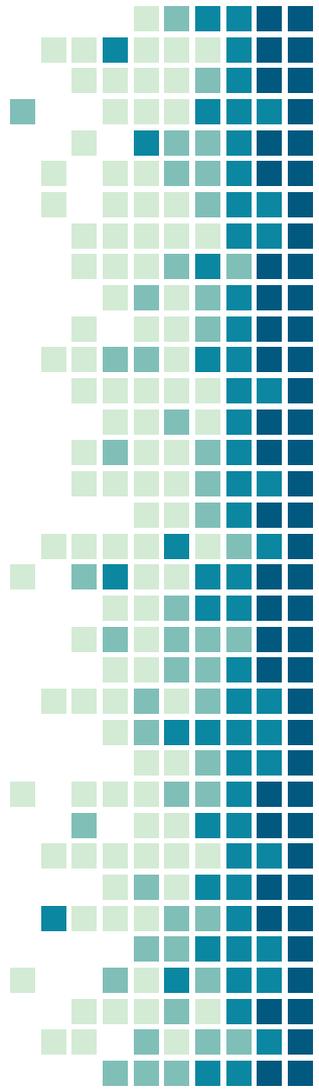
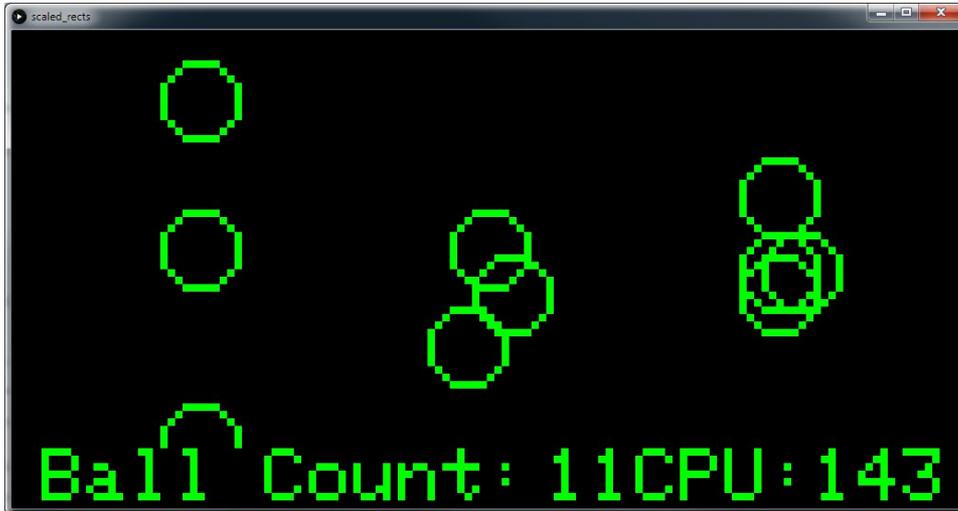
# Example Programs

- Matrix animation



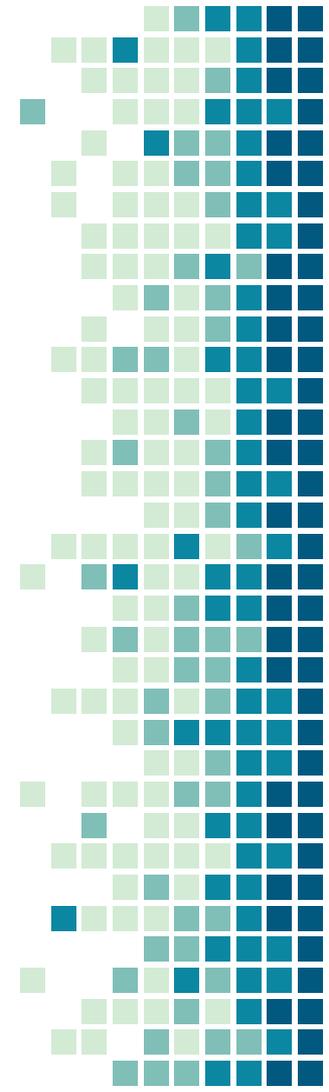
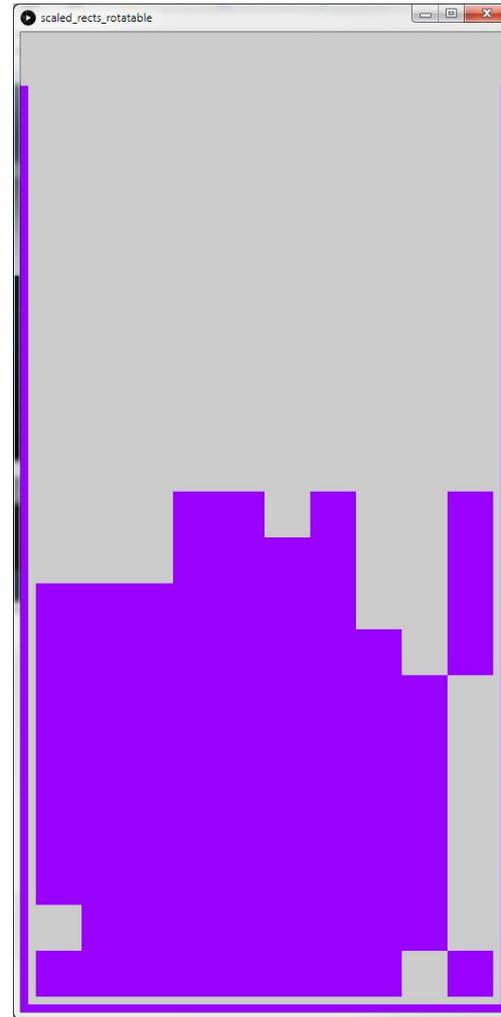
# Example Programs

- Bouncing Balls Demo



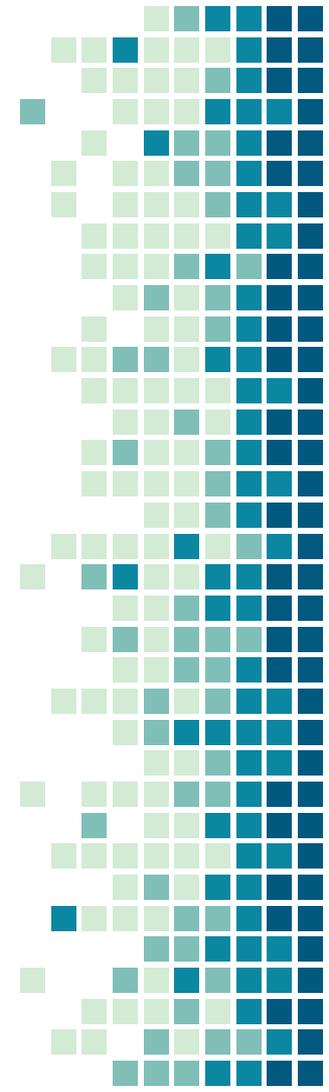
# Example Programs

- Tetris



# Programming game cheats

- Look through program for variables related to lives and/or health. You can increase them to make the game difficult easier.
- Show example, CastleBoy

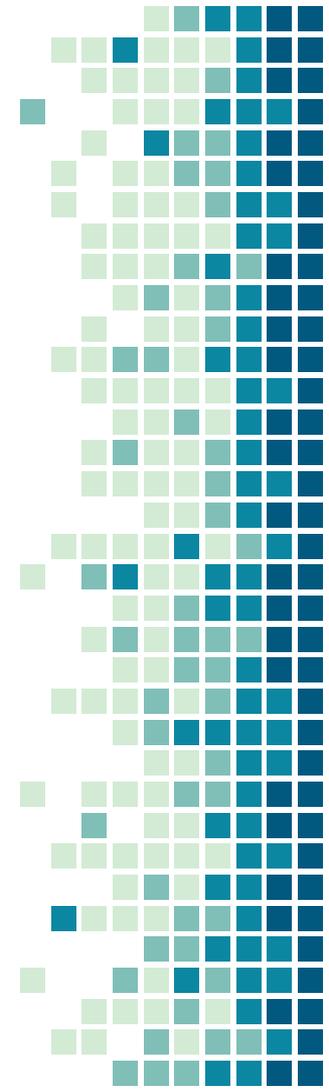


# Play Games



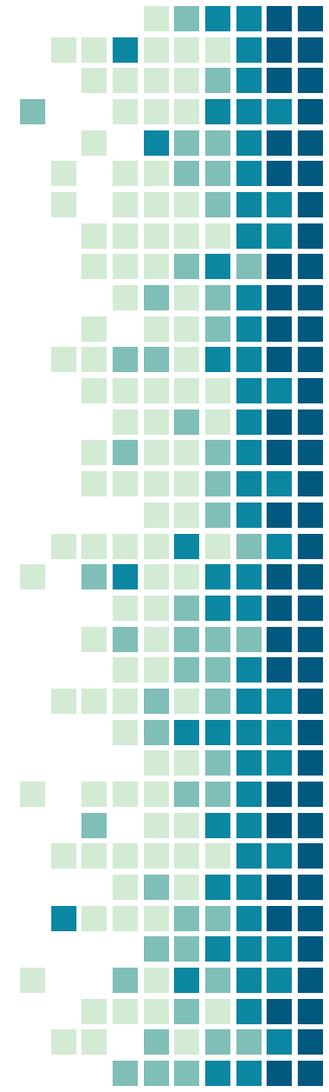
# Game Collections

1. Download ZIP file with games/utilities
  - a. <http://www.jbcse.com/downloads/arduboy/>
2. Other game download links:
  - a. <https://community.arduboy.com/c/games>
  - b. <http://arduboy.ried.cl/>
  - c. <http://blog.livedoor.jp/cobinee/search?q=arduboy>
  - d. <https://github.com/eried/ArduboyCollection>



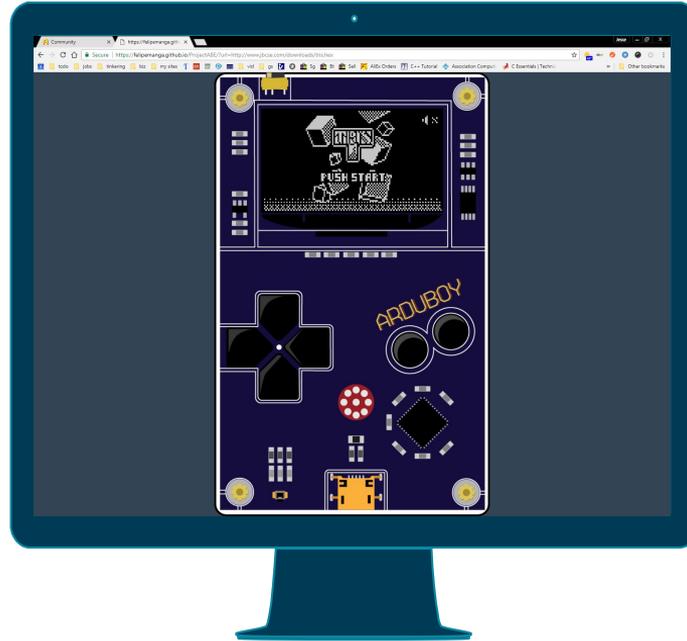
# Game List

1. Choose a game from the Games folder
  - a. Open .INO file using Arduino and upload
    - i. Press "Reset" when "PORTS ..." shows in Arduino Console
  - b. All files must be in a folder with the same name as the .INO file.
    - i. Ex: /jetpack/jetpack.ino



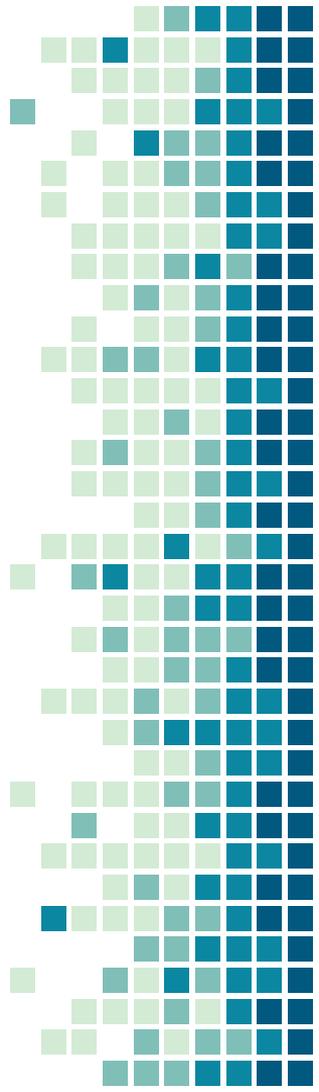
# Emulator

- Use arrow keys, x key, and z key
- Hover on areas with pointer cursor to find hidden functions



# Web-based Emulator

1. Play games from list:
  - a. <https://felipemanga.github.io/ProjectABE/>
2. Program your own from web page:
  - a. <https://felipemanga.github.io/ProjectABE/?url=new>
3. Upload HEX file from web:
  - a. <https://felipemanga.github.io/ProjectABE/?url=http://www.jbcse.com/downloads/tris.hex>



# Screen Mirroring

It's possible to send the video display to a computer over Serial (via USB).

- 128x64 = 8192 bits
- Each char is 0 to 255
- 1024 8-bit bytes hold 8192 bits



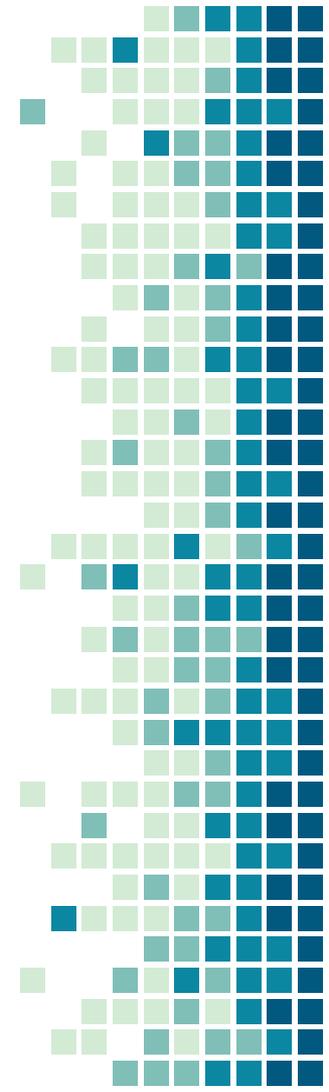
# Screen Mirroring

- Add `Serial.begin(9600);` to the end of `void setup(){`  
...  
`Serial.begin(9600);`  
};
- Add `Serial.write(arduboy.getBuffer(), 128 * 64 / 8);` before every `arduboy.display();` call



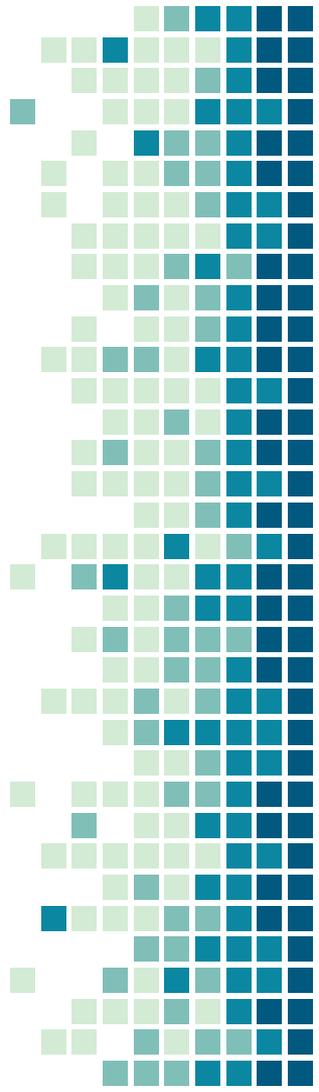
# Upgrades - Screens

1. 1.3" 128x64 OLED screen (SH1106)
2. 1.54" 128x64 OLED screen (SSD1309)
3. 2.4" 128x64 OLED screen (SSD1309)



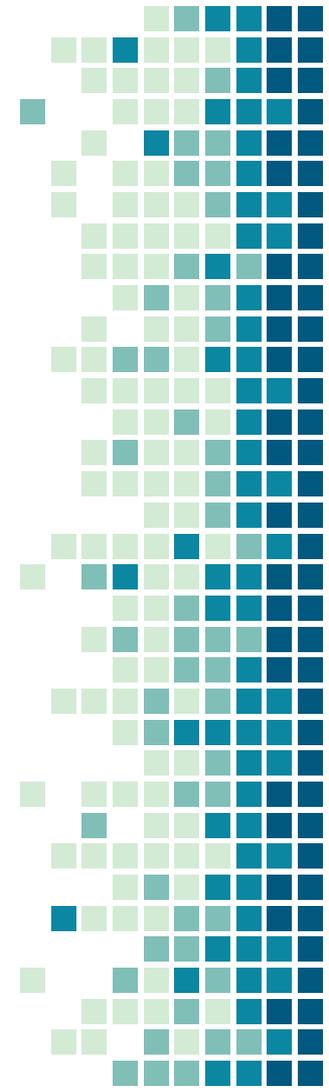
# Upgrades - USB Power Banks

1. Search on eBay.com or AliExpress.com
  - a. Examples:
    - i. [Single 18650](#)
    - ii. [Double 18650](#)
    - iii. [Universal 5V 9V 12V 6 x 18650](#)



# Modifications

1. [Check out the Arduboy Forums](#)



# THANKS!

Any questions?

You can find me at:  
@ [www.jbcse.com](http://www.jbcse.com)

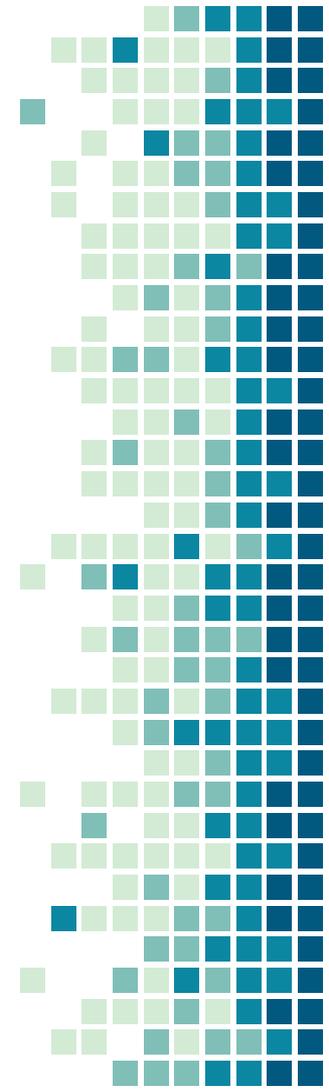


Presentation URL: <http://goo.gl/jFK3vv>

# CREDITS

Special thanks to all the people who made and released these awesome resources for free:

- Presentation template by [SlidesCarnival](#)
- Photographs by [Unsplash](#)



# PRESENTATION DESIGN

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- Body copy: **Titillium Web**

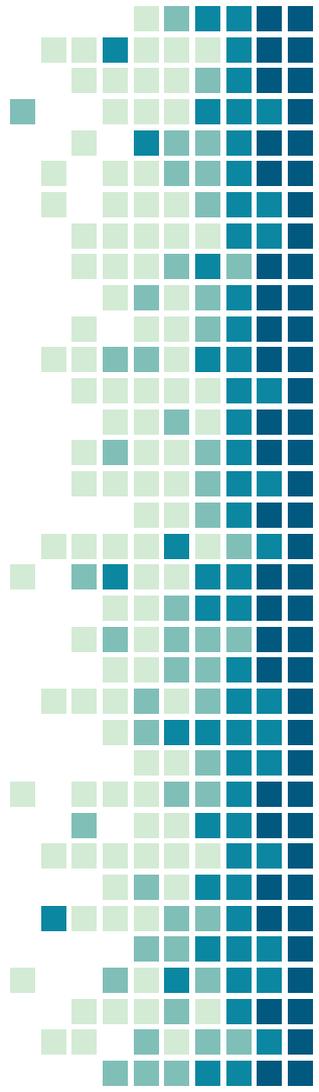
You can download the fonts on these pages:

<http://www.impallari.com/dosis>

<http://www.campivisivi.net/titillium/>

Pastel green **#d3ebd5** · Green **#80bf7** · Teal **#0b87a1** · Navy **#01597f** · Dark navy **#003b55**

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# IN TWO OR THREE COLUMNS

## Yellow

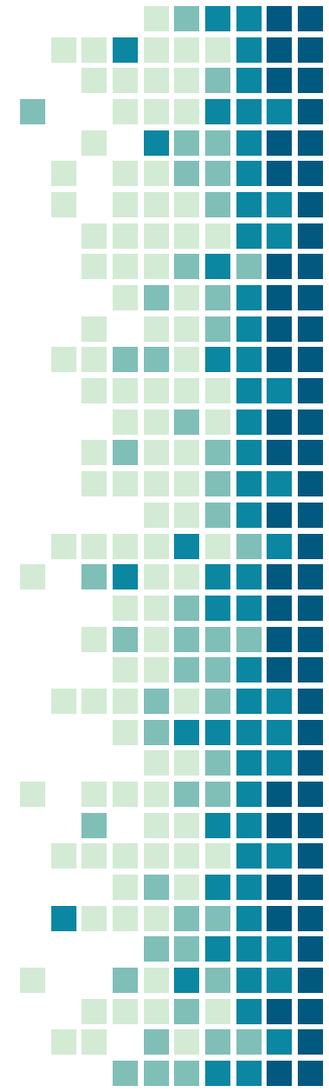
Is the color of gold, butter and ripe lemons. In the spectrum of visible light, yellow is found between green and orange.

## Blue

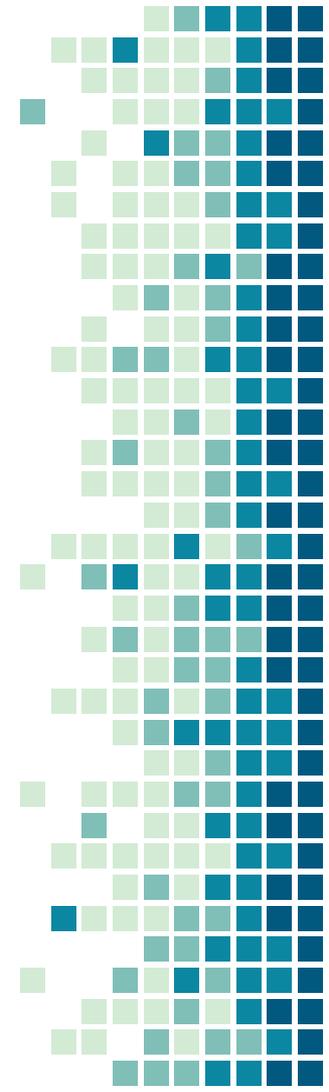
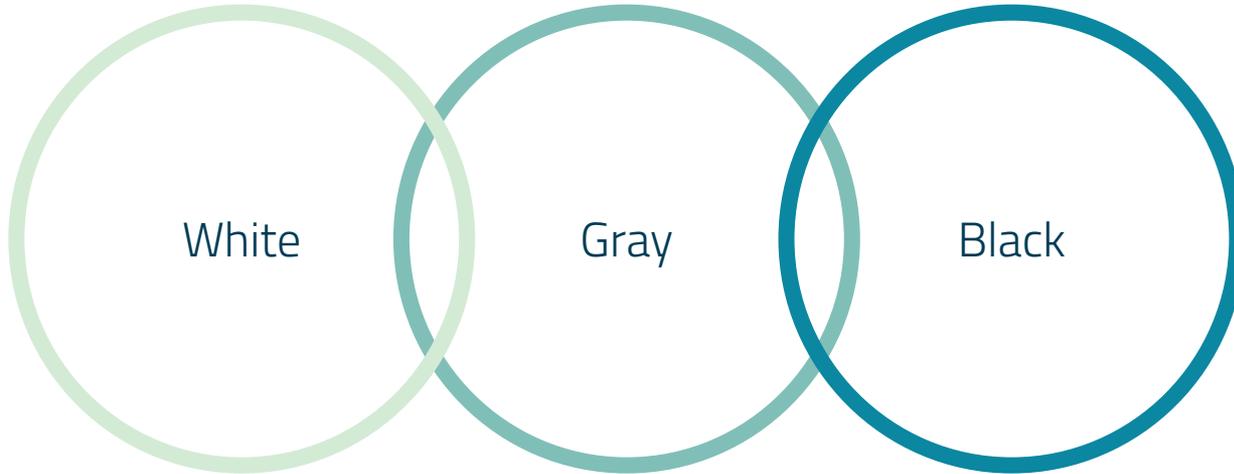
Is the colour of the clear sky and the deep sea. It is located between violet and green on the optical spectrum.

## Red

Is the color of blood, and because of this it has historically been associated with sacrifice, danger and courage.

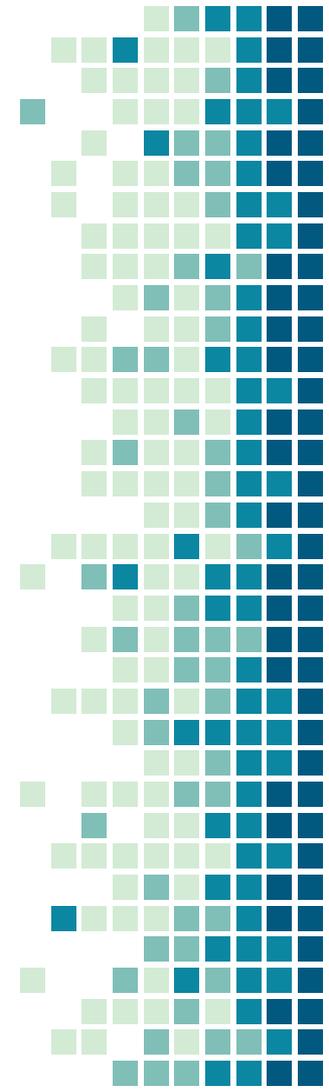


# USE CHARTS TO EXPLAIN YOUR IDEAS

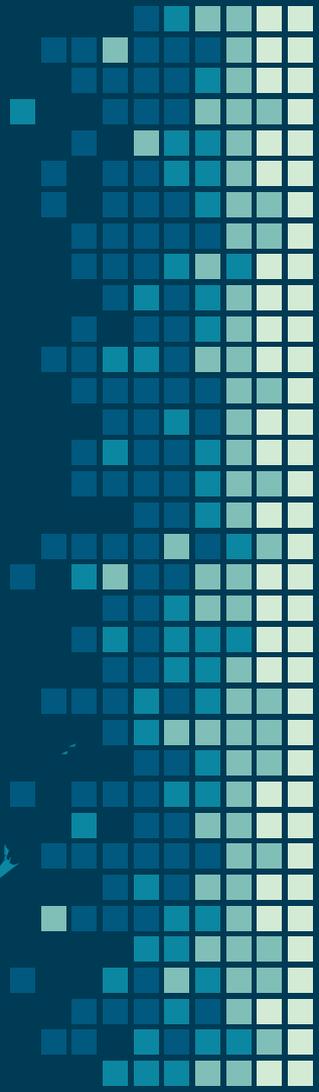


# AND TABLES TO COMPARE DATA

	A	B	C
Yellow	<b>10</b>	<b>20</b>	<b>7</b>
Blue	<b>30</b>	<b>15</b>	<b>10</b>
Orange	<b>5</b>	<b>24</b>	<b>16</b>

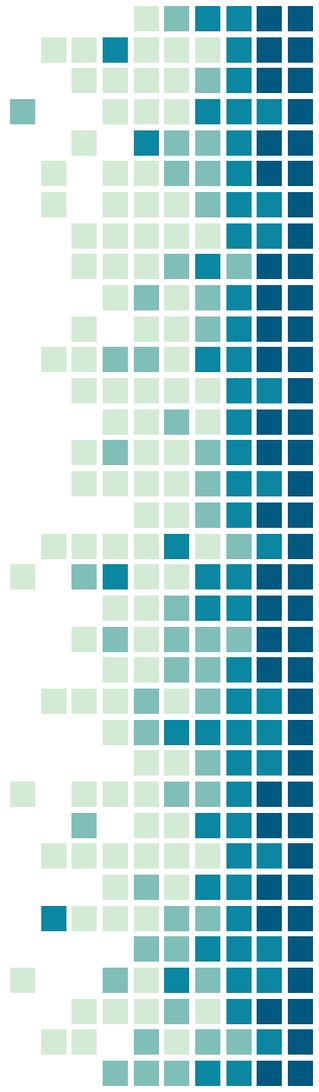


# MAPS



# 89,526,124

Whoa! That's a big number, aren't you proud?



89,526,124\$

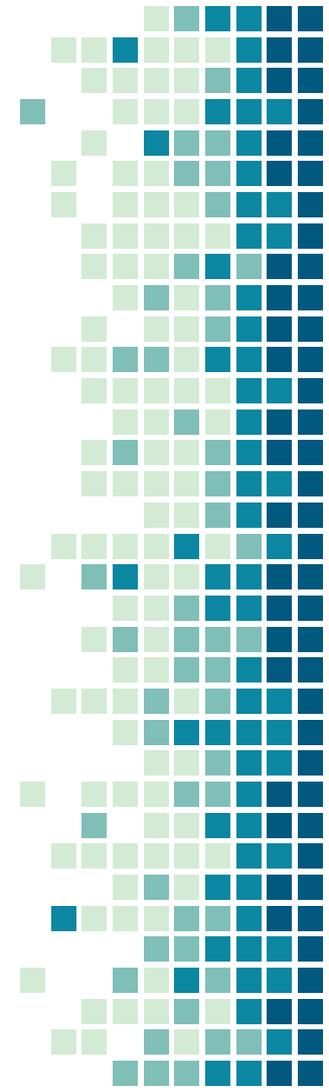
That's a lot of money

185,244 users

And a lot of users

100%

Total success!



# LET'S REVIEW SOME CONCEPTS

## Yellow

Is the color of gold, butter and ripe lemons. In the spectrum of visible light, yellow is found between green and orange.

## Yellow

Is the color of gold, butter and ripe lemons. In the spectrum of visible light, yellow is found between green and orange.

## Blue

Is the colour of the clear sky and the deep sea. It is located between violet and green on the optical spectrum.

## Blue

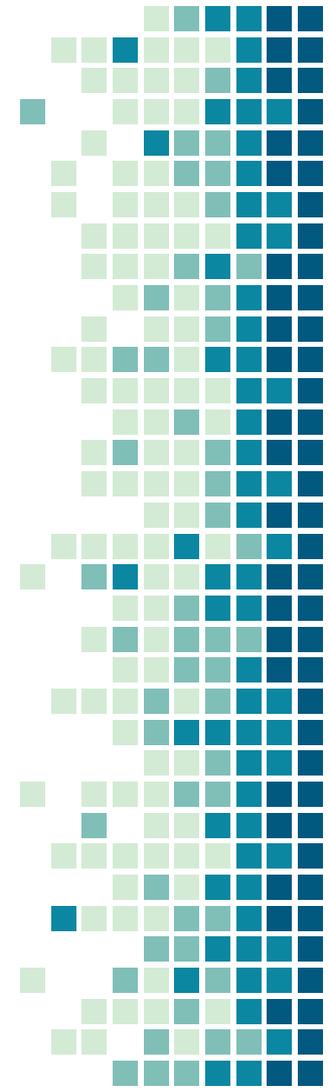
Is the colour of the clear sky and the deep sea. It is located between violet and green on the optical spectrum.

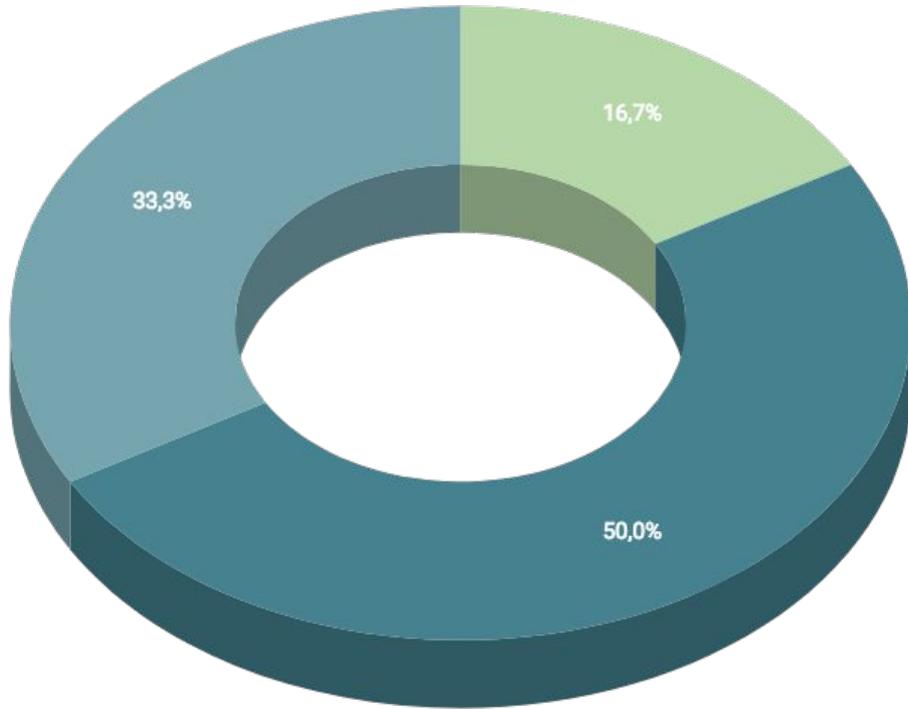
## Red

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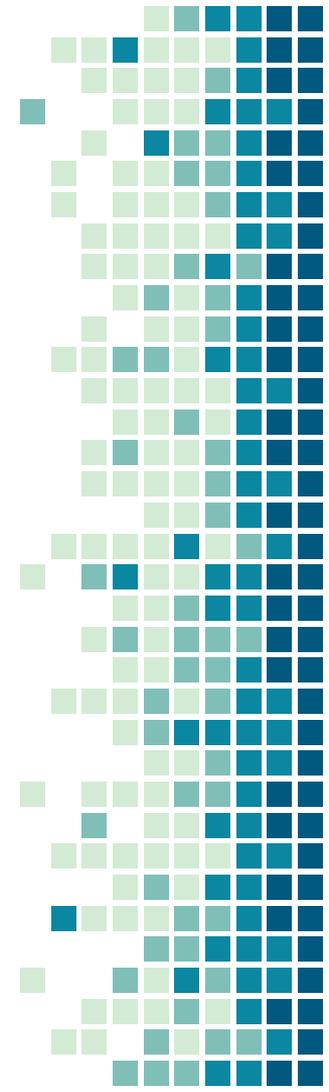
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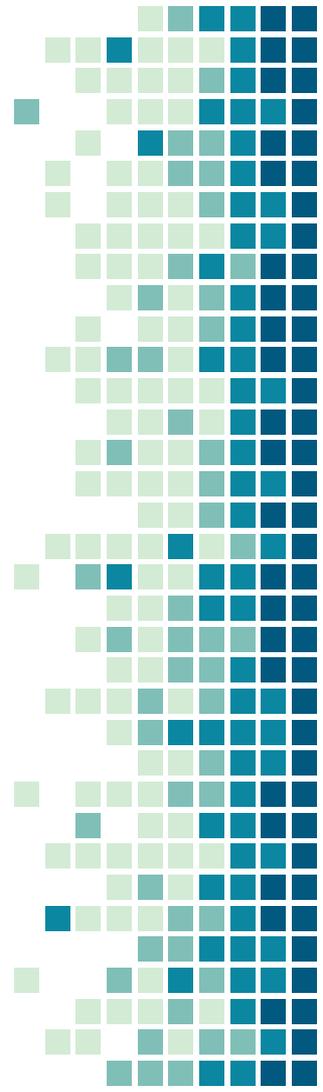
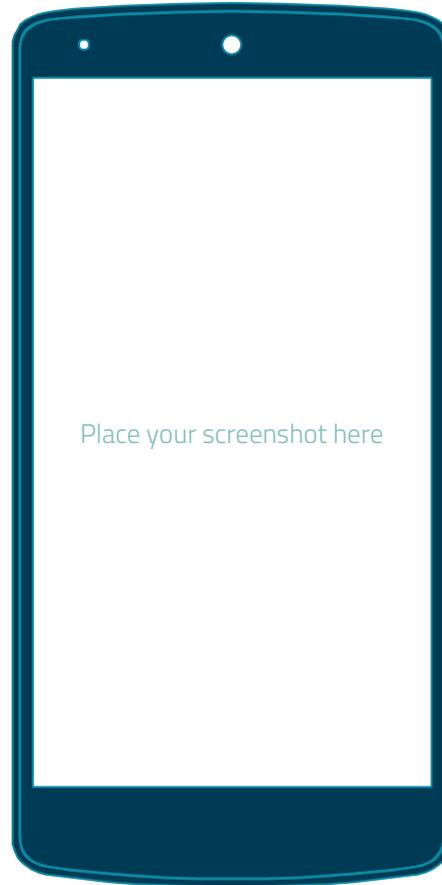


You can insert graphs from [Google Sheets](#)



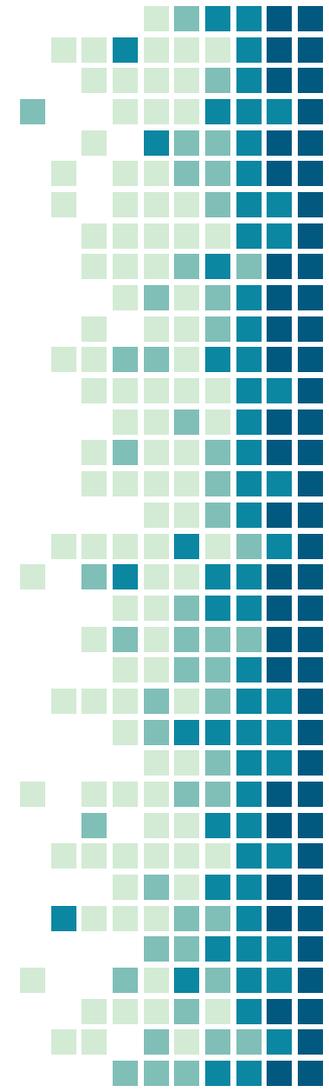
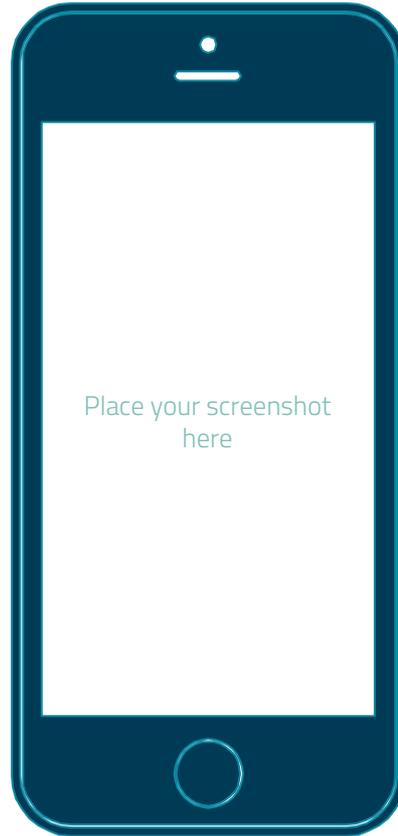
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Show and explain your web, app or software projects using these gadget templates.



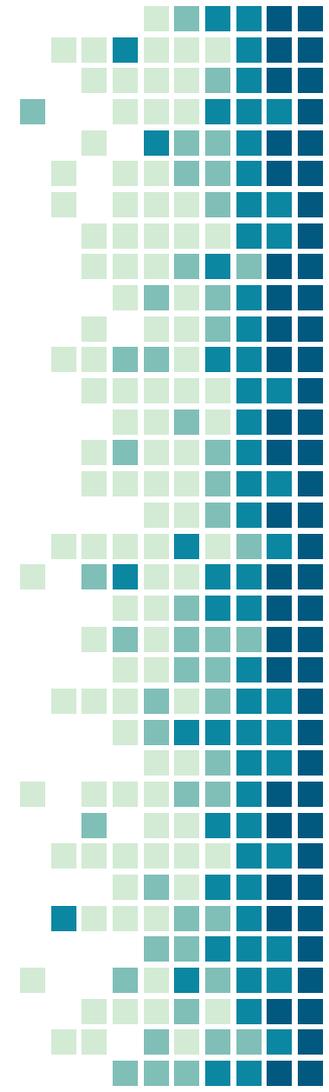
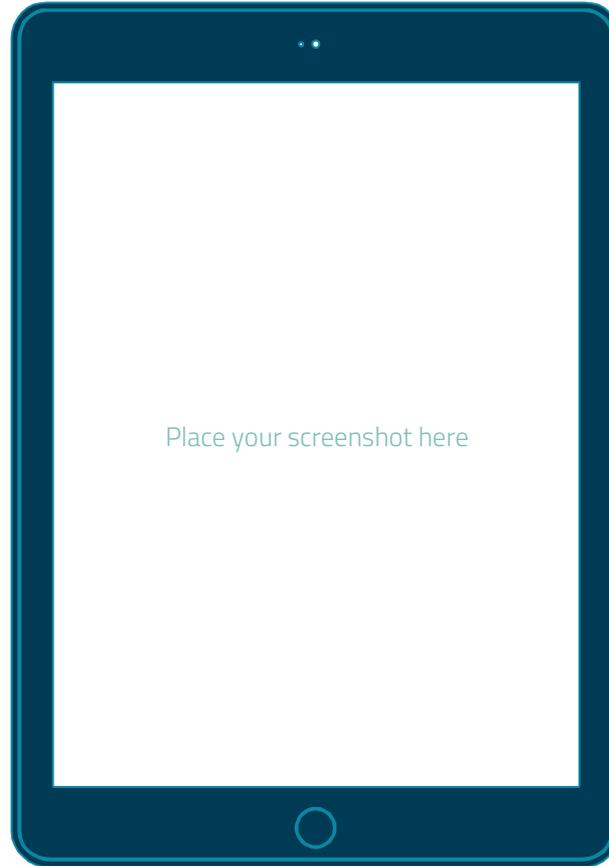
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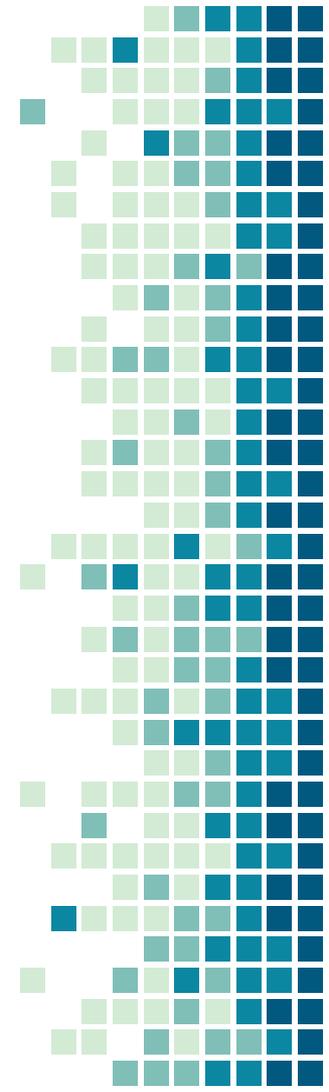
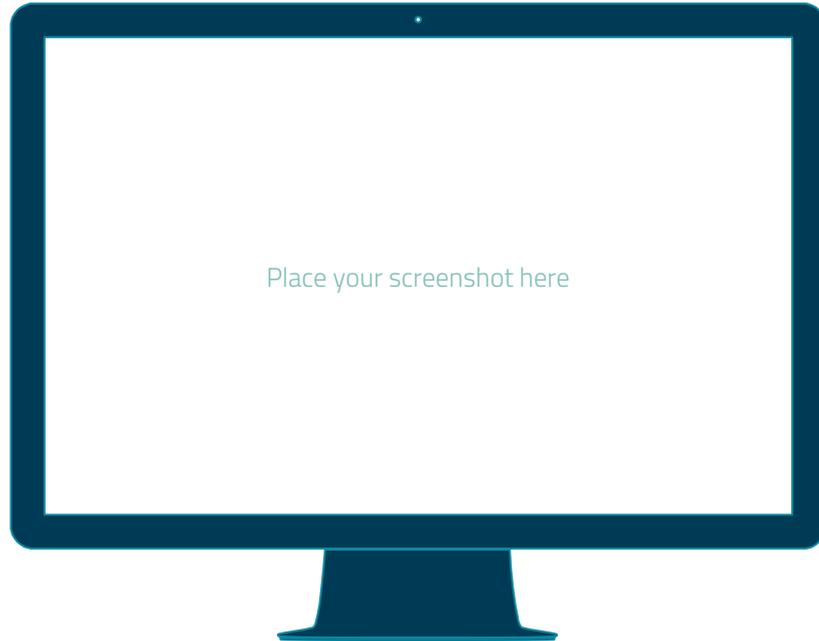
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# DESKTOP PROJECT

Show and explain your web, app or software projects using these gadget templates.





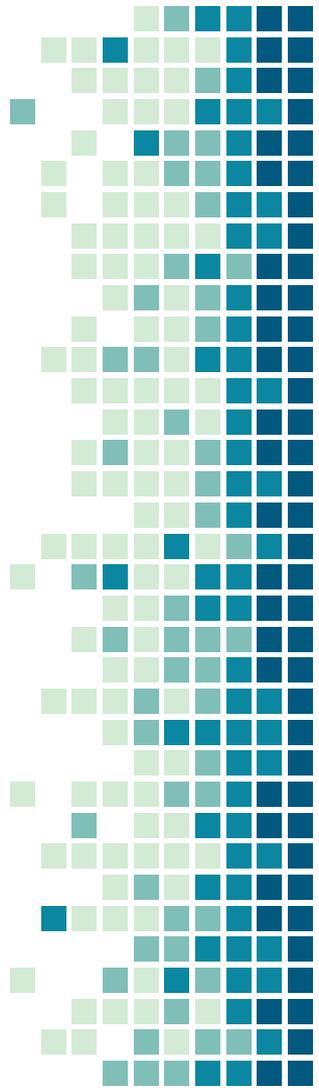
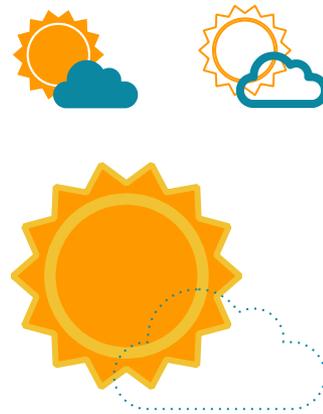
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- Change fill color and opacity.
- Change line color, width and style.

Isn't that nice? :)

Examples:



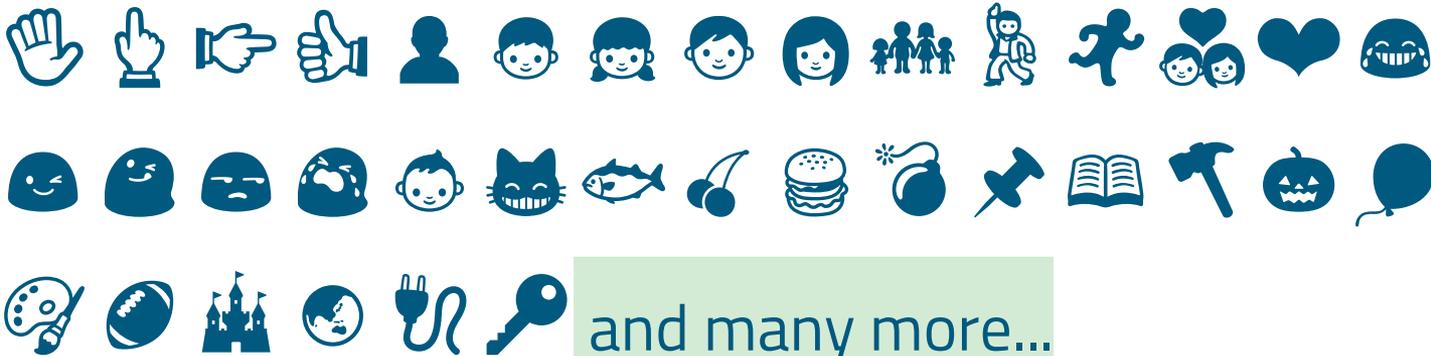


## Now you can use any emoji as an icon!

And of course it resizes without losing quality and you can change the color.

How? Follow Google instructions

<https://twitter.com/googledocs/status/730087240156643328>



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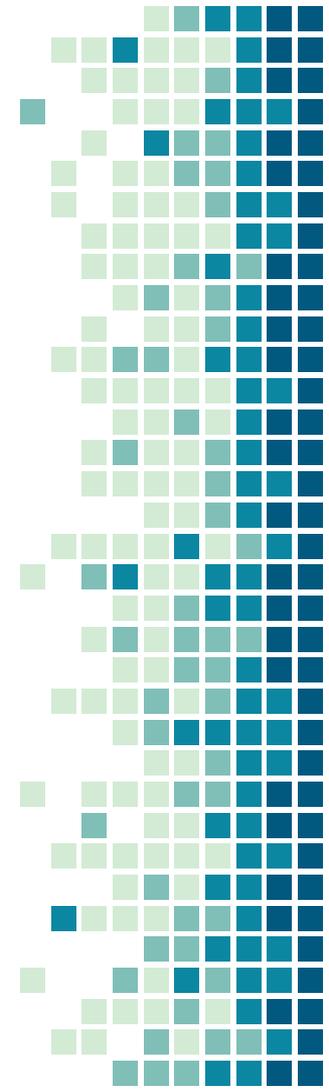
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“*Quotations are commonly printed as a means of inspiration and to invoke philosophical thoughts from the reader.*”

# Options

## White OLED Screen

Is the color of milk and fresh snow, the color produced by the combination of all the colors of the visible spectrum.

## Blue OLED Screen

Is the color of coal, ebony, and of outer space. It is the darkest color, the result of the absence of or complete absorption of light.

