

# GRAPH TRAVERSAL

Analysis of Large Scale Social Networks

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In Social Network Analysis, graph traversals describe the flow of information across networks.

Formally, a traversal can be described as a sequence of nodes and edges (or depending on the definition used, just a sequence of nodes).

Based on the restrictions that are imposed on such a sequence, it is possible to identify different types of traversals

# WHAT?

Wasserman and Faust (1994) introduces three different types of traversals or routes

- ▶ Walk: sequence of alternating nodes and edges, with a start and end node. Edges are connecting preceding and following nodes.
- ▶ Trail: A walk in which each edge only occurs once
- ▶ Path: A trail in which each node only occurs once.

## TYPES OF GRAPH TRAVERSALS

- ▶ Length of a traversal or walk is equal to the number of edges in the sequence.
- ▶ Direction of edge can be used for restricting the flow in the network
- ▶ Weight of an edge can be used to express the cost of the traversal
- ▶ Length of a walk in a weighted network can be defined as the sum of the weights of the edges in the walk.

## PROPERTIES OF GRAPH TRAVERSALS

A shortest path between two nodes is a path for which it is impossible to find a path with a shorter length between these nodes.

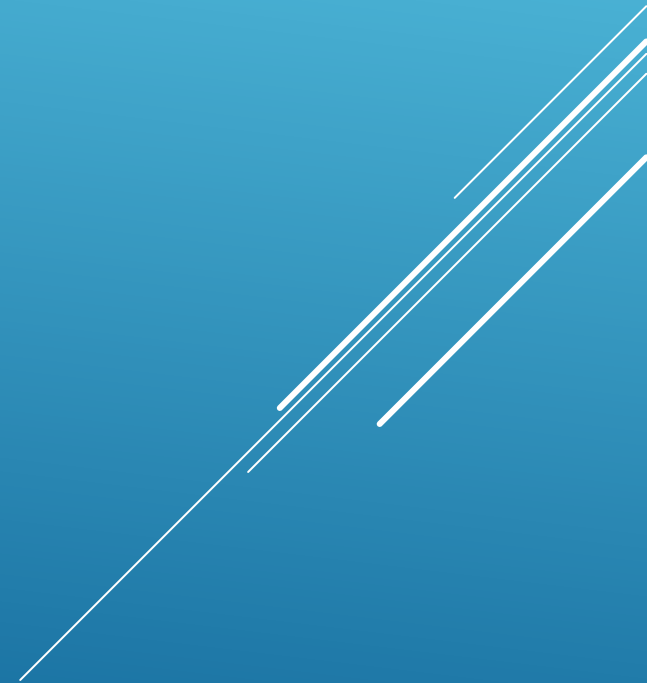
Shortest path problem is defined at the local level:

- ▶ Between individual pairs
- ▶ From one source to all/many others

At the global level:

- ▶ Between all possible pairs

## SHORTEST PATH



- ▶ Single Pair Shortest Path
  - ▶ A\* algorithm
- ▶ Single Source / Destination Shortest Path
  - ▶ Breadth-First Search
  - ▶ Depth-First Search
  - ▶ Dijkstra (Weighted Edges, implements a priority queue)
  - ▶ Bellman-Ford (Negative Edge Weights)
- ▶ All Pairs Shortest Path
  - ▶ Floyd-Warshall (Negative Edge Weights)

See: <https://www.cs.usfca.edu/~galles/visualization/Algorithms.html>

## SHORTEST PATH ALGORITHMS