

PokerBot Analysis Report v5

1. Overview

Version 5 consolidates all prior architectural developments and prepares the system for opponent range estimation.

The PokerBot now includes probabilistic decision-making, stack-aware strategy, board texture classification, adaptive bet sizing, and an upgraded preflop engine with mixed strategies.

2. Evolution Summary

- Engine communication and legal action enforcement
- Monte Carlo equity estimation
- Pot odds expected value framework
- Opponent modeling (fold rate and aggression)
- Position awareness
- Board texture classification
- Draw detection and semi-bluff logic
- Stack-to-Pot Ratio (SPR) reasoning
- Adaptive bet sizing engine
- Upgraded probabilistic preflop ranges

3. Mathematical Foundations

Equity \approx Wins / Simulations

Pot Odds = Call / (Pot + Call)

Decision Rule: Call if Equity > Pot Odds

SPR = Effective Stack / Pot

These principles are derived from probability theory and Monte Carlo convergence.

4. Current Architecture

- Preflop decision engine

- Monte Carlo equity module
- Opponent modeling
- Position-aware adjustments
- Board texture analysis
- Draw detection
- SPR logic
- Bet sizing intelligence
- Mixed strategy randomization
- Testing framework

5. Performance Improvements

- Realistic aggression patterns across board types
- Better commitment decisions with low SPR
- Improved pot control with high SPR
- Semi-bluff utilization with draw detection
- Dynamic bet sizing instead of fixed sizing
- Improved preflop discipline compared to earlier versions

6. Strength Assessment

Current Level: Strong Competitive Student PokerBot

Strengths:

- Context-aware decision system
- Multi-factor reasoning
- Probabilistic strategies
- SPR-adjusted behavior
- Intelligent bet sizing

Weaknesses:

- Opponent range estimation not implemented
- Turn/river specialization limited
- Long-term opponent memory minimal

7. Next Module: Opponent Range Estimation

The next development phase focuses on estimating opponent hand ranges based on observed actions.

This will significantly improve equity calculations, bluff decisions, and value betting accuracy.

8. Roadmap

- Opponent range estimation
- Turn and river specialization
- Range vs range equity
- Advanced bluff frequency modeling
- Monte Carlo optimization
- Game-theoretic approaches (CFR / RL)

9. Conclusion

Version 5 establishes a mature architecture capable of competitive play. The system combines probability, poker theory, and algorithmic reasoning into a cohesive decision engine ready for advanced opponent modeling.