

Week 2 Exercises

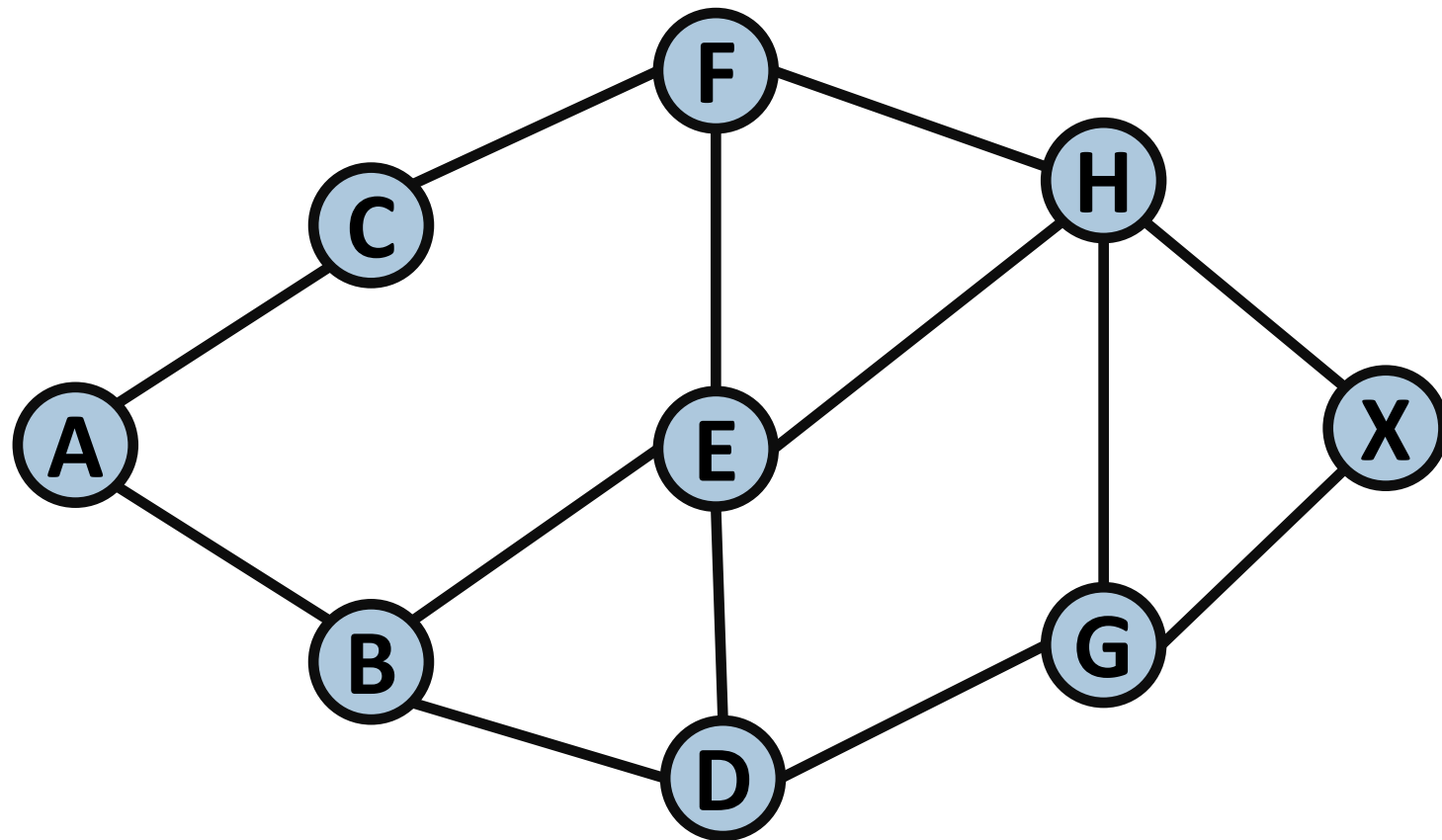
Uninformed and Informed Search

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50.021 Artificial Intelligence

The following notes are compiled from various sources such as textbooks, lecture materials, Web resources and are shared for academic purposes only, intended for use by students registered for a specific course. In the interest of brevity, every source is not cited. The compiler of these notes gratefully acknowledges all such sources.

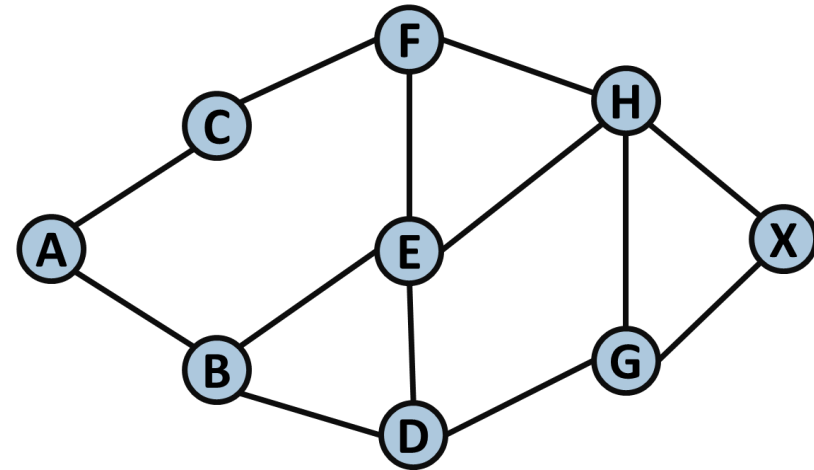
Exercise: Applying Search



Exercise: Applying Search

- Using the graph shown, run **Breadth-First Search** as a graph search, with A as the initial state and X as the goal state. Assume that we insert nodes in terms of the lowest alphabetical order first. Show all your steps and the final solution.

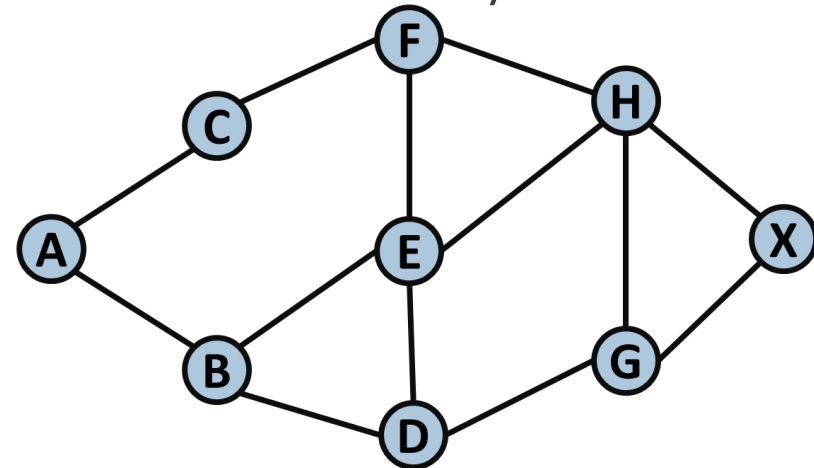
FIFO queue
Pop out one at the front and add node to be explored
A
AB, AC
AC, ABD, ABE
ABD, ABE, ACF
ABE, ACF, ABDG (ABDE not added – explored alr)
ACF, ABDG, ABEH
ABDG, ABEH (ACF removed, not expanded)
ABEH, ABDGX
ABDGX



Exercise: Applying Search

- Using the graph shown, run **Depth-First Search** as a graph search, with A as the initial state and X as the goal state. Assume that we insert nodes in terms of the lowest alphabetical order first. Show all your steps and the final solution.

LIFO queue
Pop out one at the back and add node to be explored
A
AB, AC
AB, ACF
AB, ACFE, ACFH
AB, ACFE, ACFHG, ACFHX
ACFHX

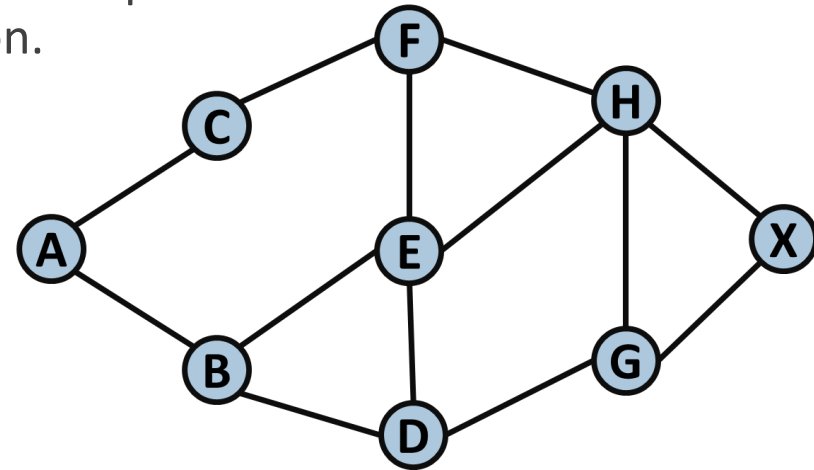


Exercise: Applying Search

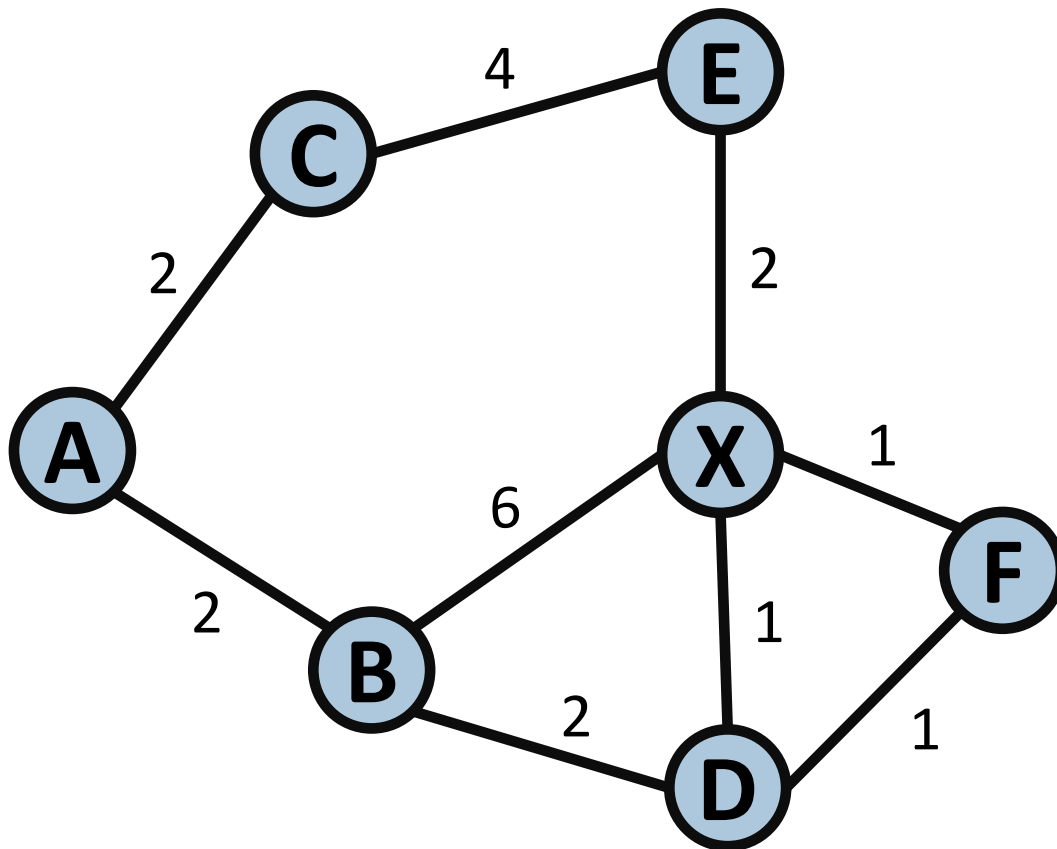
- Using the graph shown, run **Depth-Limited Search** as a graph search, with A as the initial state, X as the goal state and depth $l = 2$. Assume that we insert nodes in terms of the lowest alphabetical order first. Show all your steps and the final solution.

A
AB, AC
AB, ACF
AB,
ABD, ABE
ABD
[empty]

Solution: NIL



Exercise: Applying Search



Heuristic $h(n)$ to X

A	7
B	4
C	5
D	3
E	4
F	2

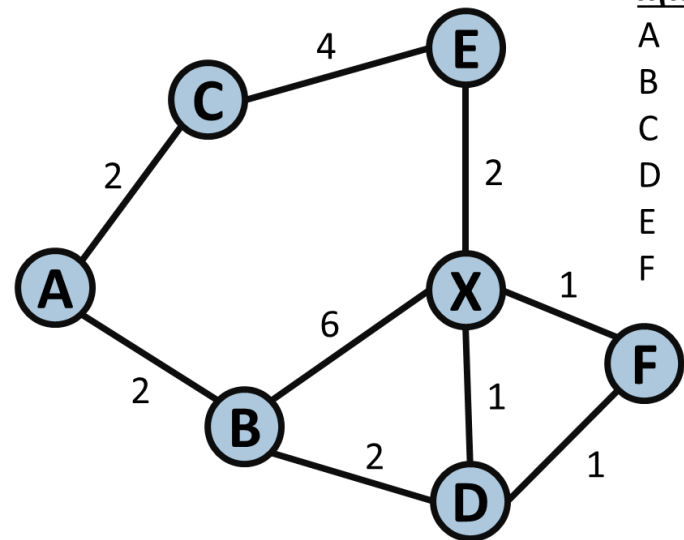
Exercise: Applying Search

- Using the graph shown, run **Greedy Best-first Search** as graph search, with A as the initial state, X as the goal state. In the event of a tie-break, assume that we insert nodes in terms of the lowest alphabetical order first. Show all your steps and the final solution.

Priority queue, pop and expand lowest $h(n)$

A (7)
AB (4), AC (5)
ABX (0), ABD (3), AC(5)

Solution: ABX



<u>Heuristic</u> <u>$h(n)$ to X</u>	
A	7
B	4
C	5
D	3
E	4
F	2

Exercise: Applying Search

- Using the graph shown, run **A* Search**, with A as the initial state, X as the goal state. In the event of a tie-break, assume that we insert nodes in terms of the lowest alphabetical order first. Show all your steps and the final solution.

Add step cost to $h(n)$, expand node that incurred least cost

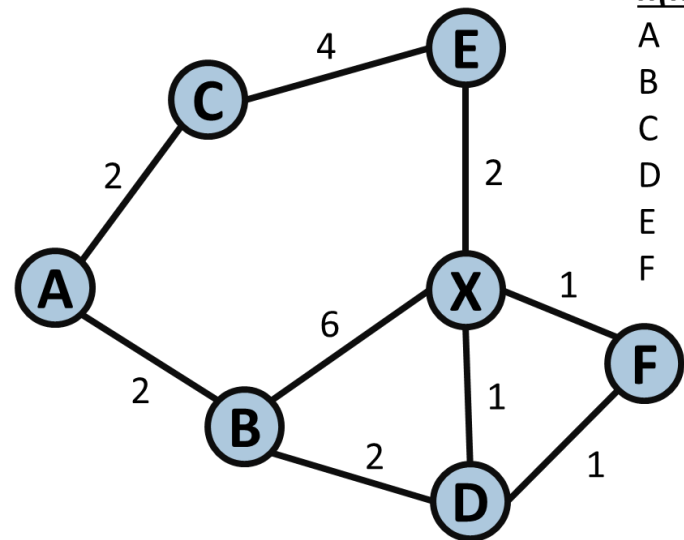
A (7)

AB (2+4=6), AC (2+5=7)

ABD (2+2+3=7), AC (7), ABX (2+6=8)

ABDX (2+2+1=5), ABDF (2+2+1+2=7), AC (7), ABX (2+6=8)

Solution: ABDX



<u>Heuristic</u> <u>$h(n)$ to X</u>	
A	7
B	4
C	5
D	3
E	4
F	2