Quiz

This is a preview of the draft version of the quiz.

[redacted]

Question 1

5 pts

With the follow code

```
import numpy as np

A = np.array([[1, 2], [3, 4]])
B = np.array([[5, 6], [5, 6]])
```

B is:

- A numpy matrix
- An ordinary list (of lists) Python object: <type 'list'>
- A numpy array

Question 2

5 pts

With the above code and

```
A * B
```

the result is

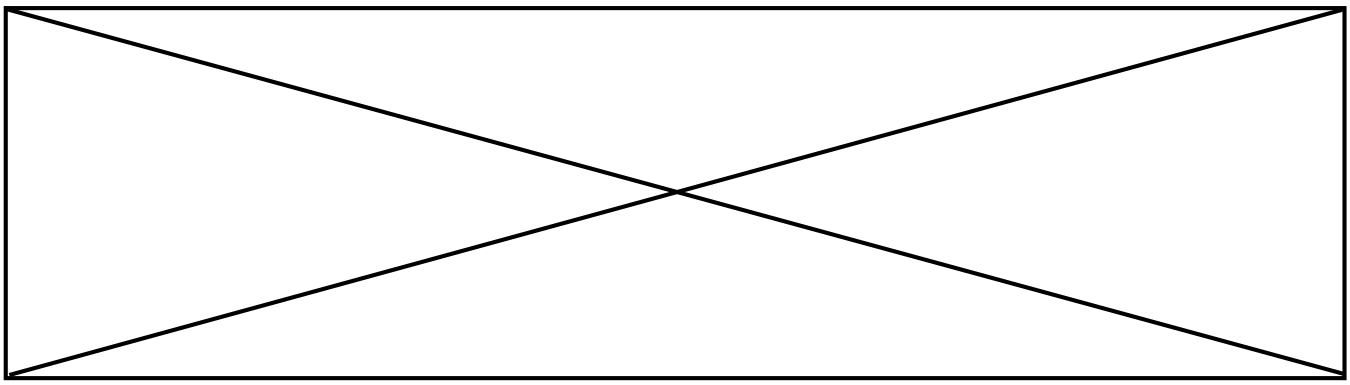
- Concatenation of the two lists
- A matrix product matrix([[15, 18], [35, 42]])
- An elementwise product of the matrix elements: array([[5, 12], [15, 24]])
- TypeError: can't multiply sequence by non-int of type 'list'

Question 3

5 pts

A is a variable in TensorFlow. Which of the following can be used to print its value?

sess = tf.Session()



Question 4

5 pts

When to use Deep Learning? (Multiple Answers)

- [ ] Large data size.
- [ ] An end-to-end infrastructure.
- [ ] Lack of domain understanding for feature introspection.
- [ ] Complex problems such as a 1000-category classification.

Question 5

5 pts

Can deep neural networks be trained in an unsupervised way?

- ( ) Yes
- ( ) No

Question 6

5 pts

There are exactly six fish tanks in a room of the aquarium. The six tanks contain the following numbers of fish:

$x_1 = 5, x_2 = 5, x_3 = 8, x_4 = 12, x_5 = 15, x_6 = 18$. The variance of the population is

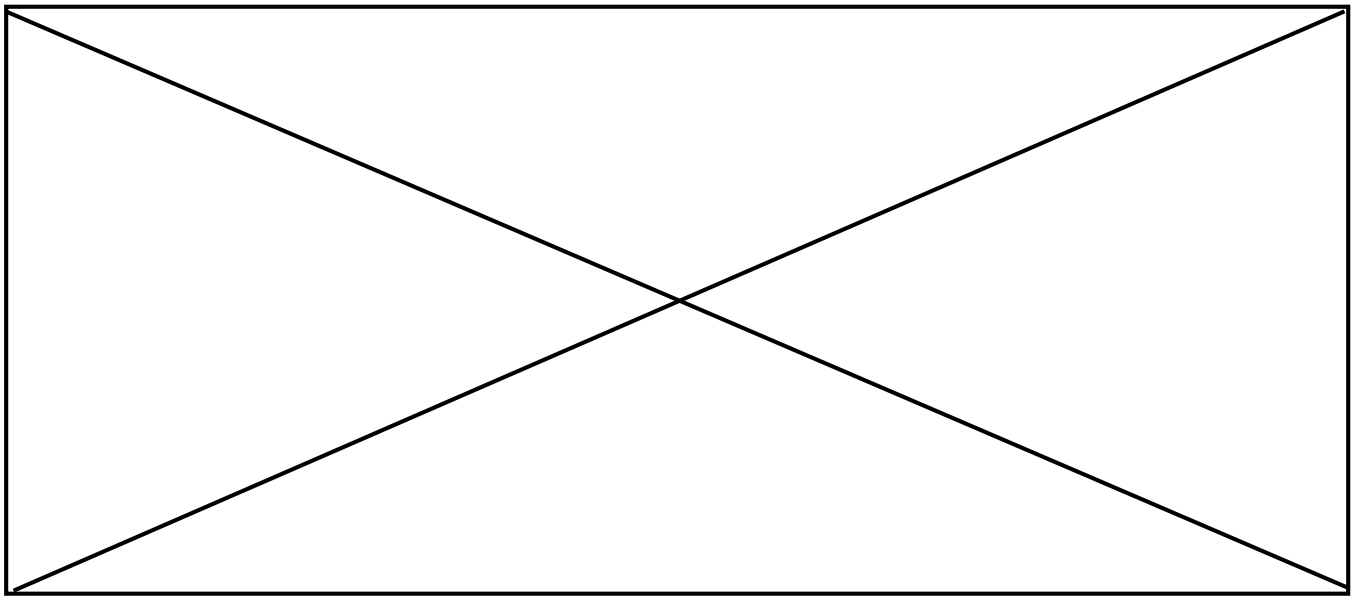
- 10.5
- 24.25
- 29.1
- 145.5

Question 7

5 pts

Consider the function $L = -u^T Su + \lambda u^T u$, where $u \in R^d$ and $S \in R^{d \times d}$.

λ is a constant value. Which of the following is the most accurate expression of $\frac{\partial L}{\partial u}$

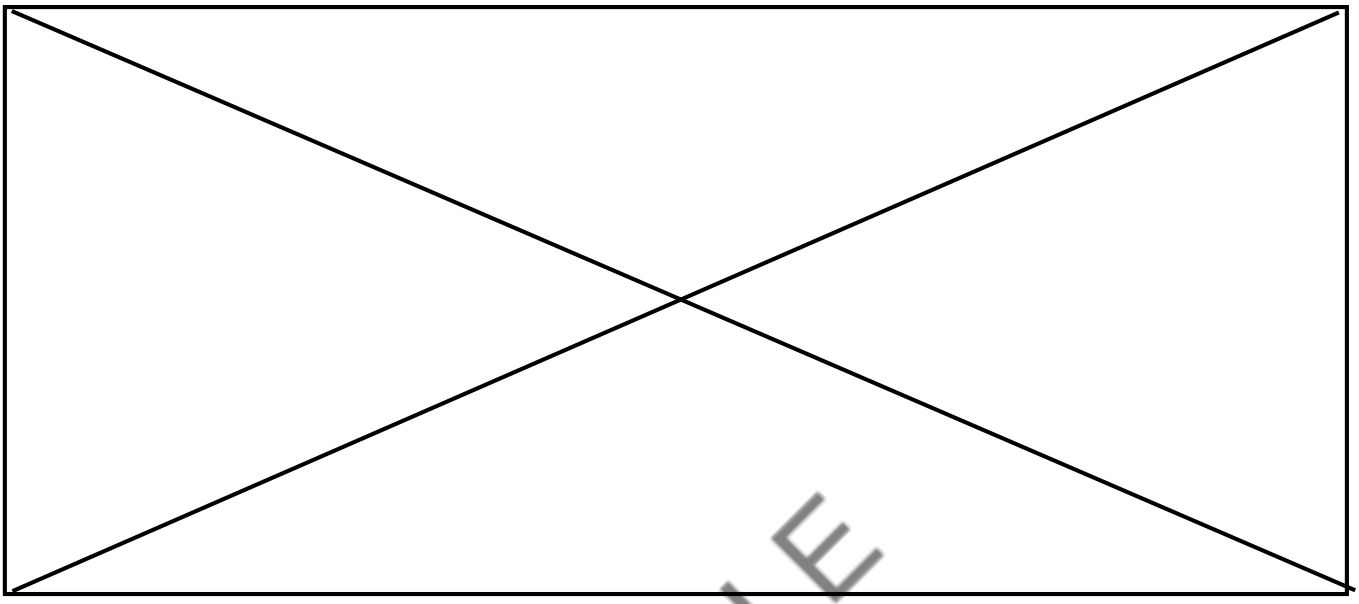


Question 8

5 pts

Let $X = \{x_i \in R^d\}_{1 \le i \le n}$ be a set of observations, and S is its corresponding scatter matrix. In Principal Component Analysis (PCA), X is projected onto a k dimensional subspace ($k < d$).

Which of the following is the objective function of PCA for $k = 1$



Question 9

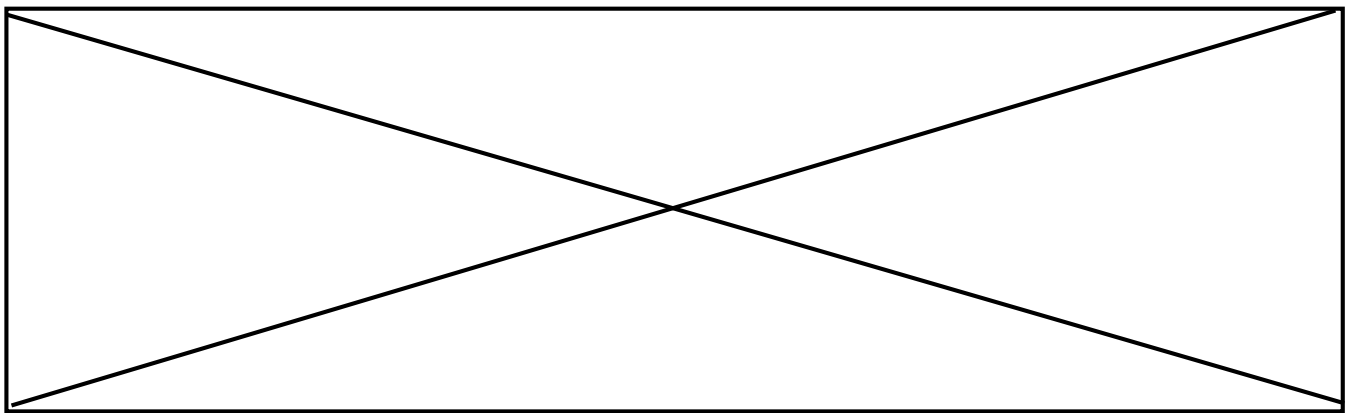
5 pts

Consider the following general objective function of sparse coding

$$\min_{\alpha,\phi} J(\theta) = \sum_{i=1}^{n} \left(\left\| x_i - \sum_{j=1}^{k} \alpha_{ij} \phi_j \right\|^2 + \beta \sum_{j=1}^{k} |\alpha_{ij}| \right)$$

$$\text{s.t. } \|\phi_j\|^2 \le 1, \forall j = 1, \ldots, k$$

Which of the following is most likely to be wrong?



Question 10

5 pts

Which of the following is the Sigmoid function

- $f(s) = \frac{e^{-s}}{1+e^{-s}}$
- $f(s) = \frac{1}{1+e^{-s}}$
- $f(s) = \frac{1}{1-e^{-s}}$
- $f(s) = \frac{e^{-s}}{1-e^{-s}}$

Question 11

10 pts

Given s as the input of Tanh function, when would Tanh function lead to vanishing gradient problem

- $s \to 1$
- $s \to 0$
- $s \to -\infty$
- $s \to e$

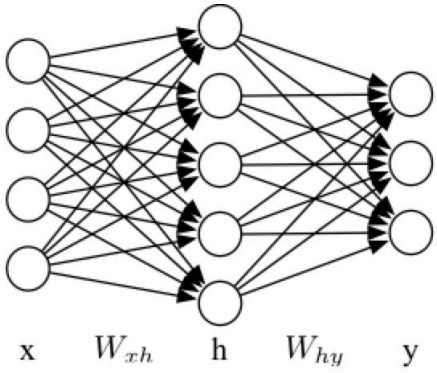
Question 12

10 pts

Suppose we have trained a neural network (ReLU on the hidden layer) for a 3-category classification problem, in which the weights and bias are

$$W_{xh} = \begin{bmatrix} 0.6 & 0.1 & 0.5 & 0.1 \\ 0.3 & 0.9 & 1.0 & 0.4 \\ 0.4 & 0.0 & 0.5 & 0.5 \\ 0.2 & 0.8 & 0.3 & 0.1 \\ 0.7 & 0.9 & 0.1 & 0.7 \end{bmatrix}, \quad b_{xh} = \begin{bmatrix} 0.9 \\ -2.4 \\ 1.3 \\ 3.8 \\ -1.2 \end{bmatrix}$$

$$W_{hy} = \begin{bmatrix} 0.9 & 0.2 & 0.4 & 0.9 & 1.0 \\ 0.9 & 0.3 & 0.9 & 0.7 & 0.4 \\ 0.6 & 0.1 & 0.9 & 0.5 & 0.4 \end{bmatrix} \quad b_{hy} = \begin{bmatrix} -5.4 \\ -5.5 \\ -3.1 \end{bmatrix}$$



Consider a test example $[1, -1, 2, -3]^T$.

The output $\hat{y}$ of the network is

- $[0.24, 0.00, 0.69]^T$
- $[0.12, 0.00, 0.99]^T$
- $[0.00, 1.00, 0.00]^T$
- $[0.05, 0.99, 0.00]^T$

Question 13

10 pts

The ground-truth output is $[0, 1, 0]^T$. Given the squared loss function $\frac{1}{2}\|y - \hat{y}\|^2$, the prediction error of this test example is

Question 14

10 pts

Given a softmax layer before y , the output of the softmax layer is

- $[0.0000, 1.000, 0.0000]^T$
- $[0.2378, 0.1947, 0.5675]^T$
- $[0.1358, 0.1289, 0.7353]^T$
- $[0.7823, 0.1502, 0.0675]^T$

Question 15

10 pts

Given a softmax layer before y , the final cross-entropy loss of this test example is

Saving...

Submit Quiz