

Final Exam

Due Dec 12 at 11:59pm **Points** 45 **Questions** 15

Available Dec 9 at 12am - Dec 12 at 11:59pm 4 days

Time Limit 75 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	53 minutes	45 out of 45

❗ Correct answers are hidden.

Score for this quiz: **45** out of 45

Submitted Dec 11 at 5:56pm

This attempt took 53 minutes.

Question 1

3 / 3 pts

We are in the age of semi-autonomous cars, where the driver is in control most of the time, but during critical scenarios when the system understands that the driver is incapable of taking actions, the car takes over the decision making. In such a system, consider a brain mobile interface application that assists drivers in a freeway by monitoring their drowsiness. The driver wears a Neurosky headset that senses brain signals (EEG) at 500 Hz. Each brain data point is a 32 bit floating point number. The brain signal is collected by a smartphone and sent to a server, where complex machine learning algorithms are employed to determine the drowsiness level of the driver. In addition, the car is equipped with sensors on the wheel and 360° camera, which are again interfaced with the smartphone of the individual. The data rate from the

sensors is 2 kbps, while that from the camera is 200 kbps. Using such data the driver assist system also attempts to predict impending accidents. If the driver is detected to be drowsy and an impending accident is predicted, the driver assist system should react with some actuation, either automatic braking or steering. The driver assist system only has 3 seconds to decide after collecting 5 seconds worth of data. There are two options for performing all the related computation: a) use a data center, and b) use a fog server such as a laptop with internet connectivity that is travelling with the driver. The data center upload speed is 1 Mbps, while that of the fog server is 3 Mbps. However, computation speed of the data center is 750 kbps, i.e., it can finish the computation on 750 kb of data in 1 second, on the other hand the fog server has a computational speed of 400 kbps. **(1 kb = 1024 b)**

What is the communication time in cloud server (write one integer round up to the nearest integer in ms)?

Question 2

3 / 3 pts

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What is the communication time to the fog server (write a number, **round up to the nearest integer in ms**)?

Question 3

3 / 3 pts

The eternal problem with deep learning systems is the following question:

"How much data do we need to ensure that a deep learning system does not overfit?"

What factors are relevant for an answer to this question?

- ☒ Complexity (number of layers, or number of neurons in a layer)
- ☒ Sensor noise while collecting data
- ☒ Feature extraction methods before providing the input to the deep learning system
- ☐ The correctness of class labels

Question 4**3 / 3 pts**

Why do we use context models?

- ☒ Easier storage of raw data
- ☒ Faster knowledge extraction
- ☒ Can be used for context prediction
- ☐ Improve reliability of sensors

Question 5**3 / 3 pts**

What is the ground Truth Challenge?

- ☐ No ground truth available for test data in a Machine learning system
- ☒ Ground Truth of Training data cannot be trusted
- ☐ No ground truth available for both training and test data
- ☐ Training data has noise

Question 6**3 / 3 pts**

Is heart rate a valid biometric (select the correct reason also)?

- ☐ Yes, because it comes from human body
- ☐ Yes, because heart rate is unique for a given person
- ☐ No, because it varies between individuals
- ☒ No, because it varies over time and there is no unique pattern

Question 7**3 / 3 pts**

One of the primary reasons of failure of Boeing 737 Max 8 was failure of the Angle of Attack sensors. There are two sensors that provide the raw angle data. Only one was used for the MCAS pitch control system. Assume that we had a module that queried both the sensors and if they agreed within an error of 10% then use one of them else do not use any

and raise alarm. What kind of context sensor is this?

- ☐ Physical sensor
- ☒ Logical sensor
- ☐ Virtual sensor
- ☐ None of the above

Question 8

3 / 3 pts

Why do we need IP-in-IP tunneling?

- ☒ Used by the home agent to forward messages from correspondent host to care of address
- ☐ Used by foreign agent to send acknowledgment back to home agent
- ☐ Used by mobile host to communicate with foreign agent
- ☐ Used by correspondent host to communicate with home agent

Question 9

3 / 3 pts

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control most of the time, but during critical scenarios when the system understands that the driver is incapable of taking actions, the car takes over the decision making. In such a system, consider a brain mobile interface application that assists drivers in a freeway by monitoring their drowsiness. The driver wears a Neurosky headset that senses brain signals (EEG) at 500 Hz. Each brain data point is a 32 bit floating point number. The brain signal is collected by a smartphone and sent to a server, where complex machine learning algorithms are employed to determine the drowsiness level of the driver. In addition, the car is equipped with sensors on the wheel and 360° camera, which are again interfaced with the smartphone of the individual. The data rate from the sensors is 2 kbps, while that from the camera is 200 kbps. Using such data the driver assist system also attempts to predict impending accidents. If the driver is detected to be drowsy and an impending accident is predicted, the driver assist system should react with some actuation, either automatic braking or steering. The driver assist system only has 3 seconds to decide after collecting 5 seconds worth of data. There are two options for performing all the related computation: a) use a data center, and b) use a fog server such as a laptop with internet connectivity that is travelling with the driver. The data center upload speed is 1 Mbps, while that of the fog server is 3 Mbps. However, computation speed of the data center is 750 kbps, i.e., it can finish the computation on 750 kb of data in 1 second, on the other hand the fog server has a computational speed of 400 kbps. **(1 kb = 1024 b)**

Suppose the failure rate of the cloud server is 0.1. This means that 10% of the time the cloud will send a failure message back to the driver assist system. At this time it will have to again transfer all information to the cloud and redo the computation. The time taken to communicate that a failure has occurred is 210 ms. What is the average total time taken for communication and computation to be performed in the cloud? (write one number and round up to the nearest integer in ms).

Question 10**3 / 3 pts**

We are in the age of semi-autonomous cars, where the driver is in control most of the time, but during critical scenarios when the system understands that the driver is incapable of taking actions, the car takes over the decision making. In such a system, consider a brain mobile interface application that assists drivers in a freeway by monitoring their drowsiness. The driver wears a Neurosky headset that senses brain signals (EEG) at 500 Hz. Each brain data point is a 32 bit floating point number. The brain signal is collected by a smartphone and sent to a server, where complex machine learning algorithms are employed to determine the drowsiness level of the driver. In addition, the car is equipped with sensors on the wheel and 360° camera, which are again interfaced with the smartphone of the individual. The data rate from the sensors is 2 kbps, while that from the camera is 200 kbps. Using such data the driver assist system also attempts to predict impending accidents. If the driver is detected to be drowsy and an impending accident is predicted, the driver assist system should react with some actuation, either automatic braking or steering. The driver assist system only has 3 seconds to decide after collecting 5 seconds worth of data. There are two options for performing all the related computation: a) use a data center, and b) use a fog server such as a laptop with internet connectivity that is travelling with the driver. The data center upload speed is 1 Mbps, while that of the fog server is 3 Mbps. However, computation speed of the data center is 750 kbps, i.e., it can finish the computation on 750 kb of data in 1 second, on the other hand the fog server has a computational speed of 400 kbps. **(1 kb is 1024 b)**

What is the computation time to cloud server in ms?

1,451

Question 11**3 / 3 pts**

In criticality aware access control mechanism, which statements are true?



It is imperative that after the criticality is mitigated you should reinstate the previous access control rules



During criticality, access should be granted to users who have the highest probability of mitigating the criticality



During criticality, access should be granted to authorized users only regardless of their probability of potential mitigation



After criticality, if access control is not handled properly, the system can be open to security attacks

Question 12**3 / 3 pts**

In a tree based replication with n location registrars what is the worst case update cost?

☒ $2 \log(n)$

☐ $\log(n)$

☐ N^2

☐ $n/2$

Question 13

3 / 3 pts

What is the drawback of context definition by Relevance?

☒ Definition is not suitable for modern IoT based applications

☐ Definition may ignore certain variables that are essential for the given application

☒ Definition encompasses all variables essential for the given application but ignores variables that can be used for other applications

☐ It restricts context to only measurable variables

Question 14**3 / 3 pts**

What is the data provenance problem?



It is a problem where data source cannot be identified to be trustworthy



It is a data integrity problem where some entity has tampered with the data during wireless communication



It is an encryption problem, where data is sent in plaintext and is stolen



It is a type of presentation attack where false data is entangled with valid data

Question 15**3 / 3 pts**

When does Mobile IP protocol introduce inefficiencies?



When mobile host goes to a remote foreign agent



When mobile host does not move



When correspondent host and mobile host are in the same network

☐ When ingress filtering is not applied

Quiz Score: **45** out of 45