Rlgraph: Flexible Computation Graphs for Deep Reinforcement learning

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RLgraph

- Framework that designs and implements RL computation
- Metagraph outlining high-level data flow, followed by execution

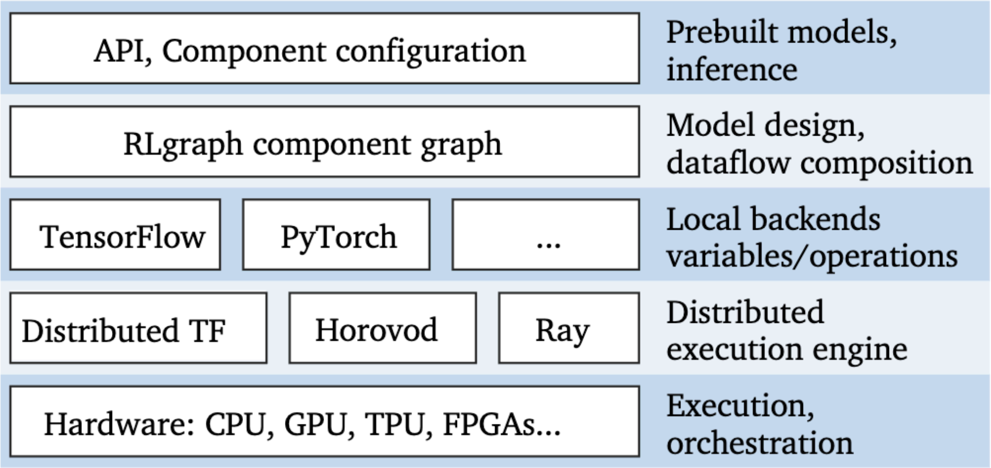
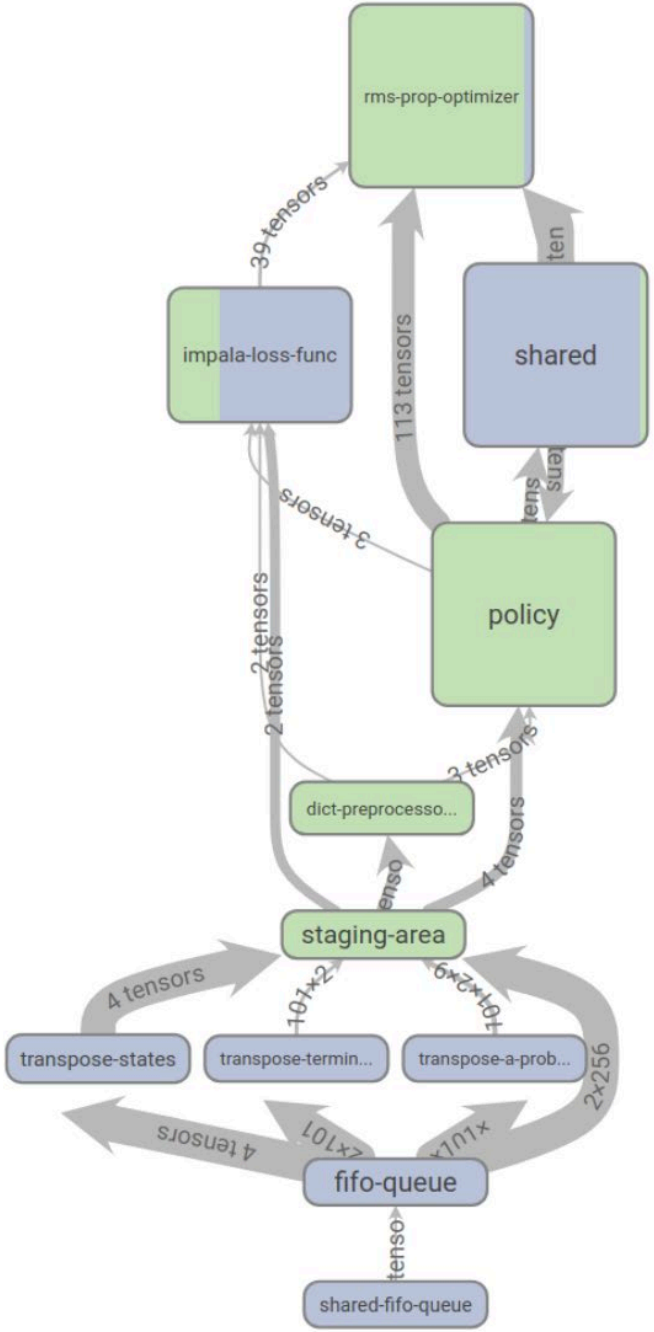
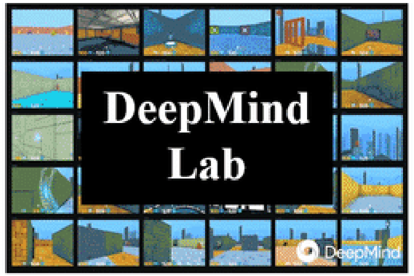


Figure 1. RLgraph stack for using and designing RL algorithms.



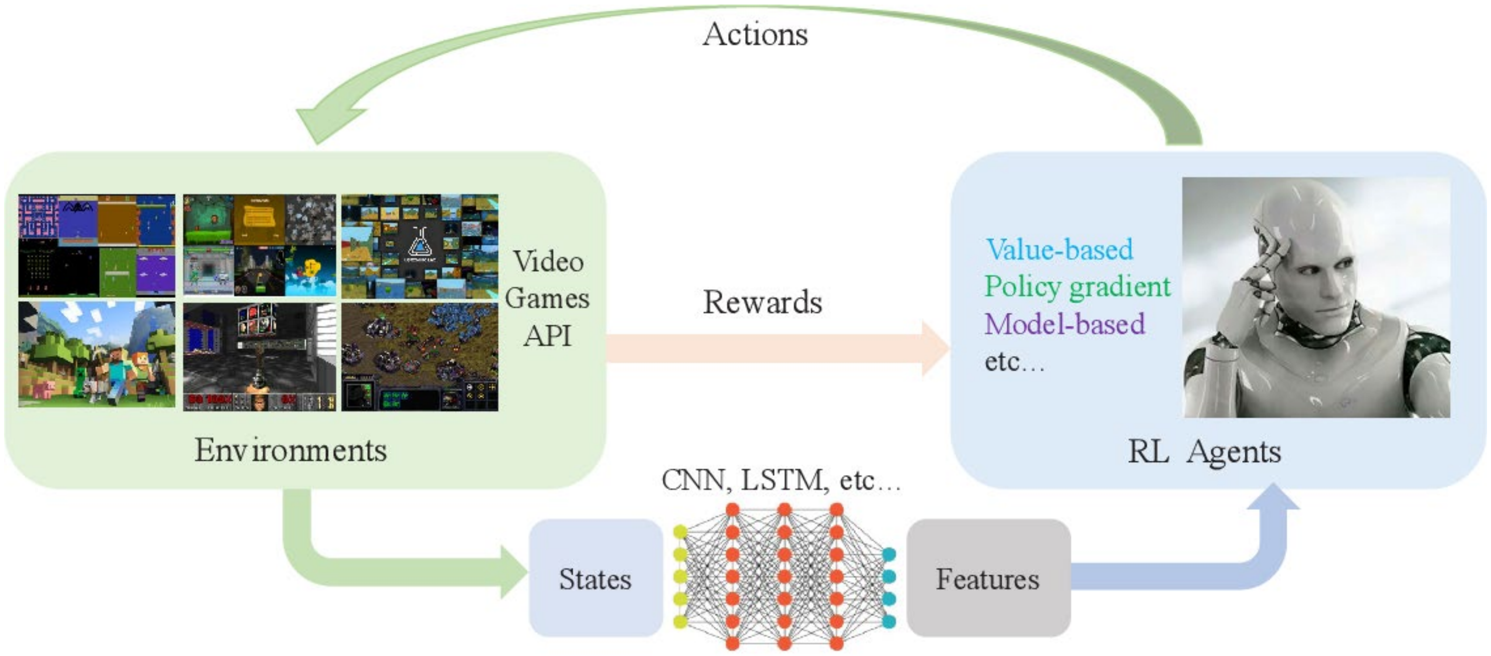
Reinforcement Learning

- ML technique that interacts with environment to make decisions
- Expanded use in gaming, robots, 3D scene simulators



RL Execution Difficulties

- Frequent problem environment interaction
- Highly varied states, resources, models



Novelty

- Novel meta-graph that generalizes dataflow to high level
- Claims to be "the first common interface to tensorflow and pytorch"
  - Rlib
  - Distributed Tensorforce
- Works on static and define-by-run graphs
- Updated systems since
  - Rlib Flow
  - MSRL

Rlgraph Creation

- Component composition phase
- Assembly phase
- Graph compilation/building phase

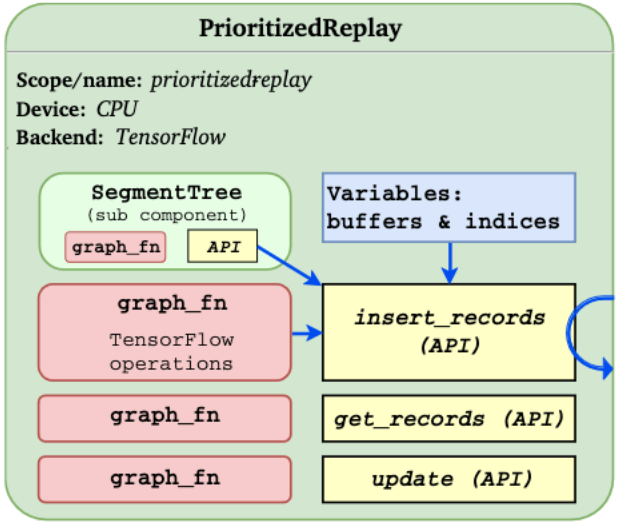
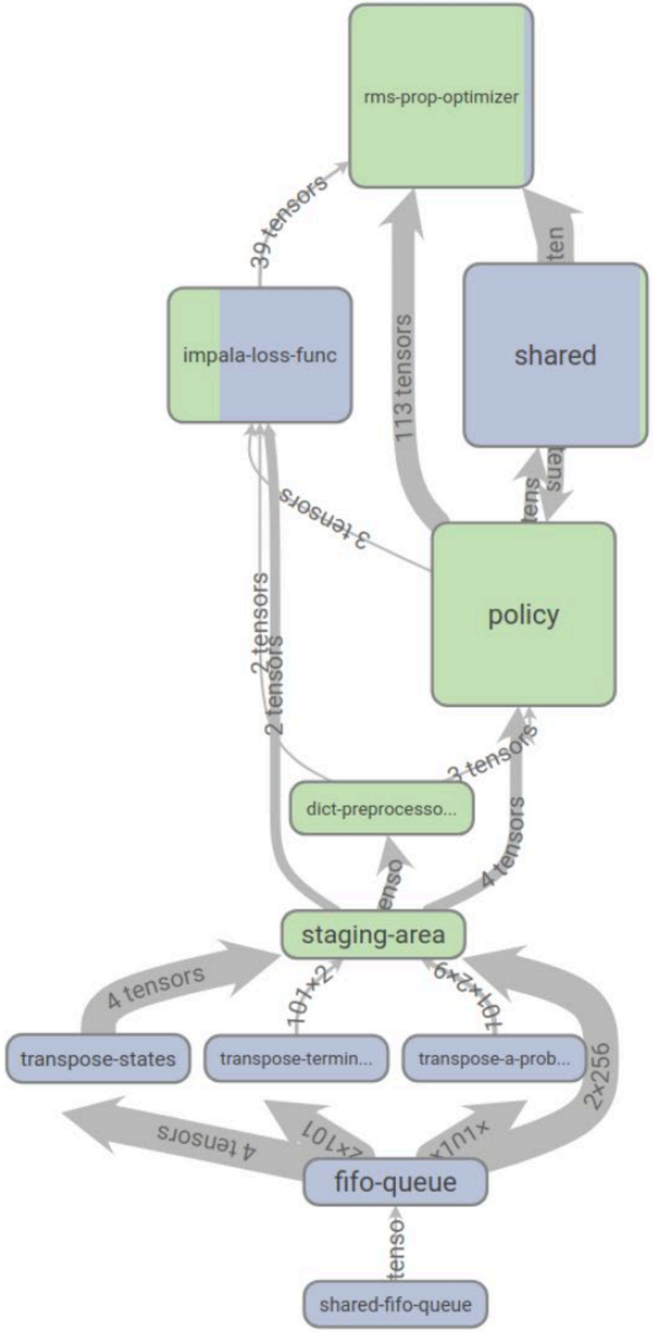


Figure 2. Example memory component with three API methods.



Rlgraph Execution

- Graph executors
- Backend support and generalization

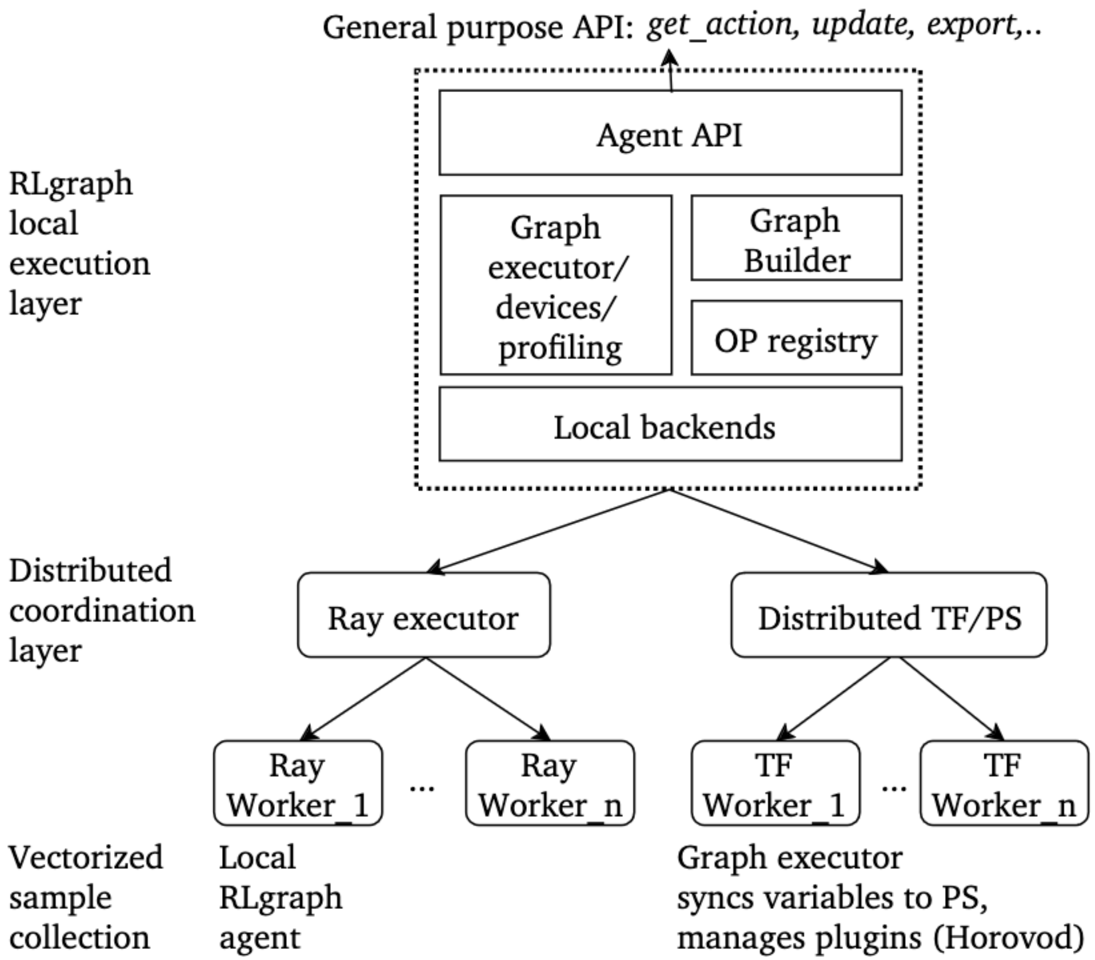
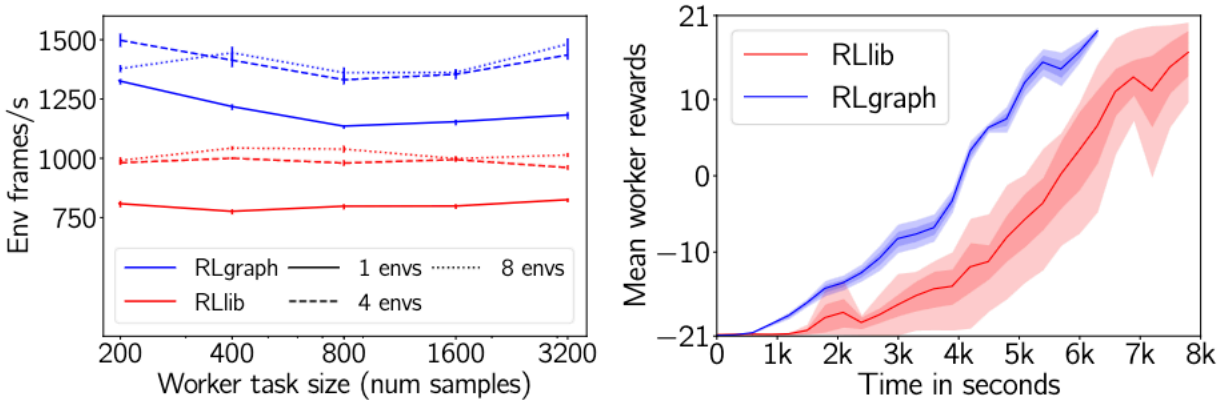


Figure 4. RLgraph execution stack.

Results

- Tested on tensorflow and pytorch
- Low build overhead
- Multiple GPU success



(a) Single worker throughput. (b) Training times for *Pong*.

Figure 7. Single task throughput and learning comparison.

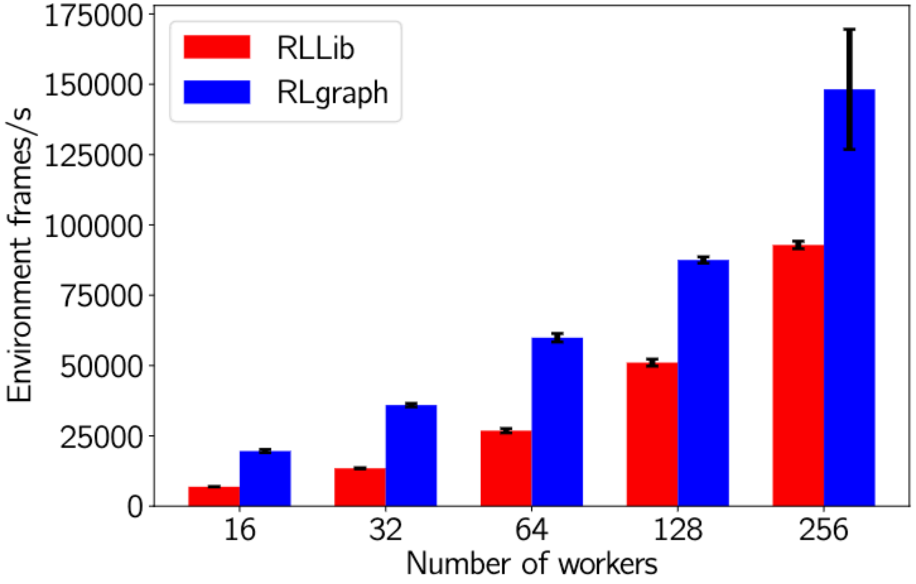


Figure 6. Distributed sample throughput on *Pong*.

RLgraph Solution

- Logical component composition separation → any distributed execution paradigm
- No restrictions on execution → supports static and define-by-run backend
- High level abstractions → Fast development cycles
- Individually built and tested components → Incremental building and testing

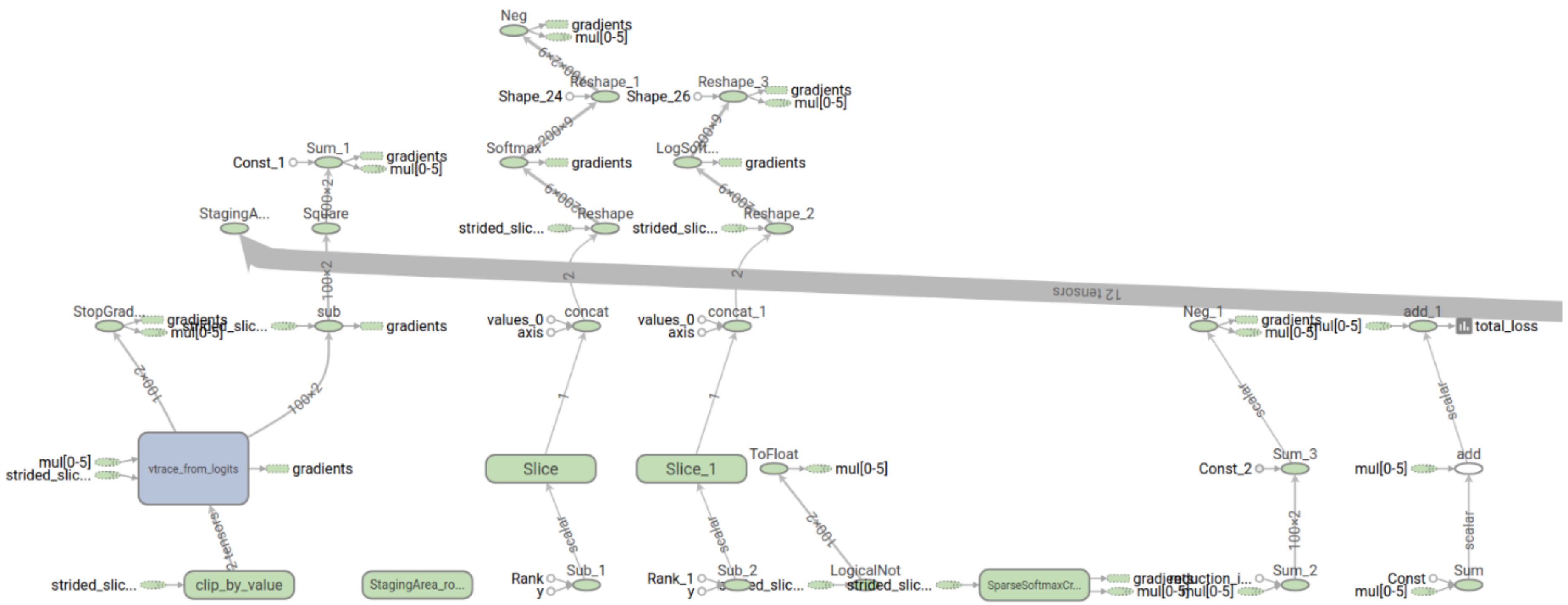


Figure 11. TensorBoard visualization of DeepMind's IMPALA learner (left).

RLgraph Impact & Future Work

- Pluggable
- Open source
- RL use cases only increasing

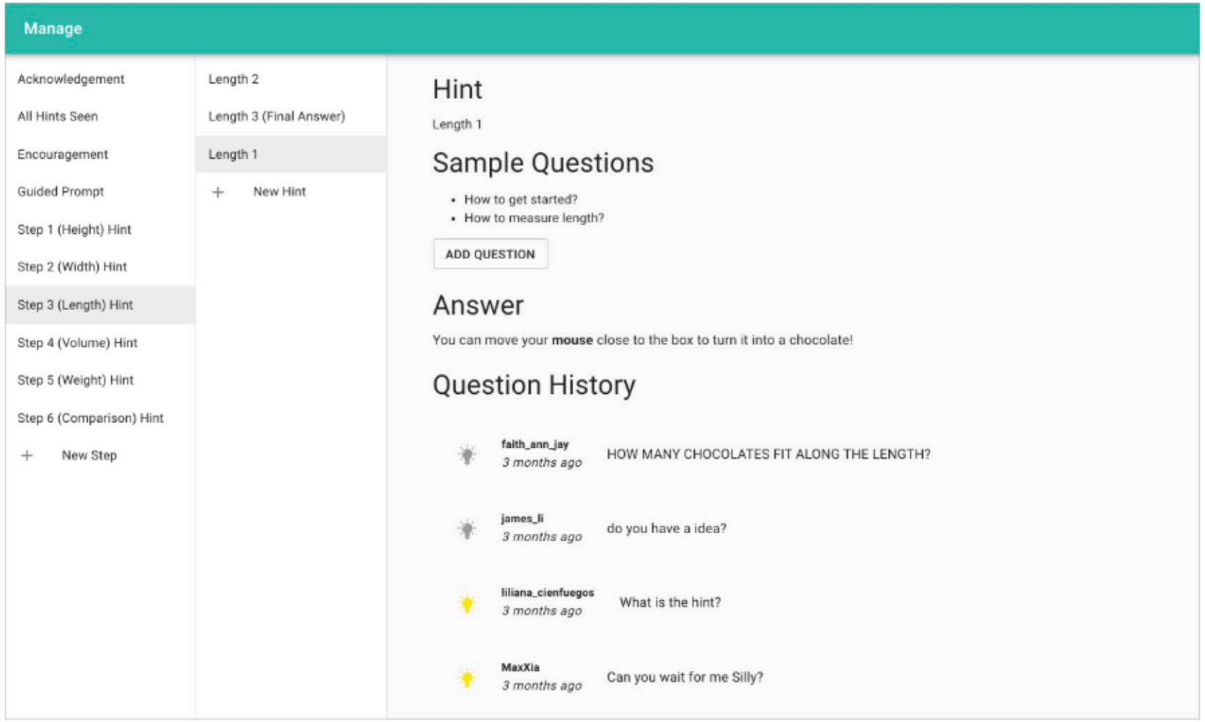


Fig. A1: Interface for teachers to write hints and prompts.

Works Cited

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