Search Progress and Potentially Expanded States in Greedy Best-First Search

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Motivation

A^* [Hart et al.,1968]:

- increasing f-value $\rightsquigarrow$ search progress
- necessarily expanded states $\rightsquigarrow$ quality of heuristic
- potentially expanded states $\rightsquigarrow$ importance of tie-breaking
- never expanded states $\rightsquigarrow$ pruning

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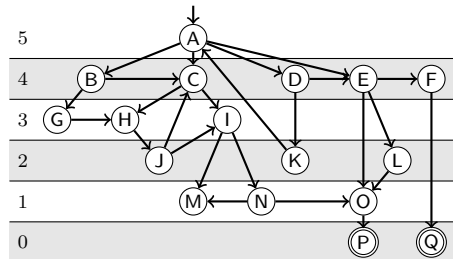Greedy best-first search [Doran and Michie, 1966]:

- ?

Greedy Best-First Search
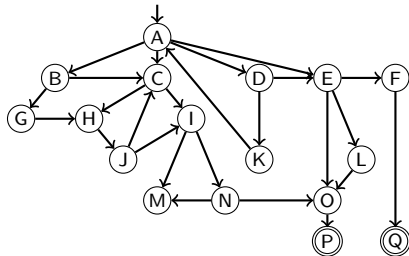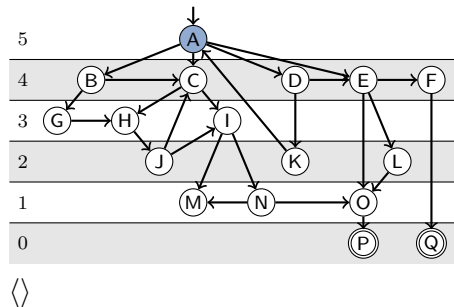
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Greedy Best-First Search

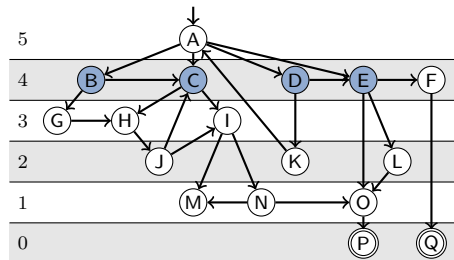- state space search algorithm
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Greedy Best-First Search

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- heuristic search algorithm
- greedily expands open states with lowest heuristic value

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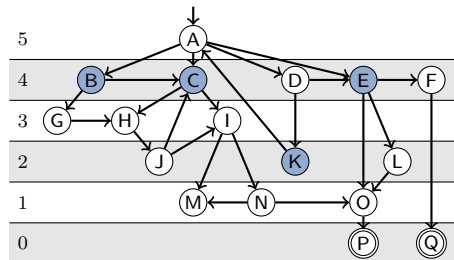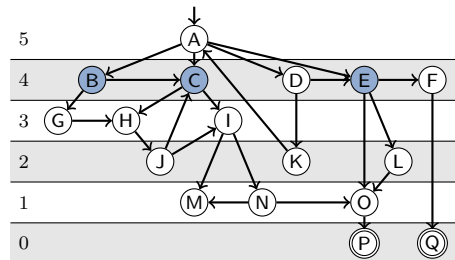## Greedy Best-First Search

- state space search algorithm
- heuristic search algorithm
- greedily expands open states with lowest heuristic value
- tie-breaking decisions

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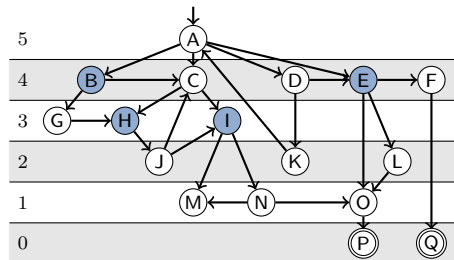
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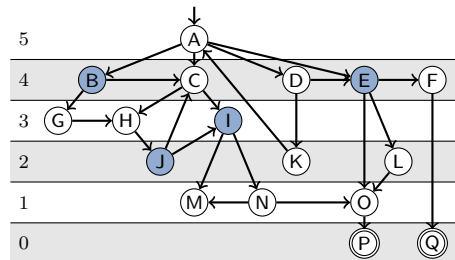

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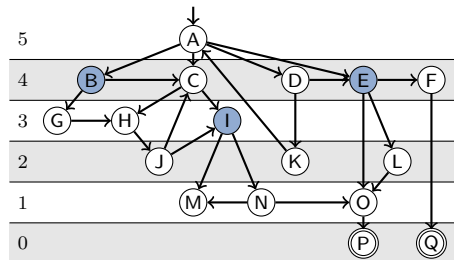
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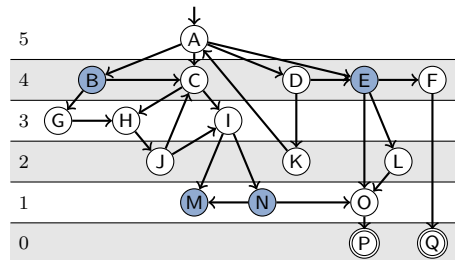
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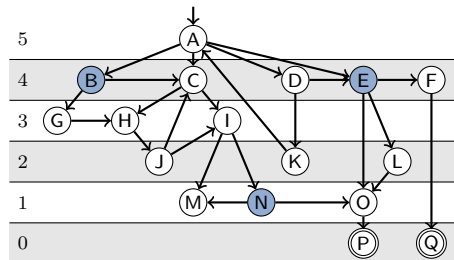
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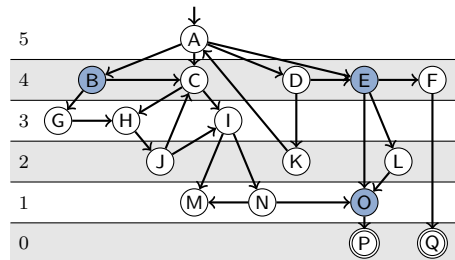
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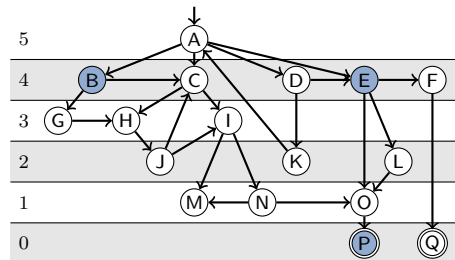
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Greedy Best-First Search

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- greedily expands open states with lowest heuristic value

- tie-breaking decisions

- many possible search runs
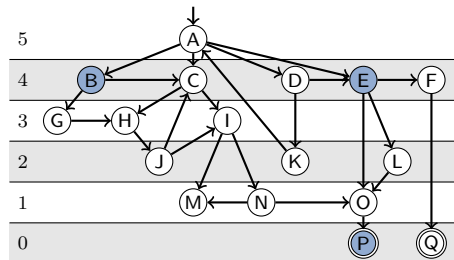
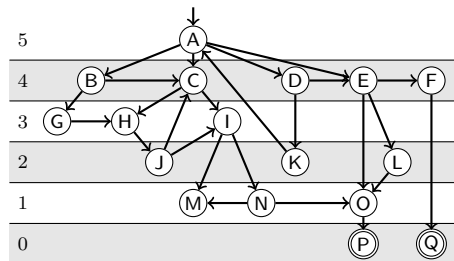$\langle A, D, K, C, H, J, I, M, N, O \rangle$
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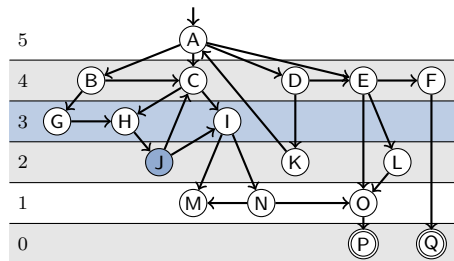. . .
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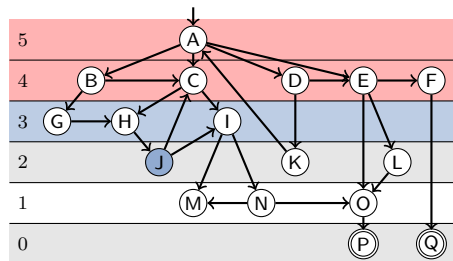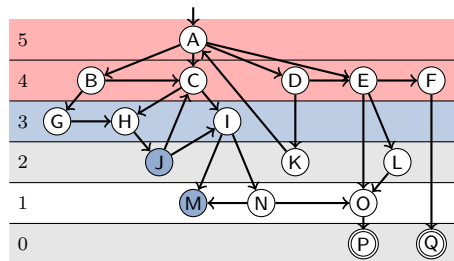## High-Water Mark

- basis of our analysis [Wilt & Ruml,2014]

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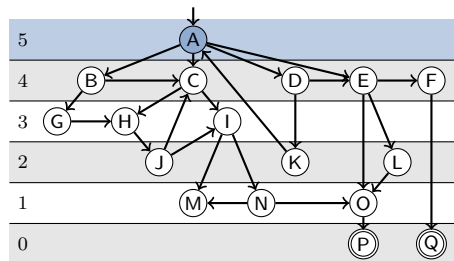- no expansions of states with heuristic values above the high-water mark

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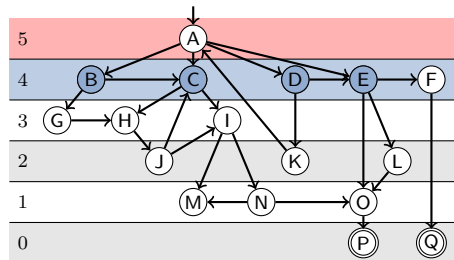
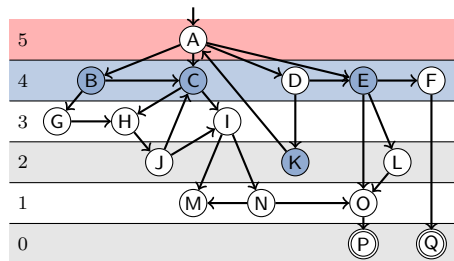- generalize to set of states because GBFS acts globally

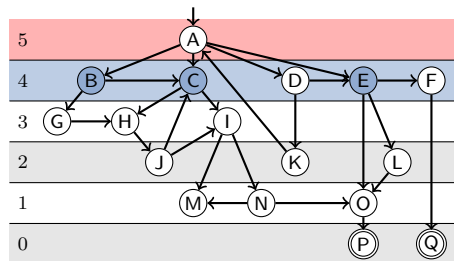## Search Progress

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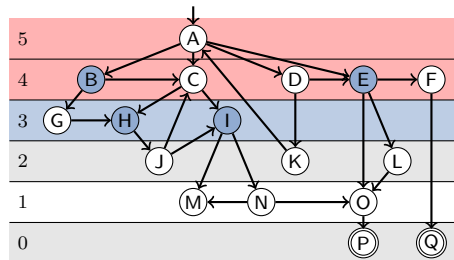
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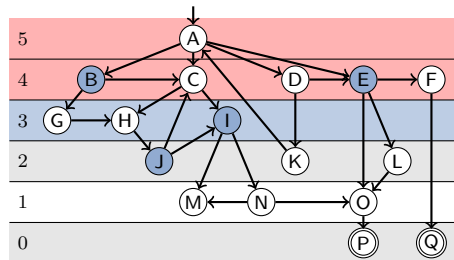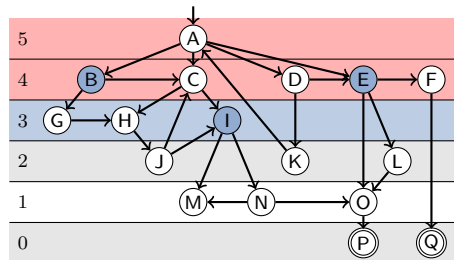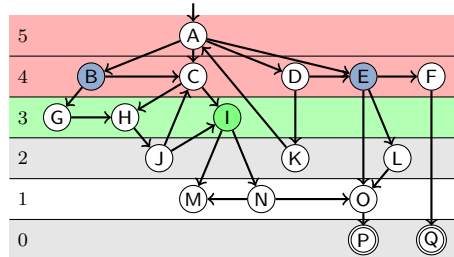- discard open states when
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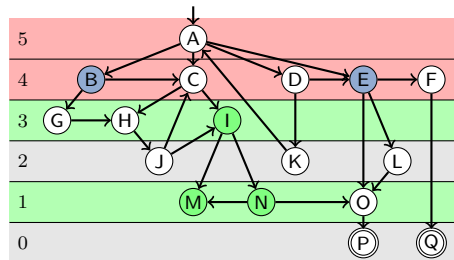- discard open states when high-water mark decreases

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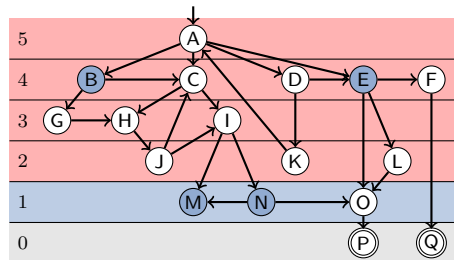- expansion of progress state generates states with lower high-water mark than that of progress state itself

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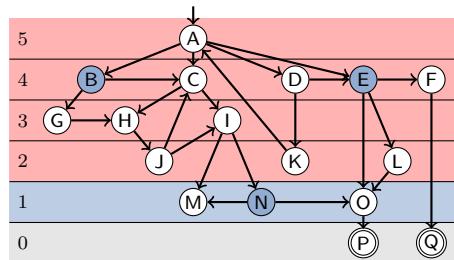
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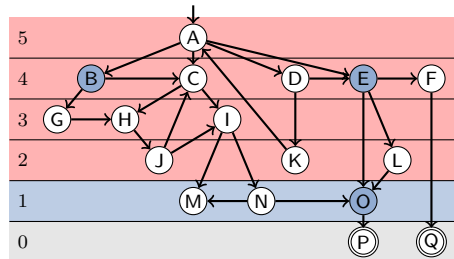
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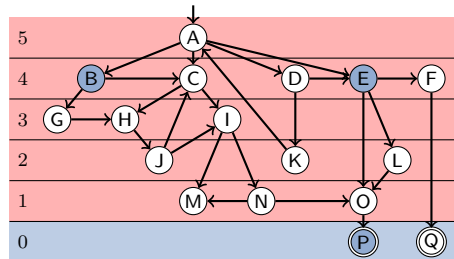
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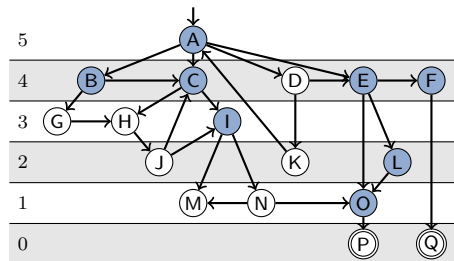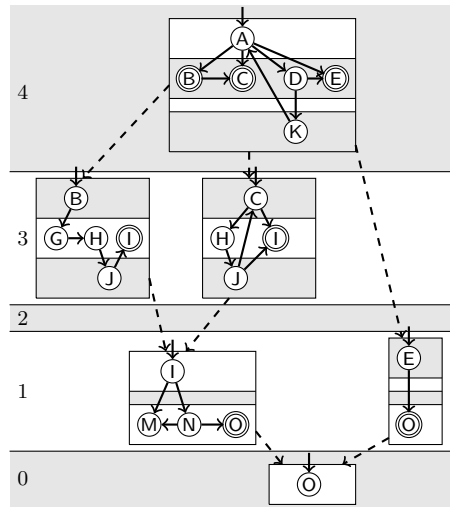- possible progress states characterized independent of tie-breaking and search history

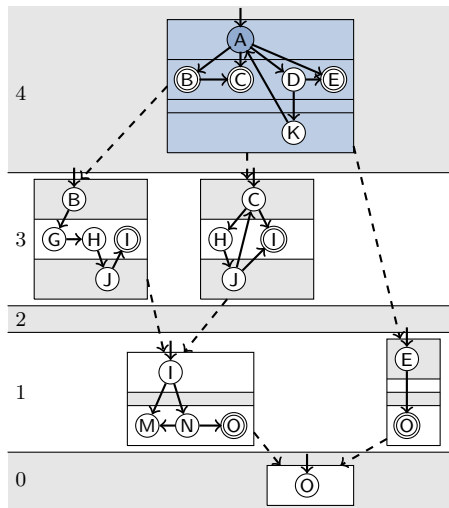## Search Behavior

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- benches are regions of the state space

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- progress splits search run into sequence of episodes
- episode is a search a bench

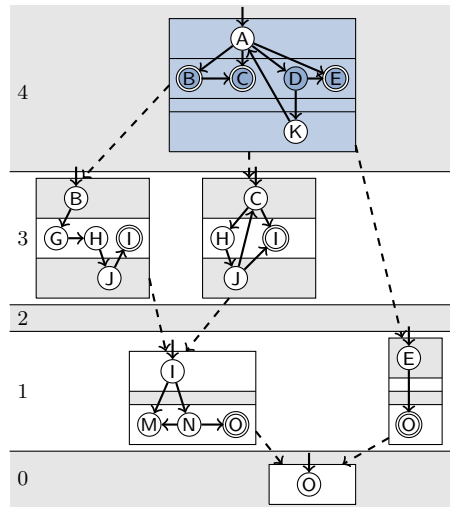## Search Behavior

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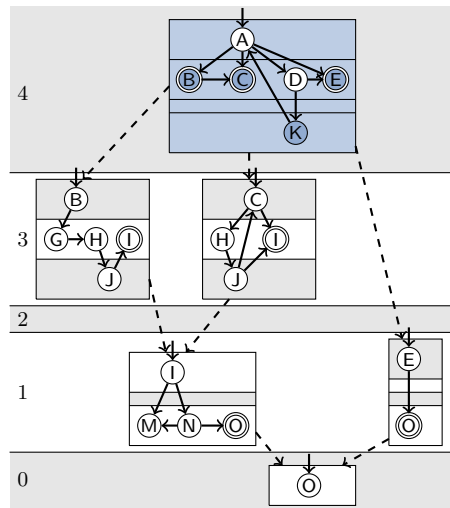## Search Behavior

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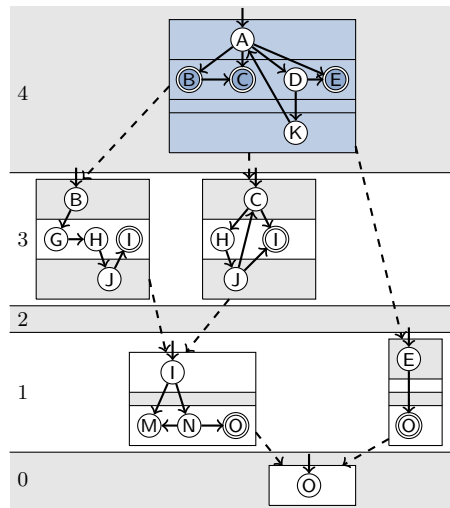## Search Behavior

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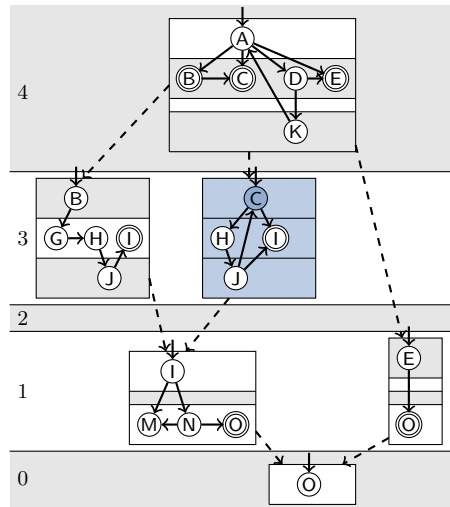- episode is a search a bench
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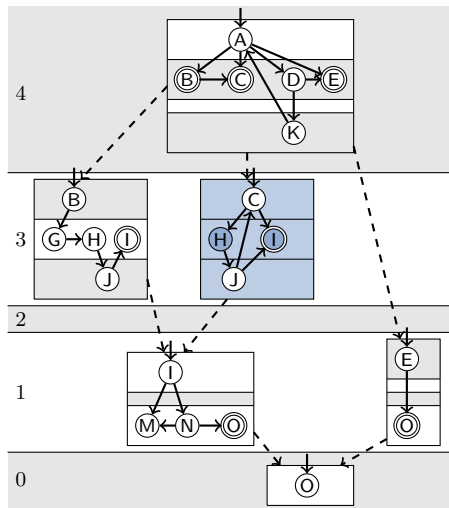- episode is a search a bench

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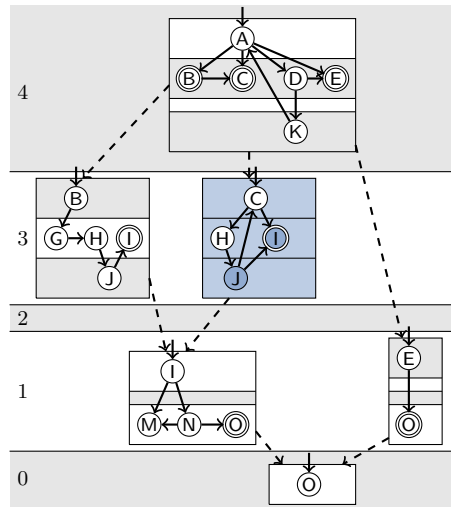- episode is a search a bench
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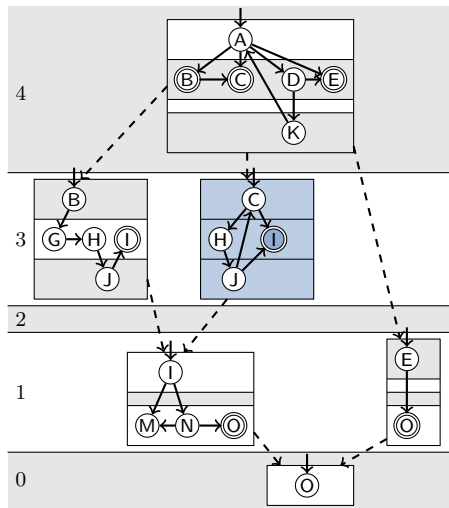- episode is a search a bench
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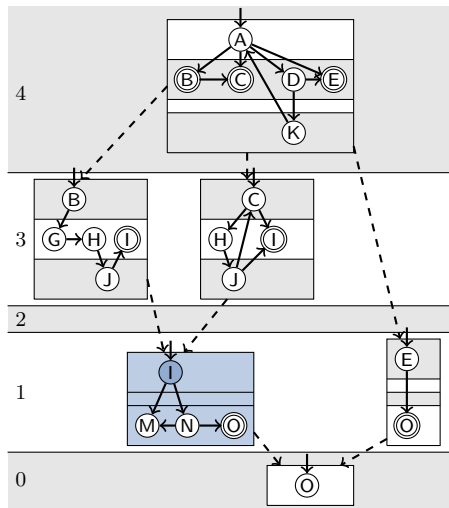- episode is a search a bench

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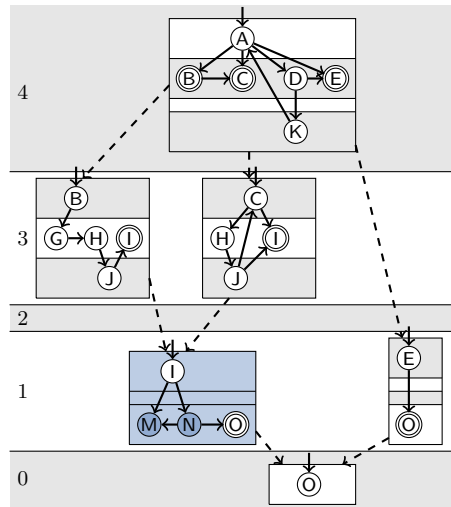- episode is a search a bench
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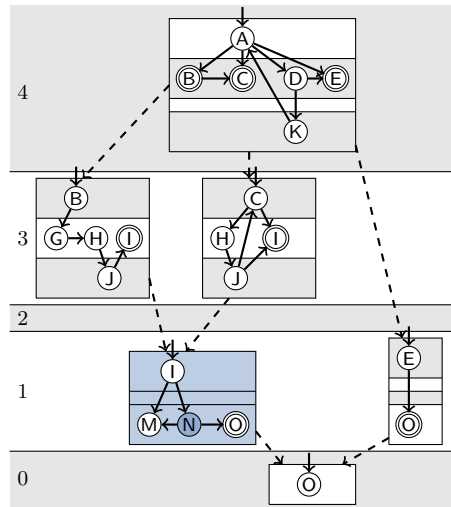- episode is a search a bench
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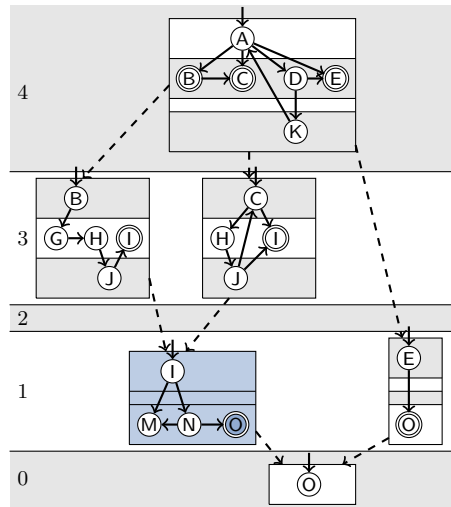- episode is a search a bench
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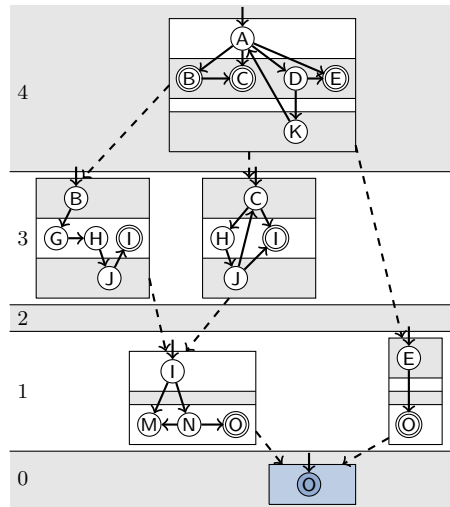- episode is a search a bench
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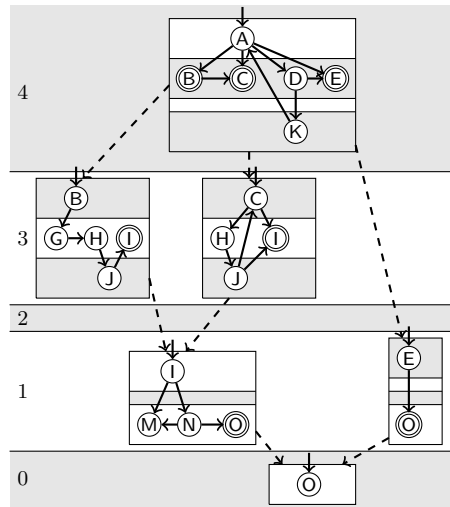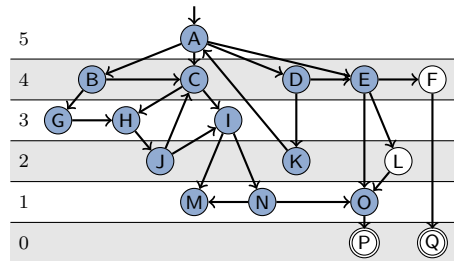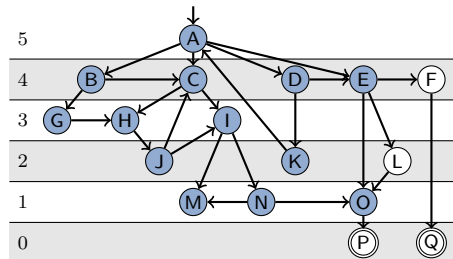- episode is a search a bench

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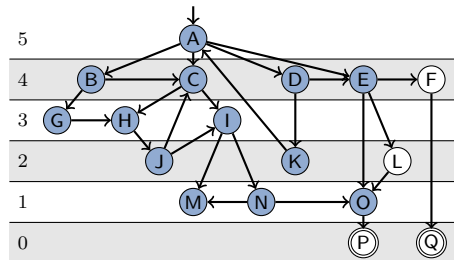
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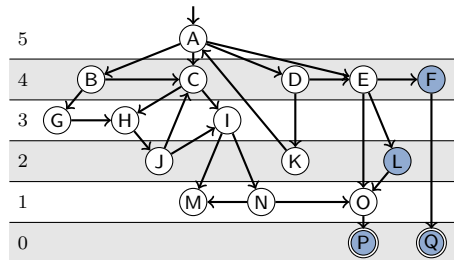- tie-breaking independent number for given state space and heuristic

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- critical role in the search behavior
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Follow up work:

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- talk + poster here at IJCAI2018

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