2) (a) The N-dimensional normal distribution is a multidimensional generlisation of the one dimensional normal distribution.

(b) The approach is to use the mean μ and the sample standard deviation σ

(c)

3) The Mahalanobis distance (MD) is the distance between two points in a multivariate space or between a vector and a distribution.

The MD occurs for correlation of the multi correlated data between variables but z-scoring doesn't and the normally distributed data can be obtained by computing z-scoring of the distance from the mean

```python
# Done by Munther Odeh and Timo Marks
import cv2
import numpy as np
from matplotlib import pyplot as plt
```

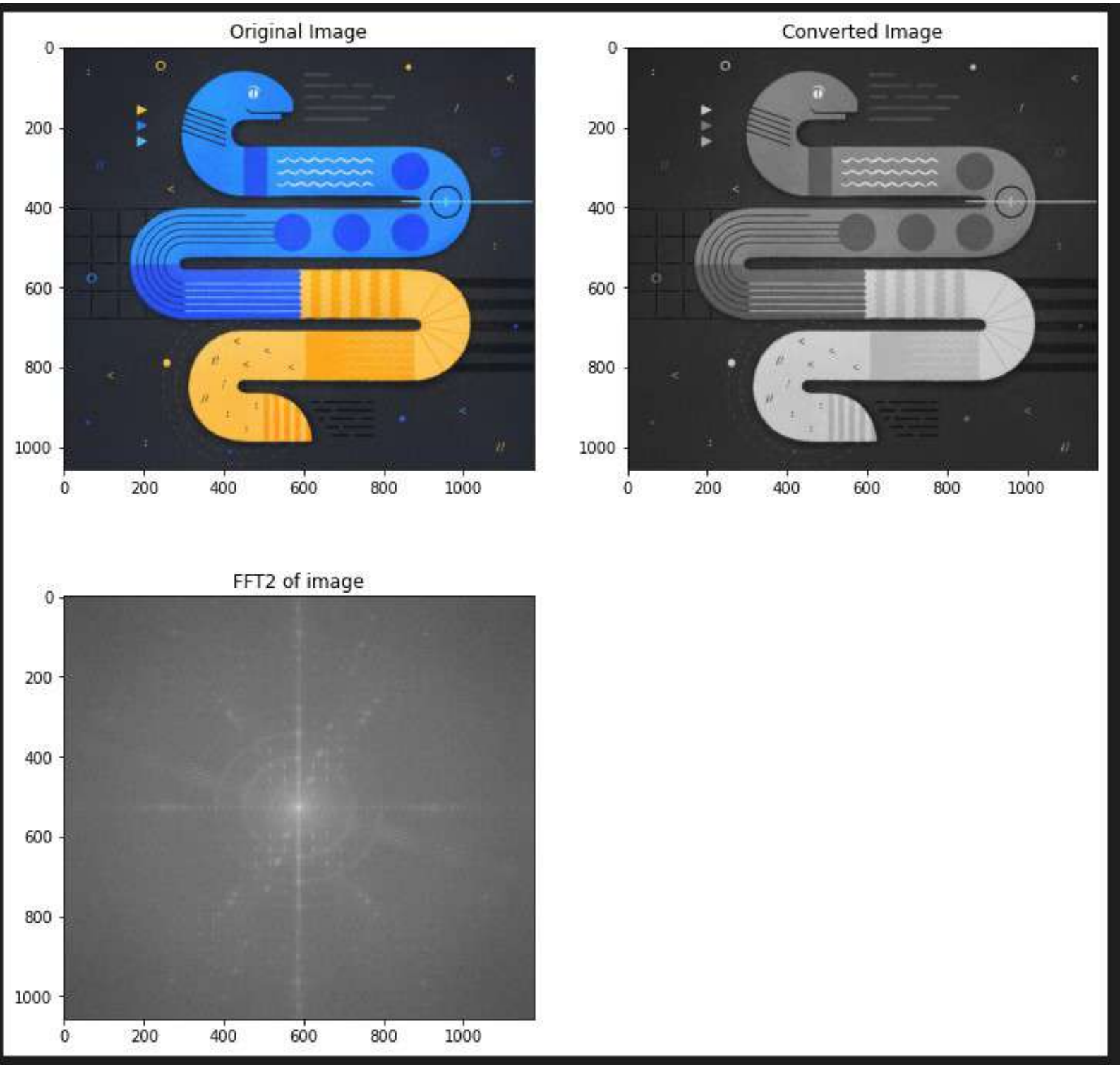
✓ 0.6s

```python
img = plt.imread('python-hero.jpg')
img_wa = cv2.imread('python-hero.jpg', 0)
img_dft = cv2.dft(np.float32(img_wa), flags=cv2.DFT_COMPLEX_OUTPUT)
shift = np.fft.fftshift(img_dft)
# Magnitude of the function is 20.log(abs(f))

magnitude_spectrum = 20 * np.log(cv2.magnitude(shift[:, :, 0], shift[:, :, 1]))
fig = plt.figure(figsize=(12, 12))
fig1 = fig.add_subplot(2,2,1)
fig1.imshow(img)
fig1.title.set_text('Original Image')
fig2 = fig.add_subplot(2,2,2)
fig2.imshow(img_wa, cmap='gray')
fig2.title.set_text('Converted Image')
fig3 = fig.add_subplot(2,2,3)
fig3.imshow(magnitude_spectrum, cmap='gray')
fig3.title.set_text('FFT2 of image')

# The plot shows the components of the frequencies
# More frequencies less magnitude and more whie region at the center
# The image information is more in the low frequencies than the higher ones
# Two dominating directions are illustrated both vertically and horizontally in the center
```

✓ 0.7s


Original Image
Converted Image
FFT2 of image
0
200
400
600
800
1000