Maximising temporal reachability in trees

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PiFORUM 22

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Motivations

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Maximising spread through a network has uses in spreading information or resources.

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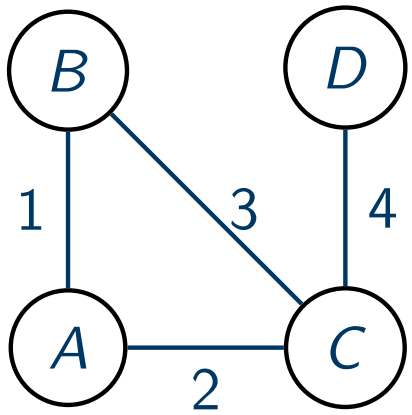
Temporal Graphs

A **temporal graph** is an underlying graph $G(V, E)$ with the function $\mathcal{T} : E \to t(E)$ that maps edges to timesteps during which they are said to be active.



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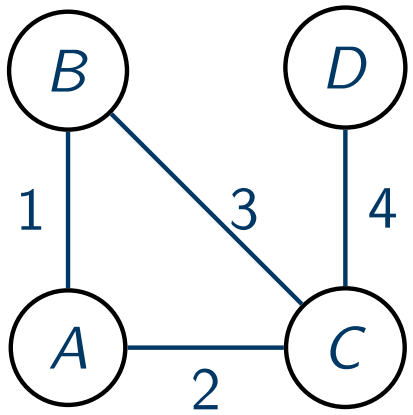
A **strict temporal path** is a path of edges $e_0, ..., e_k$ such that each e_i is assigned a time by $\mathcal{T}$ where $t(e_{i-1}) < t(e_i)$ for $1 \leq i \leq k$.



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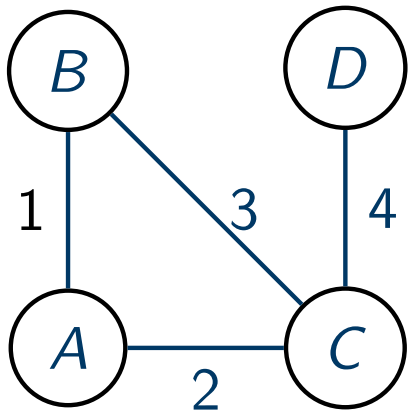
Reachability

A vertex v is **temporally reachable** from another vertex u in G if there exists a strict temporal path from u to v.



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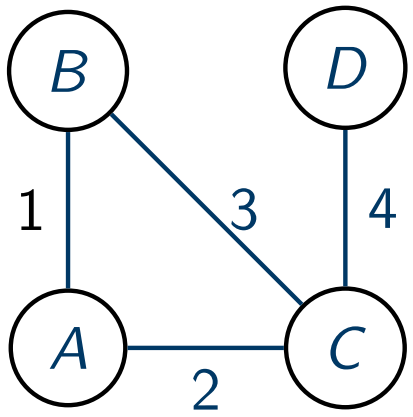

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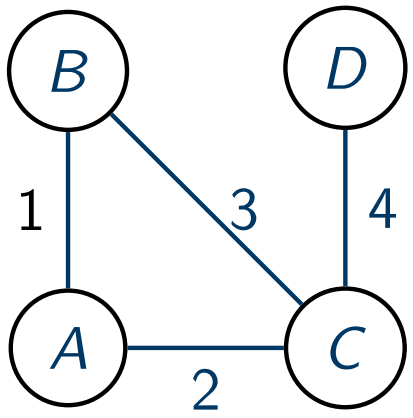

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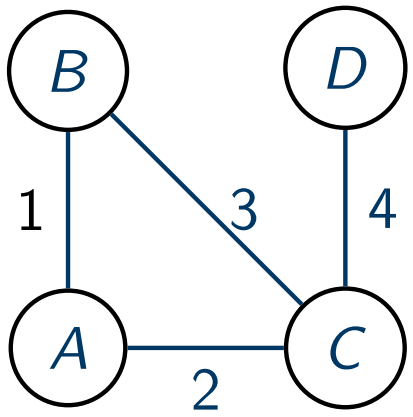

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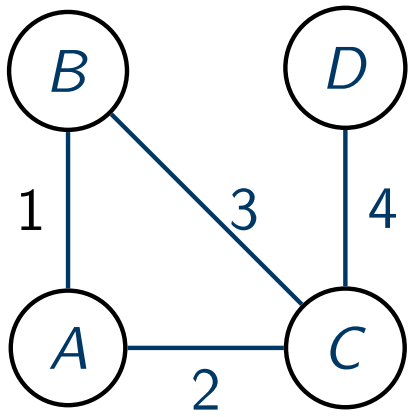

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The **minimum temporal reachability** of a graph G is the minimum cardinality of the temporal reachability sets of the vertices in G.

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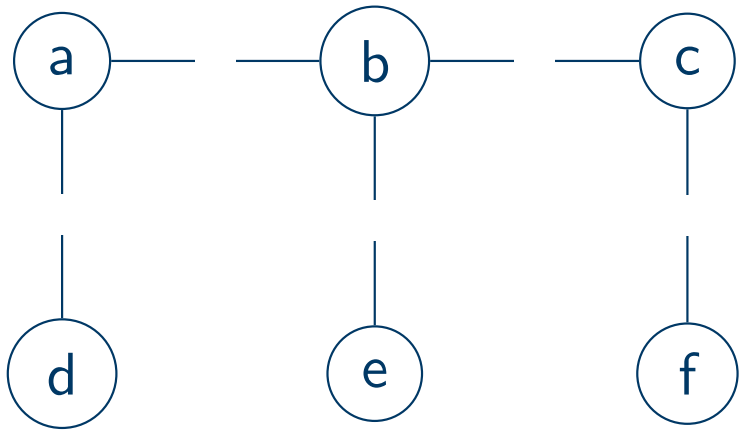
An Application

Suppose we have
a group of people where our underlying graph has an edge between two vertices if the corresponding people are friends.



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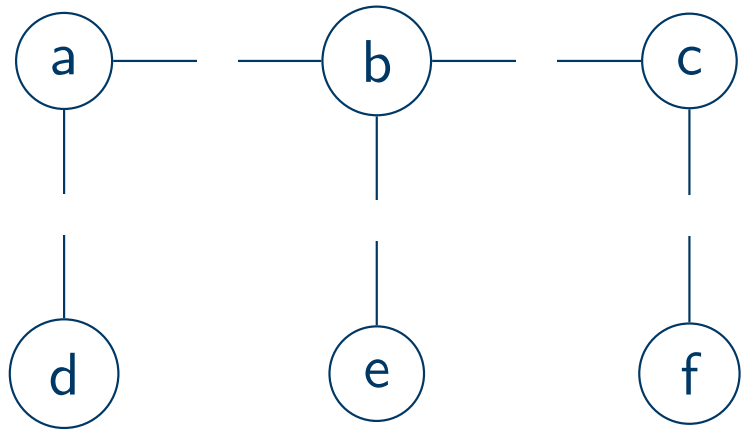

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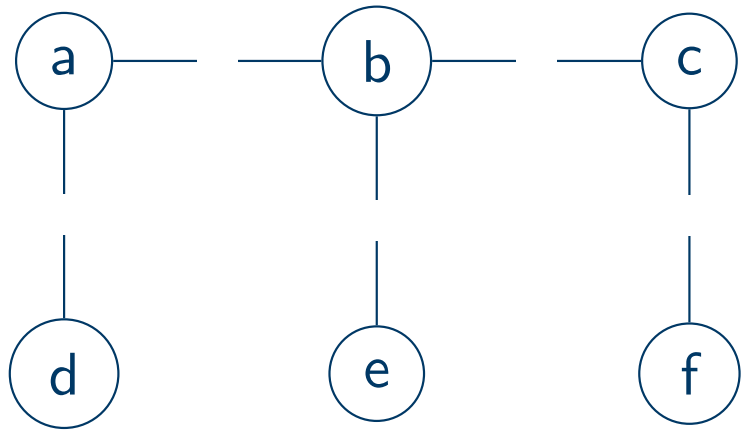

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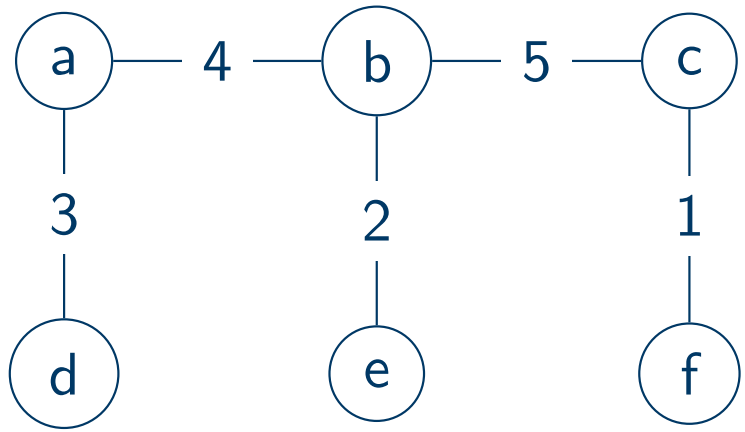

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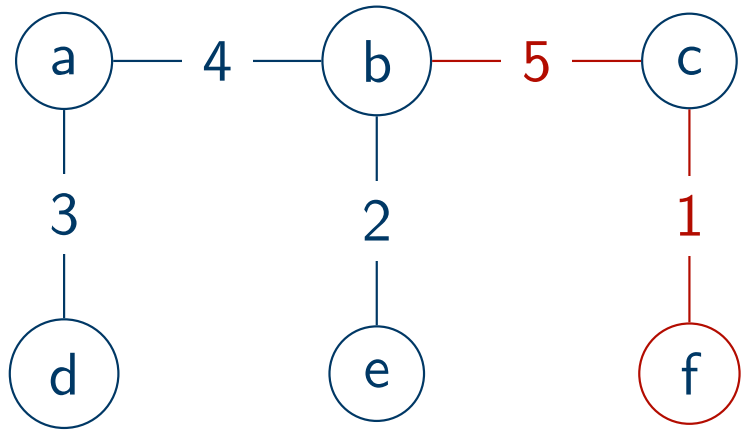

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- If so, which properties does the underlying graph need to have?
- Can we assign timesteps to edges such that the temporal reachability of every vertex falls within a given interval?
- Suppose we are performing an operation on our graph and we know some of the timesteps in the graph are wrong, how close can we get to an optimal solution?

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Thanks for listening! Any questions?

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