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AI6124 – Neuro Evolution and Fuzzy Intelligence  
Assignment # 1

Reinelle Jan Bugnot  
G2304329L

**Part I. Setting up Data**

Import Iris dataset from Scikit-learn

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Isolate target feature (**Petal Length)**, since I’m 19+ in the class list.

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Generate 10 equally sized bins ranging from 1 to 6.9 (min and max values of the feature vector)

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Generate the sample distribution across different classes.

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**Part II. Even Bins**

Isolate all Even Bins from the total sample distribution.

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Calculate the **joint probability distribution** by dividing the sample distribution by the total sample size which is calculated by adding all the values in the sample distribution for even bins.

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Calculate the **class apriori probabilities** by performing a row-wise summation across each class within the joint probability distribution dataframe.

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Calculate the **conditional probabilities** P(r|C) by dividing each value in the joint probability distribution with the class apriori probabilities of the corresponding class.

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Calculate the **posterior probabilities** by dividing the values of the joint probability distribution by the marginal probability P(r) corresponding to each bin r\_i. The marginal probability P(r) is calculated by performing a column-wise summation across the joint probability distribution dataframe.

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We can then **verify if the Bayes’ Formula holds true for our data** by checking if:

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Calculating the **lefthand side** of the formula by multiplying the posterior probability with the marginal probability, we get:

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Calculating the **righthand side** of the formula by multiplying the conditional probability (event likelihood) with the class apriori probability, we get:

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Given that we got the exact same result for both lefthand and righthand side, we can therefore confirm that **the Bayes’ Formula holds true for our data sample.** ∵

**Part III. Odd Bins**

Isolate all odd bins from the total sample distribution.

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To plot the **histogram** for each class, I used the pyplot .bar() function, since the sampled distribution already contains the aggregated sample count per specified bin.

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Similar to the previous items, to calculate the **joint probability distribution**, we will divide the sample distribution with the total sample size.

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We can also find the class apriori probabilities using the sample step done for the even bins.

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Afterwards, we can get the **conditional probabilities P(r\_i|C)**, by dividing each value in the joint probability distribution with the class apriori probabilities of the corresponding class C.

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Finally, to get the **posterior probability P(C|r\_i)**, we will first calculate the marginal probability P(r) by performing a column-wise summation across the joint probability distribution of our odd bin sample, and then dividing the values of the joint probability distribution by the P(r) of the corresponding bin r\_i.

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Please refer to my python notebook ‘AI6124\_REINELLE-BUGNOT\_assign1.ipynb’ for the detailed coding steps used in this assignment.