

Plan to Understand

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Problem

Decision-theoretic frameworks like Markov Decision Processes (MDPs) are difficult to reason about

General-purpose, efficient methods for understanding solutions (policies) do not exist

Motivation

Visualization of policies can help researchers

- understand behaviors of planning algorithms
- improve algorithms (iterate more quickly)

Answer common questions:

After taking this action, what states might I be in?
How likely are those states? What are their values?
Why did my policy choose this particular action?

New visualization techniques needed

- Graph has two types of nodes and links
- State/action/transition space can be very large

Approach

Input: MDP specification, f : state \rightarrow 2d representation

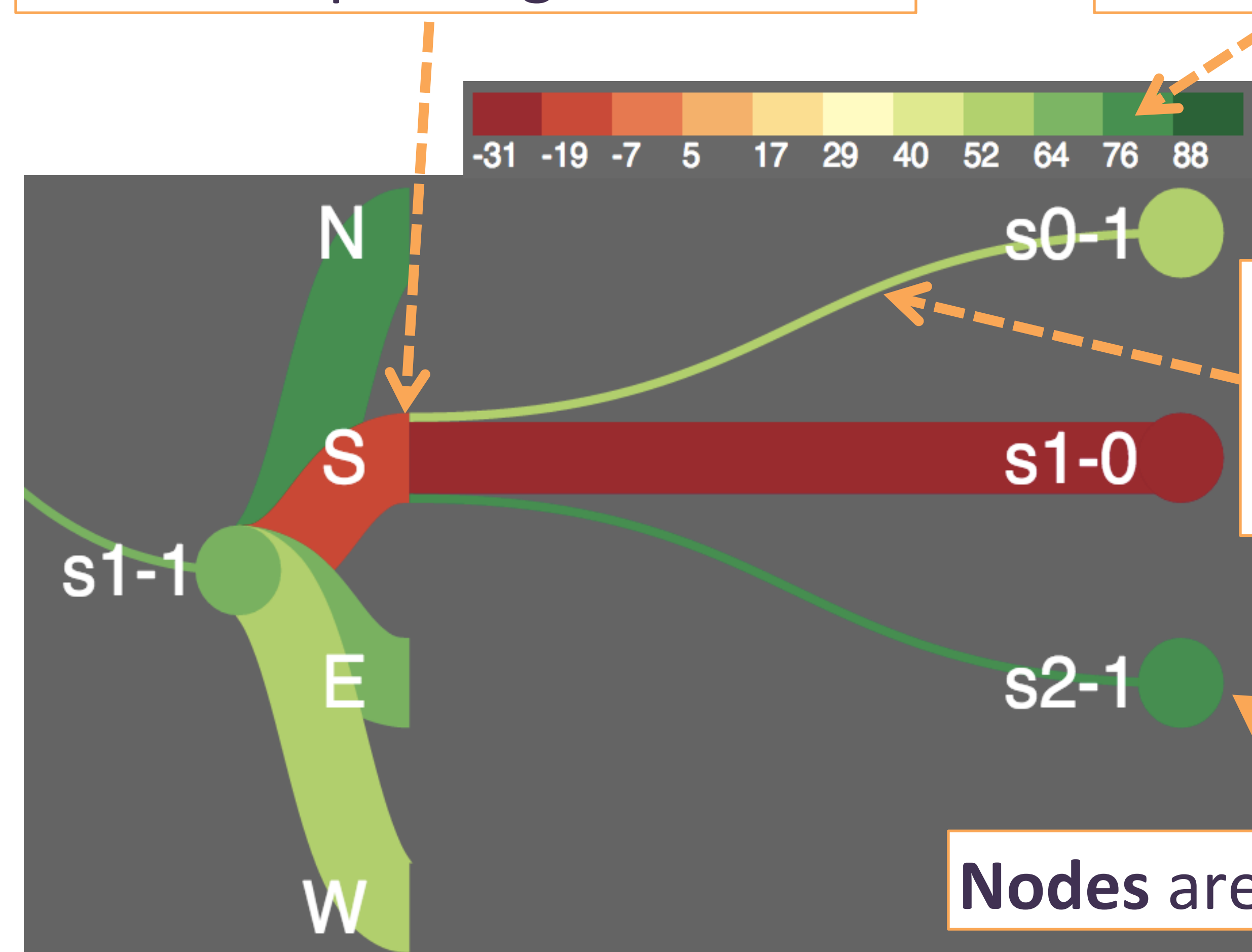
Output: Interactive tree (layout via Reingold-Tilford “tidy” algorithm)

MultiEdges are action edges with multiple target nodes

Color is value of state or action

Edge widths
are transition
probabilities

Nodes are MDP states



Future Work

- Generalize to **Partially Observable Markov Decision Processes** (POMDPs), with distributions over states
- Visualize algorithmic details (lookahead or rollout)
- Force-directed graph layout view

Results (see Demo!)

User-specified state visualization

Hover to link
matching states

- Color modes: expected or cumulative reward

Slider collapses low-probability transitions for scalability

Follow policy actions to goal

Pan and zoom to handle large trees

