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# **Adafruit***ImageLoadLibraryDocumentation*

## ***Release 1.0***

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## Contents

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<b>1</b>	<b>Usage Example</b>	<b>3</b>
<b>2</b>	<b>Contributing</b>	<b>5</b>
<b>3</b>	<b>Documentation</b>	<b>7</b>
<b>4</b>	<b>Table of Contents</b>	<b>9</b>
4.1	Simple test . . . . .	9
4.2	Requests test . . . . .	9
4.3	adafruit_imageload . . . . .	11
4.4	adafruit_imageload.bmp . . . . .	11
4.5	adafruit_imageload.bmp.indexed . . . . .	11
4.6	Developing . . . . .	12
4.6.1	Shared Bindings . . . . .	12
4.6.1.1	Palette code example . . . . .	12
4.6.1.2	Bitmap code example . . . . .	12
4.6.1.3	Example of Palette and Image . . . . .	12
<b>5</b>	<b>Indices and tables</b>	<b>15</b>
	<b>Python Module Index</b>	<b>17</b>
	<b>Index</b>	<b>19</b>



This library decodes an image file into new bitmap and palette objects of the provided type. It's designed to load code needed during decoding as needed. This is meant to minimize the memory overhead of the decoding code.

Only certain types of bitmaps work with this library, and they often have to be exported in specific ways. To find out what types are supported and how to make them, see [this learn guide page](#).



# CHAPTER 1

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## Usage Example

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```
import board
import displayio
import adafruit_imageload

image, palette = adafruit_imageload.load(
    "images/4bit.bmp", bitmap=displayio.Bitmap, palette=displayio.Palette
)
tile_grid = displayio.TileGrid(image, pixel_shader=palette)

group = displayio.Group()
group.append(tile_grid)
board.DISPLAY.show(group)

while True:
    pass
```





## CHAPTER 2

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### Contributing

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Contributions are welcome! Please read our [Code of Conduct](#) before contributing to help this project stay welcoming.



## CHAPTER 3

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### Documentation

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For information on building library documentation, please check out [this guide](#).



### 4.1 Simple test

Ensure your image loads with this simple test.

Listing 1: examples/imageload\_simpletest.py

```
1  # SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
2  # SPDX-License-Identifier: MIT
3
4  import board
5  import displayio
6  import adafruit_imageload
7
8  image, palette = adafruit_imageload.load("images/4bit.bmp")
9
10 tile_grid = displayio.TileGrid(image, pixel_shader=palette)
11
12 group = displayio.Group()
13 group.append(tile_grid)
14 board.DISPLAY.show(group)
15
16 while True:
17     pass
```

### 4.2 Requests test

Loads image that is fetched using adafruit\_request

Listing 2: examples/imageload\_from\_web.py

```
1  # SPDX-FileCopyrightText: 2021 Tim C for Adafruit Industries
2  # SPDX-License-Identifier: MIT
3  """
4  imageload example for esp32s2 that loads an image fetched via
5  adafruit_requests using BytesIO
6  """
7  from io import BytesIO
8  import ssl
9  import wifi
10 import socketpool
11
12 import board
13 import displayio
14 import adafruit_requests as requests
15 import adafruit_imageload
16
17 # Get wifi details and more from a secrets.py file
18 try:
19     from secrets import secrets
20 except ImportError:
21     print("WiFi secrets are kept in secrets.py, please add them there!")
22     raise
23
24 wifi.radio.connect(secrets["ssid"], secrets["password"])
25
26 print("My IP address is", wifi.radio.ipv4_address)
27
28 socket = socketpool.SocketPool(wifi.radio)
29 https = requests.Session(socket, ssl.create_default_context())
30
31 # pylint: disable=line-too-long
32 url = "https://raw.githubusercontent.com/adafruit/Adafruit_CircuitPython_ImageLoad/
33 ↪main/examples/images/4bit.bmp"
34
35 print("Fetching text from %s" % url)
36 response = https.get(url)
37 print("GET complete")
38
39 bytes_img = BytesIO(response.content)
40 image, palette = adafruit_imageload.load(bytes_img)
41 tile_grid = displayio.TileGrid(image, pixel_shader=palette)
42
43 group = displayio.Group(scale=1)
44 group.append(tile_grid)
45 board.DISPLAY.show(group)
46
47 response.close()
48
49 while True:
50     pass
```

## 4.3 adafruit\_imageload

Load pixel values (indices or colors) into a bitmap and colors into a palette.

- Author(s): Scott Shawcroft

`adafruit_imageload.load(file_or_filename, *, bitmap=None, palette=None)`

Load pixel values (indices or colors) into a bitmap and colors into a palette.

`bitmap` is the desired type. It must take `width`, `height` and `color_depth` in the constructor. It must also have a `_load_row` method to load a row's worth of pixel data.

`palette` is the desired palette type. The constructor should take the number of colors and support assignment to indices via `[]`.

## 4.4 adafruit\_imageload.bmp

Load pixel values (indices or colors) into a bitmap and colors into a palette from a BMP file.

- Author(s): Scott Shawcroft

`adafruit_imageload.bmp.load(file, *, bitmap=None, palette=None)`

Loads a bmp image from the open file.

Returns tuple of bitmap object and palette object.

### Parameters

- **bitmap** (*object*) – Type to store bitmap data. Must have API similar to `displayio.Bitmap`. Will be skipped if `None`
- **palette** (*object*) – Type to store the palette. Must have API similar to `displayio.Palette`. Will be skipped if `None`

## 4.5 adafruit\_imageload.bmp.indexed

Load pixel values (indices or colors) into a bitmap and colors into a palette from an indexed BMP.

- Author(s): Scott Shawcroft

`adafruit_imageload.bmp.indexed.decode_rle(bitmap, file, compression, y_range, width)`

Helper to decode RLE images

`adafruit_imageload.bmp.indexed.load(file, width, height, data_start, colors, color_depth, compression, *, bitmap=None, palette=None)`

Loads indexed bitmap data into bitmap and palette objects.

### Parameters

- **file** (*file*) – The open bmp file
- **width** (*int*) – Image width in pixels
- **height** (*int*) – Image height in pixels
- **data\_start** (*int*) – Byte location where the data starts (after headers)
- **colors** (*int*) – Number of distinct colors in the image
- **color\_depth** (*int*) – Number of bits used to store a value

- **compression** (*int*) – 0 - none, 1 - 8bit RLE, 2 - 4bit RLE

## 4.6 Developing

Strategy: \* read headers to determine file type \* keep a pointer to the start of data \* read data into the Palette for all colors present \* rewind the file pointer back to start of data \* read data into the Bitmap \* return a bitmap and palette instance

### 4.6.1 Shared Bindings

This library uses interfaces from CircuitPython's `displayio` module (Bitmap and Palette) to load images from disk into memory.

The Bitmap and Palette objects are related, and together can be used to display the image on a screen for the user.

The Palette is a list of colors present in the image. Its constructor takes a single argument: (*int*) `max_colors`, representing how many colors will be populated in the palette.

#### 4.6.1.1 Palette code example

```
palette = Palette(4)  # 4 represents that we will define four colors in palette
palette[0] = b'\x00\x00\x00\x00'  # white
palette[1] = b'\xFF\x00\x00\x00'  # red
palette[2] = b'\x00\xFF\x00\x00'  # green
palette[3] = b'\x00\x00\xFF\x00'  # blue
```

#### 4.6.1.2 Bitmap code example

```
bitmap = Bitmap(3, 2, 4)  # 3 pixels wide, two pixels tall, 4 colors
bitmap[0,0] = 0  # palette color 0
bitmap[0,1] = 1  # palette color 1
...
```

#### 4.6.1.3 Example of Palette and Image

The example is 4bit.bmp from the examples/images folder:

The Palette object appears like this after loading:

```
Palette:
[0] b'\x00\x00\x00\x00'
[1] b'\x7f\x00\x00\x00'
[2] b'\xff\x00\x00\x00'
[3] b'w\x00\x01\x00'
[4] b'\xff\x00\x9d\x00'
[5] b'\x00\x00\xff\x00'
[6] b'\xff\x00\xfe\x00'
[7] b'\xbf\x80\x00\x00'
[8] b'zzz\x00'
```

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```

[9] b'\xff\x9e\xa5\x00'
[10] b'\x00\x98\xff\x00'
[11] b'\x00\xff\x00\x00'
[12] b'h\xff\x00\x00'
[13] b'\xfb\xff\x9e\x00'
[14] b'\x00\xfb\xff\x00'
[15] b'\xfb\xfb\xfb\x00'

```

This palette has 16 colors. The value in square brackets [] is the color's index in the palette. The byte values are the RGB or RGB + padding of each color.

The Bitmap is an grid of which palette color to use in each position of the image.

The corresponding Bitmap to the example above appears like this after loading:

5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
11	11	11	5	5	5	15	15	15	5	5	5	2	2	2
11	11	11	5	5	5	15	15	15	5	5	5	2	2	2
6	6	6	5	5	5	1	1	1	5	5	5	10	10	10
6	6	6	5	5	5	1	1	1	5	5	5	10	10	10
6	6	6	5	5	5	1	1	1	5	5	5	10	10	10
14	14	14	5	5	5	9	9	9	5	5	5	8	8	8
14	14	14	5	5	5	9	9	9	5	5	5	8	8	8
14	14	14	5	5	5	9	9	9	5	5	5	8	8	8
3	3	3	5	5	5	0	0	0	5	5	5	13	13	13
3	3	3	5	5	5	0	0	0	5	5	5	13	13	13
4	4	4	5	5	5	12	12	12	5	5	5	7	7	7
4	4	4	5	5	5	12	12	12	5	5	5	7	7	7
4	4	4	5	5	5	12	12	12	5	5	5	7	7	7
5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

This grid represents the example image (15 pixels wide and 17 pixels tall). The coordinates are arranged in a zero indexed grid, starting in the top left at [0,0], and continuing down and to the right to a final coordinate of [14,16].

The value at each position is an integer, representing an entry in the palette object.

For example, the Bitmap coordinate [0,0] has the value (integer) 5.

This corresponds to the the Palette object's, [5] which is b'\x00\x00\xff\x00'. This is a byte string that represents a color.



## CHAPTER 5

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### Indices and tables

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- `genindex`
- `modindex`
- `search`



### a

`adafruit_imageload`, [10](#)  
`adafruit_imageload.bmp`, [11](#)  
`adafruit_imageload.bmp.indexed`, [11](#)



### A

`adafruit_imageload (module)`, 10  
`adafruit_imageload.bmp (module)`, 11  
`adafruit_imageload.bmp.indexed (module)`,  
11

### D

`decode_rle()` (in *module*  
*adafruit\_imageload.bmp.indexed*), 11

### L

`load()` (in *module* *adafruit\_imageload*), 11  
`load()` (in *module* *adafruit\_imageload.bmp*), 11  
`load()` (in *module* *adafruit\_imageload.bmp.indexed*),  
11