Interpretation

1 - In Figure 1 we have a data distribution, the dots represent the sparse data for the axis X and Y, and the lines represent the fit of a hypothetical classification model. Based on the distributions of Figure 1:

- Which distribution has the best balance between bias and variance?
- Describe your thoughts about your selection.

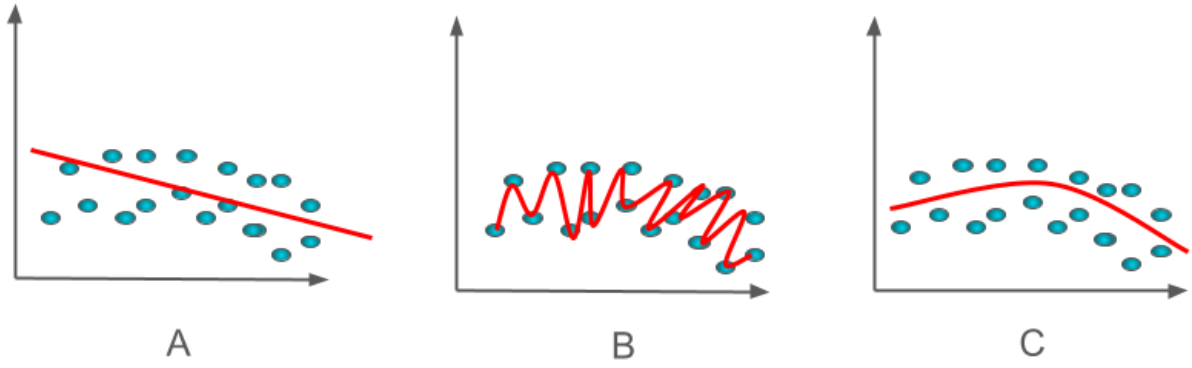


Figure 1 - Data distribution samples

Answer:
The third figure has the best balance because it is not overfitting like the B plot in which the model capture every noise of the training data, leading to a poor generalization.

2 - Figure 2 presents a simple graph with 2 curves and 1 line. In model selection and evaluation:

- What is the purpose of this graph and its name?
- What kind of model result does the dashed line represent?
- Which curve represents a better fit, the red or the green? Why?
- Describe your thoughts about your selection.

Answer:

This plot is known as the Receiver Operating Characteristic Curve. It is used to validate a classifier model based on the true positive rate on the Y-axis and False positive rate in the X-axis. The best line is where the curve is in the top-left corner, yielding an area under the curve of one (100%). To plot this the threshold of the model varies and see how the model performs for each one. If the line lies in the transverse the area is exactly 0.5 meaning that the model classifies randomly. Under this line the model is worse than randomly classifying.

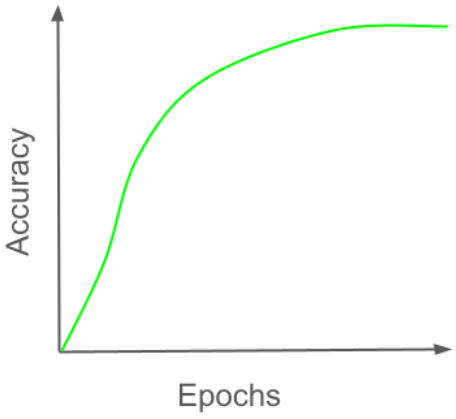
Figure 2 - Simple graph

3 - Figure 3 presents a classification model training and the evaluation. This model classifies 3 classes (A, B, C). Graph A represents the training accuracy over the epochs, Graph B represents the training loss over the epochs, and the table represents the evaluation of the model using some test samples, we used a confusion matrix to evaluate the classes trained.

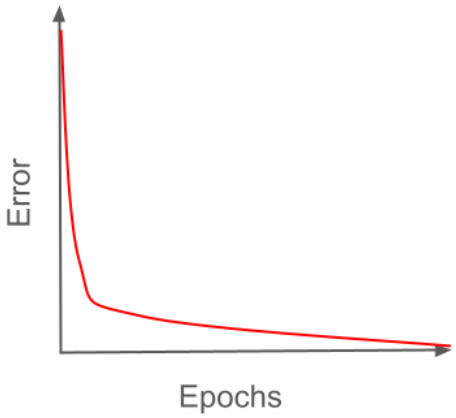
- Can we say that the model has a good performance in the test evaluation?
- What phenomenon happened during the test evaluation?
- Describe your thoughts about your selection.

After the elbow of the B curve the model do not optimize so much and maybe incur in the problem of overfitting. It means the model memorizes the training data and will not generalize well with new data. There are some methods to improve the gradient of the model such as varying the learning rate: Uses a greater value and decreases the learning rate value as the number of batches or epochs.

The confusion matrix of the test dataset shows a mildly performance probably because of overfitting.



A



B

	A	B	C
A	0.5	0.25	0.25
B	0.15	0.45	0.35
C	0.1	0.4	0.5

Figure 3 - Model train and evaluation pipeline

Additional Requirements

To ensure the test assesses your individual capability:

- **Originality**:
  - Write the code yourself. Do not copy from external sources.
  - If you refer to any resources, cite them appropriately in your report.
- **AI Assistance**:
  - You may use AI tools for debugging or minor assistance.
  - However, the core implementation and analysis should be your own work.
  - Over Reliance on AI-generated code may impact your evaluation.

Good luck, and we look forward to reviewing your submission!