Choice-75: A Dataset on Decision Branching in Script Learning

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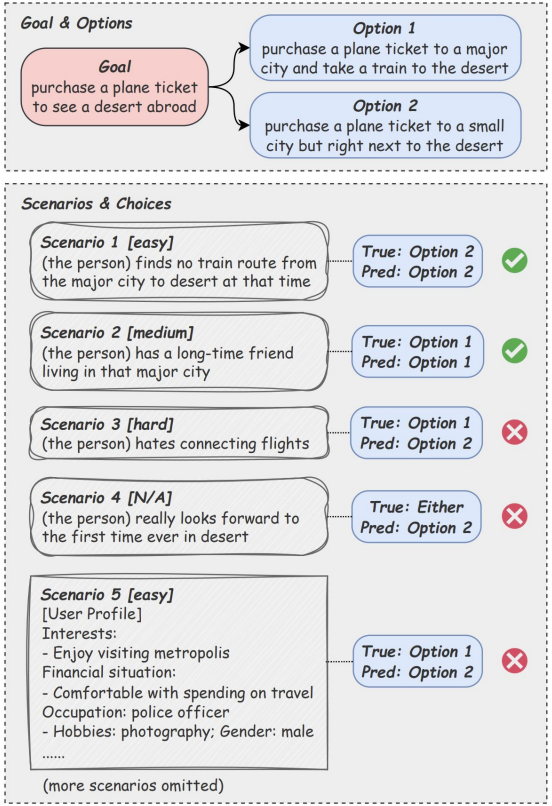
agenda.

- Problem Statement
- Dataset
- Experiment & Analysis
- Takeaway

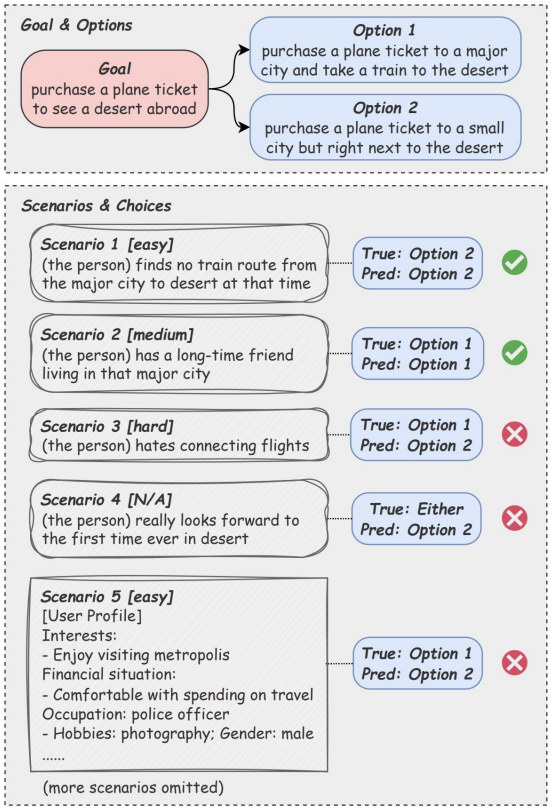
problem statement.

- Context
  - Script Learning & Event Centric Reasoning (the study of events)
  - Decision Making (daily scenarios)
- “Decision Branching”
  - Non-linear
  - Subtle differences among choices - requires commonsense



problem statement.

- Formally...
  - Task: [Goal, Option1, Option 2, Scenario] -> [Optimal Choice]
  - “Scenario”
    - verb phrase
    - user profile

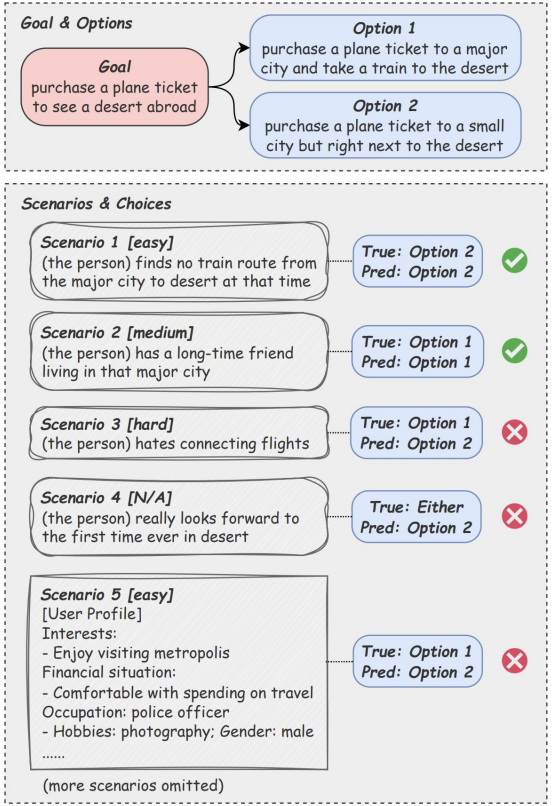


dataset.

- Structure
- Data Collection
- Difficulty Level
- Human-in-the-loop Hard Scenarios Collection
- Annotator Agreement

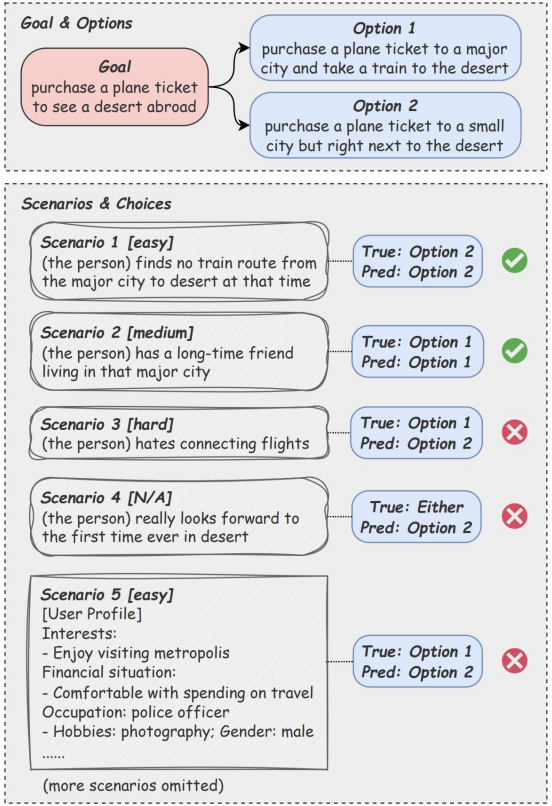
dataset.

- Structure
  - Goal - Options
  - Scenario(s)
    - Optimal Choice (#1, #2, either)
    - Difficulty Level (easy, medium, hard, either)



dataset.

- Data Collection
  - **Goal**: sampled 75 “goals” from *ProScript* [1]
  - **Options**: written by a one researcher and verified by two researchers
  - **Scenarios**: human-authored + machine generated (more details later)
  - **Difficulty Level & Optimal Choice**: annotated by one researcher and verified by two other researchers



dataset.

- Difficulty Level
  - Based on number of reason steps
  - ***Either***: no obvious differences between two options

Goal: find out the library's hours ***Option 1***: call the library ***Option 2***: search online for the library's hours
Easy Scenario: have no internet connection ***Choice***: Option 1
Medium Scenario: have special requests about the book ***Choice***: Option 1
Medium Scenario (User Profile): Name: Doe; Interests: American history Special circumstances: has a bad sore throat ... (more details omitted) ***Choice***: Option 2
Hard Scenario: is 3 am in the morning ***Choice***: Option 2

Table 2: Different levels in the *library hours* case

dataset.

- Human-in-the-loop Hard Scenarios Collection [2]
  a) Identify hard examples (rare!)
  b) Over-generation with few-shot (hard examples) prompting
  c) Manually filter valid data points

Format	Easy	Medium	Hard	Either
Verb Phrase (Manual)	65	76	36	65
Verb Phrase (Machine)	46	41	22	50
User Profile	53	76	17	73
All	164	193	75	188

Table 1: Counts of `scenario` in `Choice-75`.

dataset.

- Human-in-the-loop Hard Scenarios Collection
  - Verb Phrase - machine generated

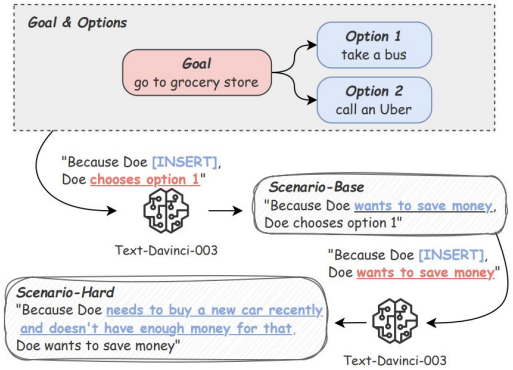


Figure 2: Hard scenario generation (verb phrase)

dataset.

- Human-in-the-loop Hard Scenarios Collection
  - User Profile - machine generated

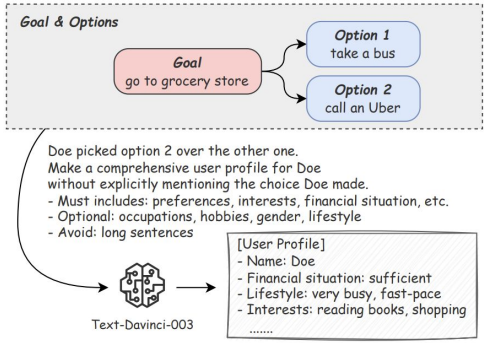


Figure 3: Hard scenario generation (user profile)

dataset.

- Annotator Agreement
  - Subset: 290 [scenarios - optimal choices] pair
  - Participants: 3 for each
  - Fleiss' kappa: 0.59 (moderate to substantial agreement)

experiment & analysis.

- Experiment Setup
- Results & Analysis

experiment & analysis.

- Experiment Setup
  - Model(s): text-davinci-003, gpt-3.5-turbo (ChatGPT)
  - Prompt(s): naive prompt, story prompt [zero-shot]

Naive Prompt

[Goal]: {step goal} [Option 1]: {option 1} [Option 2]: {option 2}

[Scenario]: {scenario}

[Question]: Given the Scenario, which option above is the better choice in order to achieve the Goal?

1) Option 1, 2) Option 2, 3) Either one, since they have similar effect when it comes to the goal

[Answer]:

Story Prompt

A person Doe needs to {step goal}. Now there are two options for Doe: we can either {option 1} (Option 1) or {option 2} (Option 2). Suppose Doe {scenario}.

[Question]: Given the Scenario, which option above is the better choice in order to achieve the Goal? 1) Option 1, 2) Option 2, 3) Either one, since they have similar effect when it comes to the goal

[Answer]:

experiment & analysis.

- Results & Analysis
  - Difficulty Level ~ Model's Performance
  - Story prompt is generally better

Group	Prompt	All		Binary		Easy		Medium		Hard		Either	
		003	Turbo	003	Turbo	003	Turbo	003	Turbo	003	Turbo	003	Turbo
Verb Phrase (Manual)	naive	0.60	0.63	0.81	0.82	0.91	0.92	0.83	0.80	0.58	0.67	0.05	0.14
	story	0.63	**0.64**	**0.86**	0.81	**0.95**	0.88	**0.87**	0.81	**0.69**	**0.69**	0.02	**0.18**
Verb Phrase (Machine)	naive	**0.56**	**0.56**	0.77	**0.80**	0.79	0.79	0.77	**0.85**	0.69	**0.75**	**0.21**	0.15
	story	0.55	0.55	0.79	**0.80**	0.79	**0.82**	**0.85**	0.81	0.69	**0.75**	0.15	0.13
User Profile	naive	**0.61**	0.59	0.72	0.69	**0.78**	0.73	0.73	0.69	0.47	**0.60**	**0.40**	**0.40**
	story	0.50	0.60	0.57	**0.73**	0.58	0.76	0.60	**0.74**	0.40	**0.60**	0.37	0.34
Average		0.57	**0.60**	0.75	**0.77**	0.80	**0.82**	0.77	**0.78**	0.59	**0.68**	0.20	**0.22**

Table 3: Prediction accuracy by difficulty levels. **Binary**: overall performance on binary classification (i.e. `Option 1` or `Option 2`); **All**: overall performance on three-class classification.

experiment & analysis.

- Results & Analysis
  - Human Performance
    - 290 scenarios
    - 2 participants each

Format	Easy	Medium	Hard	Either
Verb Phrase (Manual)	0.94	0.81	0.82	0.62
Verb Phrase (Machine)	0.94	0.77	0.68	0.41
User Profile	0.89	0.78	0.75	0.53
All	0.92	0.79	0.76	0.53

Table 4: Human performance (accuracy) on `Choice-75`

takeaway.

- Choice-75
  - A new task of decision branching in event-centric reasoning
  - A dataset with fine-grained annotation and alignment between human perception and LLM(s)
  - Hard scenarios are still challenging for LLM(s)

references.

[1] Keisuke Sakaguchi, Chandra Bhagavatula, Ronan Le Bras, Niket Tandon, Peter Clark, and Yejin Choi. 2021. *proScript: Partially Ordered Scripts Generation.* In Findings of the Association for Computational Linguistics: EMNLP 2021, pages 2138–2149, Punta Cana, Dominican Republic. Association for Computational Linguistics.

[2] Alisa Liu, Swabha Swayamdipta, Noah A. Smith, and Yejin Choi. 2022. *WANLI: Worker and AI Collaboration for Natural Language Inference Dataset Creation*. In Findings of the Association for Computational Linguistics: EMNLP 2022, pages 6826–6847, Abu Dhabi, United Arab Emirates. Association for Computational Linguistics.