1.

Question 1

Which of the following is an example of clustering?

1 point

- [ ] Separate the data into distinct groups by similarity
- [ ] Creating a new representation of the data with fewer features
- [ ] Compress elongated clouds of data into more spherical representations
- [ ] Accumulate data into groups based on labels

2.

Question 2

Which of the following are advantages to using decision trees over other models? (Select all that apply)

1 point

- [ ] Decision trees can learn complex statistical models using a variety of kernel functions
- [ ] Decision trees are highly efficient on high-dimensional data
- [ ] Decision trees are easy to interpret and visualize
- [ ] Decision trees often require less preprocessing of data
- [ ] Decision trees are naturally resistant to overfitting

3.

Question 3

What is the main reason that each tree of a random forest only looks at a random subset of the features when building each node?

1 point

- [ ] To improve generalization by reducing correlation among the trees and making the model more robust to bias.
- [ ] To learn which features are not strong predictors
- [ ] To increase interpretability of the model
- [ ] To reduce the computational complexity associated with training each of the trees needed for the random forest.

4.

Question 4

For which of the following supervised machine learning methods is it usually important to use some form of feature normalization/scaling? (Select all that apply)

1 point

- [ ] Support Vector Machines
- [ ] Neural Networks
- [ ] Naive Bayes
- [ ] Regularized logistic regression
- [ ] Decision Trees
- [ ] K-Nearest Neighbors (KNN)

5.

Question 5

Select which of the following statements are true.

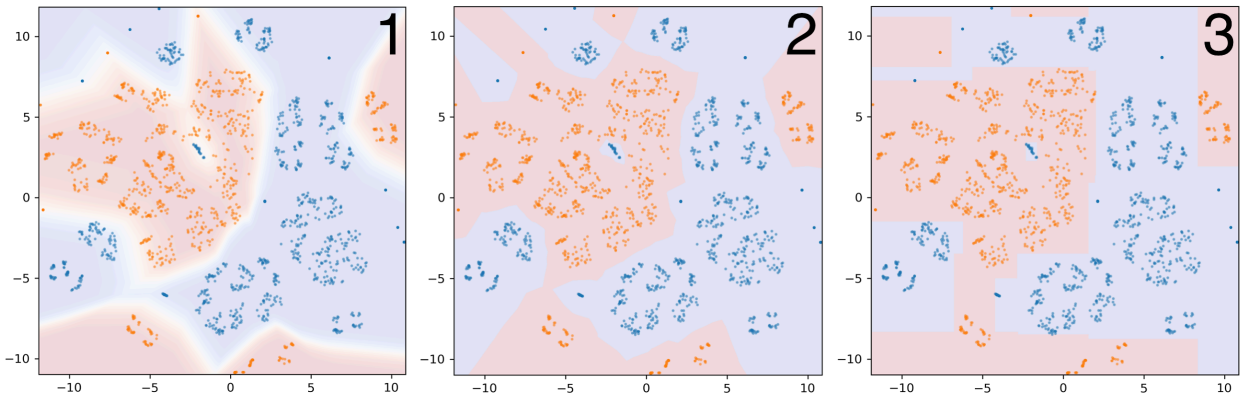
1 point

- [ ] For predicting income over time from future sales of a new product, **linear regression** would be a better choice than a **k-nearest neighbors regressor**.
- [ ] For a fitted model that doesn't take up a lot of memory, **KNN** would be a better choice than **logistic regression.**
- [ ] For having an audience easily interpret the most important features in a fitted classification model, a **support vector machine** would be a better choice than a **decision tree**.
- [ ] For a model that won't overfit a training set, **Naive Bayes** would be a better choice than a **decision tree**.

6.

Question 6

Match each of the prediction probabilities decision boundaries visualized below with the model that created them.



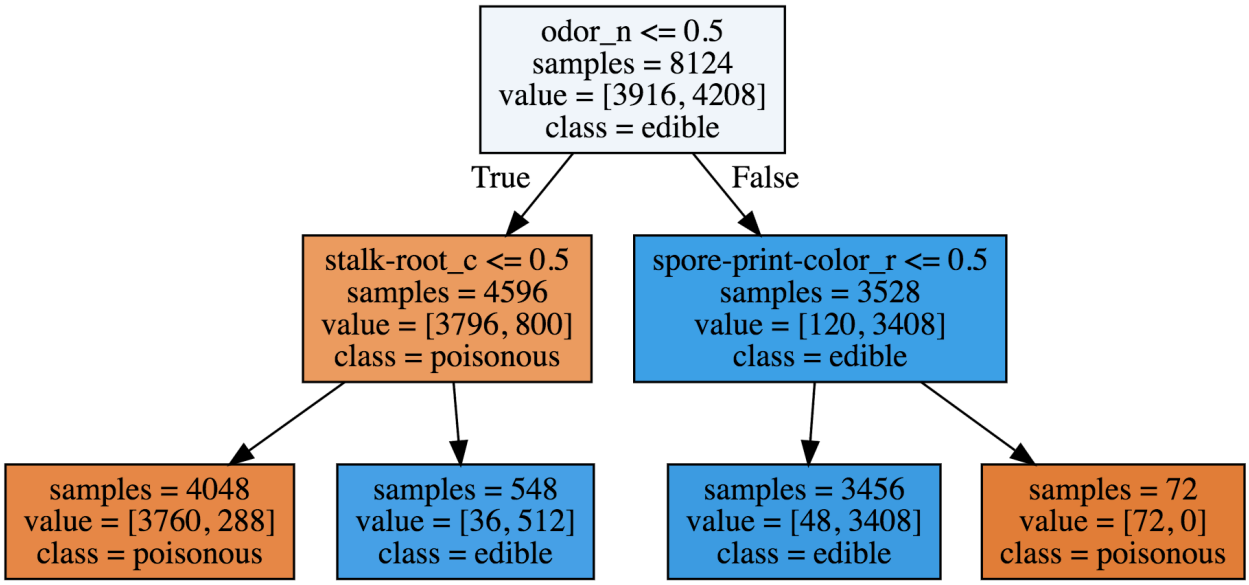
1 point

- [ ] KNN (k=1)
  Neural Network
  Decision Tree
- [ ] Neural Network
  KNN (k=1)
  Decision Tree
- [ ] KNN (k=1)
  Decision Tree
  Neural Network
- [ ] Neural Network
  Decision Tree
  KNN (k=1)

7.

Question 7

A decision tree of depth 2 is visualized below. Using the `value` attribute of each leaf, find the accuracy score for the tree of depth 2 and the accuracy score for a tree of depth 1.



What is the improvement in accuracy between the model of depth 1 and the model of depth 2? (i.e. accuracy2 - accuracy1) 0.067

	Predicted Poison	Pred Editable
Actual Poison	3796	120
Actual Editable	800	3408

	Predicted Poison	Pred Editable
Actual Poison	3760+72	36+48
Actual Editable	288+0	512+3408

1 point

8.

Question 8

Which of the following might be good ways to help prevent a data leakage situation?

1 point

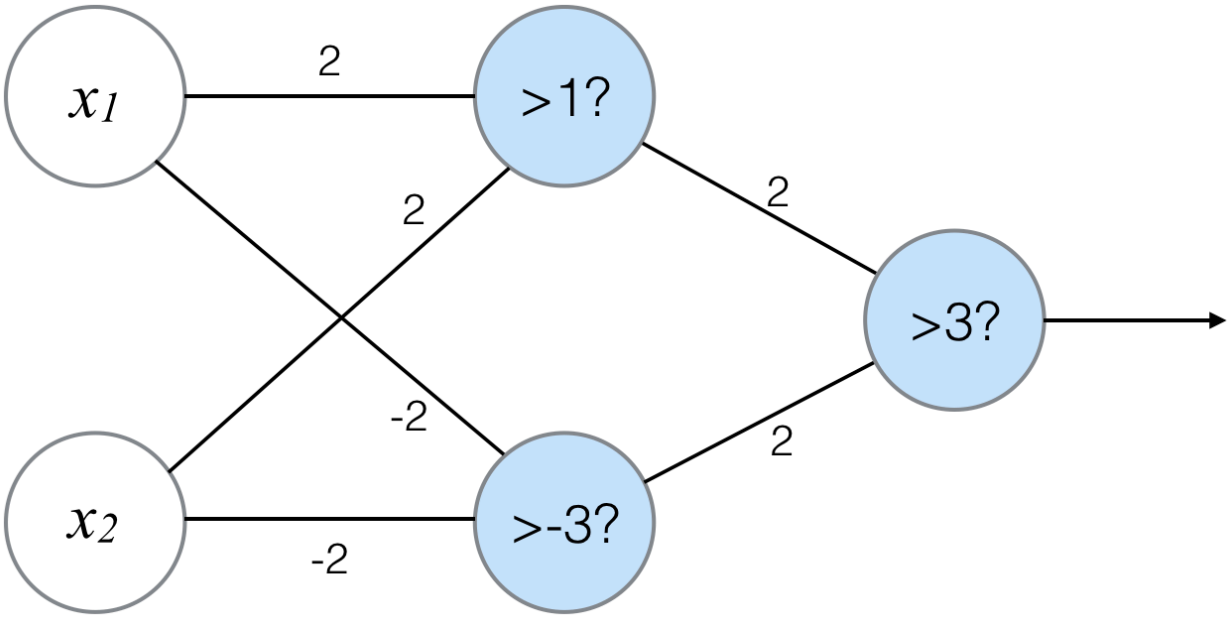
- [ ] If time is a factor, remove any data related to the event of interest that doesn't take place prior to the event.
- [ ] Remove variables that a model in production wouldn't have access to
- [ ] Sanity check the model with an unseen validation set
- [ ] Perform a feature importance analysis on a fitted model
- [ ] Ensure that data is preprocessed outside of any cross validation folds.

9.

Question 9

Given the neural network below, find the correct outputs for the given values of x1 and x2.

The neurons that are shaded have an activation threshold, e.g. the neuron with *>1?* will be activated and output 1 if the input is greater than 1 and will output 0 otherwise.



1 point

x1	***x2***	***output***
0	0	0
0	1	1
1	0	1
1	1	1

x1	*x2*	*output*
0	0	0
0	1	0
1	0	0
1	1	1

x1	*x2*	*output*
0	0	1
0	1	0
1	0	0
1	1	1

x1	*x2*	*output*
0	0	0
0	1	1
1	0	1
1	1	0

10.

Question 10

Which of the following are true statements about gradient boosted decision trees? (Select all that apply.)

1 point

- ☐ Like decision trees, gradient boosted decision trees easily handle a mixture of feature types.
- ☐ Like decision trees, gradient boosted decision tree models are easy to interpret.
- ☐ Typically the number of weak estimators (n_estimators) parameter is adjusted first to best exploit computational resources, followed by other key parameters such as the boosting learning rate (learning_rate).

- [ ] Gradient boosted decision trees have often achieved among the best ‘off the shelf’ results on many prediction problems with structured data.
- [ ] Training gradient boosted decision trees usually requires significant computation and careful parameter tuning.