Maschinelles Lernen ICE Master(SoSe19)

Started on	Mittwoch, 3 Juli 2019, 12:22
State	Finished
Completed on	Mittwoch, 3 Juli 2019, 1:18
Time taken	56 mins 1 sec
Grade	**19.00** out of 20.00 (**95%**)

Question 1
Correct
Mark 1.00 out of 1.00
⚑ Flag question

Consider the following vector

```
import numpy as np
v = np.array([2,5,3])
```

What is the content of v after scaling it with 7?

```
v = v * 7
```

Select one:

○ array([8, 20, 12])

○ array([14, 35, 28])

◉ array([14, 35, 21]) ✔

Die Antwort ist richtig.

The correct answer is:
array([14, 35, 21])

Question 2
Correct
Mark 1.00 out of 1.00
⚑ Flag question

Consider the two vectors a and v

```
import numpy as np
v = np.array([2,5,3])
a = np.array([4,1,8])
```

What is the scalar product of a and v

```
a @ v
```

Select one:
○ 23
○ 73
◉ 37 ✔

Die Antwort ist richtig.

The correct answer is: 37

Question 3
Correct
Mark 1.00 out of 1.00
⚑ Flag question

What is the result of the following matrix vector multiplication?

```
np.array([[2,3],[4,35]]) @ np.array([[2],[9]])
```

Select one:
○ array([[61],
        [673]])

○ array([[1],
        [34]])

◉ array([[31],
        [323]]) ✔

Die Antwort ist richtig

The correct answer is:
array([[31],
        [323]])

Question 4
Correct
Mark 1.00 out of 1.00
⚑ Flag question

Consider the following data point

```
x = np.array([2,13])
```

And a function that computes the euclidean distance between two points:

```
def dist(a,b):
    return np.sqrt(((a - b)**2).sum())
```

Which of the following points is closest to x?

Select one:

○
```
v = np.array([10,-3])
```

◉
```
np.array([4,15])
```

✔

○
```
np.array([2,10])
```

Question **5**

Correct

Mark 1.00 out of 1.00

⚐ Flag question

Which of the following statements about classification metrics is true?

Select one or more:

☐ If a classifier achieves 80% accuracy there is no need to check other metrics.

☑ A classifier that always predicts the most frequent class can achieve high accuracies when the class distribution is imbalanced. ✔

☑ For a binary data set in which the two classes have the same frequency, a random classifier (a classifier that flips a fair coin for its prediction) would achieve around 50% accuracy. ✔

Question **6**

Correct

Mark 1.00 out of 1.00

⚐ Flag question

Which the following statements about Machine Learning (ML) Pipelines is true?

Select one or more:

☑ Using ML Pipelines APIs can require additional implementation overhead to integrate custom feature extraction code into a pipeline. ✔

☑ ML Pipelines consist of feature extractors and ML models that take the extracted features and make a prediction. ✔

☐ Good generalization performance of a pipeline requires only tuning of the feature extraction hyperparameters.

Question **7**

Correct

Mark 1.00 out of 1.00

⚐ Flag question

Machine Learning systems ...

Select one or more:

☑ ... learn rules from data. ✔

☐ ... do not depend on data and hence can be tested just like normal software systems.

☑ ... with enough parameters can learn to correctly classify any data set corresponding to a classification problem. ✔

Question **8**

Correct

Mark 1.00 out of 1.00

⚐ Flag question

How many splits/folds of your data set are needed at least for training and evaluating a machine learning model?

Select one or more:

☑ 2 ✔

☐ 4

☐ 1

Question **9**

Correct

Mark 1.00 out of 1.00

⚐ Flag question

Which of the following statements about machine learning model evaluation is true?

Select one or more:

☐ The error of a model is usually larger on the training data than on the test data.

☐ The generalisation error of a model can be reliably estimated on training data.

☑ Cross-validation gives a more reliable estimate of the generalisation error than evaluation on the training data set. ✔

Die Antwort ist richtig

The correct answer is: Cross-validation gives a more reliable estimate of the generalisation error than evaluation on the training data set.

Question 10
Partially correct
Mark 0.50 out of 1.00
⚑ Flag question

Consider the following data set

```
[['large'], ['small'], ['medium'], ['small'], ['large']]
```

Select one or more:

☑ The one-hot encoded representation of the data is

```
array([[1., 0.],
       [0., 0.],
       [0., 1.],
       [0., 0.],
       [1., 0.]])
```

✖

☑ The one-hot encoded representation of the data is

```
array([[1., 0., 0.],
       [0., 0., 1.],
       [0., 1., 0.],
       [0., 0., 1.],
       [1., 0., 0.]])
```

✔

☐ The one-hot encoded representation of the data is

```
array([[1., 0., 0.],
       [0., 0., 1.]])
```

Die Antwort ist teilweise richtig.

You have selected too many options.
The correct answer is: The one-hot encoded representation of the data is

```
array([[1., 0., 0.],
       [0., 0., 1.],
       [0., 1., 0.],
       [0., 0., 1.],
       [1., 0., 0.]])
```

Question 11
Correct
Mark 2.00 out of 2.00
⚑ Flag question

Consider the data set

```
x = ['black','yellow','black','orange','green']
```

Which of the following programs computes a one-hot encoding of the data?

Select one or more:

☐
```
unique_items = list(set(x))

one_hot = []

for w in unique_items:

    if ui == w:
        one_hot.append(1)
```

☑
```
unique_items = list(set(x))
one_hot = []
for w in x:
    w_one_hot = []
    for ui in unique_items:
        if ui == w:
            w_one_hot.append(1)
        else:
            w_one_hot.append(0)
    one_hot.append(w_one_hot)
```

✔

☑
```
items = []
for i in x:
    if i not in items:
        items += [i]

one_hot = []
for i in x:
    this_one_hot = []
    for ui in items:
        if i == ui:
            this_one_hot.append(1)
        else:
            this_one_hot.append(0)
    one_hot.append(this_one_hot)
```

✔

☐
```
items = []
for i in x:
    if i not in items:
        items += [i]

one_hot = []
for i in x:
    this_one_hot = []
    for ui in items:
        if i == ui:
```

```
            this_one_hot.append(0)
        else:
            this_one_hot.append(1)
    one_hot.append(this_one_hot)
```

The correct answers are:
```
unique_items = list(set(x))
one_hot = []
for w in x:
    w_one_hot = []
    for ui in unique_items:
        if ui == w:
            w_one_hot.append(1)
        else:
            w_one_hot.append(0)
    one_hot.append(w_one_hot)


items = []
for i in x:
    if i not in items:
        items += [i]

one_hot = []
for i in x:
    this_one_hot = []
    for ui in items:
        if i == ui:
            this_one_hot.append(1)
        else:
            this_one_hot.append(0)
    one_hot.append(this_one_hot)
```

Question 12

Correct

Mark 1.00 out of 1.00

⚑ Flag question

Which of the following statements are true?

Select one or more:

☐ Supervised learning as well as unsupervised learning algorithms require a target variable in the training data.

☑ Unsupervised learning algorithms can help to find structure in data. How good a solution of such an algorithm is, can be assessed by evaluating how well data can be reconstructed from the structure found. ✔

☑ Principal Component Analysis (PCA) finds directions of high variance in a multivariate data set. ✔

☑ Only supervised learning algorithms require cross-validation for model evaluation and model selection. ✘   Also unsupervised learning algorithms can overfit, hence it is important to inspect the performance (usually some sort of reconstruction error) on a held out test data set that was not used for training.

Die Antwort ist richtig

The correct answers are: Principal Component Analysis (PCA) finds directions of high variance in a multivariate data set., Unsupervised learning algorithms can help to find structure in data. How good a solution of such an algorithm is, can be assessed by evaluating how well data can be reconstructed from the structure found.

Question 13

Correct

Mark 1.00 out of 1.00

⚑ Flag question

Which of the following statements about clustering is true?

Select one or more:

☐ Clustering Algorithms require labels for training.

☑ The correct number of clusters is an important parameter for the stability of the clustering solution. ✔

☐ K-Means Clustering finds cluster centers such that the distance between the cluster centers is minimized.

Die Antwort ist richtig.

The correct answer is: The correct number of clusters is an important parameter for the stability of the clustering solution.

Question 14

Correct

Mark 1.00 out of 1.00

⚑ Flag question

Which of the following statements about Principal Component Analysis (PCA) is true?

Select one or more:

☑ PCA is often used for dimensionality reduction. ✔

☐ PCA correlates the data.

☑ PCA finds the directions of maximal variance in a data set. ✔

Die Antwort ist richtig.

The correct answers are: PCA finds the directions of maximal variance in a data set., PCA is often used for dimensionality reduction.

Question 15

Correct

Mark 1.00 out of 1.00

⚑ Flag question

Which of the following statements about Linear Discriminant Analysis (LDA) is true?

Select one or more:

☑ For binary classification, LDA finds a linear separation between the two classes. ✔

☑ For binary classification, LDA finds a vector **w** such that the variance within each class is minimized. ✔

☐ For binary classification, LDA finds a vector **w** such that the variance within each class is maximized.

Die Antwort ist richtig.

The correct answers are: For binary classification, LDA finds a vector **w** such that the variance within each class is minimized., For binary classification, LDA finds a linear separation between the two classes.

Question 16

Partially correct

Mark 0.50 out of 1.00

Which of the following statements is true for n-gram bag-of-word features.

Select one or more:

☑ n-gram features contain the counts of token sequences of length n in a text. ✔

☐ Most values in an n-gram feature vector extracted from natural language texts are non-zero.

☑ Denoting the size of the vocabulary as V the memory consumption of n-gram features can become (constant factor for storing a token) times V^n ✗

Die Antwort ist teilweise richtig.

You have selected too many options.

The correct answer is: n-gram features contain the counts of token sequences of length n in a text.

Question 17

Correct

Mark 1.00 out of 1.00

Which of the following statements about Linear Regression is true?

Select one or more:

☐ Linear Regression requires the features of a data set to be uncorrelated.

☑ Linear Regression always requires a target variable and is hence a supervised learning technique. ✔

☐ Linear Regression cannot be applied to multivariate target variables.

Die Antwort ist richtig.

The correct answer is: Linear Regression always requires a target variable and is hence a supervised learning technique.

Question 18

Correct

Mark 1.00 out of 1.00

The Backpropagation Algorithm ...

Select one or more:

☐ ... requires manual computation of the gradients.

☑ ... is used to efficiently compute the gradients in deep neural networks. ✔

☑ ... requires to compute the network prediction, then error computation and finally backpropagation of the errors through the neural network. ✔

Die Antwort ist richtig.

The correct answers are: ... is used to efficiently compute the gradients in deep neural networks. , ... requires to compute the network prediction, then error computation and finally backpropagation of the errors through the neural network.
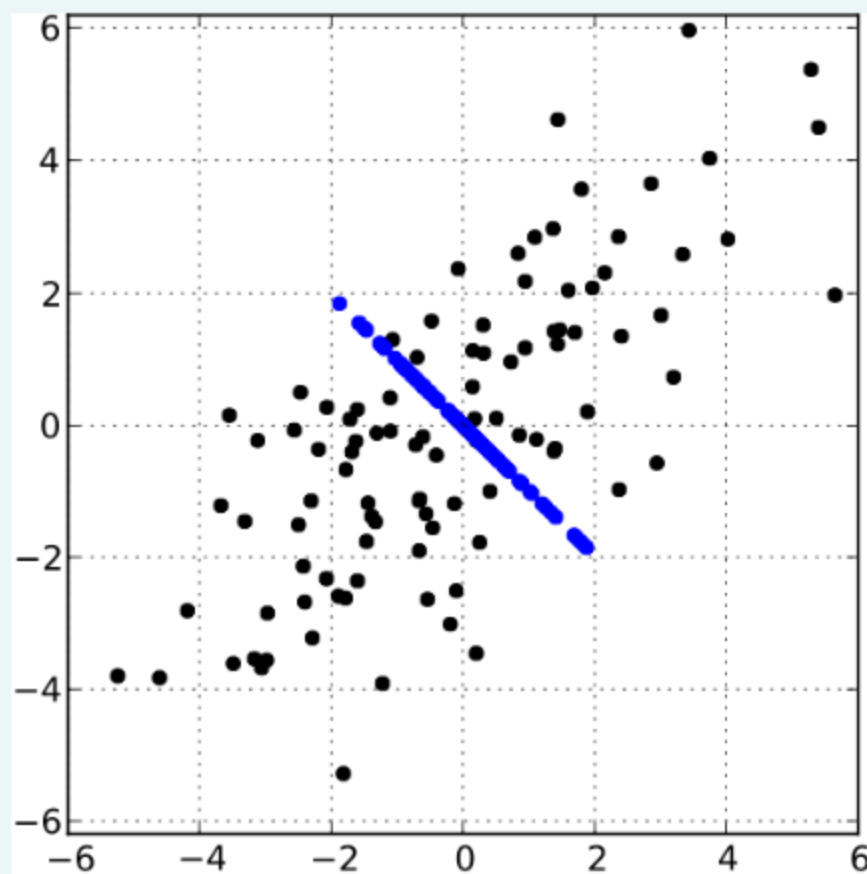

Question 19

Correct

Mark 1.00 out of 1.00

Consider two dimensional Gaussian Data in a matrix X (rows: dimensions, columns: data points), plotted as black dots, and the result of a Principal Component Analysis as vectors w_1 the direction of maximal variance, and vector w_2, the next strongest variance direction. What is shown as blue dots?

Select one or more:

☑ $w_2 \ w_2^T \ X$ ✔

☑ $X - (w_1 \ w_1^T \ X)$ ✔

☐ $X - (w_2 \ w_2^T \ X)$

Die Antwort ist richtig.

The correct answers are: $w_2 \ w_2^T \ X$, $X - (w_1 \ w_1^T \ X)$

Finish review