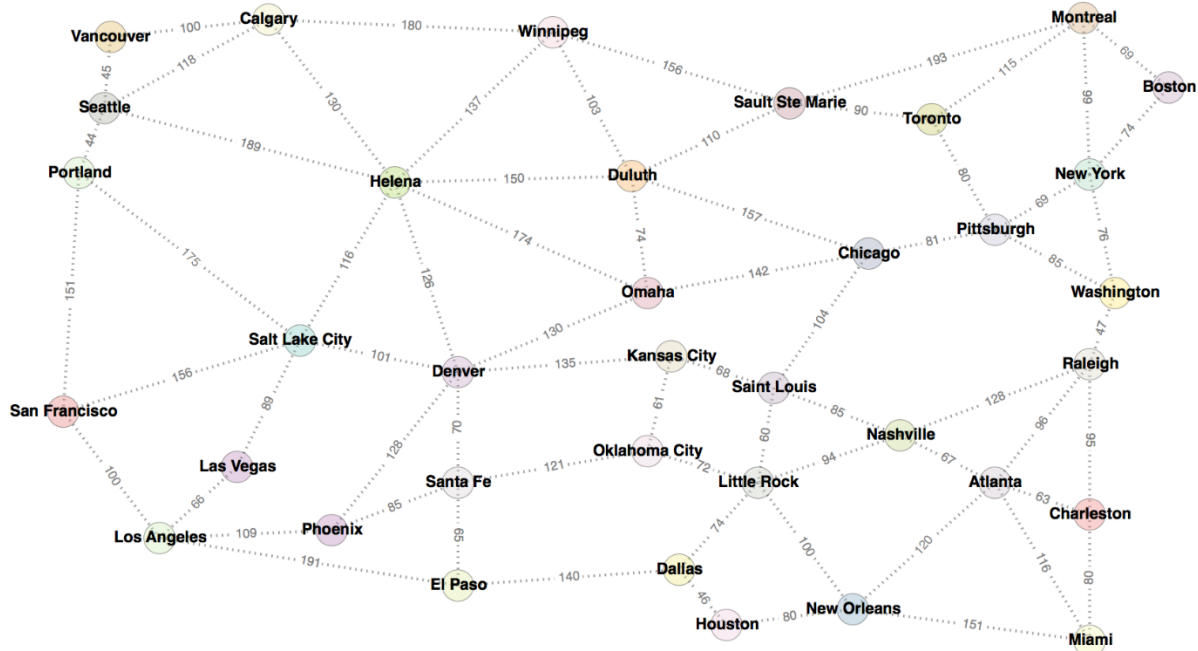


Subject: Artificial Intelligence (CA34114)

Assignments:

- a. For the following questions, you are given the city that you start in (the "start city"), and the city that you want to find (the "goal city"). With each of the following search strategies, please list the cities in the exact order in which you end up visiting the cities.

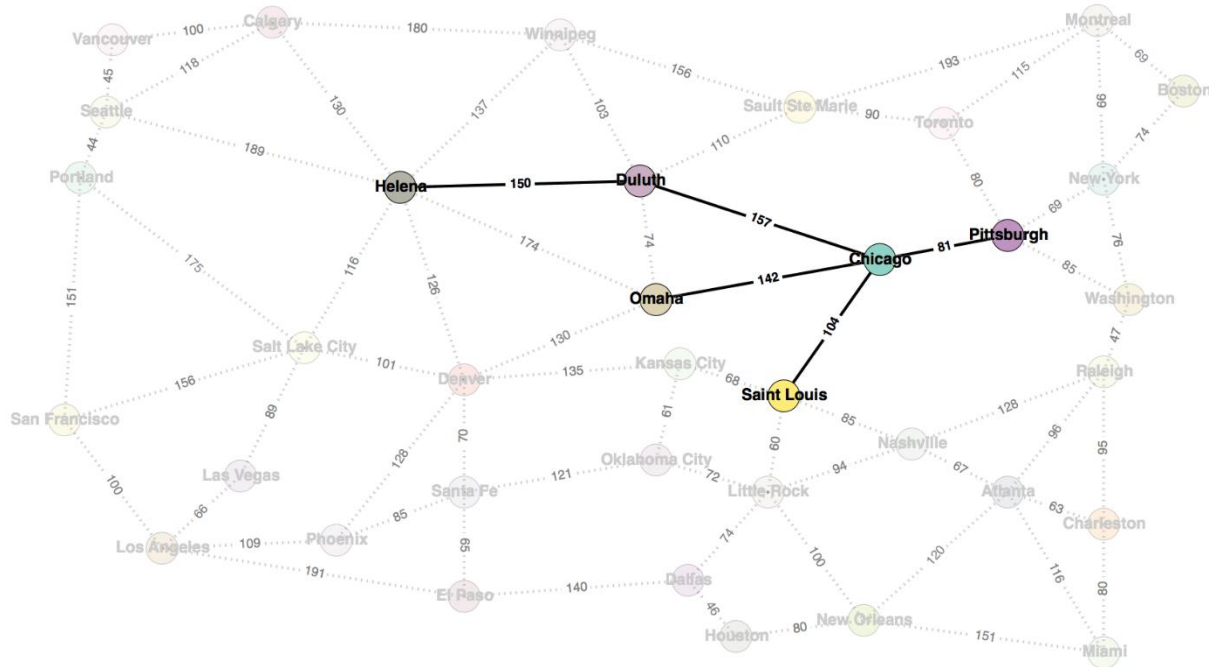


Ordering

All else equal, assume that nodes are always visited in **lexicographical** order. For example, starting at Duluth, a depth-first or breadth-first search strategy would lead to Chicago being the next node visited. In particular, for depth-first search this means that nodes are pushed onto the frontier in reverse lexicographical order (and popped in lexicographical order). For breadth-first search, nodes are simply enqueued and dequeued in lexicographical order.

Example

List the cities in the order visited, using **commas** as separators. Make sure your **spelling** matches the city names exactly. The start city will be the first on the list, and the goal city will be the last on the list. For example, a breadth-first search for Helena, starting from Chicago, will have the correct answer of "Chicago, Duluth, Omaha, Pittsburgh, Saint Louis, Helena" (without the quotes). Note that we are listing all the cities **visited**, not just the resulting **path** (which, in this case, only contains Chicago, Duluth, and Helena). The graph of this example is as follows:



- i. **Depth-First Search** **Start:** Chicago **Goal:** Vancouver
List of cities, separated by commas:
 - ii. **Breadth-First Search** **Start:** San Francisco **Goal:** Seattle
List of cities, separated by commas:
 - iii. **Uniform-Cost Search** **Start:** New Orleans **Goal:** Charleston
List of cities, separated by commas:
- b. Three missionaries and three cannibals find themselves on one side of a river. They have would like to get to the other side. But the missionaries are not sure what else the cannibals agreed to. So the missionaries managed the trip across the river in such a way that the number of missionaries on either side of the river is never less than the number of cannibals who are on the same side. The only boat available holds only two at a time. How can everyone get across the river without the missionaries risking being eaten?
Write the production rules and solution path for above mentioned problem statement.
 - c. Demonstrate Best First Search step by step using example.
 - d. Suppose you are involved in agriculture work, how will you use artificial intelligence, machine learning technique for farming? Discuss with 3 example.
 - e. How will you use Hill Climbing in Problem Solving? Show the Different regions in the State Space Diagram of Hill Climbing. What are the problems in hill climbing search methods due to which they may fail to find the solution? Also write the solutions to handle these.

f. Transform the given formula into its prenex normal form

$$\forall x \forall y [\exists z (p(x, z) \wedge p(y, z)) \rightarrow \exists u Q(x, y, z)]$$















g. Find the resolvent of the following clause using Resolution

$$\begin{aligned} \phi_1 &= A \vee B \vee \neg D \\ \phi_2 &= A \vee B \vee C \vee D \\ \phi_3 &= \neg B \vee C \\ \phi_4 &= \neg A \\ \phi &= C \end{aligned}$$

h. Consider the following facts and convert to FOPL.

- i. Some cats are intelligent
- ii. Every man is mortal
John is man, therefore john is mortal
- iii. Every lion drink coffee
- iv. Every women loves a child

i. Construct the Decision tree for given below CAR dataset using information Gain and classify the given instance: color: red; doors: 4; type: car; tires: blackwall

Color	Type	Doors	Tires	Class	
Red	SUV	2	Whitewall	+	
Blue	Minivan	4	Whitewall	-	
Green	Car	4	Whitewall	-	
Red	Minivan	4	Blackwall	-	
Green	Car	2	Blackwall	+	
Green	SUV	4	Blackwall	-	
Blue	SUV	2	Blackwall	-	
Blue	Car	2	Whitewall	+	
Red	SUV	2	Blackwall	-	
Blue	Car	4	Blackwall	-	
Green	SUV	4	Whitewall	+	
Red	Car	2	Blackwall	+	
Green	SUV	2	Blackwall	-	
Green	Minivan	4	Whitewall	-	

j. Solve the Cryptarithmic problem by assigning number (0 to 9) in such a way that each letter is assigned a unique digit which following the addition. No two letter have the same value.

$$\begin{array}{r} \text{BASE} \\ + \text{BALL} \\ \hline \text{GAMES} \end{array}$$

k. Consider the following eight patterns with two attributes X and Y:

Pattern	P1	P2	P3	P4	P5	P6	P7	P8	
Attributes	X	2	1	10	1	3	11	4	12
	Y	2	14	7	11	4	8	3	9

Take point P1, P2 and P7 as initial centroids. Then apply the k-means clustering algorithm to calculate two successive positions of those centroids. The distance between the two points P1(x1, y1) and P2(x2, y2) is defined as $D(P1, P2) = |x1 - x2| + |y1 - y2|$.

l. Predict **Bob will default his loan or not** using Naïve Bayes classification algorithm.

Bob
Home owner: No
Marital status: Married
Job experience: 3

Home owner	Marital Status	Job experience (1-5)	Defaulted
Yes	Single	3	No
No	Married	4	No
No	Single	5	No
Yes	Married	4	No
No	Divorced	2	Yes
No	Married	4	No
Yes	Divorced	2	No
No	Married	3	Yes
No	Married	3	No
Yes	Single	2	Yes

m. Define Eigen values and Eigen Vectors? Find Eigenvalues and Eigenvectors for given

2 × 2 Matrix A:

$$A = \begin{bmatrix} 1 & -3 & 3 \\ 3 & -5 & 3 \\ 6 & -6 & 4 \end{bmatrix}$$

n. Implement following Machine Learning algorithms using programming language of your choice:

- i. C 4.5
- ii. kNN
- iii. K-Means Clustering
- iv. Naïve Bayes
