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UNIVERSITY

Explorer: Scaling Exploration-driven Web Trajectory Synthesis for Web Agents

Vardaan Pahuja*, Yadong Lu*, Corby Rosset, Boyu Gou,
Arindam Mitra, Spencer Whitehead, Yu Su, Ahmed Awadallah



Motivation

- **Web agents** — autonomous systems designed to interact with real-world websites to perform everyday tasks.
- Training web agents needs high-quality and diverse trajectory data.
- We leverage **exploration** as a key mechanism for achieving **diversity** in task intents.

Data Statistics

Metric	Value
# Total trajectories	175K
# Success trajectories	94K
# Unique URLs	49K
Average steps per trajectory	7.7
Average elements per image	46.3
# Tokens	830M
# Elements	33.3M
# Images	720K
Cost per trajectory	\$0.15
Cost per successful trajectory	\$0.28

Table 1: Dataset statistics for Explorer. The number of unique URLs, average steps per trajectory, average elements per image, and number of tokens, elements, and images correspond to the successful trajectories.

Examples

Information

View the detailed 7-day weather forecast for Toronto, ON on The Weather Network website.

Find directions from Seattle, WA to Bellevue, WA using Bing Maps.

Service

Research the French Bulldog breed on the American Kennel Club website, including its popularity and family life traits.

Find the nearest Penske truck rental location in Anaheim, California, and start the reservation process for a truck.

Entertainment

Find the Basscon presents: Darren Styles EDM event on Eventbrite, save it, and share it on Twitter.

View the details of the Photography Competition Winners - Season X and share the article on Twitter.

Shopping

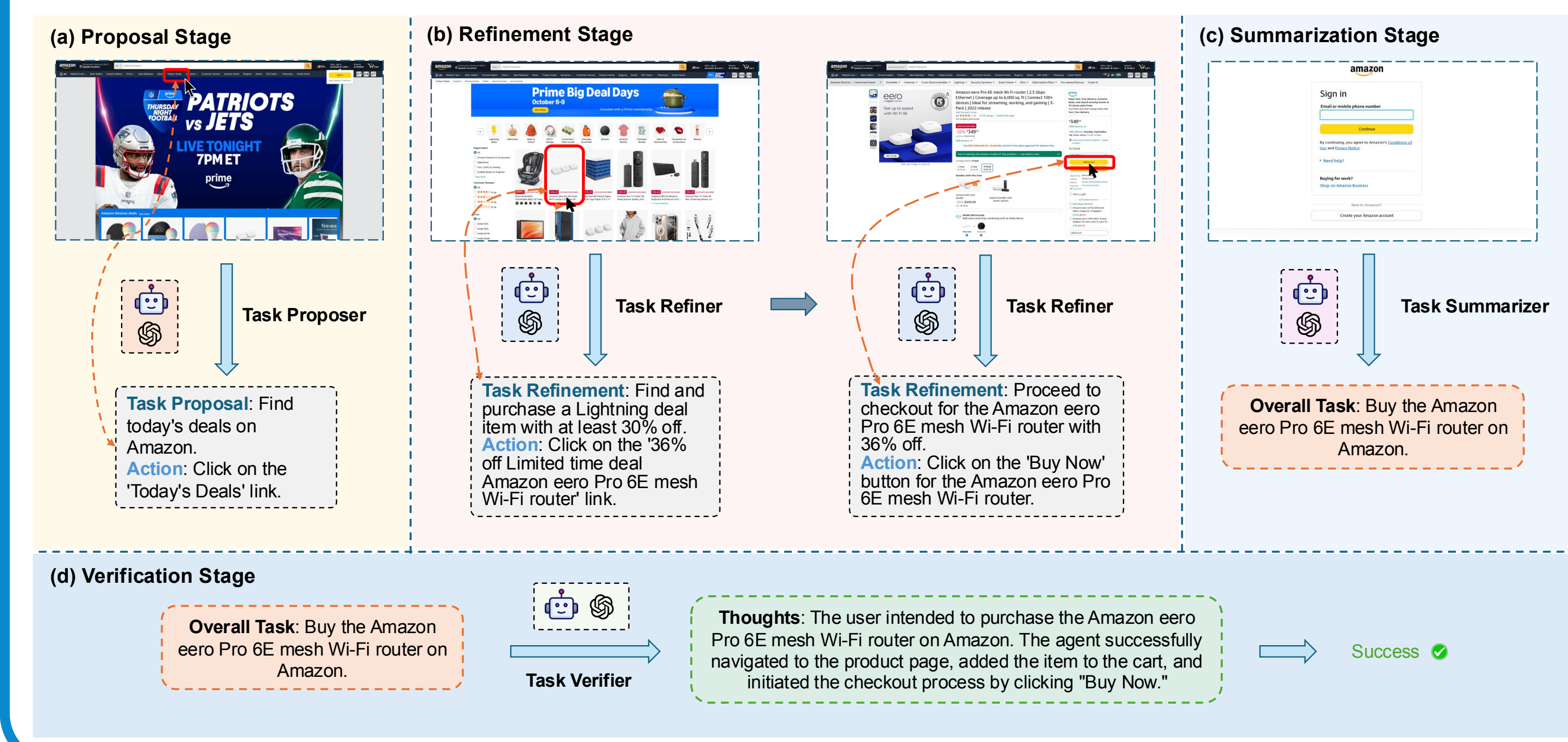
Browse through the fall home decor section on the Target website to explore a variety of fall-themed home decor items.

Travel

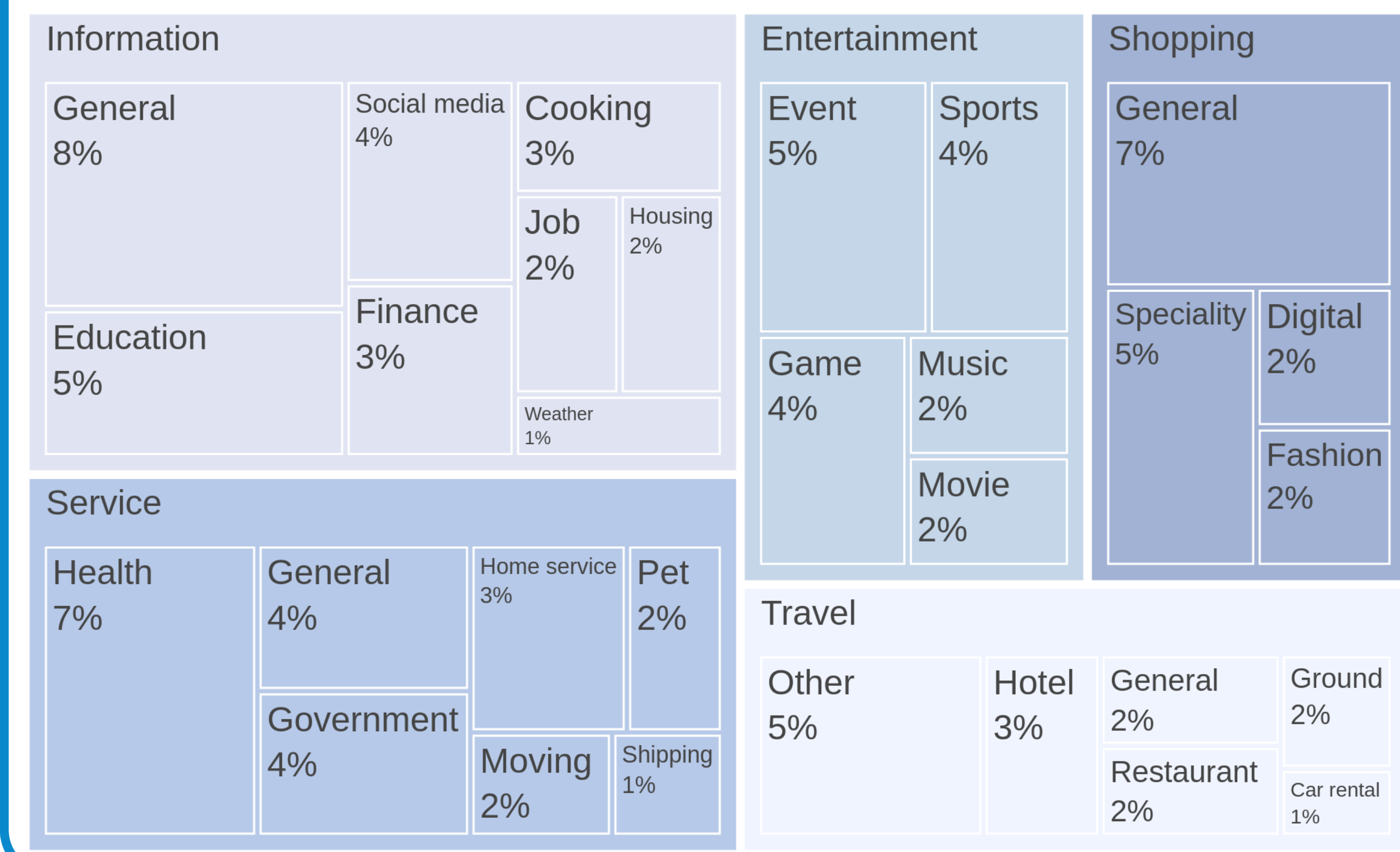
Search for flights from Seattle to New York, select travel dates, and explore various flight options.

Data Generation Pipeline

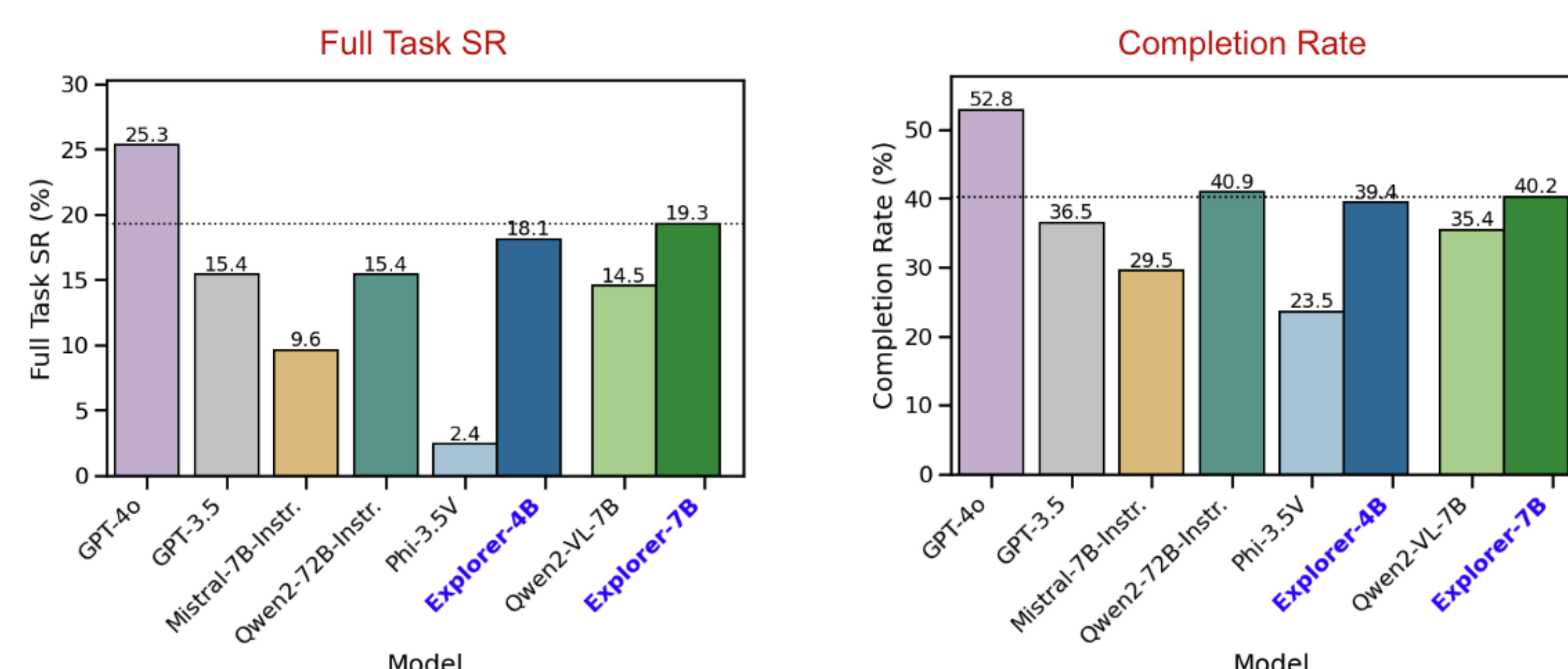
- The **Task Proposer** generates an initial abstract task based on the website homepage.
- The **Task Refiner** iteratively refines the task at each step as the trajectory progresses.
- The **Task Summarizer** processes the entire action and screenshot history to predict an overall task description.
- The **Task Verifier** serves as a critic to evaluate whether the trajectory successfully completes the specified task.



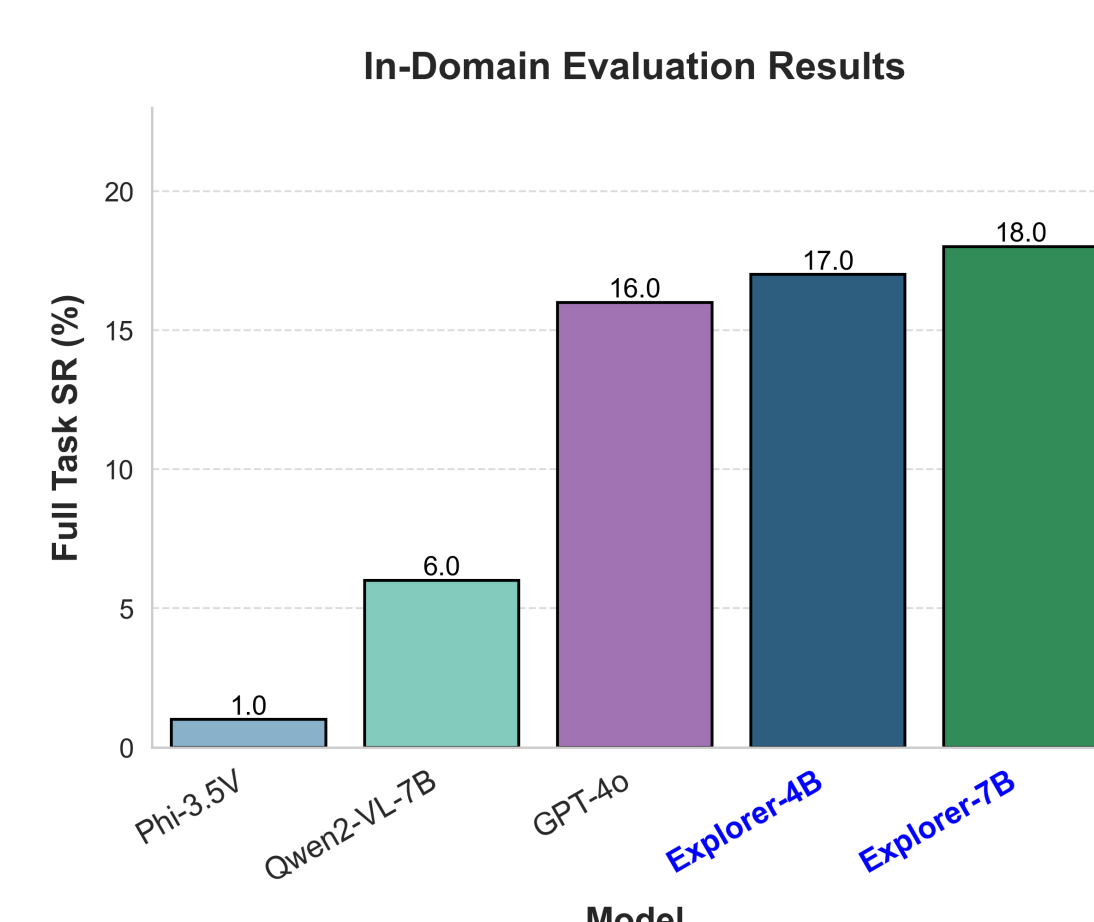
Data Composition



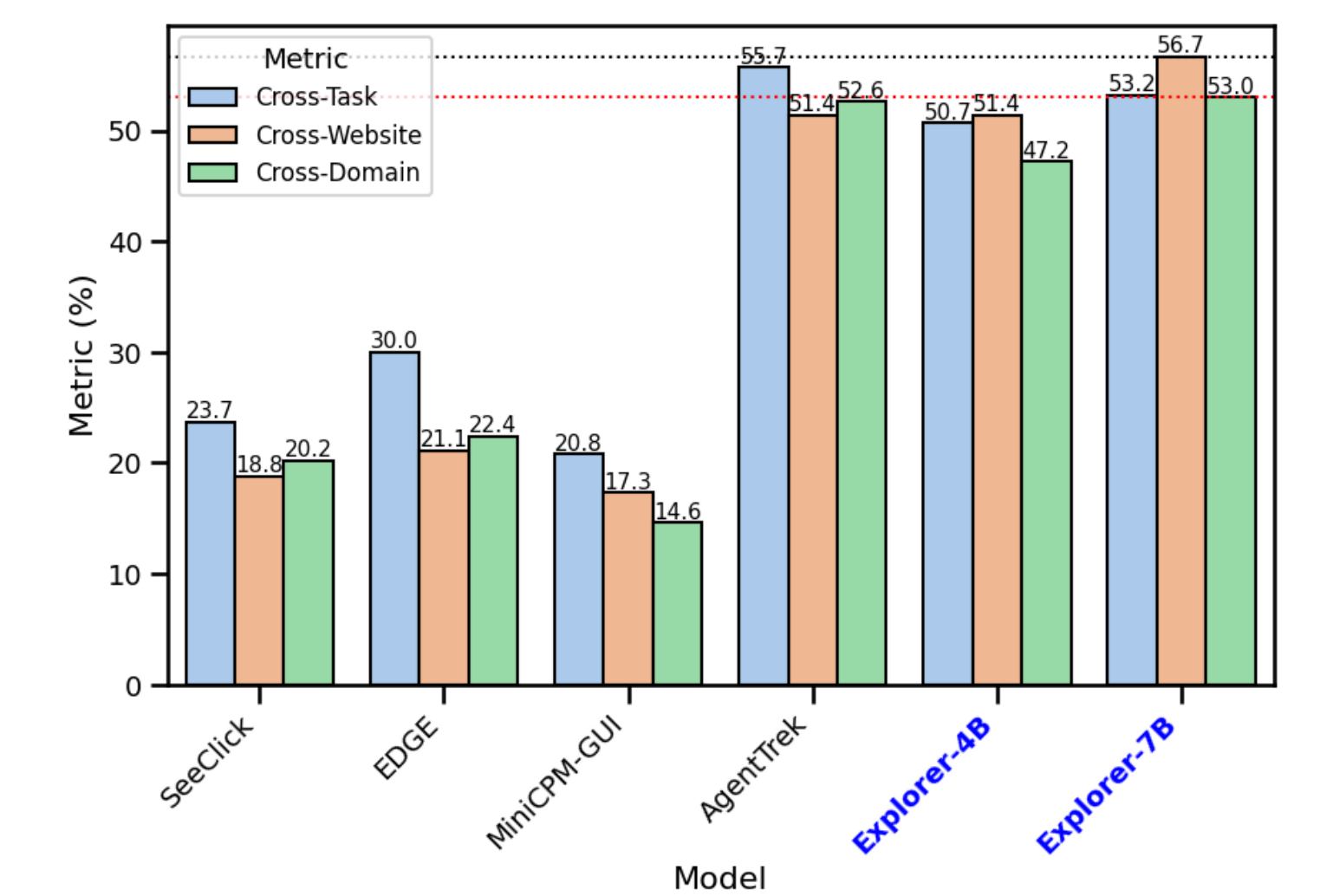
Mind2Web-Live Results



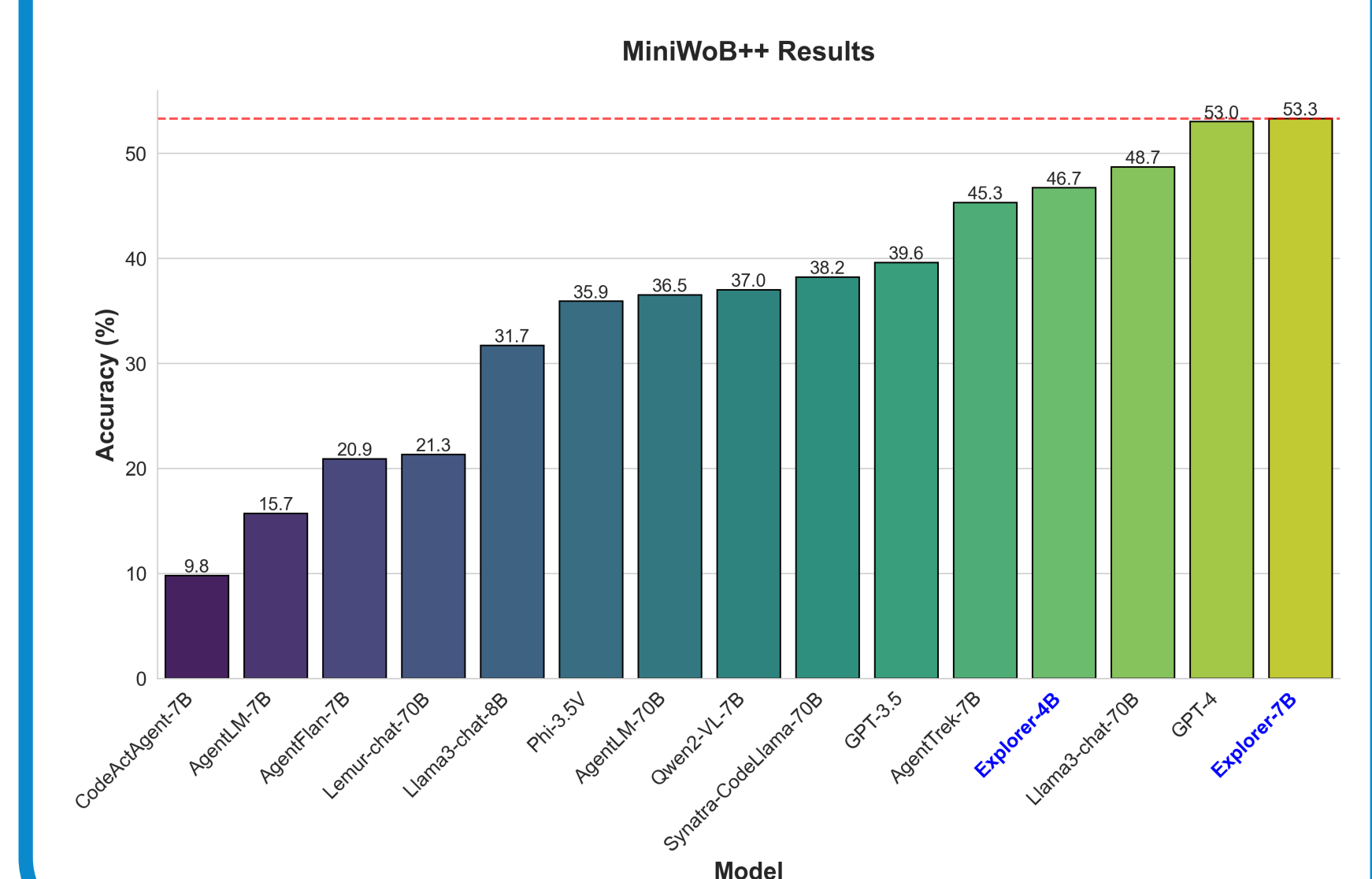
In-domain Evaluation



Mind2Web Results



MiniWoB++ Results



Data Scaling Experiments

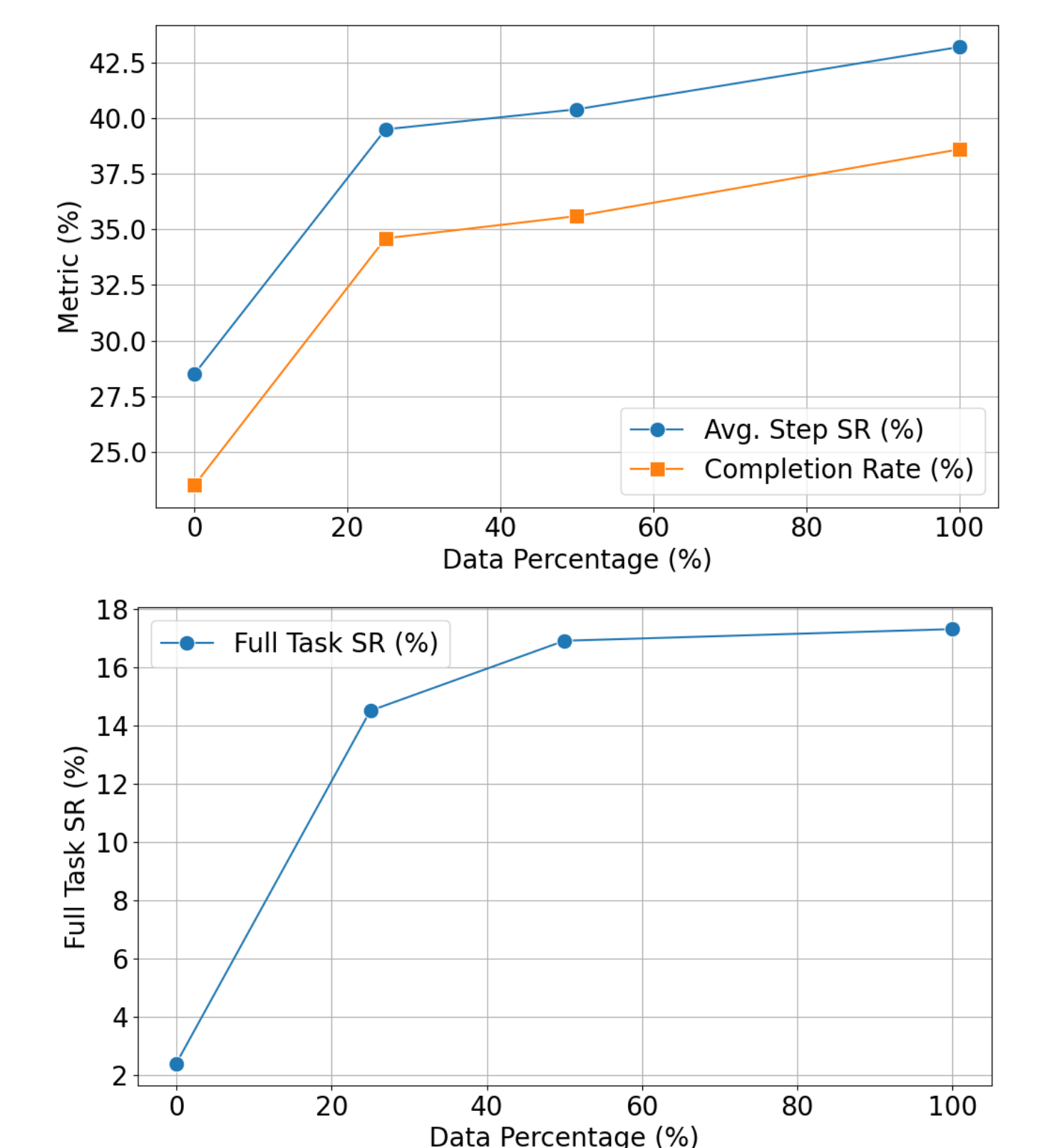


Figure 1: Experiments with data scaling using Explorer-4B on Mind2Web-Live. We experiment with using 100%, 50%, and 25% of the trajectory data. All results are averaged over three runs. All metrics exhibit improvement with increase in data scale.

Error Analysis

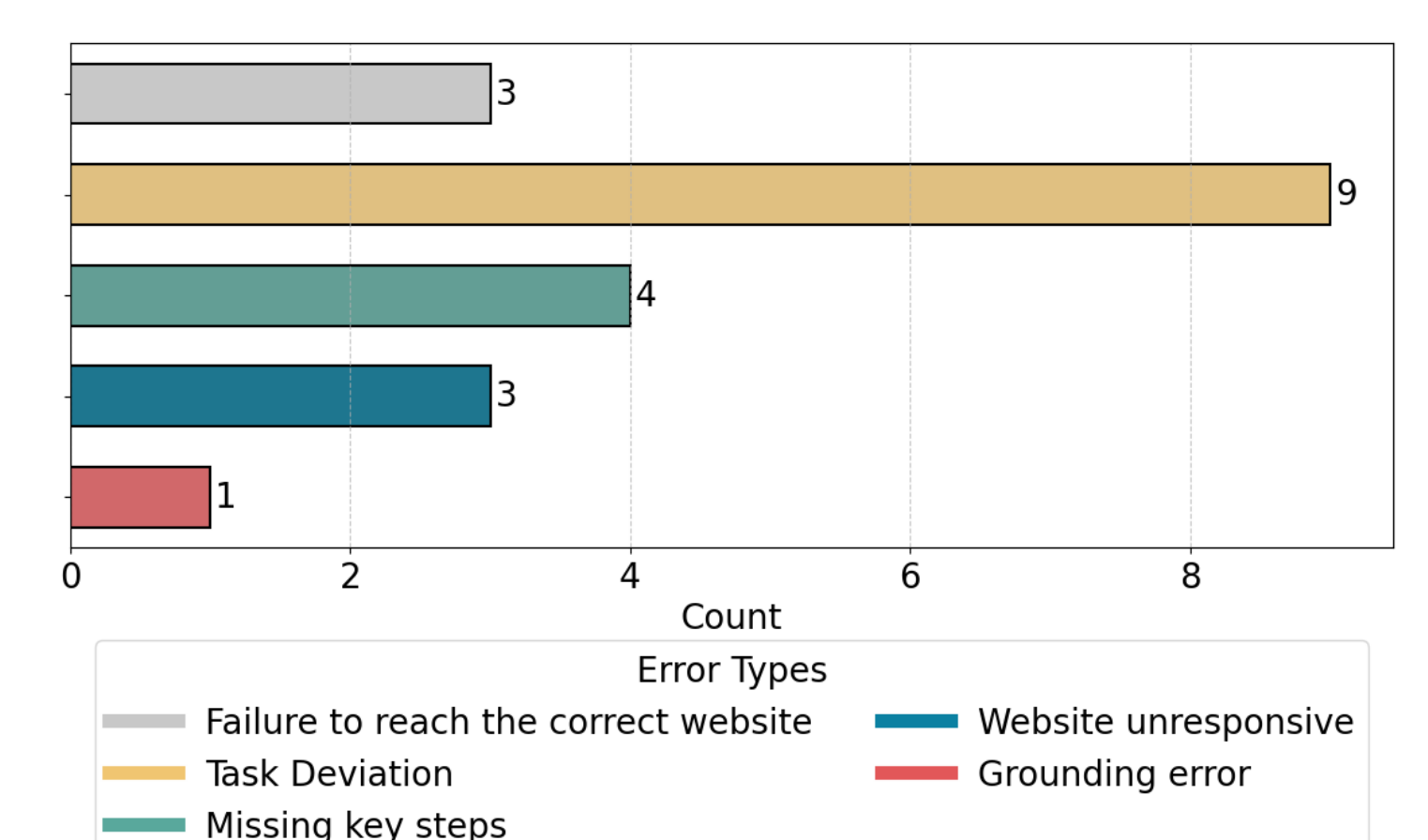


Figure 2: Statistics for different error cases in Mind2Web-Live evaluation. Task deviation is the most prevalent error type, where the agent executes actions unrelated to the given task, thus failing to complete it.