Artificial Intelligence Laboratory 3:

Bayesian Network

Things I experience in this lab

- ✓ • Learn to construct Bayesian Network from data.
- ✓ • Learn to implement Naïve Bayes algorithm for classification tasks.
- ✓ • Learn to use Bayesian Network and Naïve Bayes for inference.

Task 1

Read the code in Lab3 task1.ipynb. Learn a Bayesian Network of the smart grid data set. Construct the network and compute the following:
Steps to solve this Task:

- ✓ Create environment for lab 3 project
- ✓ Install *bnlearn* library
- ✓ Import the smart grid file in notebook using pandas
- ✓ Data Encoding/Preprocessing
- ✓ splitting Features and labels
- ✓ From the *bnlearn. structure learning*( ) library, we **fit** the preprocessed data using
- ✓ Plot the learned structure of Directed Acyclic Graph (DAG)
- ✓ From the *bnlearn. parameter_learning*( ) again model is fit which use the previous model of structure learning
- ✓ From the updated model Conditional Probability Distribution table is plotted
- ✓ performing inference is done using *bnlearn.inference.fit*( )
- ✓ Subtask of task 1 Is done using inference.fit(), which takes three arguments
    - Updated model
    - Variable
    - evidence

Task 2

Implement Naïve Bayes algorithm in Lab3 task2.ipynb, performing classification by making inference:
Steps to solve this Task:

- ✓ Create environment for lab 3 project
- ✓ Install tabulate sklearn
- ✓ Import libraries
- ✓ Convert the list data into pandas DataFrame
- ✓ Data Encoding/Preprocessing
- ✓ splitting Features and labels
- ✓ Model fitting
- ✓ Calculating Accuracy
- ✓ Prediction
- ✓ Part **2d** is done using mode.pridict() method after encoding given data

By using Following Farmoulas calculation of marginal probability, posterior probability and Likelihood table is created of task 2**a,2b,2c**

- ✓ **Bayes Formula** P (A | B) = P (B | A) · P(A) / P(B)
- ✓ **Conditional Probability**: P (A | B) = P(A∩B) / P(B)
- ✓ **Mean:** □=1□∑□□=1□□
- ✓ **Standard Deviation □=[1□−1∑□□=1(□□−□)2]12**
- ✓ **Normal Distribution:**

$$f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{\frac{-(x-\mu)^2}{2\sigma^2}}$$

$\mu =$ mean of x
$\sigma =$ standard deviation of x
$\pi \approx 3.14159 \ldots$
$e \approx 2.71828 \ldots$

- ✓ Tast 2e is done by Implementing a Naive Bayes Classifier and performing classification on the Iris dataset
  - Load iris data
  - Split training and testing features and labels
  - Create model of Naibe Bayes Classifier using (from sklearn.naive_bayes import GaussianNB)
  - Fit the training data in the model
  - Predict the testing data
  - Calculate Performance

After Doing these Task I observer and learned

- ✓ Learn how to construct Bayesian Network from data.
- ✓ Learn how to inference of the Bayesian
- ✓ Learn to estimate a DAG that captures the dependencies between the variables.
- ✓ Observe the dependencies between the variables using DAG
- ✓ Learn How to do structural learning and parameterised learning practically through bnlearn library
- ✓ Learn to estimate the (conditional) probability distributions of the individual variables.
- ✓ Learn to implement Naïve Bayes using sklearn
- ✓ encoding of data
- ✓ Probability calculation through algorithm also from the formula