

Final Exam

Started: May 3 at 8:06pm

Quiz Instructions

Question 1

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
- 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 2

3 pts

Which statement is true about configuration management problem?

- There is no established security protocol for mobile applications
- There are established security protocols, but the smartphone is resource constrained so cannot be implemented
- Given the programming mechanism, security protocols are often not appropriately

parameterized to be effective

- Existing protocols cannot handle new types of attacks

Question 3

3 pts

What is the difference between a control system and cyber physical systems?

- CPS is a specific type of control system that considers effect of plant on environment
- CPS is a specific type of control system that considers effect of environment on plant
- CPS is a specific type of control system that controls the environment
- CPS is a specific type of control system that considers two sided effects of plant on environment and vice versa

Question 4

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 5

3 pts

Consider a smart phone application that measures your heart rate and summarizes the heart rate variation trend to show it to a doctor. Is this a Cyber Physical System?

- True

- False

Question 6

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

Question 7

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 8

3 pts

Which of the following statements are true for Support Vector Machines?

- They can be both linear and non-linear classifiers
- They can be applied to data that are both linearly and non-linearly separable
- They cannot be applied for data that is non-linearly separable
- None of the above

Question 9

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
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Question 10

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 11

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What are the advantages of Fog server over cloud server?

- Communication to fog server is faster than cloud server
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- Fog servers tend to be more available than cloud servers

Question 12

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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?

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What is the data provenance problem?

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Question 14**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
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Question 15**3 pts**

Consider the emission filtering controller (Selective Catalytic Reducer) that takes the output emission from Engine Control Unit and mixes it with Urea to reduce the output emission of the SCR. The aim of the controller is to keep environmental emissions within a limit.

Is the urea injection system a Cyber - physical system?

- No because it does not care about the interaction of the SCR with the environment
- Yes because it takes into account both the ECU emission and its effect on the environment.
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Not saved

Submit Quiz

Final Exam

Started: May 3 at 8:55pm

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Question 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

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True

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Question 11

3 pts

Why ingress filtering can cause problems for mobile IP?

It introduces inefficiencies and causes delays in communication

It can potentially prevent legitimate communication

It causes message integrity problems

It causes man in the middle problems

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Quiz saved at 8:59pm

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Final Exam

Due May 4 at 11:59pm Points 45 Questions 15

Available May 3 at 12am - May 5 at 1am 2 days

Time Limit 75 Minutes

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	16 minutes	45 out of 45

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Score for this quiz: 45 out of 45

Submitted May 3 at 8:22pm

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3 / 3 pts

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Submitted May 3 at 10:40pm

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Question 4

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 5

3 / 3 pts

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Question 10

3 / 3 pts

Google Maps with recommendation of places of interest nearby is an example of the following type of context aware application-

- Presentation and Execution
- Adaptation and Execution
- Presentation and Tagging
- Tagging and Execution

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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

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Submitted May 3 at 10:40pm

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-
- Ground Truth of Training data cannot be trusted
-
- No ground truth available for both training and test data
-
- Training data has noise

Question 4

3 / 3 pts

What is the drawback of context definition by Relevance?

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- Definition is not suitable for modern IoT based applications
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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 5

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
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Question 6

3 / 3 pts

Which of the following statements are true for Support Vector Machines?

- They can be both linear and non-linear classifiers



They can be applied to data that are both linearly and non-linearly separable

- They cannot be applied for data that is non-linearly separable
- None of the above

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?



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



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**

What are the advantages of Fog server over cloud server?

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Fog servers tend to be more available than cloud servers

Question 9

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 10

3 / 3 pts

Google Maps with recommendation of places of interest nearby is an example of the following type of context aware application-

-
- Presentation and Execution
 - Adaptation and Execution
 - Presentation and Tagging
 - Tagging and Execution
-

Question 11

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 12

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 13

3 / 3 pts

Consider the emission filtering controller (Selective Catalytic Reducer) that takes the output emission from Engine Control Unit and mixes it with Urea to reduce the output emission of the SCR. The aim of the controller is to keep environmental emissions within a limit.

Is the urea injection system a Cyber - physical system?

- No because it does not care about the interaction of the SCR with the environment
- Yes because it takes into account both the ECU emission and its effect on the environment.
- No because it is only a controller and does not care about the environment
- Yes because it has actuation

Question 14**3 / 3 pts**

What is the difference between a control system and cyber physical systems?

CPS is a specific type of control system that considers effect of plant on environment

CPS is a specific type of control system that considers effect of environment on plant

CPS is a specific type of control system that controls the environment

CPS is a specific type of control system that considers two sided effects of plant on environment and vice versa

Question 15**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

Quiz Score: **45** out of 45

Final Exam

Due May 4 at 11:59pm Points 45 Questions 15

Available May 3 at 12am - May 5 at 1am 2 days

Time Limit 75 Minutes

Attempt History

	Attempt	Time	Score
LATEST	<u>Attempt 1</u>	19 minutes	45 out of 45

! Correct answers are hidden.

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

Submitted May 3 at 11:47pm

This attempt took 19 minutes.

Question 1

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.

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Question 2

3 / 3 pts

What is the ground Truth Challenge?

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Question 3

3 / 3 pts

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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
- 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 4

3 / 3 pts

Why ingress filtering can cause problems for mobile IP?

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- It can potentially prevent legitimate communication
- It causes message integrity problems
- It causes man in the middle problems

Question 5

3 / 3 pts

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Is the urea injection system a Cyber - physical system?



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Yes because it takes into account both the ECU emission and its effect on the environment.



No because it is only a controller and does not care about the environment



Yes because it has actuation

Question 6

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 7

3 / 3 pts

Consider a smart phone application that measures your heart rate and summarizes the heart rate variation trend to show it to a doctor. Is this a

Cyber Physical System? True False**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 No, because it varies over time and there is no unique pattern**Question 9****3 / 3 pts**

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Question 10

3 / 3 pts

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Presentation and Execution

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Question 11

3 / 3 pts

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Question 12**3 / 3 pts**

Which of the following statements are true for Support Vector Machines?

They can be both linear and non-linear classifiers



They can be applied to data that are both linearly and non-linearly separable

They cannot be applied for data that is non-linearly separable

None of the above

Question 13**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

Question 14**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 15**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

Quiz Score: 45 out of 45

Final Exam

Due May 4 at 11:59pm Points 45 Questions 15

Available May 3 at 12am - May 5 at 1am 2 days

Time Limit 75 Minutes

Attempt History

	Attempt	Time	Score
LATEST	<u>Attempt 1</u>	36 minutes	45 out of 45

! Correct answers are hidden.

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

Submitted May 3 at 9:09pm

This attempt took 36 minutes.

Question 1

3 / 3 pts

Which statement is true about configuration management problem?

- There is no established security protocol for mobile applications
- There are established security protocols, but the smartphone is resource constrained so cannot be implemented
- Given the programming mechanism, security protocols are often not appropriately parameterized to be effective
- Existing protocols cannot handle new types of attacks

Question 2

3 / 3 pts

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None of the above

Question 5

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 6

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.

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-
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Question 7

3 / 3 pts

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

-
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3 / 3 pts

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3 / 3 pts

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3 / 3 pts

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3 / 3 pts

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3 / 3 pts

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3 / 3 pts

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Question 15

3 / 3 pts

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Quiz Score: **45** out of 45

Final Exam

Due May 4 at 11:59pm Points 45 Questions 15

Available May 3 at 12am - May 5 at 1am 2 days

Time Limit 75 Minutes

Attempt History

	Attempt	Time	Score
LATEST	<u>Attempt 1</u>	36 minutes	45 out of 45

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Submitted May 3 at 9:09pm

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Quiz Score: **45** out of 45

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	<u>Attempt 1</u>	25 minutes	33 out of 45

Correct answers are hidden.

Score for this quiz: **33** out of 45

Submitted Dec 9 at 5:34pm

This attempt took 25 minutes.

Question 1

3 / 3 pts

What is the drawback of context definition by Relevance?

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Incorrect

Question 2

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

Incorrect

Question 3

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)?

2,543.3088

Incorrect

Question 4

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

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

3,088

Question 5

3 / 3 pts

What is the data provenance problem?



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



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Incorrect

Question 6

0 / 3 pts

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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 7**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 8**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 9**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?



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



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 10

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 11

3 / 3 pts

Which of the following statements are true for Support Vector Machines?

-
- They can be both linear and non-linear classifiers
-
- They can be applied to data that are both linearly and non-linearly separable
-
- They cannot be applied for data that is non-linearly separable
-
- None of the above

Question 12

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 13

3 / 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
- Lesser registration cost

Question 14**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 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: 33 out of 45

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	<u>Attempt.11</u>	75 minutes	19 out of 45

CD Correct answers are hidden.

Score for this quiz: **19** out of 45

Submitted Dec 10 at 4:24pm

This attempt took 75 minutes.

Incorrect	Question 1	0 / 3 pts
	Which statement is true about configuration management problem?	
	<p>There is no established security protocol for mobile applications</p> <ul style="list-style-type: none">• <p>There are established security protocols,s but the smartphone is resource constrained so cannot be implemented</p> <p>Given the programming mechanism, security protocols are often not appropriately parameterized to be effective</p> <p>Existing protocols cannot handle new types of attacks</p>	

Incorrect

Question 2**0 / 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 3**3 / 3 pts**

Why ingress filtering can cause problems for mobile IP?

It introduces inefficiencies and causes delays in communication

- It can potentially prevent legitimate communication

It causes message integrity problems

It causes man in the middle problems

Incorrect

Question 4**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

Question 5**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

Incorrect**Question 6****0 / 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

Incorrect

Question 7**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 the for server (write a number, **round up to the nearest integer in ms**)?

Partial

Question 8**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?

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 9**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

Inanswered

Question 10**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 computation time in cloud and fog server (write two numbers in the format X,Y round up to the nearest integer in ms)?

Question 11**3 / 3 pts**

Google Maps with recommendation of places of interest nearby is an

example of the following type of context aware application-

Presentation and Execution

Adaptation and Execution

- Presentation and Tagging

Tagging and Execution

Question 12

3 / 3 pts

Consider a smart phone application that measures your heart rate and summarizes the heart rate variation trend to show it to a doctor. Is this a Cyber Physical System?

True

- False

Incorrect

Question 13

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

Partial

Question 14

1 / 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

Partial

Question 15**1 / 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

Quiz Score: 19 out of 45

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	<u>Attempt 1</u>	61 minutes	45 out of 45

Correct answers are hidden.

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

Submitted Dec 11 at 5:54pm

This attempt took 61 minutes.

Question 1

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 2

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 computation time for the fog server (write one integer round up to the nearest integer in ms)?

2,720

Question 3

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
- 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 4

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)?

1,062

Question 5

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 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**

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 8**3 / 3 pts**

Consider a smart phone application that measures your heart rate and summarizes the heart rate variation trend to show it to a doctor. Is this a Cyber Physical System?

- True
- False

Question 9**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 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

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**)

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).

2,722

Question 12

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 13

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 14

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 15

3 / 3 pts

Why ingress filtering can cause problems for mobile IP?

It introduces inefficiencies and causes delays in communication

It can potentially prevent legitimate communication

It causes message integrity problems

It causes man in the middle problems

Quiz Score: 45 out of 45

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	<u>Attempt 1</u>	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)?

1,062

Question 2

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

354

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

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**)

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).

2,721

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

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	<u>Attempt 1</u>	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
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What is the communication time in cloud server (write one integer round up to the nearest integer in ms)?

1,062

Question 2

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

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

354

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

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**)

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).

2,721

Question 10**3 / 3 pts**

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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

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Question 14**3 / 3 pts**

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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

True

False

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

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

Increasing price of a given CGS



Not showing the nearest CGS but showing the second farthest and so on

Only showing the nearest CGS and not showing others



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



It will not affect the power grid because it always provisions for the peak load on any substation



It will stop EVs from using other CGS



Yes, because it comes from human body

Yes, because heart rate is unique for a given person

No, because it varies between individuals

Unanswered



Partial

Feature extraction methods before providing the input to the deep learning system

The correctness of class labels

Incorrect



Improve reliability of sensors

Incorrect

Incorrect

- $2 \log(n)$
- $\Theta(n)$
- N^2
- $n/2$

Exam

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

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

mit 75 Minutes

Attempt History

Attempt	Time	Score
<u>Attempt 1</u>	55 minutes	45 out of 45

Correct answers are hidden.

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

ited Dec 12 at 1:43am

tempt took 55 minutes.

Question 1

3 1 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 2

3 1 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 3

3 1 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 1 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 5

3 1 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?



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



Question 6

3 1 3 pts

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



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Question 7

3 1 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?

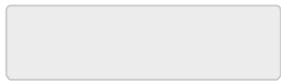
- Increasing price of a given CGS
- Drastically decreasing the price of CGSs in a given area

-
- Not showing the nearest CGS but showing the second farthest and so on
- Only showing the nearest CGS and not showing others

Question 8

3 1 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



Question 9

3 1 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 10

3 1 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 11

3 1 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

Lesser registration cost

Question 12

3 1 3 pts

Google Maps with recommendation of places of interest nearby is an example of the following type of context aware application-

- Presentation and Execution
- Adaptation and Execution
- Presentation and Tagging
- Tagging and Execution

Question 13

3 1 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 14

3 1 3 pts

Consider a smart phone application that measures your heart rate and summarizes the heart rate variation trend to show it to a doctor. Is this a Cyber Physical System?

Question 15

313 pts

Why ingress filtering can cause problems for mobile IP?

- It introduces inefficiencies and causes delays in communication
- It can potentially prevent legitimate communication
- It causes message integrity problems
- It causes man in the middle problems

Quiz Score: 45 out of 45