# Delicious Image

Delicious Image

PIXEL

R:10110011
G:01001110
B:00110111

# Can you see a difference?

PIXEL

PIXEL

# The pixels are not the same

ORIGINAL PIXEL

R:10110011
G:01001110
B:00110111

ALTERED PIXEL

R:10110010
G:01001111
B:00110110

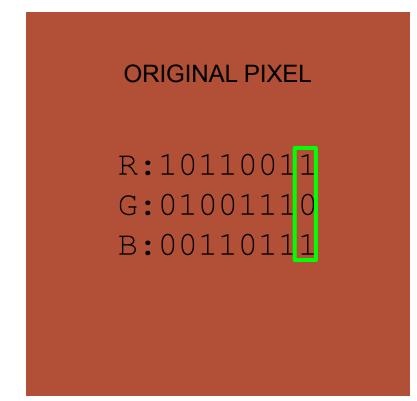Each change alters
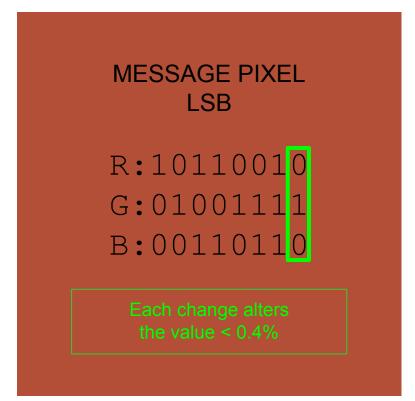the value < 0.4%
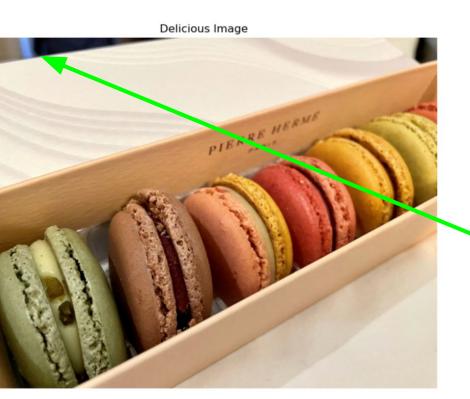
# Can you see a difference?

# What can we do with this?

# Steganography!

Steganography is the process of hiding a secret message within a larger one in such a way that someone can not know the presence or contents of the hidden message. The purpose of Steganography is to maintain secret communication between two parties. Unlike cryptography, which conceals the contents of a secret message, steganography conceals the very fact that a message is communicated. Although steganography differs from cryptography, there are many analogies between the two, and some authors classify steganography as a form of cryptography since hidden communication is a type of secret message.
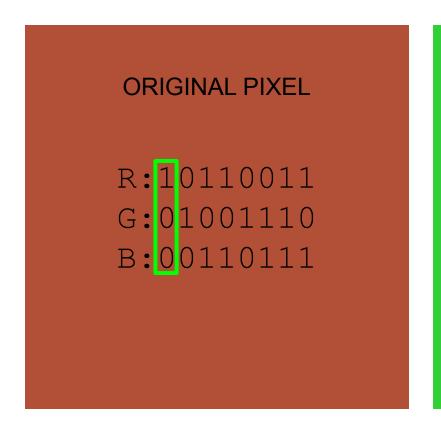
```
[0, 1, 0, 1, 0, 0, 1, 1, 0, 1, 1, 1, 0, 1, 0, 0, 0, 1, 1, 0, 0, 1, 0, 1, 0, 1, 1, 0, 0, 1, 1,
1, 0, 1, 1, 0, 0, 0, 0, 1, 0, 1, 1, 0, 1, 1, 1, 0, 0, 1, 1, 0, 1, 1, 1, 1, 0, 1, 1, 0, 0, 1,
1, 1, 0, 1, 1, 1, 0, 0, 1, 0, 0, 1, 1, 0, 0, 0, 0, 1, 0, 1, 1, 1, 0, 0, 0, 0, 0, 1, 1, 0, 1,
0, 0, 0, 0, 1, 1, 1, 1, 0, 0, 1, 0, 0, 1, 0, 0, 0, 0, 0, 0, 1, 1, 0, 1, 0, 0, 1, 0, 1, 1, 1,
0, 0, 1, 1, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 1, 1, 1, 0, 1, 0, 0, 0, 1, 1, 0, 1, 0, 0, 0, 0, 1, 1,
0, 0, 1, 0, 1, 0, 0, 1, 0, 0, 0, 0, 0, 0, 1, 1, 1, 0, 0, 0, 0, 0, 1, 1, 1, 0, 0, 1, 0, 0, 1,
1, 0, 1, 1, 1, 1, 0, 1, 1, 0, 0, 0, 1, 1, 0, 1, 1, 0, 0, 1, 0, 1, 0, 1, 1, 1, 0, 0, 1, 1, 0,
1, 1, 1, 0, 0, 1, 1, 0, 0, 1, 0, 0, 0, 0, 0, 0, 1, 1, 0, 1, 1, 1, 1, 0, 1, 1, 0, 0, 1, 1, 0,
0, 0, 1, 0, 0, 0, 0, 0, 0, 1, 1, 0, 1, 0, 0, 0, 0, 1, 1, 0, 1, 0, 0, 1, 0, 1, 1, 0, 0, 1, 0,
0, 0, 1, 1, 0, 1, 0, 0, 1, 0, 1, 1, 0, 1, 1, 1, 0, 0, 1, 1, 0, 0, 1, 1, 1, 0, 0, 1, 0, 0, 0,
```

# Steganography

[0, 1, 0, 1, 0, 0, 1, 1,

## ORIGINAL PIXEL

R:10110011
G:01001110
B:00110111

## MESSAGE PIXEL LSB

R:10110010
G:01001111
B:00110110

Each change alters
the value < 0.4%

Delicious Image


Delicious Image with Message

Steganography

[0, 1, 0, 1, 0, 0, 1, 1,

ORIGINAL PIXEL
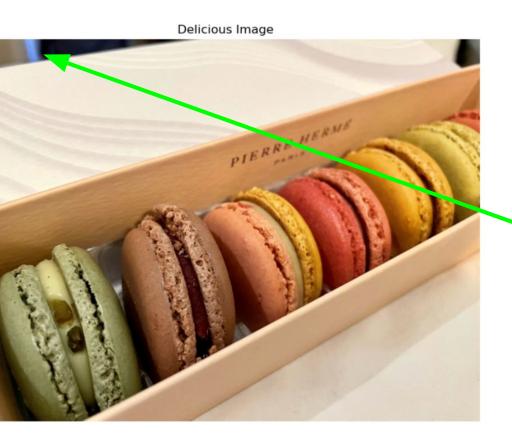
R:10110011
G:01001110
B:00110111

MESSAGE PIXEL
MSB

R:00110011
G:11001110
B:00110111

Each change halves
or doubles the value

Delicious Image

Delicious Image with Message MSB

- Works where the small alterations don't significantly change the meaning of the data. E.g.:
  - Images
  - Audio
  - Metrics - temperature, speed, cpu usage

- Alterations can be detected by digital fingerprinting

A Jupyter Notebook based demo is available at:

https://github.com/mmobarak/steganography-demo-notebook