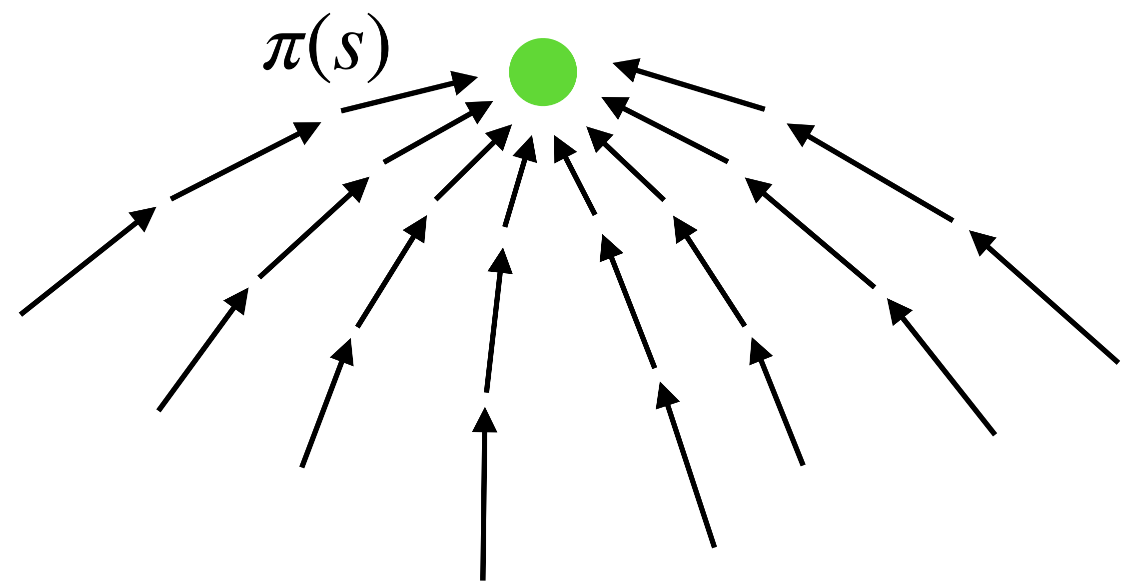
Solution 1: Dynamic programming



- Dynamic Programming (Principle of Optimality - sufficient condition)
  - ➡ Compositionality of optimal paths
  - ➡ Closed-loop solutions: find a solution for all states at all times
- Solvable via Bellman equation in a backward recursive fashion
- Algorithms as e.g. Value iteration, Policy iteration (see Sutton and Barto)
- <u>No direct notion of constraints for states or actions!</u>

Solution 2: Non-feedback control

- Calculus of Variations - Pontryagin Maximum Principle PMP (necessary condition)
- PMP turns functional minimisation in a function minimisation at each point in time
- Find a solution-sequence $(\mathbf{a}^*, \mathbf{s}^*)$ for a given initial state $\mathbf{s}_0$
- <u>Can handle constraints e.g. $\mathbf{s}_t \in S$, $\mathbf{a}_t \in A$</u>
- <u>But: open loop cannot stabilise the system!</u>