League of Legends Win Probability Model

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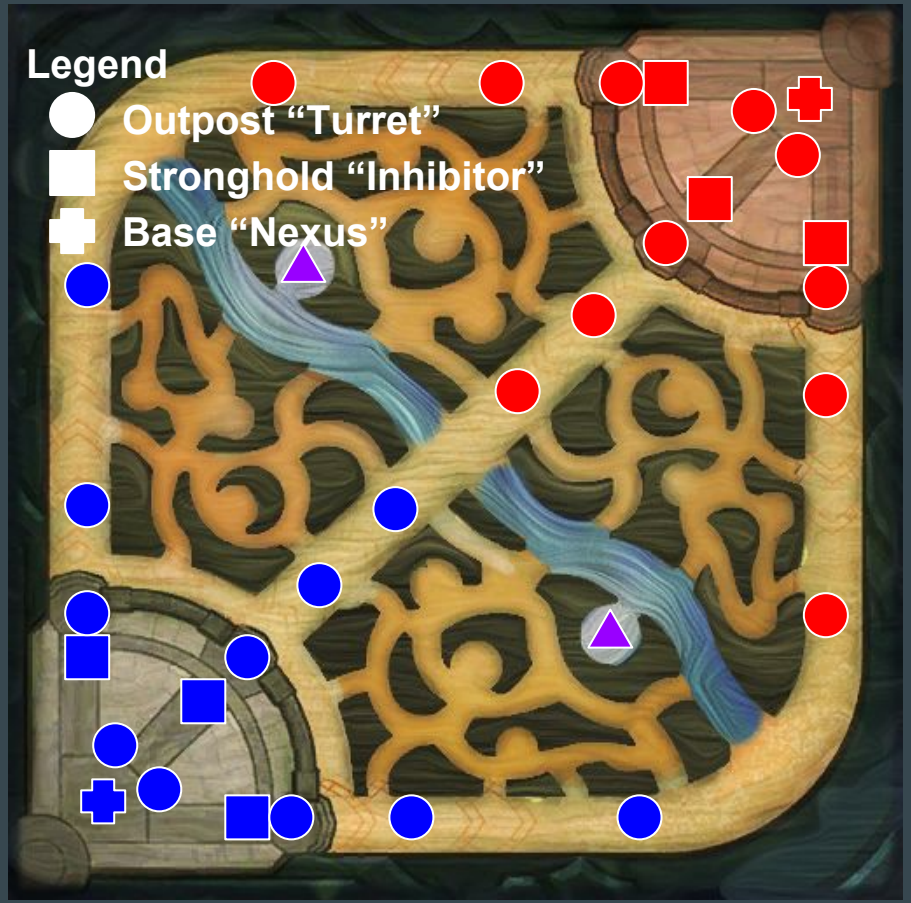
LoL Overview

- Multiplayer Online Battle Arena (MOBA) video game developed by Riot Games
- Active players >100M/month, >25M/day
- Growing professional scene with >60M unique viewers at 2017 World Championship
- North American franchising in 2018 with investments from Golden State Warriors, Houston Rockets, Cleveland Cavaliers, Madison Square Garden Co., and more.

Photo via Riot Games

Gameplay

- Battle of 2 teams with 5 players and waves of computer-controlled minions each
- Objective: Destroy the enemy team's base
- Each player controls a unique champion with a specific set of skills, and 6 item slots
- Choice of 141 champions and >250 items
- Champions become stronger over the course of a game by
  - Defeating enemy champions
  - Acquiring item upgrades
  - Securing neutral objectives



"Summoner's Rift" Base Image via Riot Games

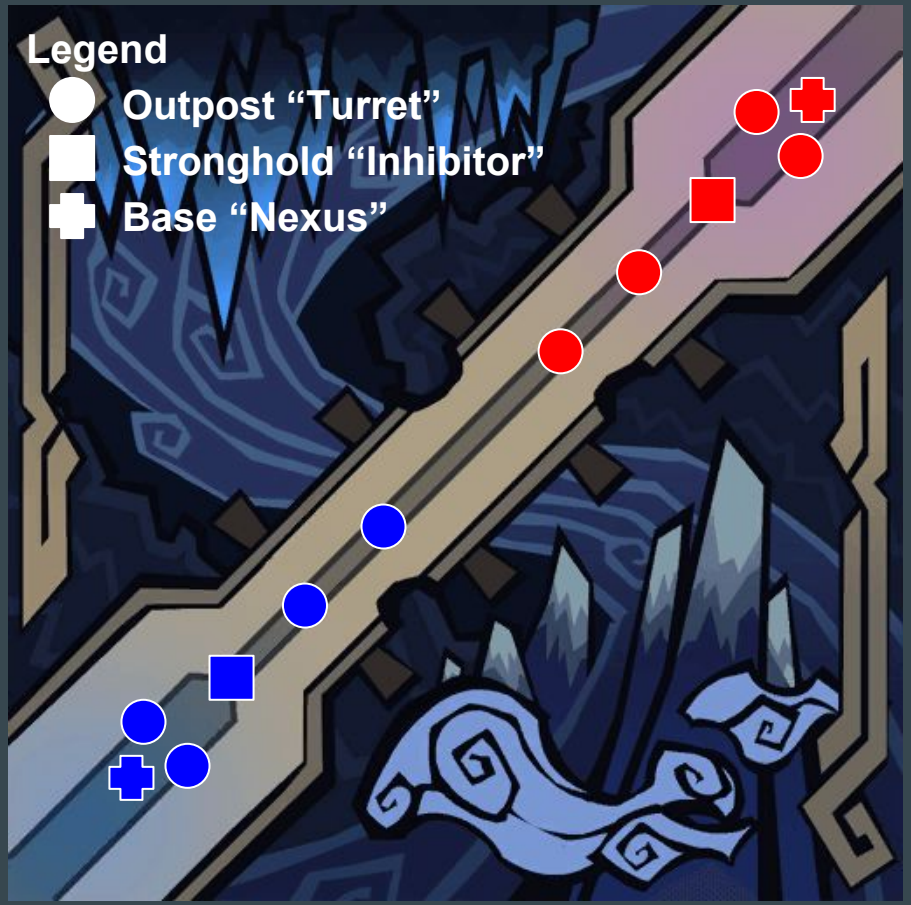
Project Objective:
Develop an in-game win probability model for League of Legends

Target Audience

Players	Developers	Producers
Optimize in-game strategy to improve win probability	Identify events that are over- or under-powering in deciding game outcome for game balance updates	Live in-game statistics and analysis provide entertainment value

Data

- Sources:
  - Game data - Riot Games through API
  - Champion attributes - LoL site web scrape
- “ARAM” game mode on “Howling Abyss”
  - Game patch V8.9 (2018 May 2-16)
  - ~68K games on 11 servers worldwide
  - ~1.3M minutes, ~5.5M events in-game
- Main Features
  - Event location
  - Kill/Turret/Inhibitor difference
  - Game time
- Secondary Features
  - Team composition by champion attributes
  - Player rank

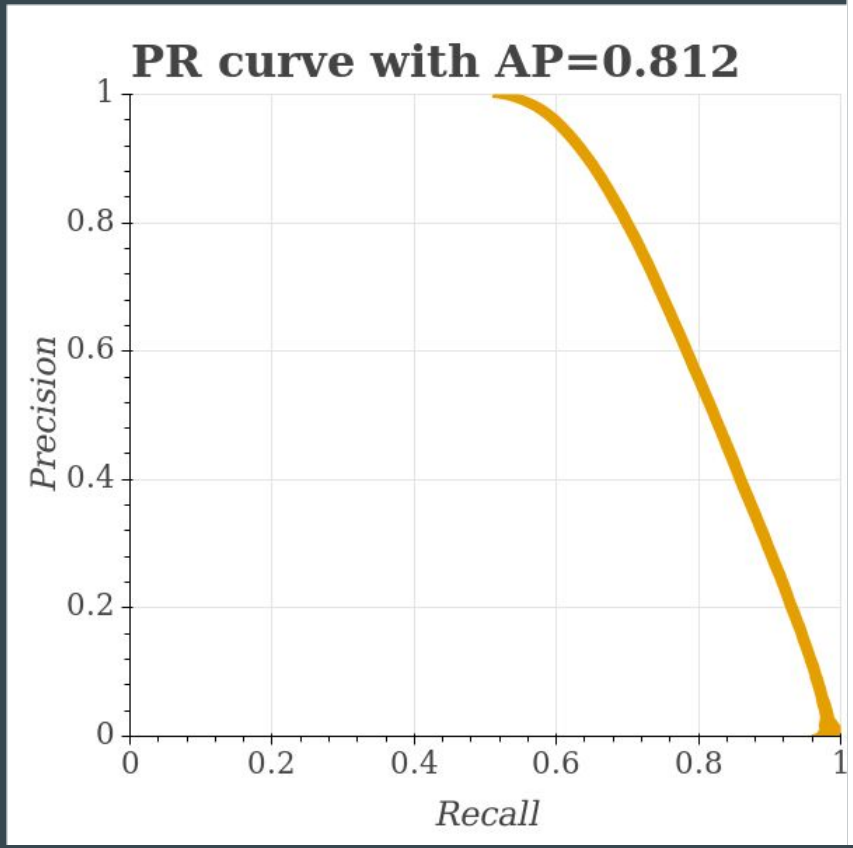


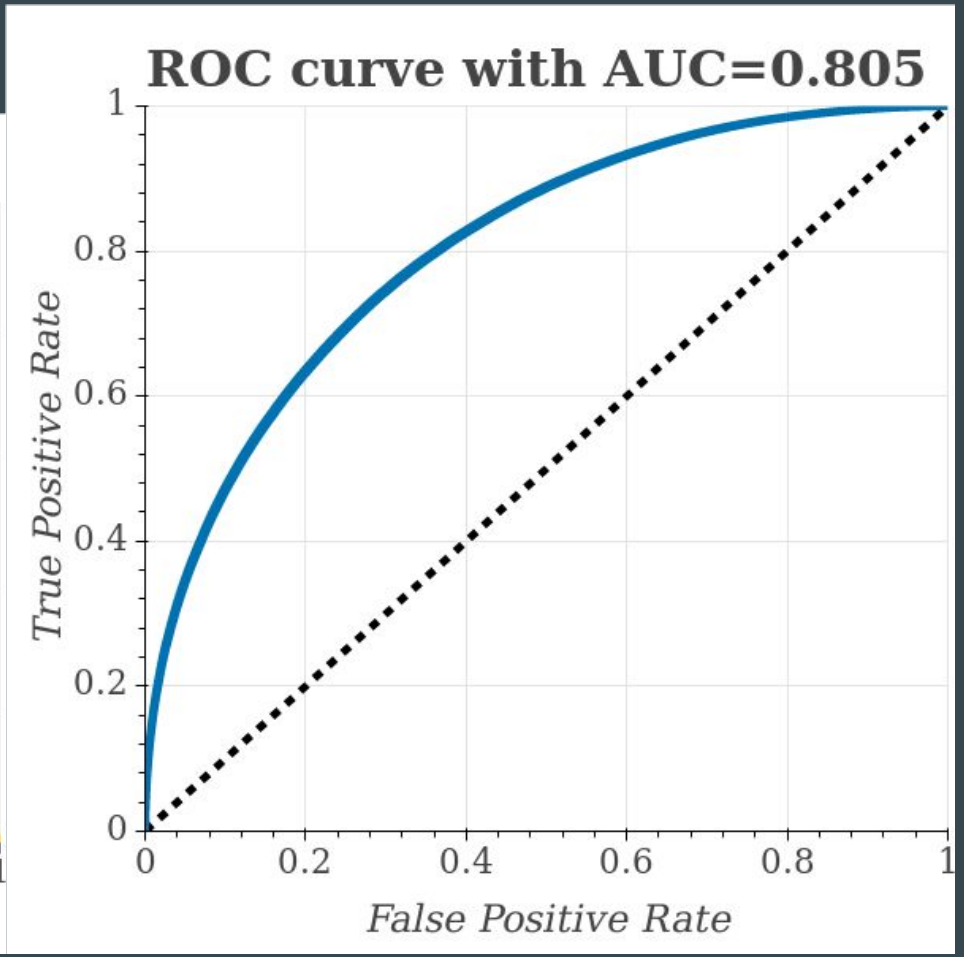
“Howling Abyss” Base Image via Riot Games

Pipeline

- Acquire data with Requests
- Cache on local MongoDB server
- Process features with Pandas
- Split train/test sets
- Train/test model with Scikit-learn
- Visualize predictions with Bokeh

Model Performance





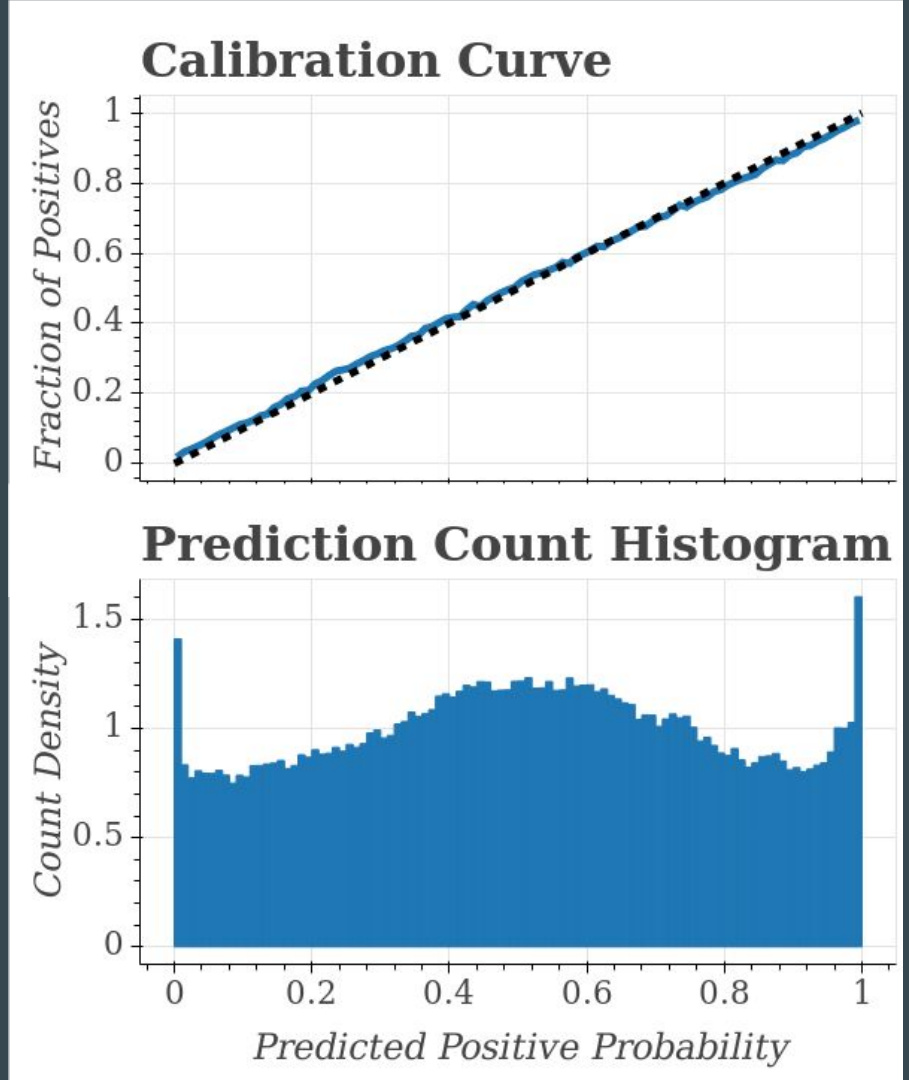
Model Performance

Calibration curve

- Well calibrated

Prediction count histogram

- Slight positive bias (reflective of game stats)
- Predictions mostly uncertain (around 0.5)
- Peaks at extreme certainty (0 and 1)



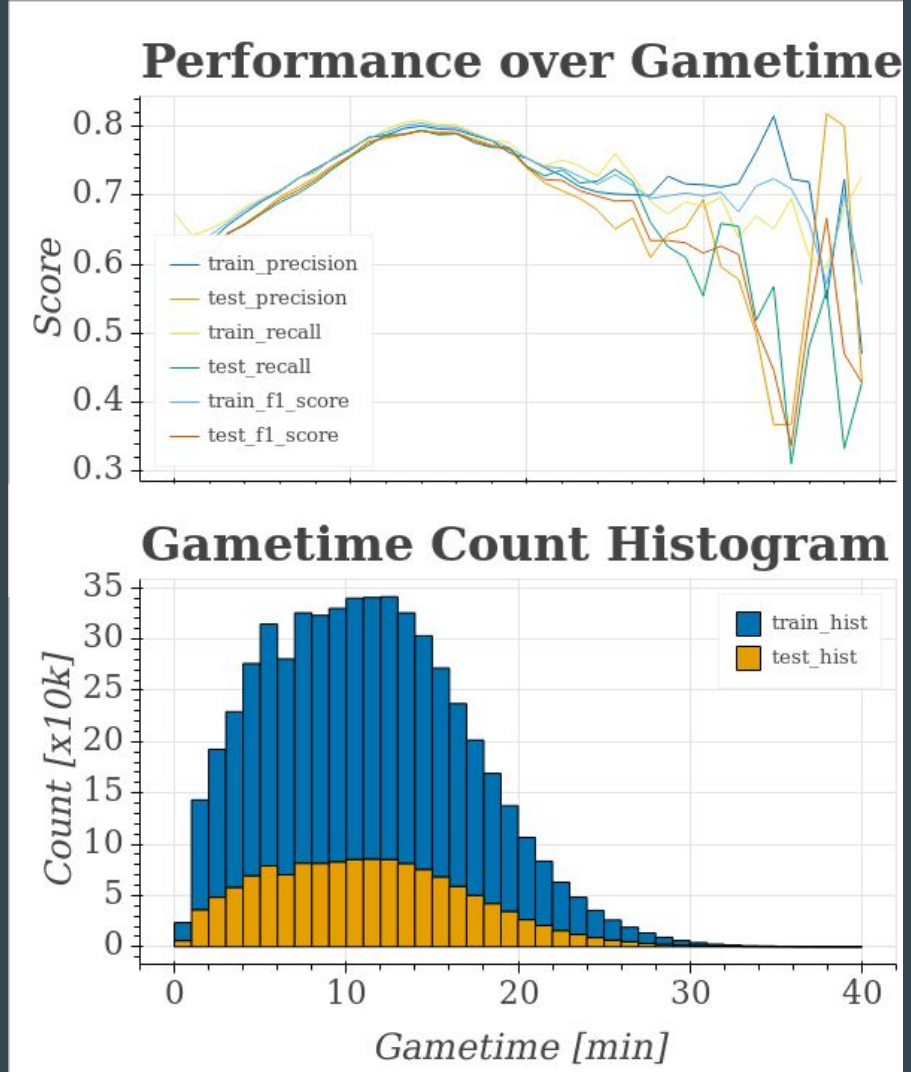
Model Performance

Performance over gametime

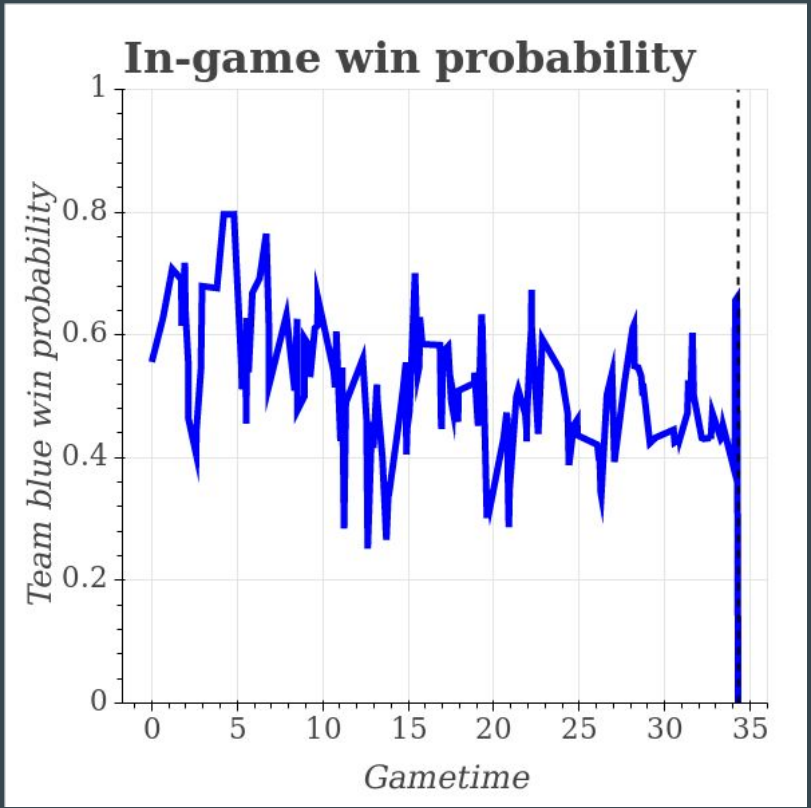
- Initial increase with gametime
- Peaks around 15mins at 0.8, when majority of games end
- Uncertain beyond 25mins due to low observation count

Gametime count histogram

- Majority of events within first 15mins
- Drops off as games end



Game Prediction - NA1_2776575277, NA1_2777986544



Game Prediction - Longest Game

Longest game in dataset - RU_172096026

- 57 mins
- 194 total champion kills
- 12 inhibitors destroyed

Last events:

- Blue team wiped out by red team
- Red team destroyed all blue structures except Nexus
- Blue team defends and wipes out red team
- Blue team destroys all red structures except Nexus
- Red team defends and wipes out blue team
- Red team destroys Blue Nexus, wins game