

Exam Simulation

Welcome to your final exam simulation!

You will have **90 minutes** to complete the test, starting when the lecturer announces the beginning.

The exam consists of **28 multiple-choice questions**, divided into three sections:

- **Section 2:** 18 easy questions
- **Section 3:** 6 medium questions
- **Section 4:** 4 hard questions

Each question has **four possible answers**, but only **one is correct**.

You will earn **1 point for each correct answer** and **0 points for incorrect ones**. Since there's no penalty for wrong answers, it's always worth making a choice—even a random guess gives you a **25% chance** of scoring a point.

Although this is just a simulation, approach it with integrity. In the real exam, the following actions will result in **immediate disqualification**:

- Using a smartphone, tablet, or any similar device
- Communicating or attempting to communicate with others
- Consulting books, notebooks, or any notes

Good luck!

* Indica una domanda obbligatoria

1. Have you read and fully understood the exam rules? *

0 punti

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- ☐ Yes
☐ No

Easy Questions

2. Which of the following is **NOT** a common example of AI in everyday life? *

1 punto

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- ☐ Weather forecast
☐ Social media feed
☐ ChatGPT
☐ Next word suggestion in keyboards

3. What is the state-of-the-art approach for most computer vision tasks? *

1 punto

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- ☐ Deep learning
☐ Linear regression
☐ Random forest
☐ Rule-based systems

4. In a machine learning model, what does the loss function measure? *

1 punto

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- ☐ The mean squared error of the model
☐ The complexity of the model
☐ The training time of the model
☐ The performance of the model in fitting the data

5. The learning algorithm... *

1 punto

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- ☐ Finds the global minimum of the loss function
- ☐ Is some form of gradient descent
- ☐ Is a set of instructions
- ☐ For the same model, can change for different datasets

6. In the AI project development cycle, what is the first step? *

1 punto

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- ☐ Business understanding
- ☐ Data gathering
- ☐ Data exploration
- ☐ Model development

7. What is SQL primarily used for? *

1 punto

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- ☐ Querying data in relational databases
- ☐ Building machine learning models
- ☐ Creating data visualizations.
- ☐ Managing cloud computing resources

8. What is the most suitable data storage solution for managing 300,000 pictures of customer ID cards?

* 1 punto

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- ☐ Relational database
- ☐ Vector database
- ☐ Graph database
- ☐ Blob storage

9. What is the best data storage solution for handling 10,000 orders per month? Each order is represented by the customer, amount, date, and salesperson.

* 1 punto

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- ☐ Relational database
- ☐ Vector database
- ☐ Graph database
- ☐ Blob storage

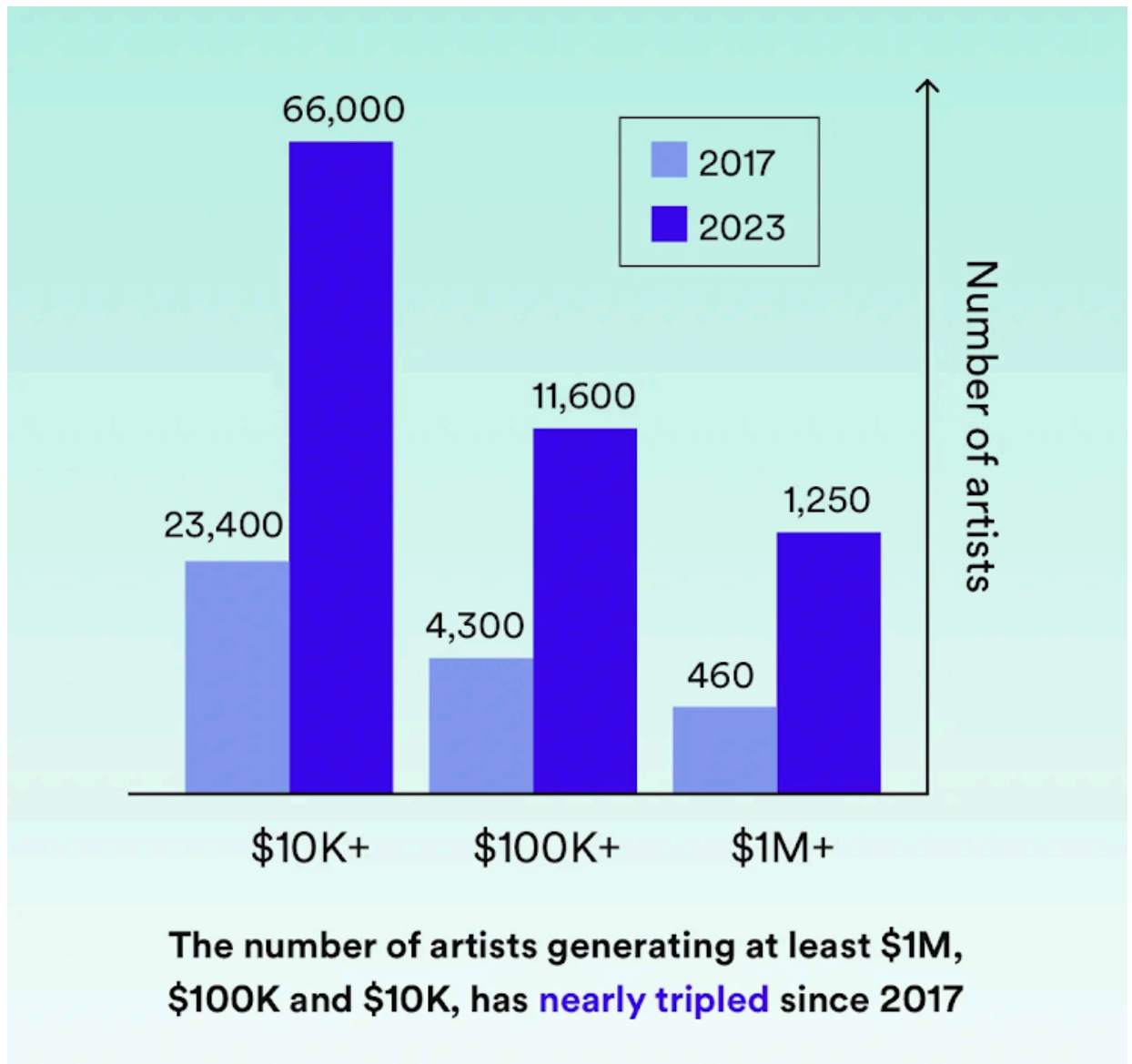
10. What is the most common positional summary statistic for nominal variables?

* 1 punto

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- ☐ Mode
- ☐ Mean
- ☐ Median
- ☐ Standard deviation

11. Take a look at the following plot. What is the primary data visualization mistake? * 1 punto



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- ☐ The use of colors
- ☐ The type of the chart
- ☐ The presence of numerical labels
- ☐ The scale on the y axis

12. Your company manufactures automotive components, and you need to illustrate the relationship between order size and the time required to complete production. Which type of visualization would be the most effective? * 1 punto

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- ☐ Bart chart
- ☐ Line chart
- ☐ Scatter plot
- ☐ Histogram

13. Which of the following is **NOT** a key assumption of linear regression? * 1 punto

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- ☐ The relationship between the features and the target is can be represented by a linear function
- ☐ Each sample is independent from all the others
- ☐ The variance of the noise affecting the target is consistent across all samples.
- ☐ The noise affecting the target follows a zero-mean Gaussian distribution

14. What is the main purpose of regularization in machine learning models? * 1 punto

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- ☐ To prevent overfitting by penalizing more complex models
- ☐ To normalize the input data to a specific range
- ☐ To speed up the training process of the model
- ☐ To sharpen the model's decision boundary

15. Consider a dataset with a numerical target variable, y , and seven numerical features: x_1, \dots, x_7 . * 1 punto

From the exploratory analysis, you have the following statistics for y :

Maximum: 35

Minimum: 10

Mean: 20

Standard deviation: 3

Given these values, you can confidently conclude that...

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- ☐ A random forest model trained on this dataset cannot generate predictions lower than 10
- ☐ A linear regression model trained on this dataset cannot predict values exceeding $35 + 3 \times 3$
- ☐ Gradient boosting is expected to outperform linear regression on this dataset
- ☐ None of the other answers is correct

16. To which models does the universal approximation theorem apply? * 1 punto

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- ☐ Feed-forward neural networks with one hidden layer
- ☐ Linear regression models incorporating a nonlinear function of the parameters
- ☐ Gradient boosting models
- ☐ Transformers

17. Why can Large Language Model hallucinate? * 1 punto

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- ☐ LLMs are programmed to prioritize creative text, even if factually inaccurate
- ☐ LLMs lack understanding of the truth and rely on statistical patterns in the training dataset
- ☐ LLMs are designed to mimic human-like errors, including hallucinations
- ☐ Limited precision in GPUs can lead to instability in output token generation

18. The attention mechanism of transformers... *

1 punto

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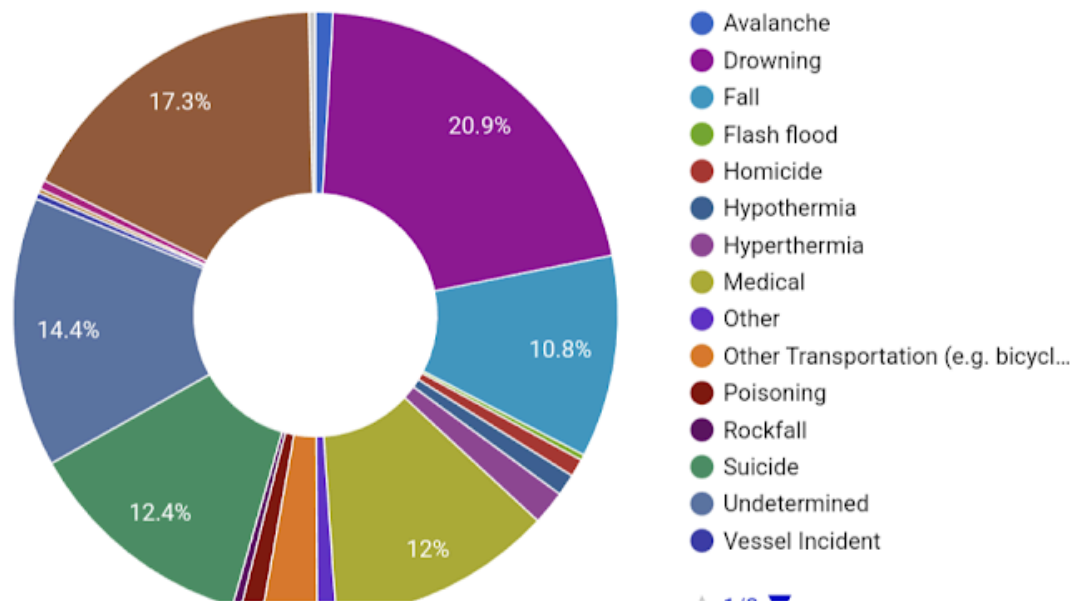
- ☐ Learns how to assign weight to previous elements in a sequence
- ☐ Mandates sequential training
- ☐ Is mainly useful for computer vision
- ☐ Can only be applied to natural language tokens

19. Pie charts can be difficult to interpret. A clearer way to visualize the dataset in the image would be...

* 1 punto

What Are the Top Causes of Death in the National Parks?

Fatalities in National Parks (2007-2023) by Cause of Death



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- ☐ A bar chart
- ☐ A scatter plot
- ☐ A histogram
- ☐ A density plot

Medium Questions

20. A dataset with two features with a correlation of 0.9, is used to train a random forest model. Then: * 1 punto

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- ☐ The predictions are unreliable because the features are highly correlated
- ☐ The predictions can exceed the range of the target
- ☐ The feature importance based on MDI cannot be trusted
- ☐ The training algorithm may not converge to a solution

21. You're designing a fraud detection system for a payment provider like Nexi or Visa. Your data includes customer ID cards, selfies, and tens of thousands of daily transactions. What type(s) of data storage would you choose? * 1 punto

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- ☐ Relational database
- ☐ Blob storage
- ☐ Blob storage and vector database
- ☐ Blob storage and relational database

22. Which of the following tasks is **NOT** suitable for a multimodal LLM? * 1 punto

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- ☐ Forecasting flight occupancy trends
- ☐ Creating an image of the U.S. and Russian presidents discussing nuclear arsenal reduction
- ☐ Replying to an email
- ☐ Detecting security issues in construction sites from videos captured by internet-connected cameras

23. You need to train a linear regression model on a dataset where 1% of the target values are missing. How should you handle this? * 1 punto

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- ☐ Train the linear regression model with the missing values included, as it can handle them effectively
- ☐ Remove the samples with missing target before training
- ☐ Replace the missing values with the mean of the target
- ☐ Replace the missing values with the output of another model

24. Why is the choice of activation function crucial in preventing vanishing or exploding gradients in deep neural networks? * 1 punto

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- ☐ Some activation functions, like sigmoid, have derivatives that approach zero for large or small input values, leading to vanishing gradients during backpropagation
- ☐ Activation functions introduce non-linearity, making it impossible to compute gradients
- ☐ The activation function determines the learning rate of the network
- ☐ The choice of activation function affects the performance of the model, thus impacting the training process

25. Consider the models shown in the image below. Based on the bias-variance trade-off, which linear regression model has the lowest bias?

* 1 punto

$$y = \beta_1 x_1 \quad (1)$$

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_1^2 + \beta_3 x_1^3 \quad (2)$$

$$y = \beta_0 + \beta_1 x_1 + \ln(\beta_2 x_1^2) + \beta_3 x_1^3 \quad (3)$$

$$y = \beta_0 + \beta_1 x_1 \quad (4)$$

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☐ Model 1

☐ Model 2

☐ Model 3

☐ Model 4

Hard Questions

26. Consider the following feed-forward neural network with the following layer sizes: ★ 1 punto
- Input layer: 3
Hidden layer 1: 4
Hidden layer 2: 2

How many parameters does the complete model have?

$$y = \mathbf{w}^T g(\mathbf{W}_2 g(\mathbf{W}_1 \mathbf{x} + \mathbf{b}_1) + \mathbf{b}_2)$$

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- ☐ 28
☐ 26
☐ 32
☐ 30

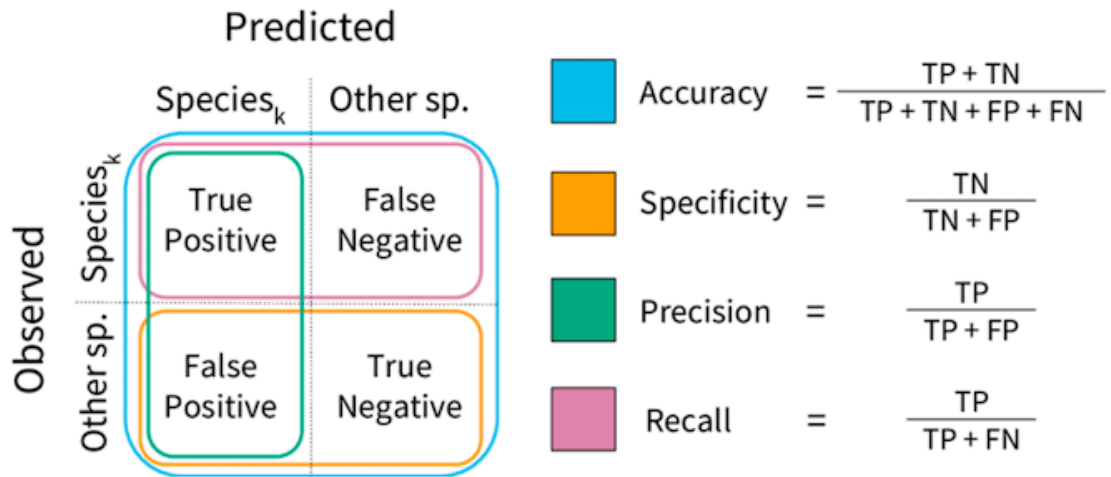
27. Consider the following code snippet. What values will be printed for the coefficients? ★ 1 punto

```
1 import numpy as np
2 from sklearn.linear_model import LinearRegression
3
4 rng = np.random.default_rng(42)
5
6 num_samples = 100
7 X = rng.uniform(size=(num_samples, 3))
8 y = 2 * X[:, 0] + 3 * X[:, 1] + 4 * X[:, 2] + 5 + rng.normal(size=num_samples)
9
10 model = LinearRegression()
11 model.fit(X, y)
12
13 print("Coefficients:", model.coef_)
14 print("Intercept:", model.intercept_)
```

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- ☐ [2.1368, 3.1873, 3.6262]
☐ [5.1091, 2.1368, 3.1873, 3.6262]
☐ [3.1368, 4.1873, 15.6262]
☐ 5.1091

28. You are designing an anti-spam filter that detects and marks spam emails as positive. Your primary goal is to minimize the risk of filtering out legitimate emails, even if it means allowing some spam to reach the inbox. Given this priority, which evaluation metric is most important for your classification model? * 1 punto



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- ☐ Precision
- ☐ Recall
- ☐ Accuracy
- ☐ Specificity

29. Large Language Model providers charge more for output tokens than input tokens. Why? * 1 punto

GPT-4.5

Largest GPT model designed for creative tasks and agentic planning, currently available in a research preview. | 128k context length

Price

Input:

\$75.00 / 1M tokens

Cached input:

\$37.50 / 1M tokens

Output:

\$150.00 / 1M tokens

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- ☐ Input tokens are typically more numerous, so they should be priced at a discount
- ☐ Output tokens must be generated sequentially, thus exploiting the hardware more
- ☐ Output tokens are more important because they are delivered to the user as the final response

☐ Output tokens are more challenging to process because of the transformer's structure.

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Google Moduli

