Question 1

Correct

Mark 1.00 out of 1.00

Flag question

Classify the following compression methods

MP3	Lossy ✓
Arithmetic coding	Lossless ✓
Undersampling	Lossy ✓
LZ77	Lossless ✓
JPEG	Lossy ✓
Wavelet transform coding	Lossy ✓
Deflate	Lossless ✓
Huffman coding	Lossless ✓

Your answer is correct.

The correct answer is: MP3 – Lossy, Arithmetic coding – Lossless, Undersampling – Lossy, LZ77 – Lossless, JPEG – Lossy, Wavelet transform coding – Lossy, Deflate – Lossless, Huffman coding – Lossless

Question 2

Not answered

Marked out of 1.00

Flag question

Consider a given source S with several letters all having non-zero probabilities.

We encode a length-n string containing a single letter repeated n times with:

1. a Huffman code based in the source S model;
2. arithmetic encoding based in the source S model;
3. LZ77 with unbounded size for the search buffer and the lookahead buffer;
4. LZ78 with unbounded dictionary size.

how does the length of the corresponding codes grow with n?

Note: for Huffman and arithmetic "length" means number of bits, and for dictionary methods "length" means number of tokens.

Select one or more:

- ☐ In (1) grows linearly with n and in (2) is bounded independently of n
- ☐ In (4) the code length grows proportionally to the square root of n
- ☐ In (4) the code length grows proportionally to the square of n
- ☐ In (2) grows linearly with n and the constant is equal to the logarithm of the inverse of the probability of the letter.
- ☐ In the four cases the length is bounded independently of n
- ☐ In (1) and (2) grows linearly with n
- ☐ In (3) the code length is bounded independently of n
- ☐ In (3) and (4) the code length is bounded independently of n

Your answer is incorrect.

The correct answer is: In (1) and (2) grows linearly with n, In (3) the code length is bounded independently of n, In (4) the code length grows proportionally to the square root of n, In (2) grows linearly with n and the constant is equal to the logarithm of the inverse of the probability of the letter.

Question 3

Correct

Mark 1.00 out of 1.00

Flag question

A text of length 1100 containing 10 different letters is LZ77-encoded using a search buffer of length 64 and a lookahead buffer of length 10 .

Tokens have the form (θ,λ,**a**) with θ the left displacement to the beginning of the longest match, λ the length of the longest match, and **a** the first letter after the match. The token (0,0,**a**) is used when there is no match.

Which are true?

Select one or more:

- [x] The first token is of type (0,0,**a**) ✓

Yes, because at the beginning the search buffer is empty and there is no match.

- [ ] A token encodes a string of text of length between 0 and 10
- [x] Some texts can be encoded using less than 110 tokens ✓

For example, the text consisting of repetitions of the same letter 10+1 times begins with a token (0,0,1), then continues with tokens of the form (10,10,a) and ends with token (10,10-1,a). The number of tokens is exactly 101.

- [x] The maximum possible match length λ is 10 ✓
- [ ] The last token cannot be of the type (0,0,**a**)
- [ ] Some texts can be encoded using at most 100 tokens

Your answer is correct.

The correct answer is: Some texts can be encoded using less than 110 tokens, The maximum possible match length λ is 10, The first token is of type (0,0,**a**)

Question 4

Partially correct

Mark 0.83 out of 1.00

Flag question

About the MP3 audio compression method, mark the following as true or false:

Passing from the time domain to the frequency domain is achieved by means of a filter bank followied by a modified discrete cosine transform	True ✓
It is a method to encode video and it is applied to the audio and the video data mixed	False ✓
The compression ratio of the MP3 algorithm depends on the type of music	False ✓
The frequencies are quantized according to a psychoacoustic model who takes care of the masking properties of some frequencies with respect to others	True ✓
The frequencies in the band between 20 Hz and 20 kHz are eliminated, and only the others outside this band are encoded in the compressed data	False ✓
It uses the MDCT (modified discrete cosine transform), which is a method for quantizing the high frequencies	True ✗

Your answer is partially correct.

You have correctly selected 5.

The correct answer is: Passing from the time domain to the frequency domain is achieved by means of a filter bank followied by a modified discrete cosine transform – True, It is a method to encode video and it is applied to the audio and the video data mixed – False, The compression ratio of the MP3 algorithm depends on the type of music – False, The frequencies are quantized according to a psychoacoustic model who takes care of the masking properties of some frequencies with respect to others – True, The frequencies in the band between 20 Hz and 20 kHz are eliminated, and only the others outside this band are encoded in the compressed data – False, It uses the MDCT (modified discrete cosine transform), which is a method for quantizing the high frequencies – False

Question 5

Incorrect

Mark -0.33 out of 1.00

Flag question

The 2-D discrete cosine transform is applied to a matrix corresponding to a **constant image block** (an image block with all pixels equal).

The transformed matrix contains the image frequencies as coefficients. These **frequency coefficients are**:

Select one:

- a. all positive
- b. all zero except maybe one
- c. none of the others ✗
- d. all equal

Your answer is incorrect.

The correct answer is: all zero except maybe one

Question 6

Partially correct

Mark 0.60 out of 1.00

Flag question

Tell whether the following statements are true or false

In LZ78 with unbounded dictionary size the number of dictionary entries is equal to the number of tokens created in the encoding process	True ✓
In LZ77 let s and t be the lengths of the search buffer and the lookahead buffer. For all values t>=s the output of the algorithm is the same than for t=s	True ✗
In LZ78 the decoder creates the alphabet from the information coming from the tokens	True ✓
In LZ78 with unbounded dictionary size, the encoding of a text consisting of n repetitions of the same alphabet letter produces about sqrt(n) tokens	False ✗
In LZSS the decoder needs to be informed about the alphabet because it cannot be deduced from the information contained in the tokens	False ✓

Your answer is partially correct.

You have correctly selected 3.

The correct answer is: In LZ78 with unbounded dictionary size the number of dictionary entries is equal to the number of tokens created in the encoding process – True, In LZ77 let s and t be the lengths of the search buffer and the lookahead buffer. For all values t>=s the output of the algorithm is the same than for t=s – False, In LZ78 the decoder creates the alphabet from the information coming from the tokens – True, In LZ78 with unbounded dictionary size, the encoding of a text consisting of n repetitions of the same alphabet letter produces about sqrt(n) tokens – True, In LZSS the decoder needs to be informed about the alphabet because it cannot be deduced from the information contained in the tokens – False

Question 7

Correct

Mark 1.00 out of 1.00

Flag question

In which step of a **image lossy compression mehtod** based on the technique **block transforms between spatial and frequency domains** the loss of information is produced?

Select one:

- Entropy encoding of the quantized frequencies
- Transformation from spatial to frequency domain
- Quantization of the frequency coefficients ✓
- Splitting of the image into blocks
- Inverse transformation from frequency to spatial domain

Your answer is correct.

The correct answer is: Quantization of the frequency coefficients

Question 8

Correct

Mark 1.00 out of 1.00

Flag question

Which functions can be expressed as a sine series of the following form?

$$f(t) = \sum_{n=1}^{\infty} b_n \sin(2\pi n t)$$

Select one:

- a. all constant functions
- b. the even functions that are periodic of period 2π
- c. the odd functions that are periodic of period 2π ✓
- d. all periodic functions of period 2π

Your answer is correct.

The correct answer is: the odd functions that are periodic of period 2π

Question 9

Not answered

Marked out of 1.00

Flag question

Consider the analog signal given as a function of time by the formula

$$f(t) = \cos(2\pi t/4096) + \sin(2\pi t/256)$$

What is the **smalliest sampling ratio** after which we may ensure that the function can be **exactly recovered** from its samples?

Select one:

- a. 16384
- b. 8192
- c. 2048

Your answer is incorrect.

The correct answer is: 8192

Question 10

Partially correct

Mark 0.83 out of 1.00

Flag question

In the JPEG compression system, mark the following statements as true or false:

A lossless compression method is used to encode the quantized frequencies	False ✗
The image is transformed using the DCT (discrete cosine transform)	True ✓
For color images the transform is applied separately to the Y, Cb and Cr components, after a change of coordinates from the RGB coordinate system	True ✓
The image is transformed using the MDCT (modified discrete cosine transform) to avoid blocking artifacts	False ✓
The frequencies are encoded using more bits for the high frequencies and less bits for the low frequencies	False ✓
All the three image RGB color components are undersampled before applying the transformation	False ✓

Your answer is partially correct.

You have correctly selected 5.

The correct answer is: A lossless compression method is used to encode the quantized frequencies – True, The image is transformed using the DCT (discrete cosine transform) – True, For color images the transform is applied separately to the Y, Cb and Cr components, after a change of coordinates from the RGB coordinate system – True, The image is transformed using the MDCT (modified discrete cosine transform) to avoid blocking artifacts – False, The frequencies are encoded using more bits for the high frequencies and less bits for the low frequencies – False, All the three image RGB color components are undersampled before applying the transformation – False

Question 11

Correct

Mark 1.00 out of 1.00

Flag question

Recall that a matrix is orthogonal if the following equivalent conditions are satisfied:

- the rows of the matrix are orthogonal vectors of length one
- the columns of the matrix are orthogonal vectors of length one
- the product of the matrix by its transpose is the identity matrix
- the product of the transpose of the matrix by the matrix itself is the identity matrix

Which of the following matrices is orthogonal?

Select one:

a. $\begin{pmatrix} 1 & 3 & 1 \\ -3 & 1 & 0 \\ -1 & -3 & 10 \end{pmatrix}$

b. $\begin{pmatrix} 1 & 3 & 1 \\ 2 & 6 & 2 \\ -1 & -3 & 10 \end{pmatrix}$

c. $\begin{pmatrix} \frac{\sqrt{11}}{11} & \frac{3\cdot\sqrt{11}}{11} & \frac{\sqrt{11}}{11} \\ -\frac{3\cdot\sqrt{10}}{10} & \frac{\sqrt{10}}{10} & 0 \\ -\frac{\sqrt{110}}{110} & -\frac{3\cdot\sqrt{110}}{110} & \frac{\sqrt{110}}{11} \end{pmatrix}$ ✓

d. $\begin{pmatrix} \frac{\sqrt{11}}{11} & \frac{3\cdot\sqrt{11}}{11} & \frac{\sqrt{11}}{11} \\ \frac{\sqrt{10}}{10} & \frac{3\cdot\sqrt{10}}{10} & \frac{\sqrt{10}}{10} \\ -\frac{\sqrt{110}}{110} & -\frac{3\cdot\sqrt{110}}{110} & \frac{\sqrt{110}}{11} \end{pmatrix}$

Your answer is correct.

The correct answer is:

$$\begin{pmatrix} \frac{\sqrt{11}}{11} & \frac{3\cdot\sqrt{11}}{11} & \frac{\sqrt{11}}{11} \\ -\frac{3\cdot\sqrt{10}}{10} & \frac{\sqrt{10}}{10} & 0 \\ -\frac{\sqrt{110}}{110} & -\frac{3\cdot\sqrt{110}}{110} & \frac{\sqrt{110}}{11} \end{pmatrix}$$

Question 12

Correct

Mark 1.00 out of 1.00

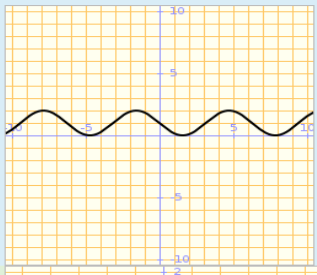
Flag question

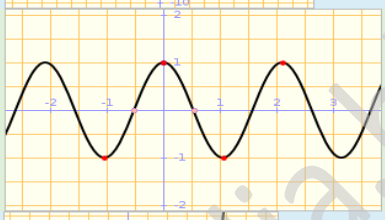
Which of the following functions are even?

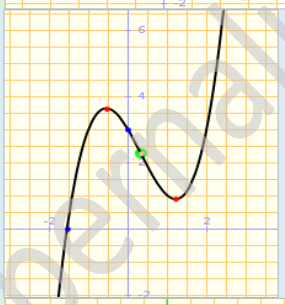
Recall that a function is even if

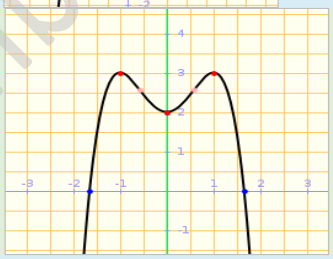
$$f(x)=f(-x)$$

Select one or more:

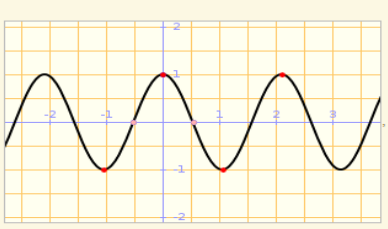
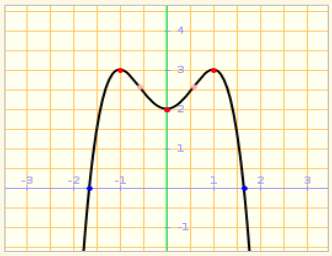
a. 

b. 

c. 

d. 

Your answer is correct.

The correct answer is:  

Pregunta 1

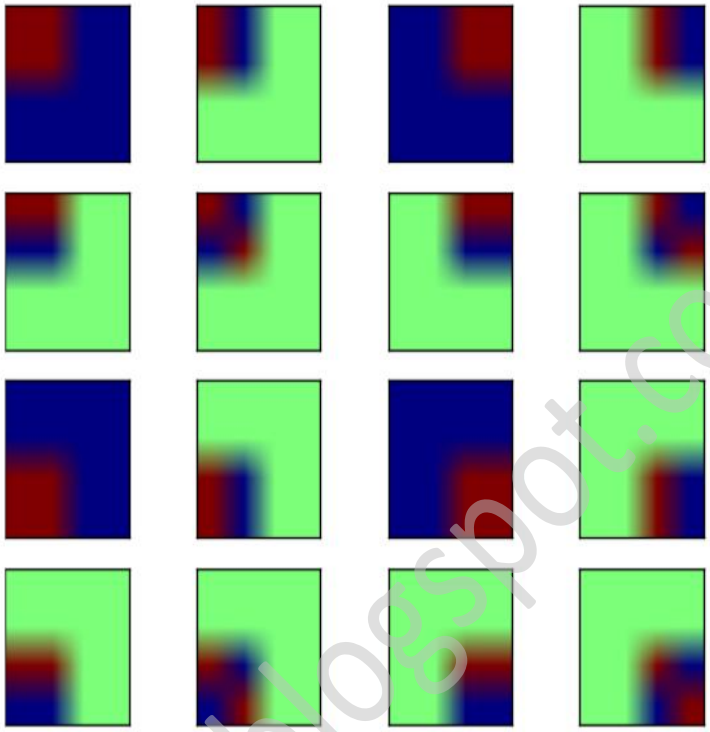
No s'ha respost encara

Puntuat sobre 1,00

Marca la pregunta

Edita la pregunta Bloques base (bloques) (còpia)

¿A qué transformación se corresponden los bloques base de la imagen adjunta?



Trieu-ne una:

a. $\begin{pmatrix} \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} & 0 & 0 \\ \frac{1}{\sqrt{2}} & -\frac{1}{\sqrt{2}} & 0 & 0 \\ 0 & 0 & \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} \\ 0 & 0 & \frac{1}{\sqrt{2}} & -\frac{1}{\sqrt{2}} \end{pmatrix}$

b. $\begin{pmatrix} 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \end{pmatrix}$

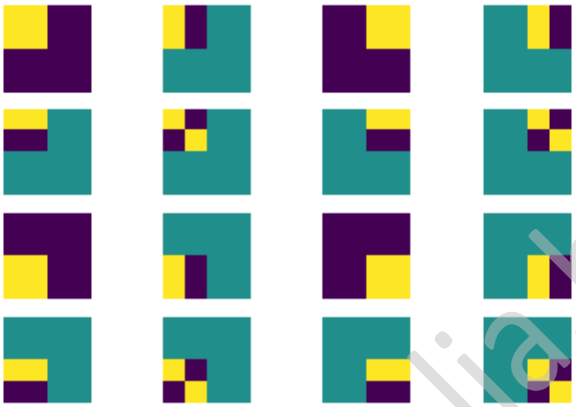
c. $\begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$

d. $\frac{1}{2}\begin{pmatrix} 1 & 1 & 1 & 1 \\ 1 & 1 & -1 & -1 \\ 1 & -1 & -1 & 1 \\ 1 & -1 & 1 & -1 \end{pmatrix}$

```
import numpy as np
from scipy import misc
from math import sqrt
import matplotlib.pyplot as plt

def idct_bloque(p):
    c = np.array([[1 / (sqrt(2)), 1 / (sqrt(2)), 0, 0],
                  [1 / (sqrt(2)), -1 / (sqrt(2)), 0, 0],
                  [0, 0, 1 / (sqrt(2)), 1 / (sqrt(2))],
                  [0, 0, 1 / (sqrt(2)), -1 / (sqrt(2))]])
    ct = np.transpose(c)
    return (np.tensordot(np.tensordot(ct,p,axes=([1],[0])), c, axes = ([1],[0]))).reshape(-1)

fig = plt.figure()
array = np.zeros((4,4))
array = array.astype(int)
for i in range(4):
    for j in range(4):
        array[i][j] = 1
        m = idct_bloque(array)
        fig.add_subplot(4,4,i*4+j+1).axis('off')
        plt.imshow(misc.toimage(m.reshape((4,4))))
        array[i][j] = 0
```



Pregunta 6

No s'ha respost encara

Puntuat sobre 1,00

Marca la pregunta

Edita la pregunta Ratio compresión usando diccionario

Tenemos una imagen de 1024×1024 píxeles, con una escala de 64 grises. Deseamos comprimirla usando un diccionario con 256 entradas cuyas palabras son bloques de 16×16 píxeles.

La ratio de compresión será aproximadamente

Trieu-ne una:

- a. 16
- b. 0.06771
- c. 14.77
- d. 192

```python
from math import log2

def ratio_de_compresion(pixeles,escala,entradas,pixelesB):
    num = pixeles*pixeles*log2(escala)
    den = (pixeles/pixelesB)*(pixeles/pixelesB)*log2(entradas) + entradas*pixelesB*pixelesB*log2(escala)
    return num/den

print(ratio_de_compresion(1024,64,256,16))

'''
14.76923076923077
'''
```

$$ratio\ de\ compresión = \frac{1024 \cdot 1024 \cdot \log_2 64 \ \text{bits/pixel}}{\frac{1024}{16} \cdot \frac{1024}{16} \cdot \log_2 256 \ + 256 \cdot 16 \cdot 16 \cdot \log_2 64 \ \text{bits/pixel}} = 14.77$$

Pregunta 10

No s'ha respost encara

Puntuat sobre 1,00

Marca la pregunta

Edita la pregunta

Transformación ortogonal

Indica qué matriz puede definir una transformación ortogonal.

Trieu-ne una:

a. $\begin{pmatrix} \frac{\sqrt{3}}{3} & \frac{\sqrt{3}}{3} & \frac{\sqrt{3}}{3} \\ -\frac{\sqrt{2}}{2} & \frac{\sqrt{2}}{2} & 0 \\ -\frac{\sqrt{6}}{6} & -\frac{\sqrt{6}}{6} & \frac{\sqrt{6}}{3} \end{pmatrix}$

b. $\begin{pmatrix} 1 & 1 & 1 \\ 2 & 2 & 2 \\ -1 & -1 & 2 \end{pmatrix}$

c. $\begin{pmatrix} 1 & 1 & 1 \\ -1 & 1 & 0 \\ -1 & -1 & 2 \end{pmatrix}$

d. $\begin{pmatrix} \frac{\sqrt{3}}{3} & \frac{\sqrt{3}}{3} & \frac{\sqrt{3}}{3} \\ \frac{\sqrt{2}}{2} & \frac{\sqrt{2}}{2} & \frac{\sqrt{2}}{2} \\ -\frac{\sqrt{6}}{6} & -\frac{\sqrt{6}}{6} & \frac{\sqrt{6}}{3} \end{pmatrix}$

A matrix T is *orthogonal* if $T \cdot T^t$ is the identity matrix, which is equivalent to the fact that its inverse coincides with the transpose:

$$T^{-1} = T^t.$$

https://www.wolframalpha.com/input/?i=Transpose%5B%7B%7Bsqrt(3)%2F3,+sqrt(3)%2F3,+sqrt(3)%2F3%7D,+%7B-sqrt(2)%2F2,+sqrt(2)%2F2,+0%7D,+%7B-sqrt(6)%2F6,+-sqrt(6)%2F6,+sqrt(6)%2F3%7D%7D%5D

https://www.wolframalpha.com/input/?i=Inverse%5B%7B%7Bsqrt(3)%2F3,+sqrt(3)%2F3,+sqrt(3)%2F3%7D,+%7B-sqrt(2)%2F2,+sqrt(2)%2F2,+0%7D,+%7B-sqrt(6)%2F6,+-sqrt(6)%2F6,+sqrt(6)%2F3%7D%7D%5D

Input:

$$\begin{pmatrix} \frac{\sqrt{3}}{3} & \frac{\sqrt{3}}{3} & \frac{\sqrt{3}}{3} \\ -\frac{\sqrt{2}}{2} & \frac{\sqrt{2}}{2} & 0 \\ -\frac{\sqrt{6}}{6} & -\frac{\sqrt{6}}{6} & \frac{\sqrt{6}}{3} \end{pmatrix}^{\mathrm{T}}$$

Input:

$$\begin{pmatrix} \frac{\sqrt{3}}{3} & \frac{\sqrt{3}}{3} & \frac{\sqrt{3}}{3} \\ -\frac{\sqrt{2}}{2} & \frac{\sqrt{2}}{2} & 0 \\ -\frac{\sqrt{6}}{6} & -\frac{\sqrt{6}}{6} & \frac{\sqrt{6}}{3} \end{pmatrix}^{-1}$$

(matrix inverse)

Exact result:

$$\frac{1}{6}\begin{pmatrix} 2\sqrt{3} & -3\sqrt{2} & -\sqrt{6} \\ 2\sqrt{3} & 3\sqrt{2} & -\sqrt{6} \\ 2\sqrt{3} & 0 & 2\sqrt{6} \end{pmatrix}$$

Result:

$$\frac{1}{6}\begin{pmatrix} 2\sqrt{3} & -3\sqrt{2} & -\sqrt{6} \\ 2\sqrt{3} & 3\sqrt{2} & -\sqrt{6} \\ 2\sqrt{3} & 0 & 2\sqrt{6} \end{pmatrix}$$

```
from numpy import array
from numpy.linalg import inv
from math import sqrt

matriz = array([
[sqrt(3)/3, sqrt(3)/3, sqrt(3)/3],
[-sqrt(2)/2, sqrt(2)/2, 0],
[-sqrt(6)/6, -sqrt(6)/6, sqrt(6)/3]])

print(inv(matriz))
print(matriz.transpose())

'''
[[ 0.57735027 -0.70710678 -0.40824829]
 [ 0.57735027  0.70710678 -0.40824829]
 [ 0.57735027  0.          0.81649658]]
[[ 0.57735027 -0.70710678 -0.40824829]
 [ 0.57735027  0.70710678 -0.40824829]
 [ 0.57735027  0.          0.81649658]]
'''
```

Pregunta 1

Correcte

Puntuació 1,00 sobre 1,00

Desmarca aquesta pregunta

En el JPEG, ¿En qué etapa se puede producir la mayor pérdida?

Trieu-ne una:

- a. Transformación del color.
- b. Cuantización ✓
- c. DCT
- d. RLE+Huffman/Aritmética

La teva resposta és correcta.

La resposta correcta és: Cuantización.

Pregunta 2

Correcte

Puntuació 1,00 sobre 1,00

Marca la pregunta

Tenemos una imagen de 4096×4096 píxeles, con una escala de 256 grises. Deseamos comprimirla usando un diccionario con 128 entradas cuyas palabras son bloques de 16×16 píxeles.

La ratio de compresión será aproximadamente

Trieu-ne una:

- a. 512
- b. 186.2 ✓
- c. 0.005371
- d. 292.6

La teva resposta és correcta.

La resposta correcta és: 186.2.

```
from math import log2

def ratio_de_compresion(pixeles,escala,entradas,pixelesB):
    num = pixeles*pixeles*log2(escala)
    den = (pixeles/pixelesB)*(pixeles/pixelesB)*log2(entradas) + entradas*pixelesB*pixelesB*log2(escala)
    return num/den

print(ratio_de_compresion(4096,256,128,16))

'''
186.1818181818182
'''
```

$$ratio\ de\ compresión = \frac{4096 \cdot 4096 \cdot \log_2 256 \ \text{bits/pixel}}{\frac{4096}{16} \cdot \frac{4096}{16} \cdot \log_2 128 \ + 128 \cdot 16 \cdot 16 \cdot \log_2 256 \ \text{bits/pixel}} = 186.2$$

Pregunta 3

Correcte

Puntuació 1,00 sobre 1,00

Desmarca aquesta pregunta

Se usan transformaciones ortogonales porque

Trieu-ne una o més:

- a. conservan la norma (energía). ✓
- b. su inversa coincide con la traspuesta. ✓
- c. su determinante es 0.
- d. transforma enteros en enteros.

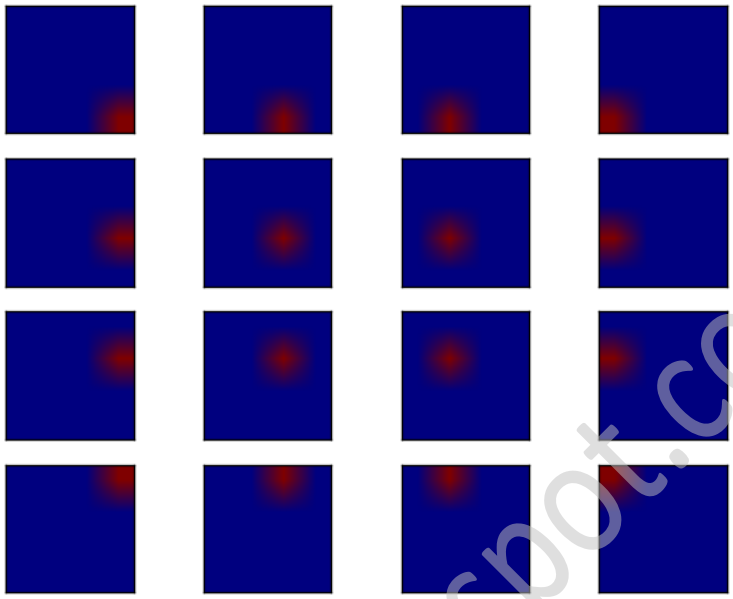
Pregunta 4

Correcte

Puntuació 1,00 sobre 1,00

Marca la pregunta

¿A qué transformación se corresponden los bloques base de la imagen adjunta?



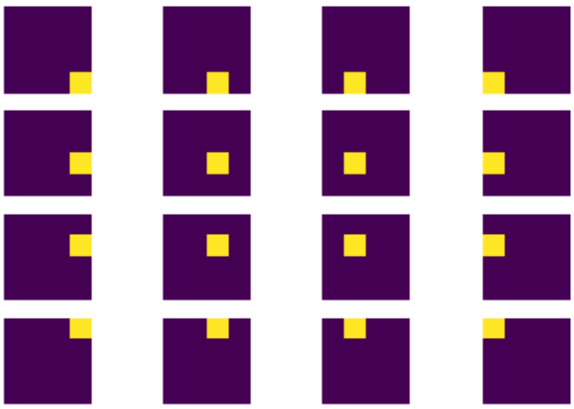
Trieu-ne una:

a. $\begin{pmatrix} 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \end{pmatrix}$ ✓

```
import numpy as np
from scipy import misc
import matplotlib.pyplot as plt

def idct_bloque(p):
    c = np.array([[0, 0, 0, 1],
                  [0, 0, 1, 0],
                  [0, 1, 0, 0],
                  [1, 0, 0, 0]])
    ct = np.transpose(c)
    return (np.tensordot(np.tensordot(ct,p,axes=([1],[0])), c, axes = ([1],[0]))).reshape(-1)

fig = plt.figure()
array = np.zeros((4,4))
array = array.astype(int)
for i in range(4):
    for j in range(4):
        array[i][j] = 1
        m = idct_bloque(array)
        fig.add_subplot(4,4,i*4+j+1).axis('off')
        plt.imshow(misc.toimage(m.reshape((4,4))))
        array[i][j] = 0
```



Pregunta 5

Correcte

Puntuació 1,00 sobre 1,00

Marca la pregunta

De los siguientes parámetros, h_k, indica cuáles pueden definir una wavelet

Trieu-ne una:

- a. $[0.2, 0.8294, 0.5071, -0.1223]$ ✓
- b. $[0.2, 0.8294, -0.1223, 0.5071]$
- c. $[-0.2, 0.4294, 0.1071, -0.5223]$
- d. $[-0.2, 1.229, 0.1071, 0.2777]$

La teva resposta és correcta.

La resposta correcta és: $[0.2, 0.8294, 0.5071, -0.1223]$

Pregunta 6

Correcte

Puntuació 1,00 sobre 1,00

Marca la pregunta

Indica qué matriz puede definir una transformación ortogonal.

Trieu-ne una:

- a. $\begin{pmatrix} 3 & 2 & 2 \\ 6 & 4 & 4 \\ -6 & -4 & 13 \end{pmatrix}$
- b. $\begin{pmatrix} \frac{3\cdot\sqrt{17}}{17} & \frac{2\cdot\sqrt{17}}{17} & \frac{2\cdot\sqrt{17}}{17} \\ \frac{3\cdot\sqrt{13}}{13} & \frac{2\cdot\sqrt{13}}{13} & \frac{2\cdot\sqrt{13}}{13} \\ -\frac{6\cdot\sqrt{221}}{221} & -\frac{4\cdot\sqrt{221}}{221} & \frac{\sqrt{221}}{17} \end{pmatrix}$
- c. $\begin{pmatrix} 3 & 2 & 2 \\ -2 & 3 & 0 \\ -6 & -4 & 13 \end{pmatrix}$
- d. $\begin{pmatrix} \frac{3\cdot\sqrt{17}}{17} & \frac{2\cdot\sqrt{17}}{17} & \frac{2\cdot\sqrt{17}}{17} \\ -\frac{2\cdot\sqrt{13}}{13} & \frac{3\cdot\sqrt{13}}{13} & 0 \\ -\frac{6\cdot\sqrt{221}}{221} & -\frac{4\cdot\sqrt{221}}{221} & \frac{\sqrt{221}}{17} \end{pmatrix}$ ✓

```
from numpy import array
from numpy.linalg import inv
from math import sqrt

matriz = array([
[(3*sqrt(17))/17, (2*sqrt(17))/17, (2*sqrt(17))/17],
[(-2*sqrt(13))/13, (3*sqrt(13))/13, 0],
[(-6*sqrt(221))/221, (-4*sqrt(221))/221, sqrt(221)/17]])

print(inv(matriz))
print(matriz.transpose())

'''
[[ 0.72760688 -0.5547002  -0.40360368]
 [ 0.48507125  0.83205029 -0.26906912]
 [ 0.48507125  0.          0.87447463]]
[[ 0.72760688 -0.5547002  -0.40360368]
 [ 0.48507125  0.83205029 -0.26906912]
 [ 0.48507125  0.          0.87447463]]
'''
```