**Sprint-2**

**Introduction**

In this Sprint, I extended the existing trading environment by introducing an LSTM-based policy network (with both DQN and PPO heads) and wiring up a full RecurrentPPO training pipeline using Stable-Baselines3 Contrib. The following sections contain the user stories I worked on with a detailed description of the tasks I worked on.

**User Stories**

I worked on the following User Stories:

[**RDNN: RDNN-Style Recurrent Reinforcement Learner #590**](https://github.com/Rivier-Computer-Science/AI-Agent-Stock-Prediction/issues/590)

**Conditions of Satisfiability:**

* Environment Correctness: Unit tests validate state transitions, actions, and rewards.
* Model Validity: RNN policy outputs have correct dimensions and numeric ranges.
* Training Stability: Reward curves show non-divergent, improving behavior.
* Latency: End-to-end inference (model load + forward pass + JSON) ≤ 1 s.
* Decision Consistency: Crew AI agent always returns a valid recommendation.

**Definition of Done:**

* Gym environment, policy network, and RL scripts implemented and unit-tested.
* Training loop configured, logs metrics, and saves best checkpoints.
* Inference API returns correct JSON under latency budget.
* Crew AI DecisionAgent defined and verified end-to-end.
* Integration tests and documentation completed.

**Tasks**

[RDNN.1 Implement Trading Environment #591](https://github.com/Rivier-Computer-Science/AI-Agent-Stock-Prediction/issues/591)

[RDNN.1.1 Create gym.Env subclass with obs/action/reward logic (4 ph) #592](https://github.com/Rivier-Computer-Science/AI-Agent-Stock-Prediction/issues/592)

[RDNN.1.2 Add transaction cost and slippage modeling (3 ph) #593](https://github.com/Rivier-Computer-Science/AI-Agent-Stock-Prediction/issues/593)

[RDNN.1.3 Write unit tests for state transitions and reward calculations (2 ph) #594](https://github.com/Rivier-Computer-Science/AI-Agent-Stock-Prediction/issues/594)

[RDNN.2 Build RNN Policy Network #617](https://github.com/Rivier-Computer-Science/AI-Agent-Stock-Prediction/issues/617)

[RDNN.2.1 Define LSTM encoder module in PyTorch/TensorFlow (3 ph) #618](https://github.com/Rivier-Computer-Science/AI-Agent-Stock-Prediction/issues/618)

[RDNN.2.2 Add DQN head and PPO policy/value heads (3 ph) #619](https://github.com/Rivier-Computer-Science/AI-Agent-Stock-Prediction/issues/619)

[RDNN.2.3 Validate forward pass using dummy data (1 ph) #620](https://github.com/Rivier-Computer-Science/AI-Agent-Stock-Prediction/issues/620)

[RDNN.3 Configure RL Algorithm #668](https://github.com/Rivier-Computer-Science/AI-Agent-Stock-Prediction/issues/668)

[RDNN.3.1 Integrate SB3’s RecurrentPPO or custom DQN wrapper (4 ph) #669](https://github.com/Rivier-Computer-Science/AI-Agent-Stock-Prediction/issues/669)

[RDNN.3.2 Set and document hyperparameters (lr, batch size, buffer size) (2 ph) #670](https://github.com/Rivier-Computer-Science/AI-Agent-Stock-Prediction/issues/670)

[RDNN.3.3 Hook up logging (TensorBoard or W&B) (2 ph) #671](https://github.com/Rivier-Computer-Science/AI-Agent-Stock-Prediction/issues/671)

[RDNN.4 Train #672](https://github.com/Rivier-Computer-Science/AI-Agent-Stock-Prediction/issues/672)

[RDNN.4.1 Run training on historical price data (4 ph) #673](https://github.com/Rivier-Computer-Science/AI-Agent-Stock-Prediction/issues/673)

[RDNN.4.2 Evaluate periodically on hold-out data and tune (4 ph) #674](https://github.com/Rivier-Computer-Science/AI-Agent-Stock-Prediction/issues/674)

[RDNN.4.3 Save best model checkpoints with early stopping (1 ph) #675](https://github.com/Rivier-Computer-Science/AI-Agent-Stock-Prediction/issues/675)

[RDNN.5 Develop Inference API #676](https://github.com/Rivier-Computer-Science/AI-Agent-Stock-Prediction/issues/676)

[RDNN.5.1 Write InferenceAgent script to load policy checkpoint (3 ph) #677](https://github.com/Rivier-Computer-Science/AI-Agent-Stock-Prediction/issues/677)

[RDNN.5.2 Given a new T-bar window, compute and format {action\_probs} JSON (2 ph) #678](https://github.com/Rivier-Computer-Science/AI-Agent-Stock-Prediction/issues/678)

[RDNN.5.3 Benchmark latency and optimize code path (2 ph) #679](https://github.com/Rivier-Computer-Science/AI-Agent-Stock-Prediction/issues/679)

[RDNN.6 Crew AI DecisionAgent #680](https://github.com/Rivier-Computer-Science/AI-Agent-Stock-Prediction/issues/680)

[RDNN.6.1 Define Crew AI task prompt mapping action\_probs to BUY/SELL/HOLD (2 ph) #681](https://github.com/Rivier-Computer-Science/AI-Agent-Stock-Prediction/issues/681)

[RDNN.6.2 Test DecisionAgent with edge-case JSON inputs (2 ph) #682](https://github.com/Rivier-Computer-Science/AI-Agent-Stock-Prediction/issues/682)

[RDNN.7 Integration & Validation #683](https://github.com/Rivier-Computer-Science/AI-Agent-Stock-Prediction/issues/683)

[RDNN.7.1 Write end-to-end integration test: train → inference → decision (3 ph) #684](https://github.com/Rivier-Computer-Science/AI-Agent-Stock-Prediction/issues/684)

[RDNN.7.2 Confirm metrics, JSON schema, and error handling (2 ph) #685](https://github.com/Rivier-Computer-Science/AI-Agent-Stock-Prediction/issues/685)

[RDNN.7.3 Document setup, usage examples, and agent prompts in README (2 ph) #686](https://github.com/Rivier-Computer-Science/AI-Agent-Stock-Prediction/issues/686)

[RDNN.8 Backtesting & Evaluation #687](https://github.com/Rivier-Computer-Science/AI-Agent-Stock-Prediction/issues/687)

[RDNN.8.1 Prepare historical test sets and data conversion (4 ph) #688](https://github.com/Rivier-Computer-Science/AI-Agent-Stock-Prediction/issues/688)

[RDNN.8.2 Implement backtesting harness to simulate the full inference + decision pipeline over history (6 ph) #689](https://github.com/Rivier-Computer-Science/AI-Agent-Stock-Prediction/issues/689)

[RDNN.8.3 Calculate performance metrics (e.g., accuracy, return, drawdown) and analysis (4 ph) #690](https://github.com/Rivier-Computer-Science/AI-Agent-Stock-Prediction/issues/690)

[RDNN.8.4 Generate a backtesting report and visualizations (4 ph) #691](https://github.com/Rivier-Computer-Science/AI-Agent-Stock-Prediction/issues/691)

**Tasks I Worked On**

[RDNN.2 Build RNN Policy Network #617](https://github.com/Rivier-Computer-Science/AI-Agent-Stock-Prediction/issues/617)

I have created the RNN policy network by defining a LSTM encoder and added a DQN head and PPO heads alon gwith including a dummy forward pass in main to validate output shapes. The task is estimated at 7 person hours but it took me 15 person hours to complete.

[RDNN.3 Configure RL Algorithm #668](https://github.com/Rivier-Computer-Science/AI-Agent-Stock-Prediction/issues/668)

I have configured the RL algorithm by integrating RecurrentPPO to leverage the LSTM network. I have hooked up training/evaluation logging via EvalCallback. The task is estimated at 8 person hours but it took me 16 hours to complete.

**Summary Table of Work**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| UserStory GitHub Issue ID | User Story | Story Points | Task GitHub Issue ID | Task | Task Hours | Status | Actual Hours |
| [RDNN](https://github.com/Rivier-Computer-Science/AI-Agent-Stock-Prediction/issues/590) | [RDNN-Style Recurrent Reinforcement Learner](https://github.com/Rivier-Computer-Science/AI-Agent-Stock-Prediction/issues/590) |  | [RDNN.2](https://github.com/Rivier-Computer-Science/AI-Agent-Stock-Prediction/issues/617) | Build RNN Policy Network #617 | 7 | Completed | 15 |
| [RDNN](https://github.com/Rivier-Computer-Science/AI-Agent-Stock-Prediction/issues/590) | [RDNN-Style Recurrent Reinforcement Learner](https://github.com/Rivier-Computer-Science/AI-Agent-Stock-Prediction/issues/590) |  | [RDNN.3](https://github.com/Rivier-Computer-Science/AI-Agent-Stock-Prediction/issues/668) | Configure RL Algorithm #668 | 8 | Completed | 16 |

**Summary Table of Commits**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Date | Commit Number | Commit Description (exactly as in github) | User Story | Task |
| June 22 nd, 2025 | c9b5a416e44f95fb2d4d2831bd8f002241407c9d | [RDNN.2 and RDNN.3](https://github.com/Rivier-Computer-Science/AI-Agent-Stock-Prediction/pull/763/commits/c9b5a416e44f95fb2d4d2831bd8f002241407c9d) | [RDNN](https://github.com/Rivier-Computer-Science/AI-Agent-Stock-Prediction/issues/590) | [RDNN.2](https://github.com/Rivier-Computer-Science/AI-Agent-Stock-Prediction/issues/617)  [RDNN.3](https://github.com/Rivier-Computer-Science/AI-Agent-Stock-Prediction/issues/668) |