# AlgoR.dijkstra - On Graph Shortest Path

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1. Introduction
   - What is this?
2. The Dijkstra Algorithm
   - But what is a graph?
   - The Problem...

# AlgoR

AlgoR is a set of R Packages to learn algorithmic and RCpp programming.
**Subject** : see V. RUNGE projet statement (fr.)
**AlgoR.dijkstra** : the R package that implements shortest path algorithm.

# Graph

Let $G = (V, E)$ be a graph, where $V$ is a set of vertices and $E$ is a set of edges.
An edge $e = (u, v)$ is a pair of vertices $u$ and $v$ such that $u, v \in V$.

- $G$ is a directed graph if $e = (u, v)$ implies $u \to v$.
- $G$ is an undirected graph if $e = (u, v)$ implies $u \leftrightarrow v$.

We can add a weight $w$ to each edge $e = (u, v)$, to get a weighted graph.

# Directed graph

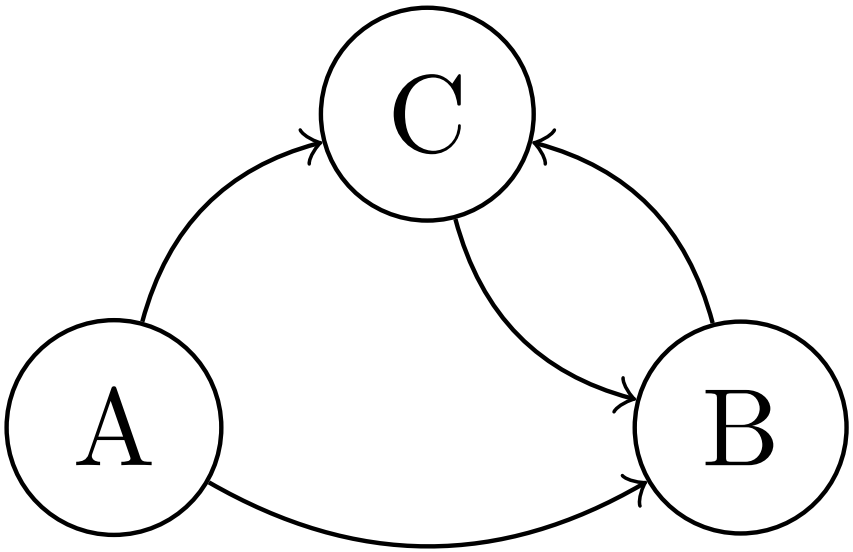


Figure: Directed graph

$$G = (V, E) = (\{A, B, C\}, \{(A, B), (A, C), (B, C), (C, B)\})$$

# Weighted graph

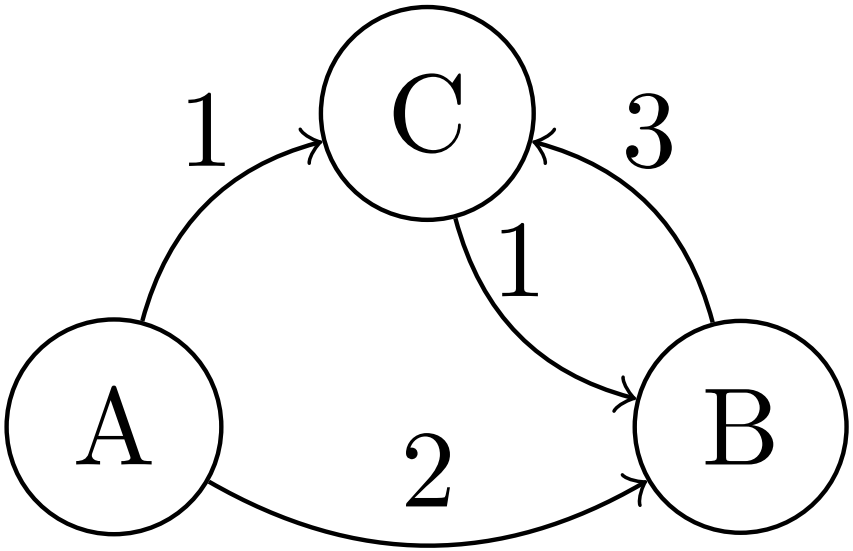


Figure: Weighted directed graph

$$G = (V, E) = (\{A, B, C\}, \{(A, B), (A, C), (B, C), (C, B)\})$$
$$W = \{2, 1, 3, 1\}$$

# Shortest Path

Let be a graph $G$, a source vertex $s$ and a destination vertex $d$.
What is the **shortest path** from $s$ to $d$?
(That is to say the set of vertex $S$ such that there exists an edge between each vertex in $S$ and the next one in $S$ and the sum of the weight of the edges is minimal.)

# Shortest Path - An example

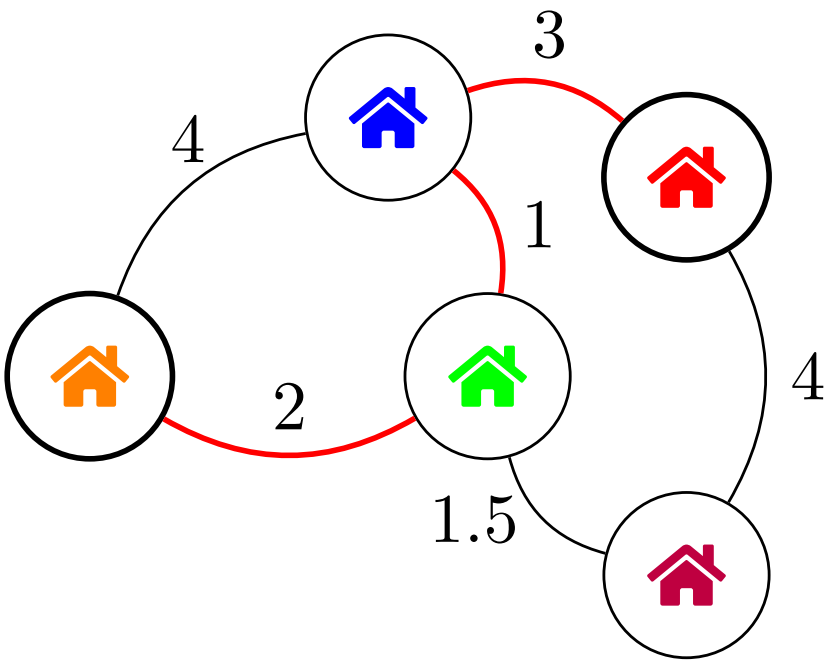


Figure: Find the shortest path from the orange house to the red house