

## Howls03 Documentation

Based on the championship agent Basket in the 4th International Competition, we improve it in two directions:

On the one hand, assuming the Basket's action policies for different roles do not outperform every other agent, we analyze the policies of agents with available code, modify and integrate them into ours to compose a mixture of policies. We hope that by switching between different policies, it's more difficult for other agents to identify our identity.

On the other hand, we find agent policies heavily depend on the role prediction based on the game status, thus the accuracy of the prediction significantly affects the effectiveness of the policy. While most existing agents rely on the Bayesian inference from previous game logs, we switch to using neural networks to perform prediction. We expect that the neural network, which is trained from large amounts of data, can generalize to unseen agents, and recognize action patterns to predict roles.

Our agent improves both the policy and the internal prediction model. To be more specific, we found that while Basket had developed a complicated action mechanism from previous agents, most decisions are made based on parameters given by humans which are not necessarily optimal. We analyzed other previous agents with good results and integrate their policies into ours. For the prediction model, we replace the original Bayesian inference from game logs with a neural network model, which has a novel architecture that composes of Convolutional Neural Networks (CNN) and Recurrent Neural Networks (RNN). The model is trained on a large amount of data from previous competitions and can be used on any werewolf games with 15 or fewer plays and 6 or fewer roles.