A Data-driven Spatiotemporal Simulator for Reinforcement Learning Methods

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Motivation

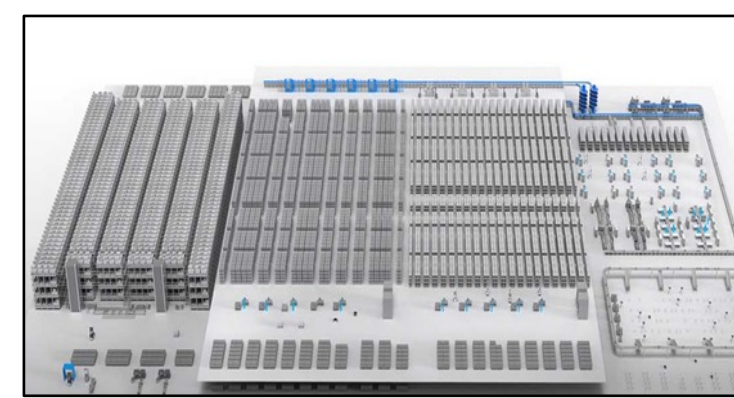Mobile services give rise to numerous spatiotemproal applications.

Algorithms determine the operational efficiency in these domains
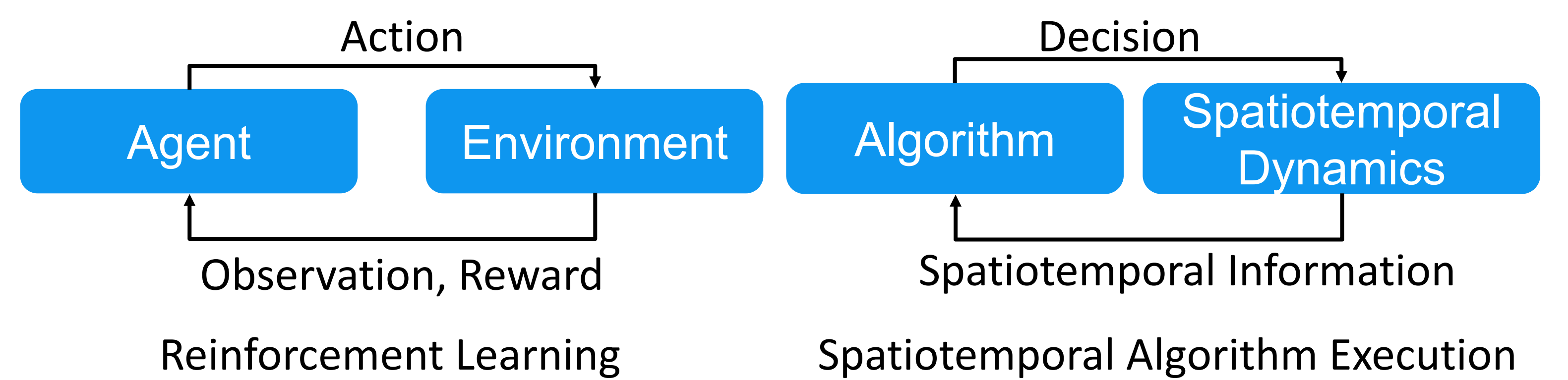
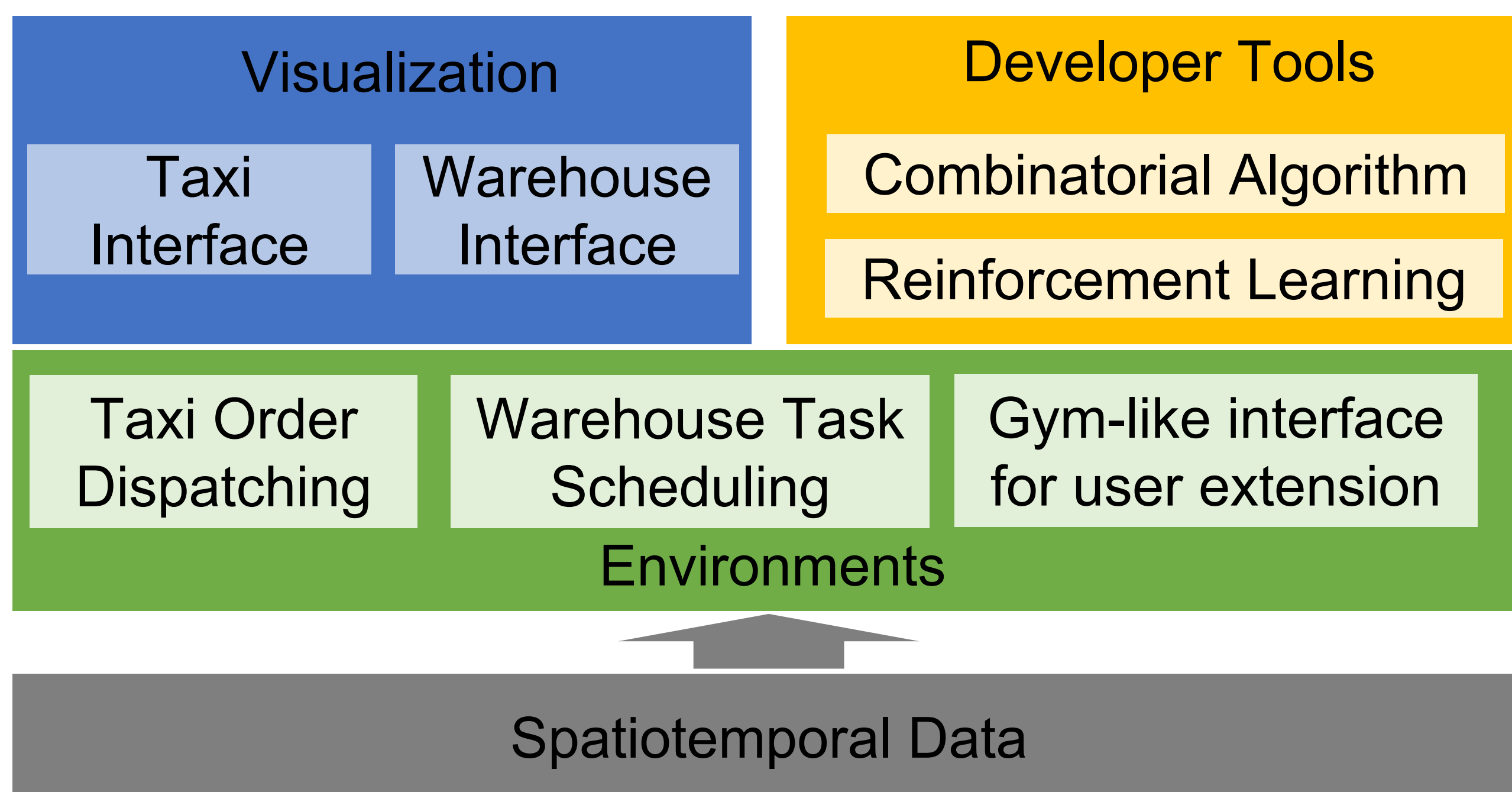RoboTaxi   Loading task scheduling   Warehouse robots

The growing body of spatiotemporal data has spurred a surge in reinforcement learning

No specially designed simulation system for spatiotemporal algorithms

Reinforcement Learning   Spatiotemporal Algorithm Execution

Data-driven Spatiotemporal Simulator (DSS)

Framework

Visualization
Taxi Interface | Warehouse Interface

Developer Tools
Combinatorial Algorithm
Reinforcement Learning

Taxi Order Dispatching | Warehouse Task Scheduling | Gym-like interface for user extension
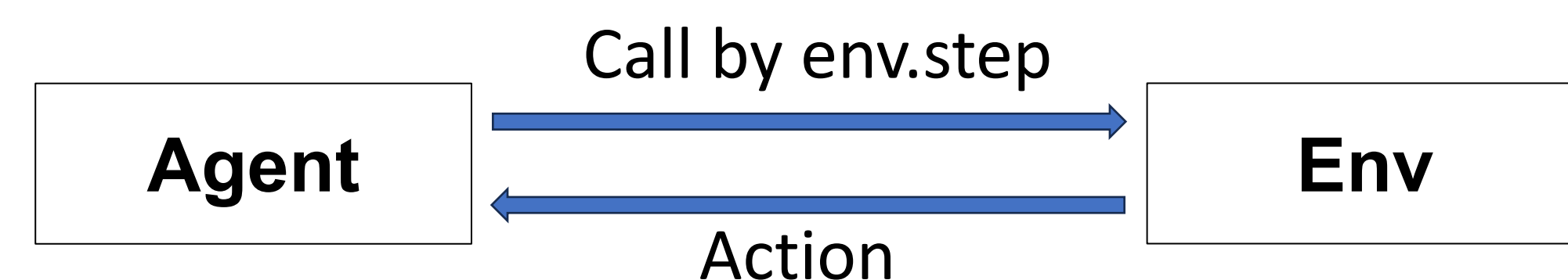Environments

Spatiotemporal Data

Supported Algorithms

Reinforcement Learning
    PPO/REINFORCE/DQN/DDPG/LAF/C51/...
    Prioritized Experience Replay

Combinatorial Optimization
    Hungarian/Kuhn-Munkres/Dijkstra's/A*/...
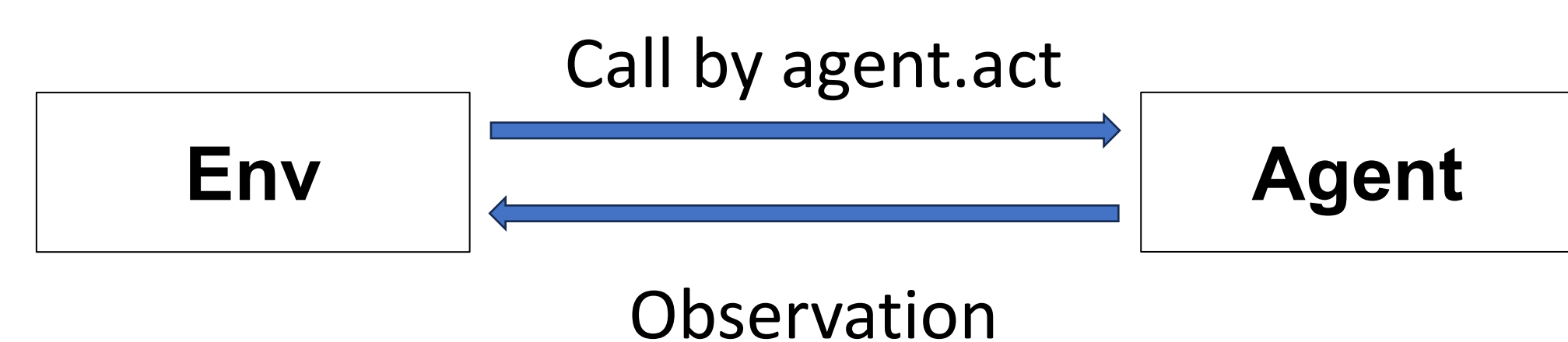
Two Modes

Agent-central mode (Gym like)

Agent → Call by env.step → Env
Action

Environment-central mode

Env → Call by agent.act → Agent
Observation

System Snapshot

Taxi Order Dispatching
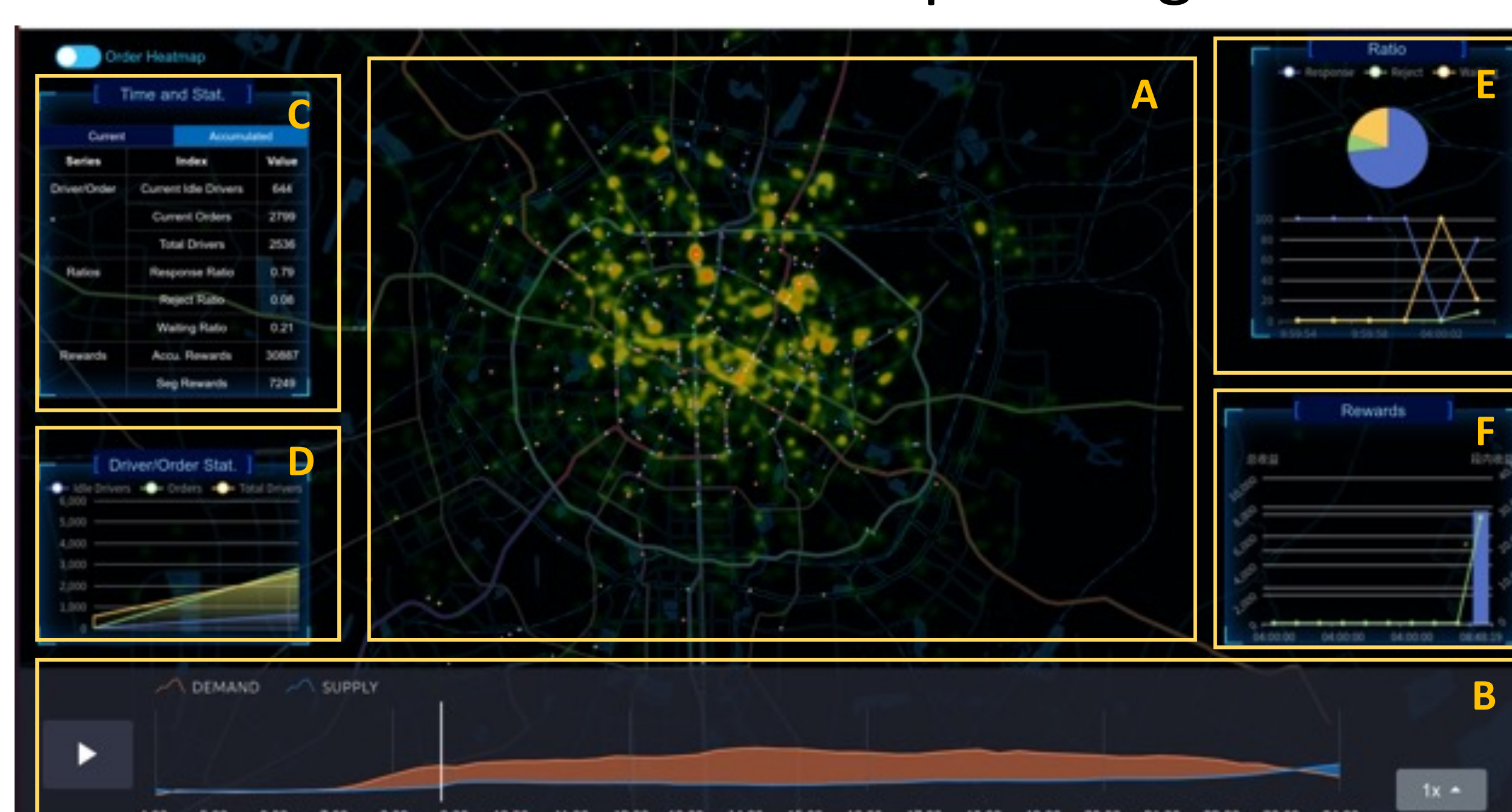
Warehouse Task scheduling

Source code: https://github.com/dingyuan-shi/spatiotemporal-simulator-rl