

Path of Legends Investigation:

Abstract:

In this investigation, I model the Path of Legends (PoL). Using this model, I can gain insights about the PoL and determine the effects of moving/removing golden steps on the percentage of players who reach Ultimate champion. I found that {SOLUTION PARAMS HERE} provides a 1% UC rate and maximizes winrate of UC players while minimizing the average games required to get to UC and the length of the path itself.

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The source code, PoL frameworks and summaries of results are in [this github repo](#).

Introduction

The current Path of Legends system requires 93 steps. If you reach Ultimate Champ and win every game, you can finish in 48 games. Not many players can win 48/48 games and the actual amount of gameplay required to reach UC is normally much higher. In this write up, I will detail how I built and used a computational model of the PoL to find a PoL framework that will best align to these 3 principles:

1. Given n battles played per season, close to 1% of players will reach Ultimate Champion(UC).
2. Minimize the number of games required to reach Ultimate Champion
3. The Win Pct of the UC players should be maximized

After testing 9 different frameworks, the design that best accomplished this goal was {SOLUTION}

Method:

Simplifying Assumptions

First, I built a computational model of the system and made 2 simplifying assumptions:

- Player card and king levels do not matter due to the path level caps. The sole factor in determining who wins a battle is dependent on the two player's legacy bests since it wraps up card level and king level conveniently.
- The players skill/levels stay the same throughout the testing. All 500000 players tested were generated by examining 24000 real players from the api and getting their card level and trophy PBs.

When 2 players match against each other under this assumption, the probability of the higher PB player winning the match, with a given PB difference d is approximated by the equation:

$$-0.0000001097213d^2 + 0.00030971d + 0.48544$$

This approximation is from roughly 80000 real battles of players playing at tournament standard.

Data Collection Process

First I needed to know how long to run my model for each path framework. I simulated the current path system with 500k players until 1% of players reached UC. It took roughly 62 million battles for 1% of the playerbase in UC. I ran this simulation for 5 seasons to ensure that the effect of the win multiplier took affect. The number of battles required tended to reach a steady value about 4-5 seasons, sometimes earlier.

With the calibration for the simulation complete, I could experiment with the path framework. Each experiment was run by doing 10 trials (with rng seeds 0-9 for reproducability) and calculating the Avg/Stdev 3 things: - Finishing Step - Games played to reach UC (UC players only) - Win Percent (UC Players only)

Finally I calculated the average number of UC players. The goal was for this final average to be close to 1%.

Results:

There were 9 new path frameworks that were studied in this investigation. When I say no gold steps, I mean no gold steps except for the bottom step. I began by running the simulation on the current PoL model.

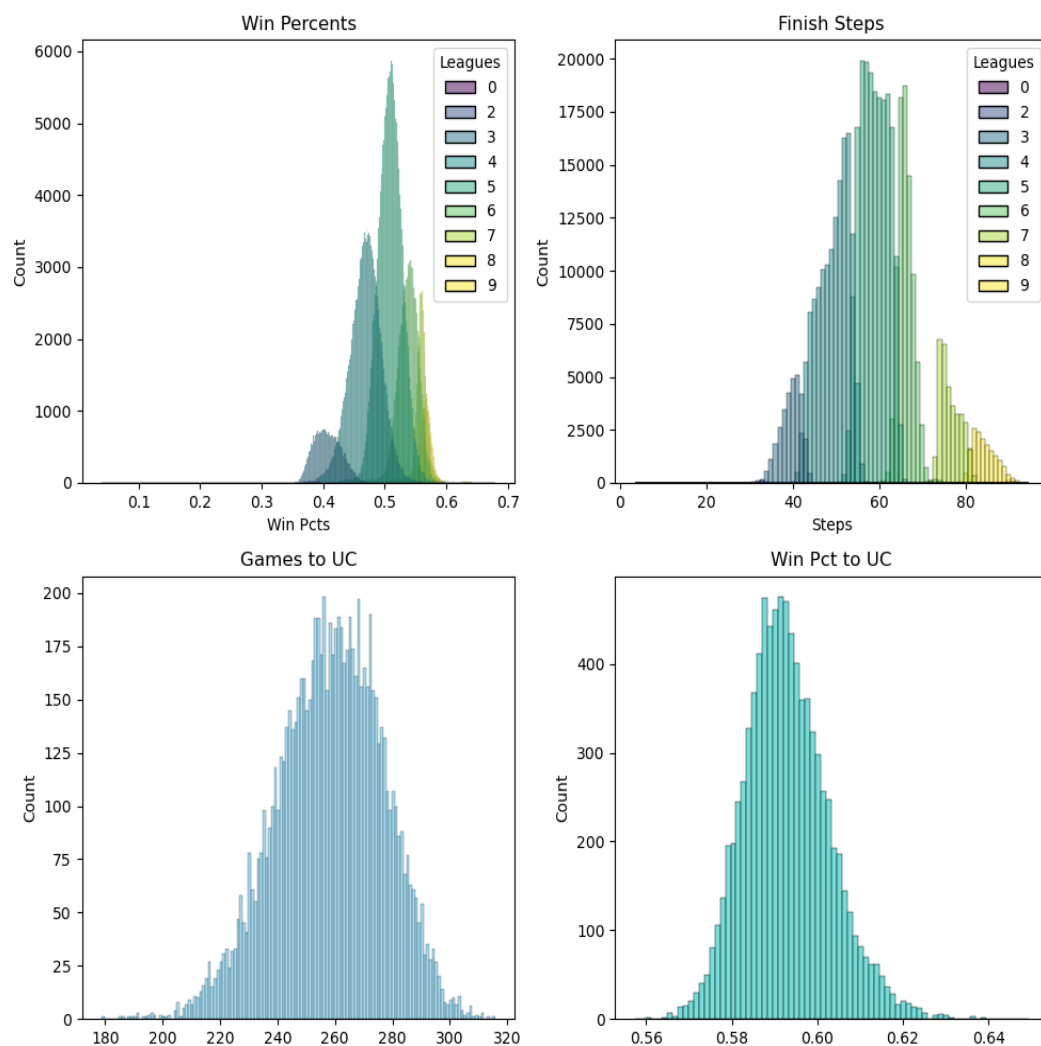
Current Path with 93 steps:

League	0	1	2	3	4	5	6	7	8	UC
Step Requirement	0	10	21	32	43	54	65	73	82	93
Gold Step rule	2	3	4	5	6	7	0	0	0	N/A

Drop Leagues: False, Max Multiplier: 9

Statistic	Average	St Dev.
Finishing Step	58	11.4935
UC Games Played	257.3	31.2986
UC Win Percent	0.593175	0.0185538

Percent UC: 0.9968



With the current system, players took on average 257 games to finish the path. Many players finish faster than this, but 257 games is a significant time investment. There are quite a few players reaching UC with a win percent less than 60%. In the histogram of finishing steps, there is a significant drop off of players between steps 65 and 70. This is due to the *final* golden step being at step 65.

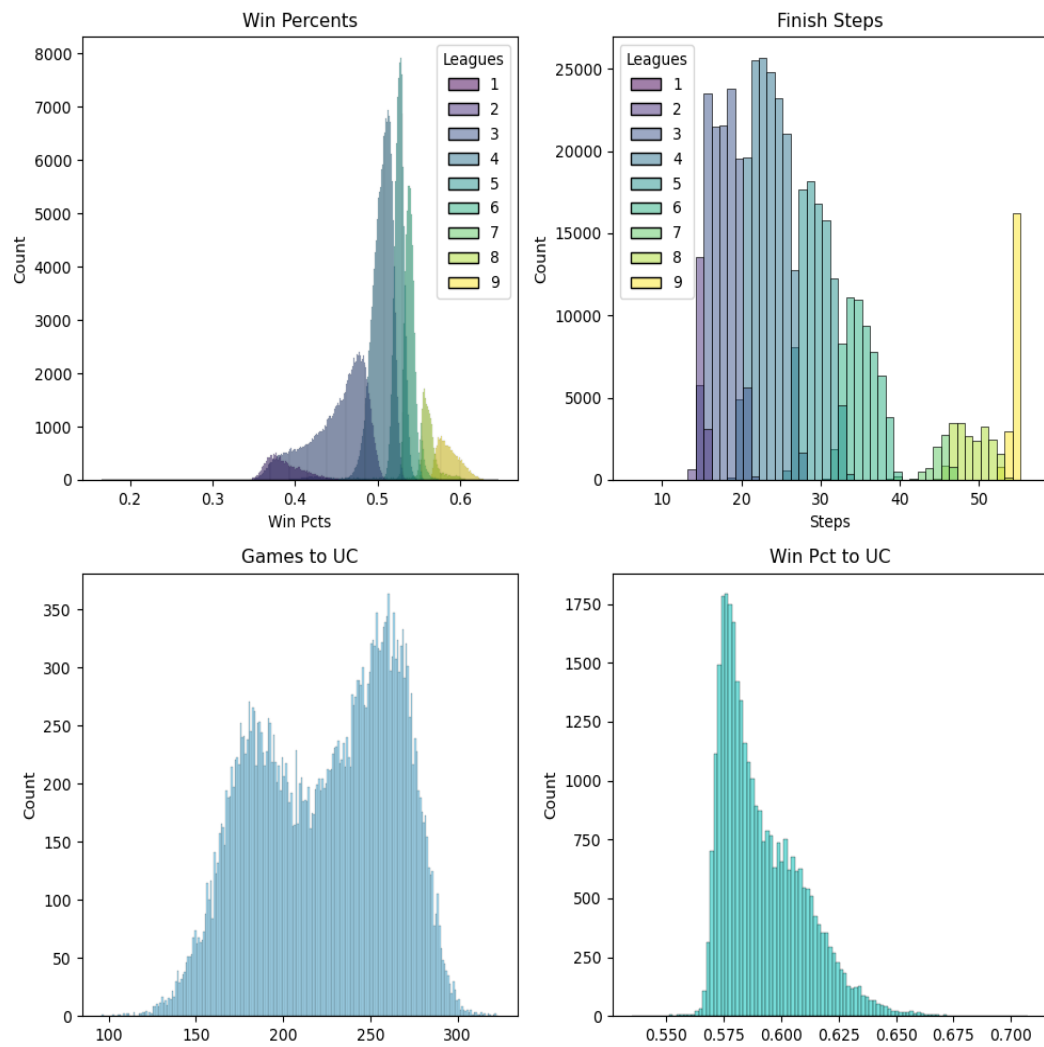
55-step path with less gold Steps:

League	0	1	2	3	4	5	6	7	8	UC
Step Requirement	0	5	10	15	21	27	33	40	47	55
Gold Step rule	4	3	2	0	0	0	0	0	0	N/A

Drop Leagues: True, Max Multiplier: 6

Statistic	Average	St Dev.
Finishing Step	26	10.6771
UC Games Played	222.2	46.9734
UC Win Percent	0.591978	0.0252655

Percent UC: 5.17024



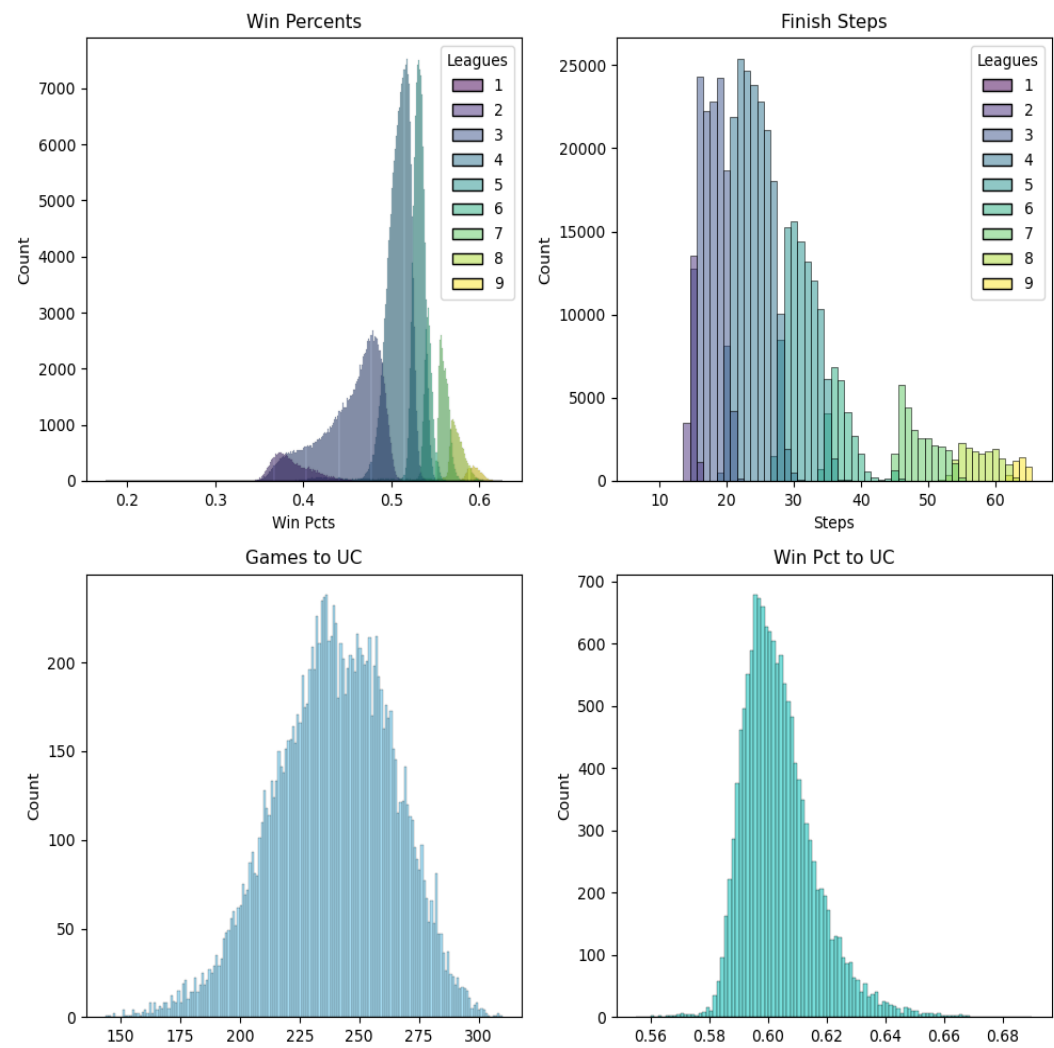
65-step path with less gold steps:

League	0	1	2	3	4	5	6	7	8	UC
Step Requirement	0	5	10	15	21	28	36	45	55	65
Gold Step rule	4	3	2	0	0	0	0	0	0	N/A

Drop Leagues: True, Max Multiplier: 6

Statistic	Average	St Dev.
Finishing Step	26	11.4018
UC Games Played	239	38.3523
UC Win Percent	0.60371	0.022345

Percent UC: 1.85394



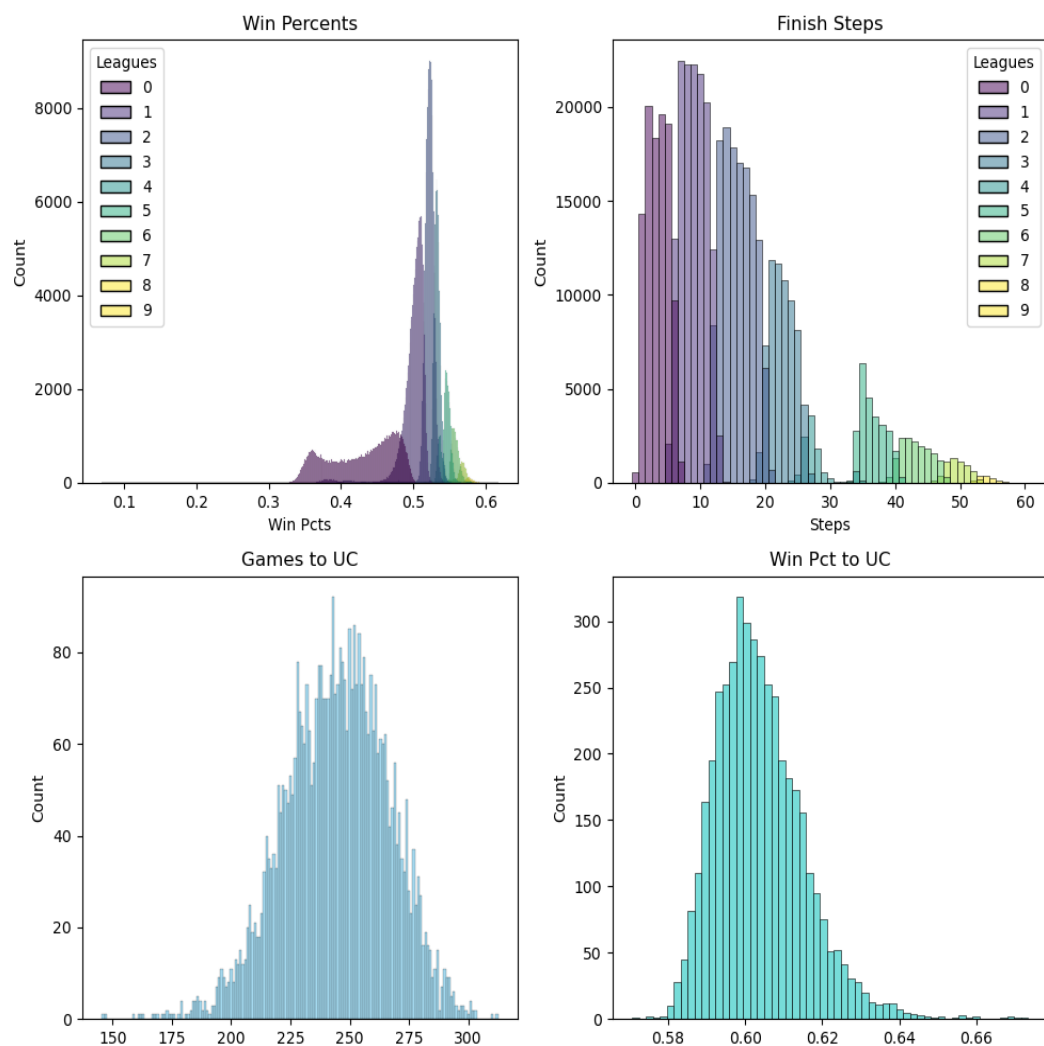
60-step path with no gold steps:

League	0	1	2	3	4	5	6	7	8	UC
Step Requirement	0	6	13	20	27	34	41	48	54	60
Gold Step rule	0	0	0	0	0	0	0	0	0	N/A

Drop Leagues: True, Max Multiplier: 5

Statistic	Average	St Dev.
Finishing Step	14	11.8996
UC Games Played	242.8	37.7677
UC Win Percent	0.60456	0.020625

Percent UC: 0.54826



55-step path with no gold steps in leagues

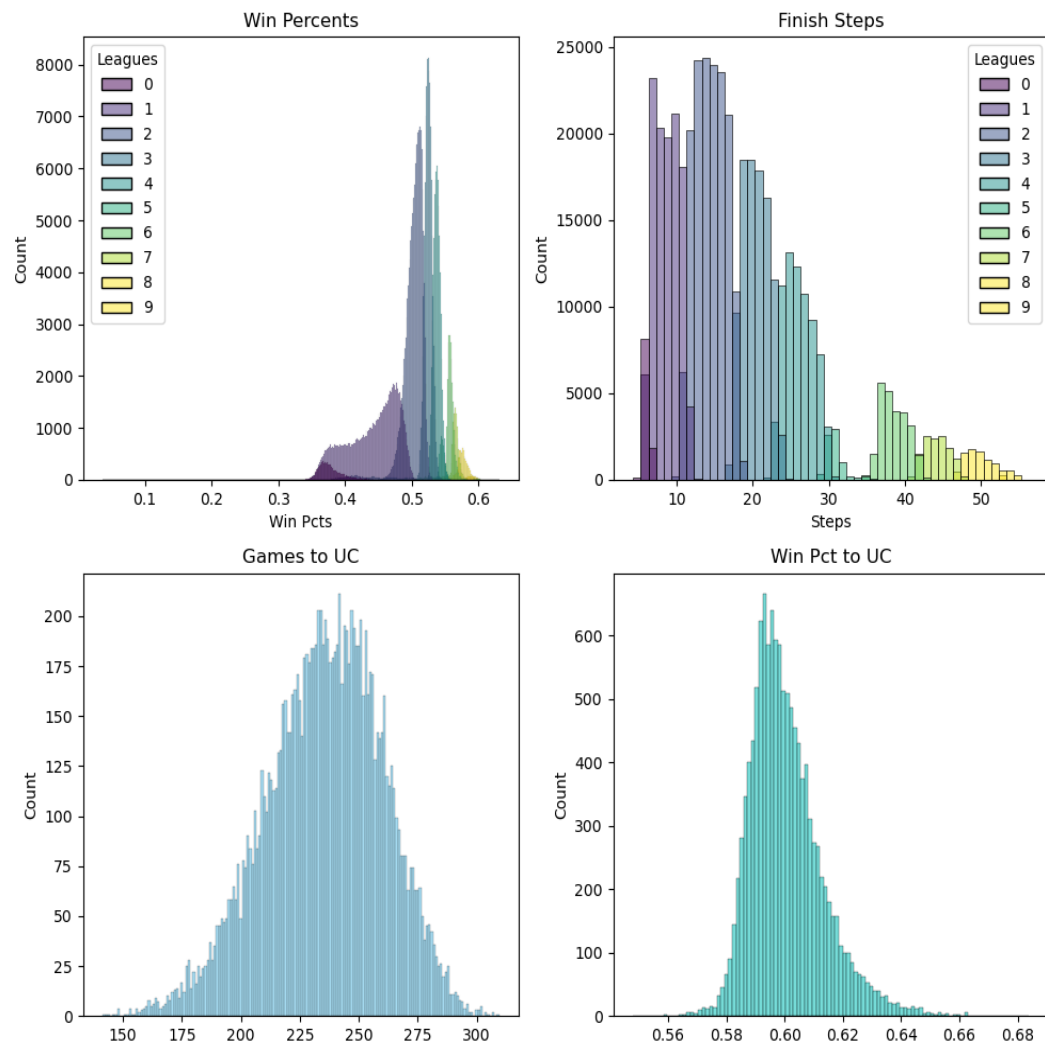
League	0	1	2	3	4	5	6	7	8	UC
Step Requirement	0	6	12	18	24	30	36	42	48	55
Gold Step rule	1	0	0	0	0	0	0	0	0	N/A

Drop Leagues: False

Max Multiplier: 4

Statistic	Average	St Dev.
Finishing Step	18	10.9545
UC Games Played	235	40.0525
UC Win Percent	0.600599	0.0235259

Percent UC: 1.51738



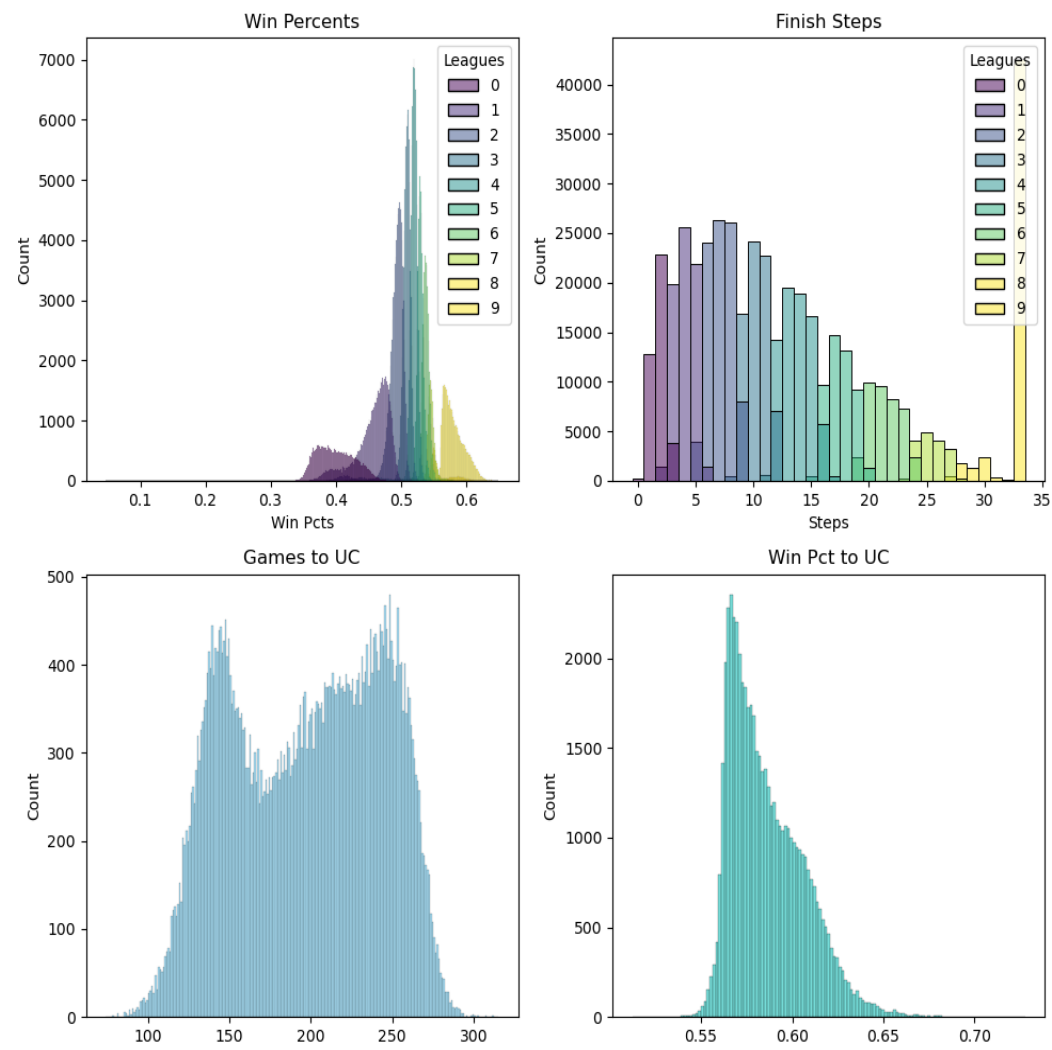
33-step path with no gold steps or multiplier:

League	0	1	2	3	4	5	6	7	8	UC
Step Requirement	0	3	6	9	12	16	20	24	28	33
Gold Step rule	0	0	0	0	0	0	0	0	0	N/A

Drop Leagues: True, Max Multiplier: 1

Statistic	Average	St Dev.
Finishing Step	12	9.79796
UC Games Played	200	51.2903
UC Win Percent	0.584974	0.0286103

Percent UC: 10.3074



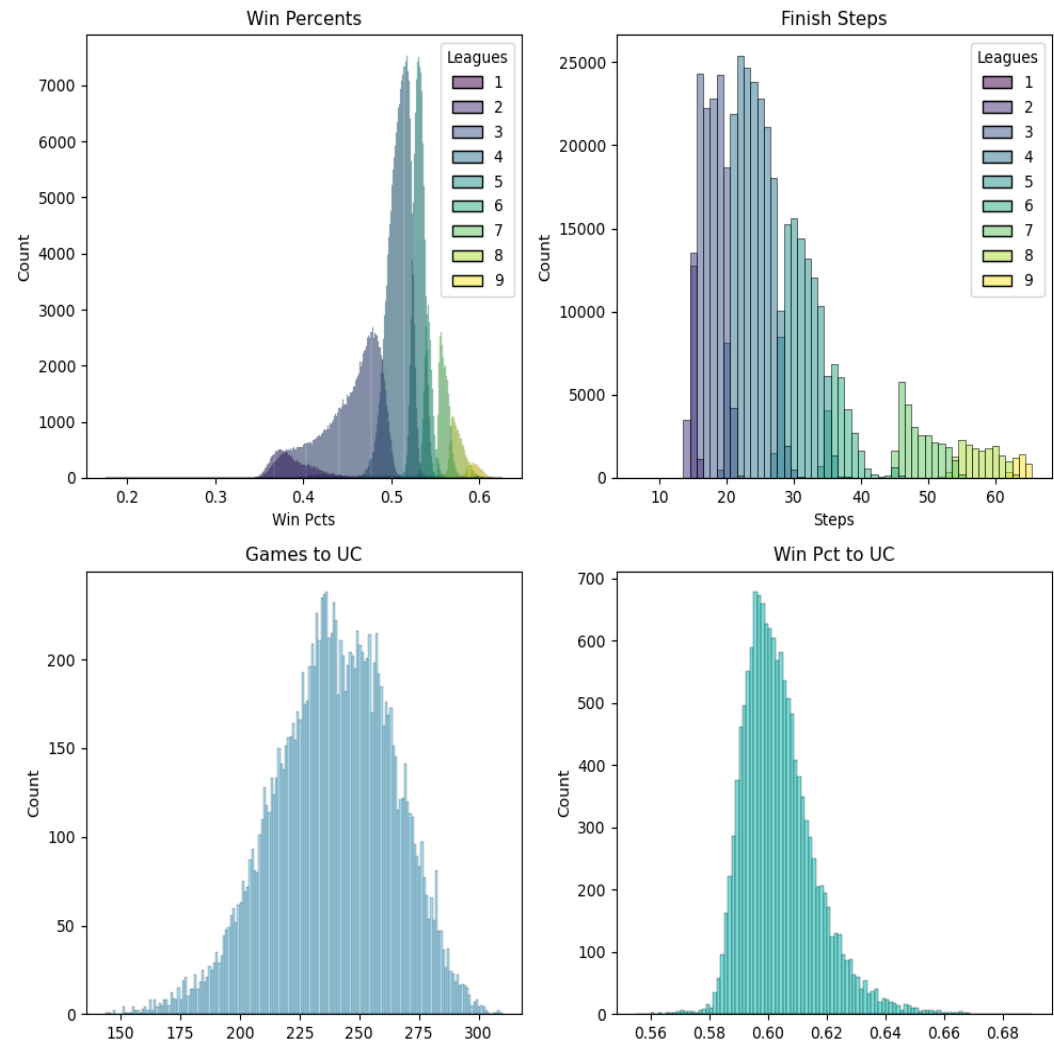
45-step path with no gold steps or multiplier

League	0	1	2	3	4	5	6	7	8	UC
Step Requirement	0	4	8	12	16	21	26	32	38	45
Gold Step rule	0	0	0	0	0	0	0	0	0	N/A

Drop Leagues: True, Max Multiplier: 1

Statistic	Average	St Dev.
Finishing Step	13	10.3923
UC Games Played	229	43.1729
UC Win Percent	0.59417	0.0247397

Percent UC: 2.60978



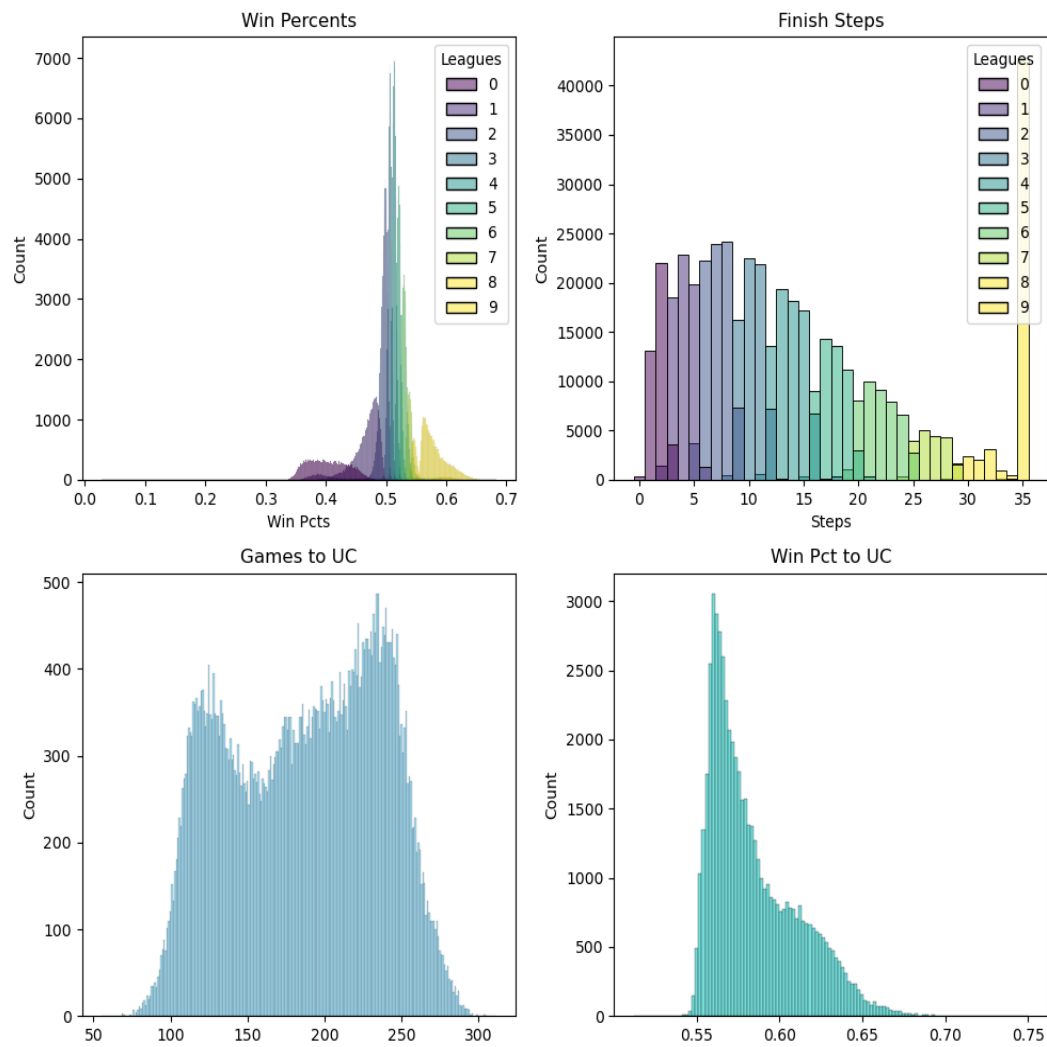
35-step path with no gold steps and small multiplier

League	0	1	2	3	4	5	6	7	8	UC
Step Requirement	0	3	6	9	12	16	20	25	30	35
Gold Step rule	0	0	0	0	0	0	0	0	0	N/A

Drop Leagues: True, Max Multiplier: 4

Statistic	Average	St Dev.
Finishing Step	13	10.4403
UC Games Played	187	53.0745
UC Win Percent	0.58381	0.032679

Percent UC: 10.6504



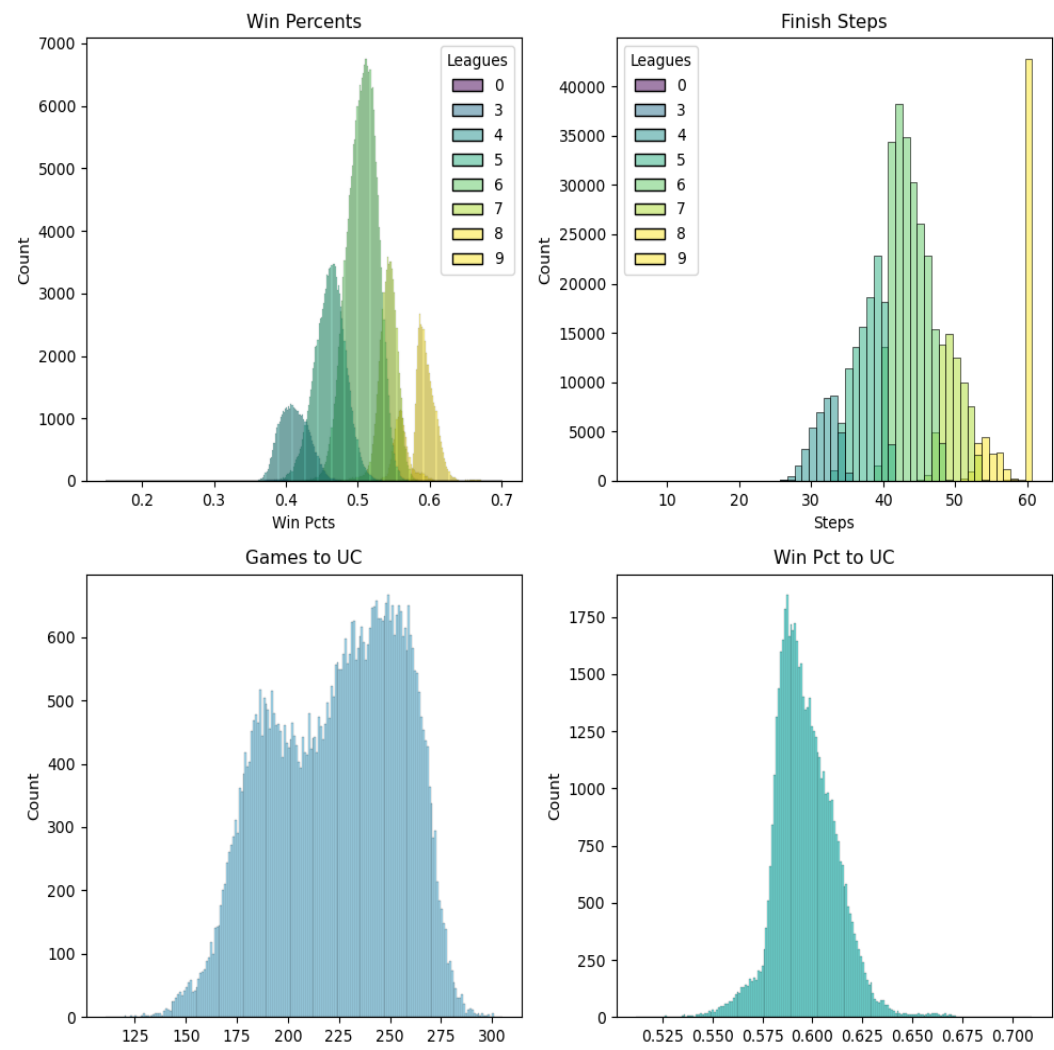
60-step path, dropping leagues allowed:

League	0	1	2	3	4	5	6	7	8	UC
Step Requirement	0	6	13	20	27	34	41	48	54	60
Gold Step rule	2	3	4	5	6	7	0	0	0	N/A

Drop Leagues: True, Max Multiplier: 5

Statistic	Average	St Dev.
Finishing Step	43	8.30662
UC Games Played	225.4	37.7849
UC Win Percent	0.596047	0.0244686

Percent UC: 10.4715



75-step path, dropping leagues allowed

League	0	1	2	3	4	5	6	7	8	UC
Step Requirement	0	8	15	23	31	38	44	57	66	75
Gold Step rule	2	3	4	5	6	7	0	0	0	N/A

Drop Leagues: True

Max Multiplier: 8

Analysis Files:

Statistic	Average	St Dev.
Finishing Step	49	10.4499
UC Games Played	234	40.0137
UC Win Percent	0.596399	0.0211164

Percent UC: 6.26232

