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	59 minutes	32 out of 45

ⓘ Correct answers are hidden.

Score for this quiz: **32** out of 45
Submitted Dec 9 at 5:16pm
This attempt took 59 minutes.

Question 1

3 / 3 pts

Consider the fitbit mobile application, that measures your activity, heart rate and sleep and shows it to you. Is this a Cyber Physical System?

- ○ True
- ◉ False

Question 2

3 / 3 pts

Consider the hydro cooling unit of a nuclear power plant that changes the injection rate of cold water based on reaction rate. Is this a Cyber-Physical System?

- ◉ True
- ○ False

Question 3

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 4

3 / 3 pts

What are the advantages of Fog server over cloud server?

- ☑ Communication to fog server is faster than cloud server
- ☐ fog server has pre-trained machine learning models that can accessed faster than the cloud
- ☐ It is never advantageous to use fog server over cloud. We only use fog server to test applications but in the real world we always use cloud
- ☑ Fog servers tend to be more available than cloud servers

Question 5

3 / 3 pts

Consider the following scenario: A mobile app (ChargeBuddy) has been developed that an Electric Vehicle owner can use to wirelessly search for a local charging station (CGS). The app lists the nearby CGSs, along with providing relevant information such as current price of charging, and distance from owner's current location. The EV owner selects the preferred CGS and undertakes responsibility to reach the chosen CGS within a specified time-period. On reaching the chosen CGS, the EV owner starts charging the EV.

Please answer the following questions on how loss of privacy through hacking of the mobile app can cause the problems for the power grid.

Which action can cause the demand in a particular substation increase beyond the supply cap?

- ○ Increasing price of a given CGS

- [x] Drastically decreasing the price of CGSs in a given area
- [ ] Not showing the nearest CGS but showing the second farthest and so on
- [ ] Only showing the nearest CGS and not showing others

Question 6

3 / 3 pts

Why do we need IP-in-IP tunneling?

- [x] 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 7

3 / 3 pts

Consider that the ChargeBuddy app now uses historical data to identify busiest CGS in a given smart city. Whenever an EV reaches a CGS it uploads a message to the ChargeBuddy server with its location and time of arrival. This data is used to determine busiest CGS. The smart grid uses the busiest CGS each day and parameterizes power supply to meet the power demands of the CGS that is predicted to be busiest that day. The prediction is performed using the same principle of a recommendation system which ranks the CGS with the most busiest as the top recommendation. An attacker now introduces spurious training data into this recommendation system with false labels of CGS locations.

How will this false data injection affect the power grid?

- [x] A wrong classification of busiest CGS can be induced by tampering the training process, which will in-turn cause overload in the truly busiest CGS
- [ ] It will not affect the power grid because it always provisions for the peak load on any substation
- [x] It might trigger usage of backup generators to meet the demand of the busiest CGS, which are costly and bad for the environment
- [ ] It will stop EVs from using other CGS

Question 8

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
- [x] No, because it varies over time and there is no unique pattern

Unanswered

Question 9

0 / 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.

What is the communication time to cloud and fog server (write two numbers in the format X,Y round up to the nearest integer in ms)?

Partial

Question 10

2 / 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?

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

Incorrect

Question 11

0 / 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.

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).

2,723

Question 12

3 / 3 pts

Why do we use context models?

- [x] Easier storage of raw data
- [x] Faster knowledge extraction
- [x] Can be used for context prediction
- [ ] Improve reliability of sensors

Incorrect

Question 13

0 / 3 pts

What are the advantages of Registration area based location information as opposed to cell based location information?

- [ ] Lesser update cost
- [ ] Lesser handoff cost
- [ ] Lesser search cost
- [x] Lesser registration cost

Question 14

3 / 3 pts

What is the ground Truth Challenge?

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

Incorrect

Question 15

0 / 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

Quiz Score: **32** out of 45