

CE205 Data Structures

Week-6

Graph MST, Backtracking, Topological Sorting, Shortest Paths, Connectivity, Max Flow and Cycle Detection Algorithms.

Graph Isomorphism and canonization

Graph Cuts

Download [DOC](#), [SLIDE](#), [PPTX](#)

Outline-1

- Graph Topological Sorting
- Graph MST
- Graph Backtracking
 - Tug of War
 - n-Queen's Problem
 - m Coloring Problem
 - Euler & Hamiltonian Path

Outline-2

- Graph Shortest Paths
- Graph Connectivity - SCC
- Graph Max Flow
- Graph Isomorphism
- Graph canonization
- Graph Cuts
 - Min Cut
 - Max Cut

Outline-3

- Alpha-Beta Pruning
- Hasse Diagrams
- Petri Nets
- Bipartite Graphs
- Cycle Detection
 - Brent's Algorithm
 - Hare and Tortoise Algorithm
- Bayesian Network

Graph Topological Sorting

- CE100
 - <https://ucoruh.github.io/ce100-algorithms-and-programming-II/week-10/ce100-week-10-graphs/?h=topolo#directed-acyclic-graphs-dag>
- Geeks for Geeks
 - <https://www.geeksforgeeks.org/topological-sorting/>

Graph MST

- CE100
 - <https://ucoruh.github.io/ce100-algorithms-and-programming-II/week-10/ce100-week-10-graphs/?h=mst#minimum-spanning-tree-mst>
- Geeks for Geeks
 - <https://www.geeksforgeeks.org/prims-minimum-spanning-tree-mst-greedy-algo-5/>

Graph Backtracking

- Tug of War
 - Geeks for Geeks
 - <https://www.geeksforgeeks.org/tug-of-war/>

Graph Backtracking

- n-Queen's Problem
 - Geeks for Geeks
 - <https://www.geeksforgeeks.org/n-queen-problem-backtracking-3/?ref=lbp>

Graph Backtracking

- m Coloring Problem
 - Geeks for Geeks
 - <https://www.geeksforgeeks.org/m-coloring-problem-backtracking-5/>
 - Tutorials Point
 - <https://www.tutorialspoint.com/M-Coloring-Problem#:~:text=The problem is to find,is assigned on which vertex.>

Graph Backtracking

- Euler & Hamiltonian Path
 - <https://www.geeksforgeeks.org/mathematics-euler-hamiltonian-paths/>

Graph Shortest Paths

- Single-Source Shortest Paths (SSSP)
 - <https://ucoruh.github.io/ce100-algorithms-and-programming-II/week-11/ce100-week-11-shortestpath/>
 - <https://visualgo.net/en/sssp?slide=1>

Graph Connectivity

- Strongly Connected Components
 - <https://ucoruh.github.io/ce100-algorithms-and-programming-II/tr/week-10/ce100-week-10-graphs/?h=scc#strongly-connected-components-scc>

Graph Max Flow

- Geeks for Geeks
 - <https://www.geeksforgeeks.org/max-flow-problem-introduction/>

Graph Isomorphism

- <https://www.sciencedirect.com/science/article/pii/S0747717113001193>
- <https://www3.cs.stonybrook.edu/~algorithm/implement/nauty/implement.shtml>
- <https://github.com/Mith13/Graphs-isomorphism>

Graph Cuts

1. Min Cuts

2. Max Cuts

- Wikipedia

- [https://en.wikipedia.org/wiki/Cut_\(graph_theory\)#:~:text=In graph theory%2C a cut,said to cross the cut.](https://en.wikipedia.org/wiki/Cut_(graph_theory)#:~:text=In graph theory%2C a cut,said to cross the cut.)

Graph canonization

- Wikipedia
 - https://en.wikipedia.org/wiki/Graph_canonization

Cycle Detection

- <https://ucoruh.github.io/ce100-algorithms-and-programming-II/week-10/ce100-week-10-graphs/#cycle-detection>

Graph Coloring

- <https://ucoruh.github.io/ce100-algorithms-and-programming-II/week-10/ce100-week-10-graphs/#graph-coloring>

Alpha-Beta Pruning

- Geeks for Geeks
 - <https://www.geeksforgeeks.org/minimax-algorithm-in-game-theory-set-4-alpha-beta-pruning/>

Hasse Diagrams

- Geeks for Geeks
 - <https://www.geeksforgeeks.org/discrete-mathematics-hasse-diagrams/>

Petri Nets

- Wikipedia
 - https://en.wikipedia.org/wiki/Petri_net

Bipartite Graphs

- CE100
 - <https://ucoruh.github.io/ce100-algorithms-and-programming-II/week-10/ce100-week-10-graphs/?h=bipartite#bipartite-checker>
- Geeks for Geeks
 - <https://www.geeksforgeeks.org/bipartite-graph/>

Cycle Detection

- Brent's Algorithm
 - Geeks for Geeks
 - <https://www.geeksforgeeks.org/brents-cycle-detection-algorithm/>
- Hare and Tortoise Algorithm
 - Geeks for Geeks
 - <https://www.geeksforgeeks.org/tag/tortoise-hare-approach/>

Cycle Detection

- CE100
 - <https://ucoruh.github.io/ce100-algorithms-and-programming-II/week-10/ce100-week-10-graphs/?h=bipartite#cycle-detection>

Bayesian Network

- <https://towardsdatascience.com/introduction-to-bayesian-networks-81031eed94e>

End – Of – Week – 6