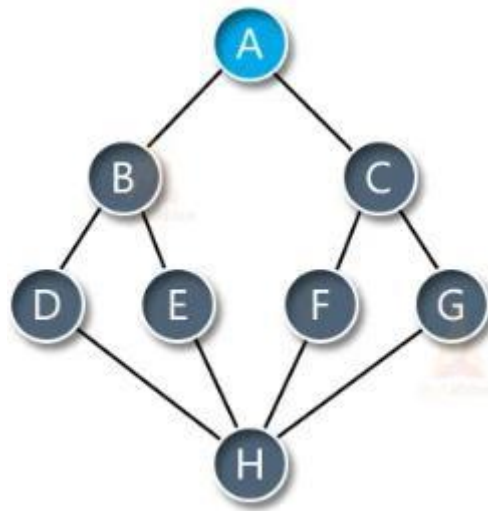


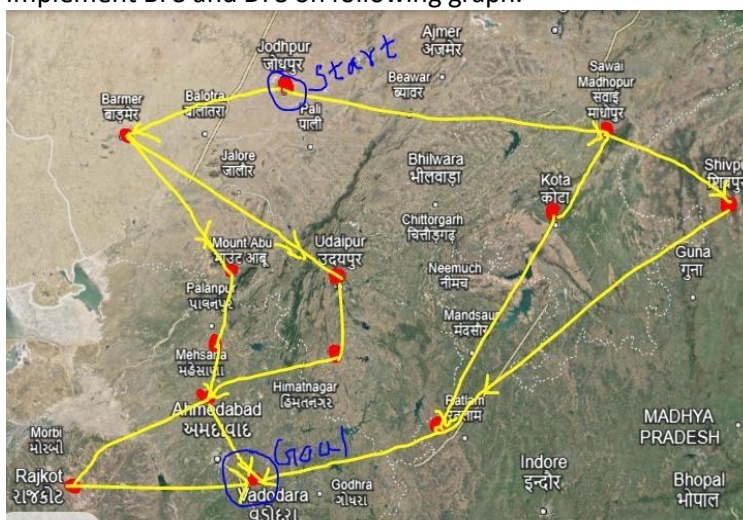
Artificial Intelligence Laboratory

Practical

1. Write a program in Python to find factorial of a number using a loop. Also find the same using a recursive function. Implement this creating both the function in a class.
2. Write a python program to implement stack and queue using OOP paradigm.
3. Write a python program to create a binary tree, add elements, retrieve elements using pre-order, post-order and in-order traversal.
4. Write a Program in Python to solve tic-tac-toe problem implementing minimax algorithm.
5. Write a program in Python for Breadth First Search.
6. Write a python program to implement Breadth First Search and Depth First Search algorithm on following graph. Consider start node as A.

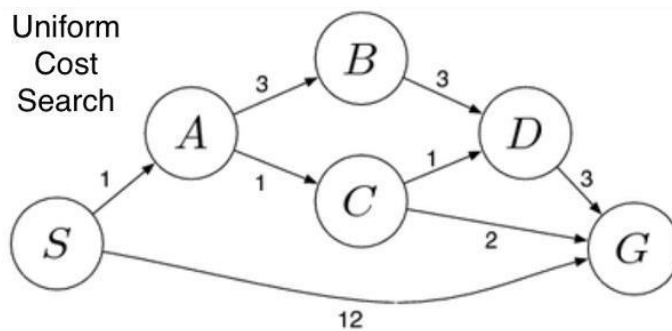


7. Write a program in Python to implement Depth First Search.
8. Implement BFS and DFS on following graph.



9. Write a program in Python for Best First Search

10. Write a python program to implement Uniform Cost Search with cumulative cost.



11. Write a program in Python for A* Search
12. Write a program to implement Depth Limited Search and Iterative Deepening Search on following graph/tree.

```

graph = {
    '6': ['4', '8'],
    '4': ['3', '5'],
    '8': ['9'],
    '3': ['10'],
    '5': ['11'],
    '9': ['12'],
    '10': [],
    '11': [],
    '12': []
}

```

13. Write a program to implement UCS on following graph.

```

graph = {
    'A': {'B': 1, 'C': 2},
    'B': {'D': 3, 'E': 4},
    'C': {'F': 5},
    'D': {'G': 6},
    'E': {'G': 7},
    'F': {'G': 8},
    'G': {}
}
start = 'A'
goal = 'G'

```

14. Write a program to implement Best First Search on following graph.

```

graph = {
    'A': {'B': 12, 'C': 14}, #heuristic value A to H is 13, B to H is 12, C to H is 4
    'B': {'D': 11, 'E': 10},
    'C': {'F': 6, 'G': 7},
    'D': {'H': 0},
    'E': {'H': 0},
    'F': {'H': 0},
    'G': {'H': 0}
}

```

15. Write a program to implement A* search on following graph.

```

graph = {
    'A': {'B': [3,8], 'C': [2,9]},
    'B': {'D': [3,7], 'E': [4,6]},
    'C': {'F': [5,4]},
    'D': {'G': [6,0]},
    'E': {'G': [9,0]},
}

```

```

    'F': {'G': [6,0]},
    'G': {}
}
start = 'A'
goal = 'G'

```

16. Write a program to implement A* search on the following graph.

Note : Structure of data : "Key Name " : {"City Name": Latitude, Longitude, Heuristic value}

```

graph = {
    'START': {'Jammu': [32.7266,74.8570,1600]},
    'Jammu': {'Amritsar': [31.6339, 74.8722,1400], 'Delhi': [28.7040,77.1024,1300]},
    'Amritsar': {'Sri-Gangaganar': [29.9094,73.8800,1340], 'Jodhpur': [26.2389,73.0243, 1230]},
    'Delhi': {'Jaipur': [26.9124, 75.7873,1000], 'Gwalior': [26.2124, 78.1772,1100]},
    'Sri-Gangaganar': {'Udaipur': [24.5854, 73.7125,400]},
    'Jodhpur': {'Himmatnagar': [23.5969, 72.9630,300]},
    'Jaipur': {'Kota': [25.2138, 75.8648,300]},
    'Gwalior': {'Ratlam': [23.3315,75.0367,250]},
    'Udaipur': {'Vadodara': [22.3072,73.1812,0]},
    'Himmatnagar': {'Vadodara': [22.3072,73.1812,0]},
    'Kota': {'Vadodara': [22.3072,73.1812,0]},
    'Ratlam': {'Vadodara': [22.3072,73.1812,0]},
}
start =
'Jammu'
goal =
'Vadodara'

```

HINT:

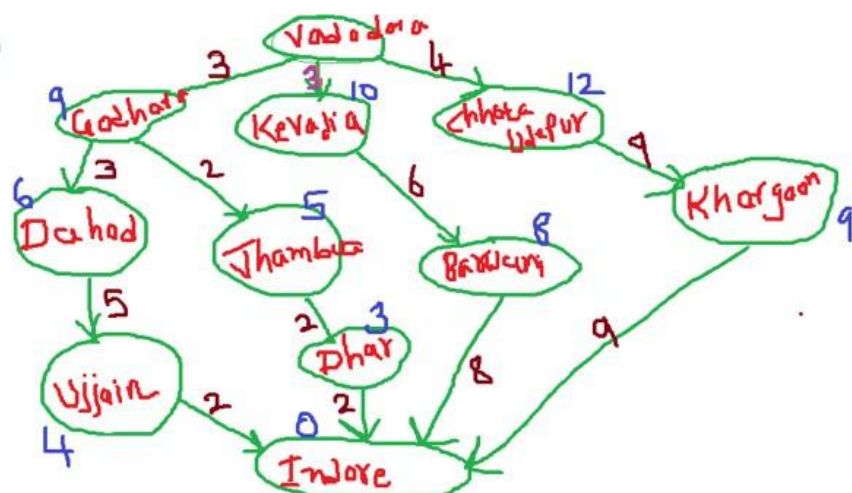
```

#pip install
geopy import
geopy.distance
coords_1 = (22.3071, 73.1812) #Vadodara
coords_2 = (23.0225, 72.5713) #Ahmedabad
print ("distance in kms is ", geopy.distance.geodesic(coords_1, coords_2).km)

```

17. Implement the following.

Implement A* Search
on following Graph /
Map



18. Write a program in Python for calculating conditional probability for following data in CSV file. The input columns are light blue coloured, remaining are calculative.

year	Students with Job at Campus	P(Job)	Students who learnt python	P(Py)	Students with python and job	P(job^py)	Con-P(Job Py)	Con-P(Py Job)
2015	28	0.56	15	0.3	10	0.2	0.666666667	0.357142857
2016	32	0.64	21	0.42	17	0.34	0.80952381	0.53125
2017	34	0.68	25	0.5	21	0.42	0.84	0.617647059
2018	37	0.74	34	0.68	31	0.62	0.911764706	0.837837838
2019	38	0.76	39	0.78	37	0.74	0.948717949	0.973684211
2020	46	0.92	44	0.88	42	0.84	0.954545455	0.913043478

19. Naive Bayes classification from scratch using Excel for below given tabular data.

20. Naive Bayes classification using python sklearn lib for below given tabular data.

Sr. No.	Color	Type	Origin	Stolen
1	Red	SUV	Domestic	Yes
2	Red	SUV	Imported	Yes
3	Red	Sports	Imported	Yes
4	Red	Sports	Domestic	No
5	Red	Sports	Imported	Yes
6	Yellow	SUV	Imported	Yes
7	Yellow	SUV	Imported	Yes
8	Yellow	SUV	Domestic	No
9	Red	SUV	Imported	Yes
10	Red	Sports	Imported	No
11	Yellow	Sports	Imported	Yes/No ??

21. Create a model to predict next word conditional probability-based prediction model for Gujarati language (Download gujarati text from sources available on internet)
22. Create a model to predict whether a person will have car or not based on dataset attached using Naive Bayes Classifier. (user_data_cars_1.csv)

1. Calculate Entropy and Gini for following dataset in Excel. (playplaynot.csv)
2. Write a python script to implement Decision Tree classifier on same dataset. (playplaynot.csv)
3. Write python script to implement Random Forest classifier on following dataset. (iris.csv)

Attachment playplaynot.csv, iris.csv, ML Observation Table.docx

23. Write a python script to implement

1. KNN Classifier and
2. KNN Regression

based on match on 3 attached datasets.

Record your observations with different parameters in the ML record sheet attached.

Upload code and ML Observation table.

Data set attached : user_data_cars_1.csv, pima-indiana-diabetes.csv, cars.csv

24. Write a python script to implement
1. Regression using KNN, Linear, Ridge, Lasso and ElasticNet on cars.csv dataset to predict CO2 emission.
 2. Classification using LogisticRegression on pima-indiana-diabetes.csv.
25. Develop a ML model to predict Quality of Milk (Low, Medium, High) from the given dataset (Milk_Quality.csv).
- Perform following operations
1. Read the dataset.
 2. Display the shape of dataset
 3. Display columns of dataset.
 4. Check for null values.
 5. Show descriptive statistics of dataset.
 6. Display unique values in each column (for pH, Temp, etc)
 7. Draw hist plots for each column.
 8. Remove outliers if required.
 9. Balance the dataset equally for the target output variable by removing or augmenting records.
 10. Using K-Best or any Feature selection technique, use the best X features.
 11. Perform scaling or encoding on features.
 12. Create multiple models.
 13. Select the most appropriate model to host on web creating a web-api and consume.
26. Develop a ML model to predict car price from the given dataset (usedcars.csv).
- Perform following operations
1. Read the dataset.
 2. Display the shape of dataset
 3. Display columns of dataset.
 4. Check for null values.
 5. Show descriptive statistics of dataset.
 6. Display unique values in each column.
 7. Draw hist plots for each column.
 8. Remove outliers if required.
 9. Using K-Best or any Feature selection technique, use the best X features.
 10. Perform scaling or encoding on features.
 11. Create multiple models.
 12. Select the most appropriate model to host on web creating a web-api and consume.
27. Write a python script to transliterate between hindi and Gujarati and vice-versa.
- Please find unicode chart
<https://www.ssec.wisc.edu/~tomw/java/unicode.html>
28. Write a Python script for language transliteration between Gujarati and English Script.
- Input : આપણે બધા કૃત્રિમ બુદ્ધિ વિષય સીખી રહ્યા છે.
- output : Aapde badha krutrim buddhi vishay sikhi rahya chee.
29. Write an Object-Oriented Program which reads texts from a file. It must display file statistics a below.
- a. No. of sentences.
 - b. No. of words.
 - c. No. of total characters (Does not include whitespace)
 - d. No. of whitespaces
 - e. Total no. of digits, uppercase and lowercase letters.
30. Write an Object Oriented Program which creates vocabulary of words and also counts each word in a document.

Eg. Content

The birds are flying. The boy is walking. The Ganges are great river system. The Narmada river flows from rift valley.

output :

[(The,3), (birds,1), (are,1), (birds,1), (are,2), (flying,1), (boy,1), (river,2)]

31. Develop an NLP application which tokenizes text, removes punctuation marks, converts to lower case, removes spelling errors, removes stopwords, convert to root word using either stemmer or lemmatizer and displays counts/frequency of the main text words.
32. Write a program for next word prediction using N-Gram conditional probability.
33. Write an script to build Bag-of-Word and TF-IDF model from English text.
34. Write a program to create a POS tagger for English/Hindi/Gujarati language using DL model.
35. Write a NLP application which classifies Gujarati news to categories (Entertainment, tech, business).