

NashtyNegotiator: An agent submitted to the ANAC 2026 ANL league

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Abstract

This report details the architecture and strategic design of *NashtyNegotiator*, a negotiation agent submitted to the Automated Negotiation League (ANL) 2026. The agent utilizes a multi-phasic approach within the BOA (Bidding, Opponent Model, Acceptance) framework, in which the agent conceals his true preferences as long as possible until it starts to concede at the very end of the negotiation.

1 Introduction

In this years Automated Negotiation League (ANL) a new challenge was introduced: agents must maximize their individual utility while simultaneously concealing their preferences from the opponent. Furthermore, the introduction of variable, hidden reservation values introduces a severe risk: accepting a mathematically poor deal can result in a negative advantage score, heavily penalizing naive agents.

To solve these challenges, we developed *NashtyNegotiator*. It immunizes itself against negative scores by pruning the domain space during initialization, and utilizes a false-profile anchoring strategy for the majority of the negotiation before smoothly conceding to find a Pareto-optimal agreement.

2 The Design of NashtyNegotiator

NashtyNegotiator is implemented using the modular BOA framework provided by NegMAS. The architecture is divided into three synchronized components:

- **Opponent Model:** The standard `GSmithFrequencyModel`.

- **Bidding Strategy:** A custom time-based policy that transitions from a static feint into a bucketed concession phase.
- **Acceptance Strategy:** An enhanced ACNext policy featuring dynamic thresholds, endgame panic mechanisms, and reservation-value shields.

3 Concealing Bidding Strategy

The Bidding Strategy (BS) operates in two distinct phases, prioritizing safety, concealment, and finally mutual agreement.

3.1 Domain Initialization and Safety Shields

At the start of the negotiation ($t = 0$), the agent enumerates the outcome space and compares the maximum possible utility against its assigned reservation value (r). If $\max(U) \leq r$, the domain is unplayable, and the agent ends negotiation. Otherwise, it filters the domain by removing any deal where $U \leq r$. This guarantees the agent will never propose a “suicidal” deal.

3.2 Phase 1: The Midpoint Feint (0% - 90% of Time)

To conceal our true top preferences and anchor the opponent’s expectations, the agent does not offer its best deals early in the game. Instead, it calculates a target utility exactly halfway between its maximum utility and its reservation value:

$$U_{target} = r + (\max(U) - r) \times 0.5 \quad (1)$$

The agent selects the safe deal closest to (but strictly below) this midpoint and proposes it repeatedly for the first 90% of the negotiation. With that we want to poise the enemy’s opponent model for as much and as long as possible.

3.3 Phase 2: Bucketed OM Concession (90% - 100% of Time)

In the final 10% of the game, the agent begins to concede to secure a deal. The remaining utility space is divided into ten strict 10% buckets. As time progresses, the acceptable utility floor drops from 90% down to 0% (scaled to the reservation value). Within each strict utility bucket, the agent queries the Opponent Model to evaluate all valid deals, proposing the exact deal that maximizes the opponent’s estimated utility. If a bucket is empty, it safely falls back to the previous bucket’s offer.

4 Acceptance Strategy

The Acceptance Strategy (AS) is designed to act as a final safety net while smoothly tracking the Bidding Strategy’s concessions. The very first check the

AS performs is evaluating the opponent’s offer against the reservation value. If $U(\textit{offer}) \leq r$, it is instantly rejected. This guarantees the agent can never achieve a negative advantage score. During normal play, the AS uses a dynamic threshold calculated as $r + (\max(U) - r) \times 0.75$. Any offer exceeding this 75% threshold is accepted. During the final 10% concession phase, the AS utilizes **ACNext** logic. It asks the BS what deal it is about to propose next. If the opponent’s current offer is better than or equal to the utility of our planned next offer, the agent accepts it. In the absolute final step of the negotiation (or $t \geq 0.99$), the agent will accept any offer that is strictly better than the reservation value to avoid a timeout.

5 Opponent Model

We utilize the **GSmithFrequencyModel** natively provided by NegMAS. Because highly concealing opponents might attempt to spoof this model with dummy offers, we explicitly delay utilizing the model’s predictions until the 90% time mark. By waiting until the concession phase to evaluate the **safe_outcomes** against the OM, we ensure the frequency model has ingested the maximum possible amount of opponent data before we rely on it to break ties in our utility buckets.