

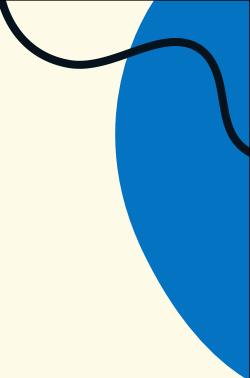


# LOL E-sports

# Win Prediction Research

**Pre-game prediction & In-game prediction**

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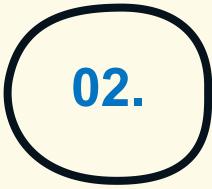


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# BACKGROUND



## Global Impact of Esports

With the growing size of events and prize pools, the audience of esports has reached 650 million in 2024.



## Importance of Outcome Prediction

Accurate predictions enhance viewer engagement and assist teams in tactical adjustments.



## Research Objectives

Use machine learning to improve performance predictions and offer new insights for esports analysis.

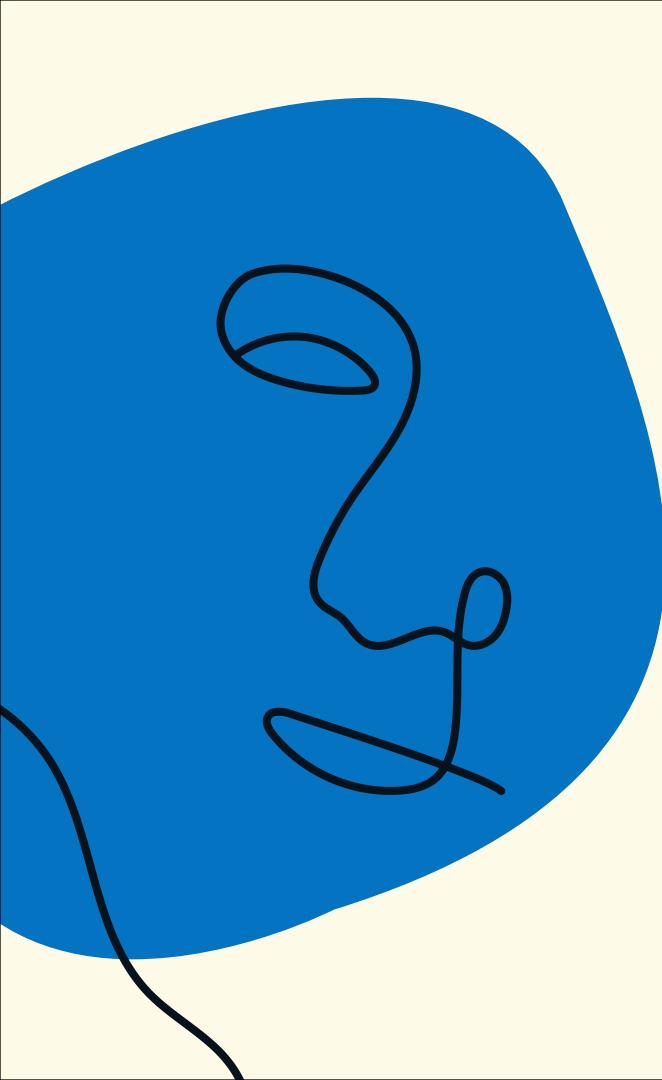
# RESEAR QUESTIONS



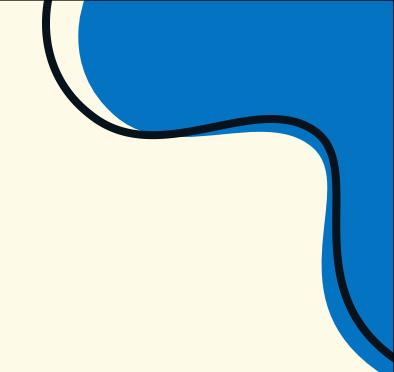
**RQ1:** How can Random Forest models leverage historical match data to accurately predict the outcome of League of Legends (LOL) matches before the game starts?

**RQ2:** How does the accuracy of in-game predictions evolve as the match progresses, and which in-game features contribute most to the prediction?

**RQ3:** How can the predictions from this research enhance viewer engagement or assist teams in tactical decision-making?



## **02. DATA SOURCE & PROCESSING**



# DATA SOURCE

## Oracle's Elixir

Oracle's Elixir is an online platform that provides data and statistics for a variety of games, especially esports, with a focus on popular titles like LOL. The site provides detailed match data, player statistics and team performance for players, analysts and users interested in esports.

Shared with me > OE Public Match Data

Name	Owner	Last modified	File size	⋮
2025_Lol_esports_match_data_from_OraclesElixir.csv	tsevenhuysen	9:02 AM	21.1 MB	⋮
2024_Lol_esports_match_data_from_OraclesElixir.csv	tsevenhuysen	12:17 AM	71.5 MB	⋮

The screenshot shows the Oracle's Elixir homepage. At the top, there are social media links (Twitter, LinkedIn, YouTube) and navigation links for STATS, PLAYERS, TEAMS, BLOG, PODCAST, TOOLS & DOWNLOADS. Below the navigation is a search bar for Players, Teams, and Blog. The main content area features news about VALORANT being live, followed by sections for Upcoming, Live, and Recent matches. The 'Upcoming' section lists matches for April 12, 23, and 13. The 'Recent' section lists matches for April 12, 23, and 13. On the right side, there is a 'Quick Access' sidebar with links for Most Recent Split (LCS, LEC, NIP, LPL, DRX, CK), Recent VODs (LYON vs. TL, DIG vs. TL), and other league links (GEN, LCK, LCK, LPL, LCK, LPL). The bottom of the page has a footer with links for ABOUT, DEFINITIONS, FAQ, CONTACT, NEWS, and VALORANT.

On this website, we can obtain a collated number of years of raw data.

# RAW DATA

## 2025&2024&2023 DATA

The raw data includes a full year's worth of data from players and teams in all regions of the world in all dimensions of competition. (The pictures are presented as part of the raw data)

league	year	split	playoffs	date	game	patch	participant	side	position	playername	playerid	teamname	teamid	champion	ban1	ban2	ban3	ban4	ban5	pick	xbloodas	firstbloodvi	team kpm	ckpm	firstdragon	dragons	opp_dragor	elementa
LCK	2025	Cup		0	2025/1/15 8:09	1	15.01	1	Blue	top	Morgan	oeplayer:f7OKSavings	oet:team:66eK'Sante	Ashe	Varus	Aurora	Ambessa	Jax										
LCK	2025	Cup		0	2025/1/15 8:09	1	15.01	2	Blue	jng	HamBak	oeplayer:84OKSavings	oet:team:66eSkarner	Ashe	Varus	Aurora	Ambessa	Jax										
LCK	2025	Cup		0	2025/1/15 8:09	1	15.01	3	Blue	mid	Clozer	oeplayer:60OKSavings	oet:team:66eYone	Ashe	Varus	Aurora	Ambessa	Jax										
LCK	2025	Cup		0	2025/1/15 8:09	1	15.01	4	Blue	bot	Hype	oeplayer:24OKSavings	oet:team:66eMissFortur	Ashe	Varus	Aurora	Ambessa	Jax										
LCK	2025	Cup		0	2025/1/15 8:09	1	15.01	5	Blue	sup	Pollu	oeplayer:31OKSavings	oet:team:66eRell	Ashe	Varus	Aurora	Ambessa	Jax		0	0	0.62	0.6889					
LCK	2025	Cup		0	2025/1/15 8:09	1	15.01	6	Red	top	Rich	oeplayer:f6DRX	oet:team:101Joyce	Kalista	Rumble	Azir	Ziggs	Kai'Sa		0	0	0.62	0.6889					
LCK	2025	Cup		0	2025/1/15 8:09	1	15.01	7	Red	jng	Sponge	oeplayer:3fDRX	oet:team:101Sejuani	Kalista	Rumble	Azir	Ziggs	Kai'Sa		0	0	0.62	0.6889					
LCK	2025	Cup		0	2025/1/15 8:09	1	15.01	8	Red	mid	Ucal	oeplayer:bcDRX	oet:team:101Viktor	Kalista	Rumble	Azir	Ziggs	Kai'Sa		0	1	0.62	0.6889					
LCK	2025	Cup		0	2025/1/15 8:09	1	15.01	9	Red	bot	LazyFeel	oeplayer:adDRX	oet:team:101Corki	Kalista	Rumble	Azir	Ziggs	Kai'Sa		0	0	0.0689	0.6889					
LCK	2025	Cup		0	2025/1/15 8:09	1	15.01	10	Red	sup	Andil	oeplayer:5eDRX	oet:team:101Leona	Kalista	Rumble	Azir	Ziggs	Kai'Sa		1	0	0.0689	0.6889					
LCK	2025	Cup		0	2025/1/15 8:09	1	15.01	100	Blue	team		OKSavings	oet:team:66ccb6facaf7d	Ashe	Varus	Aurora	Ambessa	Jax	Ska	0	0	0.0689	0.6889					
LCK	2025	Cup		0	2025/1/15 8:09	1	15.01	200	Red	team		DRX	oet:team:101f8589e58c72	Kalista	Rumble	Azir	Ziggs	Kai'Sa	Vik	1	0	0.0689	0.6889					
LCK	2025	Cup		0	2025/1/15 9:03	2	15.01	1	Blue	top	Rich	oeplayer:f6DRX	oet:team:101Galio	Azir	Ashe	Nautlius	Caitlyn					0.62	0.6889	1	4	0		
LCK	2025	Cup		0	2025/1/15 9:03	2	15.01	2	Blue	jng	Sponge	oeplayer:3fDRX	oet:team:101Wukong	Azir	Ashe	Nautlius	Caitlyn					0.0689	0.6889	0	0	4		
LCK	2025	Cup		0	2025/1/15 9:03	2	15.01	3	Blue	mid	Ucal	oeplayer:bcDRX	oet:team:101Auroma	Azir	Ashe	Nautlius	Caitlyn	0				0.4713	0.6526					
LCK	2025	Cup		0	2025/1/15 9:03	2	15.01	4	Blue	bot	LazyFeel	oeplayer:adDRX	oet:team:101Kai'Sa	Azir	Ashe	Nautlius	Caitlyn	0				0.4713	0.6526					
LCK	2025	Cup		0	2025/1/15 9:03	2	15.01	5	Blue	sup	Andil	oeplayer:5eDRX	oet:team:101Poppy	Azir	Ashe	Varus	Nautlius	Caitlyn		0	0	0.4713	0.6526					
LCK	2025	Cup		0	2025/1/15 9:03	2	15.01	6	Red	top	Morgan	oeplayer:f7OKSavings	oet:team:66eRumble	Nocturne	Vi	Kalista	Ornn	Ambessa		0	1	0.4713	0.6526					
LCK	2025	Cup		0	2025/1/15 9:03	2	15.01	7	Red	jng	HamBak	oeplayer:84OKSavings	oet:team:66eViego	Nocturne	Vi	Kalista	Ornn	Ambessa		0	0	0.1813	0.6526					
LCK	2025	Cup		0	2025/1/15 9:03	2	15.01	8	Red	mid	Clozer	oeplayer:60OKSavings	oet:team:66eTaliyah	Nocturne	Vi	Kalista	Ornn	Ambessa		0	0	0.1813	0.6526					
LCK	2025	Cup		0	2025/1/15 9:03	2	15.01	9	Red	bot	Hype	oeplayer:24OKSavings	oet:team:66eXayah	Nocturne	Vi	Kalista	Ornn	Ambessa		0	0	0.1813	0.6526					
LCK	2025	Cup		0	2025/1/15 9:03	2	15.01	10	Red	sup	Pollu	oeplayer:31OKSavings	oet:team:66eRakan	Nocturne	Vi	Kalista	Ornn	Ambessa		1	0	0.1813	0.6526					
LCK	2025	Cup		0	2025/1/15 9:03	2	15.01	100	Blue	team		DRX	oet:team:101f8589e58c72	Azir	Ashe	Varus	Nautlius	Caitlyn	Aur	1	0	0.1813	0.6526					
LCK	2025	Cup		0	2025/1/15 9:03	2	15.01	200	Red	team		OKSavings	oet:team:66ccb6facaf7d	Nocturne	Vi	Kalista	Ornn	Ambessa	Ran				0.4713	0.6526	1	3	1	
LCK	2025	Cup		0	2025/1/15 9:54	3	15.01	1	Blue	top	Morgan	oeplayer:f7OKSavings	oet:team:66eRenekton	Nocturne	Lee Sin	LeBlanc	Orianna	Ornn					0.1813	0.6526	0	1	3	
LCK	2025	Cup		0	2025/1/15 9:54	3	15.01	2	Blue	jng	HamBak	oeplayer:84OKSavings	oet:team:66eBrand	Nocturne	Lee Sin	LeBlanc	Orianna	Ornn					0.4113	0.9435				
LCK	2025	Cup		0	2025/1/15 9:54	3	15.01	3	Blue	mid	Clozer	oeplayer:60OKSavings	oet:team:66eYasuo	Nocturne	Lee Sin	LeBlanc	Orianna	Ornn					0.4113	0.9435				
LCK	2025	Cup		0	2025/1/15 9:54	3	15.01	4	Blue	bot	Hype	oeplayer:24OKSavings	oet:team:66eVarus	Nocturne	Lee Sin	LeBlanc	Orianna	Ornn					0.4113	0.9435				
LCK	2025	Cup		0	2025/1/15 9:54	3	15.01	5	Blue	sup	Pollu	oeplayer:31OKSavings	oet:team:66eNautilus	Nocturne	Lee Sin	LeBlanc	Orianna	Ornn					0.4113	0.9435				
LCK	2025	Cup		0	2025/1/15 9:54	3	15.01	6	Red	top	Rich	oeplayer:6fDRX	oet:team:101Gragas	Vi	Azir	Ashe	Nidalee	Zyra					0	0.5323	0.9435			

## CLEANED DATA — Total

teamname	team2name	result	firstbluetooth	firstdratime	firstherald	firstbarontower	firsttower	firstmidreplays	teamlurk	team2lurk	golddiff10at10	xpdifffat10	csdiffat10	team1kill1lsat10	team2kill1lsat10	team1assistsat10	team2assistsat10	team1deathsat10	team2deathsat10	team1kd1asat10	team2kd1asat10	golddiffat15	xpdifffat15	csdiffat15	team1kill1lsat15	team2kill1lsat15	team1assistsat15	team2assistsat15	team1deathsat15	team2deathsat15	team1kd1asat15	team2kd1asat15		
IZI Dream Team Valj	0	0	0	0	0	0	0	0	1	8	-1724	-662	-32	0	1	0	1	1	0	0	0	2	-3837	-469	-16	0	3	0	9	3	0	0	0	12
Esprit SKillcamp	1	1	0	1	1	1	1	1	8	2	3104	1069	33	0	3	15	2	4	8	5	5.75	625	5069	2014	64	10	5	20	8	6	10	5	1.3	
Karmine (Project C)	0	0	0	0	0	0	0	1	7	10	-915	-354	-30	5	5	7	10	5	5	2.4	3	118	1990	-43	10	6	13	12	6	10	3.0	8.333333		
Zerance Lille Est	0	1	1	0	0	0	0	0	3	8	181	518	12	3	3	4	4	3	3	2.333333	2.333333	-4439	-1319	10	3	10	4	19	10	3	0.7	9.666667		
Team Vali/Karmine (C)	1	1	1	1	0	1	1	1	4	3	2582	1163	27	6	1	10	2	1	6	16	0.5	5490	2208	24	12	1	26	2	1	12	38	0.25		
IZI Dream Skillcamp	1	1	1	1	0	1	1	1	8	2	3425	2029	25	6	0	12	0	0	6	18	0	7586	4499	58	10	0	23	0	0	10	33	0		
Esprit SL Zerance	1	0	1	0	1	1	1	0	6	2	-800	-37	-12	1	1	2	1	1	3	2	-310	-625	9	1	3	2	4	3	1	1	7			
Project (Lille Est)	1	0	0	1	1	1	1	1	4	2	107	743	21	4	6	11	15	6	4	2.5	5.25	2420	2570	62	7	7	21	17	7	7	4	3.428571		
Nongshim DN Freecs	0	1	0	0	0	0	0	0	3	4	801	379	19	2	1	5	3	1	2	7	2	-230	-98	15	3	3	8	9	3	3	3.6	6.666667		
DN Freecs/Nongshim	1	1	0	0	1	1	1	1	7	2	1022	416	-6	4	2	4	0	2	4	4	0.5	2074	2160	14	6	4	6	2	4	6	3	1		
OKSavings TI Esport	0	1	0	0	0	0	0	0	5	8	135	-858	-40	2	0	5	0	0	2	7	0	-1477	-1472	-45	3	3	9	8	3	3	4	3.666667		
OKSavings TI Esport	0	0	1	1	0	0	0	0	2	4	1	-1200	0	1	1	1	0	1	1	2	1	-2548	-3476	-21	1	4	1	4	1	4	1	0.5		
BNK FEAR/Hanwha Li	0	1	1	0	0	0	0	0	2	8	-394	-986	-9	0	0	0	0	0	0	0	-2386	-3226	-9	1	4	3	8	4	4	1	1	12		
Hanwha Li/BNK FEAR	0	1	0	0	0	0	0	0	1	4	-650	-1014	-18	1	1	1	0	1	1	2	1	-1022	-2154	-25	1	1	1	0	1	1	2	1		
BNK FEAR/Hanwha Li	0	0	0	0	0	1	1	0	6	3	85	-322	-13	0	0	0	0	0	0	0	364	-241	-10	0	1	0	2	1	0	0	3			
Oplus K/LKT Rolste	0	0	0	0	0	0	0	0	0	6	-1858	-1550	-26	0	2	0	3	2	0	0	0	5	-2446	-2753	-41	1	3	2	3	3	3	1	6	
KT Rolste/Oplus K/LKT	1	1	1	1	1	1	1	1	4	3	15	-381	-11	1	0	0	0	0	0	1	0	1539	-107	13	2	0	5	0	0	2	7	0		
DRX Chall/Gen.G/Gi	1	0	0	1	1	1	1	1	4	2	262	264	7	0	0	0	0	0	0	0	0	420	-246	16	0	1	0	4	1	0	0	5		
DRX Chall/GidRDX Chall	0	0	0	1	0	0	0	1	4	-255	13	-1	0	1	0	4	1	0	0	5	-316	-1452	-34	1	1	3	4	1	1	1	4	5		
Ramboot ZETA	1	1	0	1	1	1	1	1	5	1	2115	870	29	2	0	4	0	0	2	6	0	3256	1831	45	5	2	14	5	2	5	9.5	1.4		
LUMI GUARANIES	1	1	0	1	0	1	1	1	7	2	1193	1274	29	1	0	0	0	1	1	0	1909	20	23	1	2	0	3	2	1	0.5	5.5			
GIANTZ PVen1 Vidi	0	1	1	0	0	0	0	0	4	3	-2100	-1833	-19	1	5	2	15	5	1	0.6	20	-2760	-2641	-21	3	9	5	18	9	3	0.888889	9		
Movistar UCAM Espc	0	1	0	0	1	0	1	0	3	2	336	1231	3	2	1	1	2	1	2	3	1.5	541	1032	15	2	2	1	4	2	2	1.5	3		
Los Heret/BaJa eS	1	0	0	0	0	1	1	0	5	1	1100	1768	28	2	1	3	2	1	2	5	1.5	1456	2256	48	2	1	3	2	1	2	5	1.5		
OKSavings DRX	1	0	1	1	1	1	1	1	4	1	1415	1377	26	3	1	9	3	1	3	12	1.333333	3067	2588	24	5	1	13	13	1	1	18	0.8		
DRX OKSavings	1	0	1	1	1	1	1	1	7	2	-381	-116	-11	1	1	3	2	1	1	4	3	1476	811	-6	3	1	6	2	1	3	9	1		
OKSavings DRX	0	1	0	1	0	0	1	1	2	3	1583	554	7	4	0	8	0	0	4	12	0	1993	1056	5	5	0	9	0	0	5	14	0		
DN Freecs/Nongshim	1	0	1	0	1	0	0	1	2	4	488	31	12	0	0	0	0	0	0	0	0	958	-232	-7	3	2	7	3	2	3	2	5.1		
Nongshim DN Freecs	1	0	1	0	1	1	1	1	3	-429	-491	-15	1	1	2	2	1	1	3	3	1406	557	2	4	2	9	5	2	4	6	6.5	1.75		
Nongshim DN Freecs	1	0	1	0	1	0	1	1	3	3	83	-478	-11	1	1	1	1	1	2	2	694	-772	-3	3	4	6	8	4	3	2.25	4			
Los Rator/NORD Espc	1	1	1	1	1	1	1	1	7	3	827	-80	-27	2	3	3	3	3	1	2.666667	3135	344	53	6	5	13	7	5	6	3.8	2			
GIANTZ PLU/LGM Gami	0	0	0	1	0	0	0	0	2	4	766	772	15	3	2	4	3	2	3	3	3.5	1.666667	674	-30	-8	4	2	6	3	2	4	5		
UCAM Espc/Ramboot C	0	1	0	0	0	1	0	0	2	2	-196	-382	-17	0	0	0	0	0	0	0	-566	-1314	-22	1	1	0	1	1	1	1	2			
Bulldog I/Verdant	0	0	0	0	1	0	0	0	4	7	-2	395	5	4	4	5	3	4	4	2.25	1.75	-1550	-1079	2	6	8	9	9	8	6	1.875	2.833333		
Lundqvist Los Rator	0	0	0	0	0	0	0	0	2	2	-1896	-1998	-18	1	4	2	11	4	1	0.75	15	-2149	-1866	-34	4	9	6	20	9	4	1.111111	7.25		
Veni Vid/Los Heret	0	0	0	0	0	0	0	0	0	11	-2505	-2145	-48	0	2	0	5	2	0	0	7	5695	-3272	-74	1	3	2	7	3	1	1	10		
Verdant/NORD Espc	0	1	0	0	1	0	1	1	3	4	675	406	0	3	2	4	1	2	3	3.5	1	434	-260	-12	5	5	8	7	5	2.6	2.4			
BaJa eS/ZETA	1	1	0	1	0	1	1	1	8	2	1462	1116	15	3	0	4	0	3	7	0	6864	6564	80	9	0	18	0	9	27	0	1			
Bulldog Lundqvist	1	1	1	1	1	0	0	0	2	8	-2293	105	-11	1	7	1	0	1	2	0.285714	8.5	-4968	-997	-20	3	11	8	21	11	4	8			
DN Freecs/OKSavings	1	0	1	0	1	1	1	1	1	4	-18	595																						
DN Freecs/Nongshim	1	0	1	0	1	1	1	1	2	-18	595																							
DRX Chall/OKSavings	1	0	0	1	1	1	1	1	6	4	1156	1245																						
DRX Chall/Nongshim	1	0	0	0	1	1	1	1	6	2	1156	1245																						
KT Rolste/Hanwha Li	1	1	1	1	0	0	1	1	6	4	-242	-585																						
OKSavings/DN Freecs	0	1	0	1	0	0	0	0	2	6	-650	-877																						
Nongshim DRX Chall	0	1	0	0	0	0	0	0	2	7	-334	-475																						
Hanwha Li/KT Rolste	0	0	0	0	0	0	0	0	3	2	-315	-329																						
BNK FEAR/KT Rolste	0	1	0	0	0	0	0	0	3	2	-1066	-1507																						
BNK FEAR/KT Rolste	1	1	0	1	1	1	1	1	3	1	656	140																						
KT Rolste/BNK FEAR	1	1	1	1	1	1	1	1	3	-487	-576	-18	0	0	0	0	0	0	0	0	-804	318	1	2	2	2	7	7	2	2	4.5			

collected a total of 20,170 matches

# CLEAN DATA —— Pre-game

```
# 获取最近10场比赛数据
recent_matches_team1 = get_recent_matches(team1, date, 10)
recent_matches_team2 = get_recent_matches(team2, date, 10)

if recent_matches_team1 is None or recent_matches_team2 is None:
    continue

# 计算历史对战数据
head_to_head = df[((df['team1name'] == team1) & (df['team2name'] == team2)) |
                   ((df['team1name'] == team2) & (df['team2name'] == team1)) &
                   (df['date'] < date)]

team1_wins = len(head_to_head[(head_to_head['team1name'] == team1) & (head_to_head['result'] == 1)]) + \
len(head_to_head[(head_to_head['team2name'] == team1) & (head_to_head['result'] == 0)])
team2_wins = len(head_to_head) - team1_wins

# 计算最近10场比赛的胜率
team1_recent_win_rate = calculate_win_rate(recent_matches_team1, team1)
team2_recent_win_rate = calculate_win_rate(recent_matches_team2, team2)

# 计算当前赛季的胜率
current_season = df[(df['year'] == match['year']) & (df['split'] == match['split']) & (df['date'] < date)]
team1_season_win_rate = calculate_win_rate(current_season, team1)
team2_season_win_rate = calculate_win_rate(current_season, team2)

# 计算首龙率、先锋率和首塔率
def calculate_first_rates(matches):
    if matches.empty:
        return 0, 0, 0 # 返回0值
    first_dragon_rate = matches['firstdragon'].mean() # 假设值为1表示队伍赢得首龙
    first_herald_rate = matches['firstherald'].mean() # 假设值为1表示队伍赢得先锋
    first_tower_rate = matches['firstattower'].mean() # 假设值为1表示队伍赢得首塔
    first_baron_rate = matches['firstbaron'].mean() # 假设值为1表示队伍赢得首塔
    return first_dragon_rate, first_herald_rate, first_tower_rate, first_baron_rate
```

Cycle data processing, obtain pre-match prediction data: records of the last ten games between the two teams, the team's winning rate of the last ten games, the team's winning rate this season, the team's relevant data average of the last ten games.

# CLEANED DATA — Pre-game

match_id	league	year	split	date	team1	team2	result	team1_hist	team2_hist	team1_rec	team2_rec	team1_season	team2_season	team1_firs	team1_firs	team1_firs	team2_firs	team2_firs	team2_firs
					orical_wins	orical_wins	ent_win_rate	ent_win_rate	ent_win_rate	ent_win_rate	_win_rate	_win_rate	t_dragon_rate	t_herald_rate	t_tower_rate	t_dragon_rate	t_herald_rate	t_tower_rate	
LCKC_2022	LCKC	2023	Spring	2023/1/30 5:07	DN Freecs	Gen.G Glol	0	0	0	0.4	0.2	0.012195122	0.006097561	0.5	0.6	0.7	0.3	0.7	0.3
LCKC_2022	LCKC	2023	Spring	2023/1/30 5:58	Gen.G Glol	DN Freecs	0	1	0	0.2	0.3	0.009118541	0.012158055	0.3	0.6	0.3	0.4	0.5	0.6
LCKC_2022	LCKC	2023	Spring	2023/1/30 6:54	DN Freecs	Gen.G Glol	1	1	1	0.4	0.2	0.015151515	0.009090909	0.3	0.4	0.5	0.2	0.6	0.3
LCKC_2022	LCKC	2023	Spring	2023/1/30 8:14	Dplus KIA	T1 Esports	1	0	0	0.8	0.8	0.024169184	0.024169184	0.5	0.2	0.2	0.4	0.6	0.6
LCKC_2022	LCKC	2023	Spring	2023/1/30 9:21	T1 Esports	Dplus KIA	1	0	1	0.7	0.8	0.024096386	0.027108434	0.3	0.6	0.6	0.5	0.3	0.3
LCKC_2022	LCKC	2023	Spring	2023/1/30 10:15	Dplus KIA	T1 Esports	1	1	1	0.7	0.7	0.027027027	0.027027027	0.6	0.4	0.3	0.4	0.7	0.7
LCKC_2022	LCKC	2023	Spring	2023/1/30 13:47	DRX Challengers	Liiv SANDI	1	1	1	0.5	0.3	0.014880952	0.008928571	0.2	0.6	0.4	0.1	0.7	0.5
LCKC_2022	LCKC	2023	Spring	2023/1/31 12:03	KT Rolster	Hanwha Life	1	0	1	0.6	0.8	0.017045455	0.022727273	0.4	0.8	0.7	0.6	0.5	0.6
LCKC_2022	LCKC	2023	Spring	2023/1/31 12:54	Hanwha Life	KT Rolster	0	1	1	0.7	0.7	0.02266289	0.019830028	0.6	0.6	0.7	0.4	0.8	0.7
LCK_2023-LCK		2023	Spring	2023/2/1 8:07	Liiv SANDI	Nongshim I	1	0	0	0.6	0.3	0.015789474	0.007894737	0.5	0.7	0.5	0.3	0.5	0.7
LCK_2023-LCK		2023	Spring	2023/2/1 9:00	Nongshim I	Liiv SANDI	0	0	1	0.3	0.7	0.007874016	0.018372703	0.4	0.4	0.7	0.6	0.6	0.5
LCK_2023-LCK		2023	Spring	2023/2/1 11:35	Gen.G	Dplus KIA	1	1	0	0.7	0.7	0.018276762	0.018276762	0.5	0.5	0.6	0.4	0.5	0.6
LCKC_2022	LCKC	2023	Spring	2023/2/25:10	Dplus KIA	DRX Challengers	1	0	0	0.7	0.6	0.024691358	0.014814815	0.6	0.4	0.4	0.2	0.6	0.4
LCKC_2022	LCKC	2023	Spring	2023/2/25:11	KT Rolster	T1 Esports	1	0	0	0.7	0.6	0.019704433	0.022167488	0.3	0.8	0.6	0.3	0.7	0.8
LCKC_2022	LCKC	2023	Spring	2023/2/25:13	Hanwha Life	DN Freecs	1	0	0	0.6	0.5	0.01965602	0.014742015	0.6	0.6	0.6	0.3	0.4	0.5
LCKC_2022	LCKC	2023	Spring	2023/2/26:04	DN Freecs	Hanwha Life	0	0	1	0.5	0.6	0.014705882	0.022058824	0.3	0.5	0.6	0.6	0.6	0.6
LCKC_2022	LCKC	2023	Spring	2023/2/26:10	T1 Esports	KT Rolster	0	0	1	0.5	0.7	0.02200489	0.02200489	0.3	0.7	0.8	0.2	0.9	0.6
LCKC_2022	LCKC	2023	Spring	2023/2/26:26	DRX Challengers	Dplus KIA	0	0	1	0.6	0.8	0.014634146	0.026829268	0.2	0.5	0.5	0.7	0.3	0.4
LCK_2023-LCK		2023	Spring	2023/2/29:01	BRION	DRX	0	1	0	0.5	0.3	0.014563107	0.007281553	0.5	0.7	0.7	0.3	0.5	0.4
LCK_2023-LCK		2023	Spring	2023/2/29:50	DRX	BRION	0	1	1	0.4	0.4	0.00968523	0.014527845	0.2	0.4	0.3	0.4	0.7	0.6
LCK_2023-LCK		2023	Spring	2023/2/21:23	Hanwha Life	T1	0	0	0	0.4	0.8	0.009661836	0.019323671	0.5	0.8	0.3	0.5	0.5	0.6
LCK_2023-LCK		2023	Spring	2023/2/21:29	T1	Hanwha Life	0	1	0										
LCK_2023-LCK		2023	Spring	2023/2/21:31	Hanwha Life	T1	1	1	1										
LCKC_2022	LCKC	2023	Spring	2023/2/35:07	Gen.G Glol	Nongshim I	0	0	0										
LCKC_2022	LCKC	2023	Spring	2023/2/35:08	Liiv SANDI	BRION Challengers	0	0	0										
LCKC_2022	LCKC	2023	Spring	2023/2/36:04	Liiv SANDI	BRION Challengers	1	0	1										
LCKC_2022	LCKC	2023	Spring	2023/2/36:13	Gen.G Glol	Nongshim I	1	0	1										

We collected a total of **15,946** matches

# MODEL DATA

## Pre-game prediction model

MODEL	Type	Feature	Label
Pre-game	Match record	'team1_historical_wins','team2_historical_wins'	result
	Win rate	'team1_recent_win_rate','team2_recent_win_rate','team1_season_win_rate','team2_season_win_rate'	result
	Team Status	'team1_first_dragon_rate','team1_first_herald_rate','team1_first_tower_rate','team2_first_dragon_rate','team2_first_herald_rate','team2_first_tower_rate'	result

# CLEANED DATA — In-game

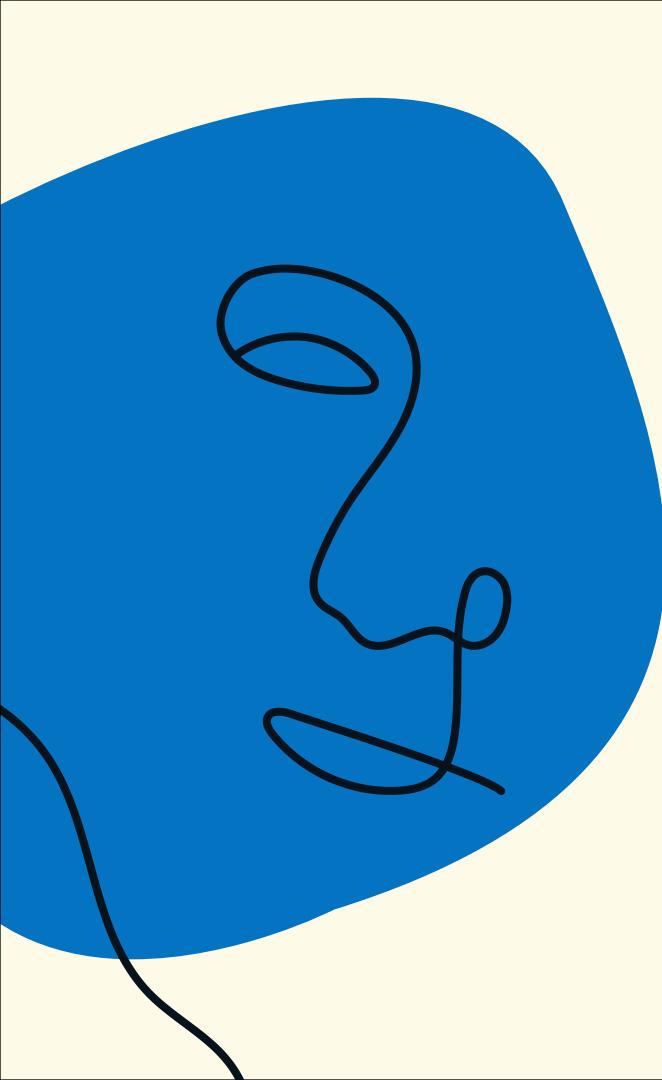
teamname	teamname	result	firstblood	firstdraf	firstherald	firstbaron	firsttower	firstmid	team1tur	team2tur	golddiff	xpdifffat	csdiffat	team1kil	team2kil	team1ass	team2ass	team1dea	team2dea	team1_kd	team2_kd	golddiff	xpdifffat	csdiffat	team1kil	team2kil	team1ass	team2ass	team1dea	team2dea	team1_kd	team2_kd		
one	two	od	gon	ald	on	er	tower	replayt	s	replayt	at10	10	10	1sat10	1sat10	1stsat10	1stsat10	1thsat10	1thsat10	1sat10	1sat15	15	15	15	1sat15	1sat15	1stsat15	1stsat15	1thsat15	1thsat15	1sat15	1sat15		
IZI DreamTeam	Vali	0	0	0	0	0	0	0	1	8	-1722	-662	-32	0	1	0	1	1	0	0	2	-3837	-469	-16	0	3	0	9	3	0	0	12		
Esprit SiSkilcamp		1	1	0	1	1	1	1	8	2	3104	1069	33	8	3	15	2	4	8	5	5.75	0.625	5069	2014	64	10	5	20	8	6	10	5	1.3	
Karmine (Project C)		0	0	0	0	0	0	0	1	7	10	-915	-354	-30	5	5	7	10	5	5	2.4	3	118	1990	-43	10	6	13	12	6	10	3.833333	1.8	
Zerance Lille Esp		0	1	1	0	0	0	0	3	8	181	518	12	3	3	4	4	3	3	2.333333	2.333333	-4439	-1319	10	3	10	4	19	10	3	0.79	6.666667		
Team ValiKarmine (		1	1	1	1	1	0	1	1	4	3	2582	1163	27	6	1	10	2	1	6	0.5	5.490	2208	24	12	1	26	2	1	12	38	0.25		
IZI Dream Skilcamp		1	1	1	1	1	0	1	1	8	2	3425	2029	25	6	0	12	0	0	6	18	0	7586	4499	58	10	0	23	0	0	10	33	0	
Esprit SiZerance		1	0	1	0	1	1	0	6	2	-800	-37	-12	1	1	2	1	1	1	3	2	-310	-625	9	1	3	2	4	3	1	1	7		
Project (Lille Esp		1	0	0	0	1	1	1	4	2	107	743	21	4	6	11	15	6	4	2.5	5.25	2420	2570	62	7	7	21	17	7	7	4.342857			
Nongshin DN Freecs		0	1	0	0	0	0	0	3	4	801	379	19	2	1	5	3	1	2	7	2	-230	-98	15	3	3	8	9	3	3	3.666667			
DN Freecs Nongshin		1	1	0	0	0	1	1	1	7	2	1022	416	-6	4	2	4	0	2	4	4	0.5	2074	2160	14	6	4	6	2	4	6	3		
OKSavings Ti Esport		0	1	0	0	0	0	0	5	8	135	-858	-40	2	0	5	0	0	2	7	0	-1477	-1472	-45	3	3	9	8	3	3	4.3666667			
OKSavings Ti Esport		0	0	0	1	1	0	0	2	4	-1	-1200	0	1	1	1	0	1	1	2	1	-2548	-3476	-21	1	4	1	4	1	1	0.58			
BNK FEAR! Hanwha Li		0	1	1	0	0	0	0	2	8	-394	-986	-9	0	0	0	0	0	0	0	0	-2386	-3226	-9	1	4	3	8	4	1	1	12		
Hanwha Li BNK FEAR!		0	1	0	0	0	0	0	1	4	-650	-1014	-18	1	1	1	0	1	1	2	1	-1022	-2154	-25	1	1	1	0	1	1	2	1		
Hanwha Li BNK FEAR!		0	0	0	0	0	1	1	0	6	3	85	-322	-13	0	0	0	0	0	0	0	0	364	-241	-10	0	1	0	2	1	0	0		
Dplus K1/KT Rolste		0	0	0	0	0	0	0	0	6	-1858	-1550	-26	0	2	0	3	2	0	0	5	-2446	-2753	-41	1	1	3	2	3	3	1	1	6	
KT Rolste Dplus K1/		1	1	1	1	1	1	1	4	3	15	-381	-11	1	0	2	0	0	1	3	0	1539	-107	13	2	0	0	5	0	0	2	7		
DRX ChallGen G Glc		1	0	0	1	1	1	1	4	2	262	264	7	0	0	0	0	0	0	0	0	420	246	16	0	1	0	4	1	0	0	5		
Gen. G Glc DRX Chall		0	0	0	0	1	0	0	1	4	-255	13	-1	0	1	0	4	1	0	0	5	-316	-1452	-34	1	1	3	4	1	1	4	1		
Ramboot ZETA		1	0	0	1	1	1	1	5	1	2115	870	29	2	0	4	0	0	2	6	0	3256	1831	45	5	2	14	5	2	5	9.5	1.4		
LUA Gamir Guasones		1	1	0	1	0	1	1	7	2	1193	1274	29	1	0	0	0	1	1	0	1909	20	23	1	2	0	3	2	1	0.5				
GIANXT PiVeni Vidi		0	1	1	0	0	0	0	4	3	-2100	-1833	-19	1	5	2	15	5	1	0.6	20	-2760	-2641	-21	3	9	5	18	9	3.888889				
Movistar UCAM Espo		0	1	0	0	1	0	1	3	2	336	1231	3	2	1	1	2	1	2	3	1.5	541	1032	15	2	2	1	4	2	2	1.5			
Los HeretBarça eSp		1	0	0	0	0	1	1	0	5	1	1100	1768	28	2	1	3	2	1	2	5	1.5	1456	2256	48	2	1	3	2	1	2	5.15		
OKSavings DRX		1	0	1	1	1	1	1	4	1	1415	1377	26	3	1	9	3	1	3	12.333333	3067	2588	24	5	1	13	3	1	5	18	0.8			
DRX OKSavings		1	0	1	1	1	1	1	7	2	-381	-116	-11	1	1	3	2	1	1	4	3	1476	811	-6	3	1	6	2	1	3	9	1		
OKSavings DRX		0	1	0	1	0	0	1	2	3	1583	554	7	4	0	8	0	0	4	12	0	1993	1056	5	5	0	9	0	0	5	14	0		
DN Freecs Nongshin		1	0	1	1	0	0	1	2	4	488	31	12	0	0	0	0	0	0	0	0	0	958	-232	-7	3	2	7	3	2	3	5.1666667		
Nongshin DN Freecs		1	0	1	1	1	1	1	3	4	-429	-491	-15	1	1	2	2	1	1	3	3	1.406	557	2	4	2	9	5	2	4	6.5	1.75		
DN FreecNongshin		1	0	1	0	0	1	0	1	3	3	83	-478	-11	1	1	1	1	1	2	2	694	-772	-3	3	4	8	4	3	4	3.25			
Los Rotor NORD Espo		1	1	1	1	1	1	1	7	3	827	-80	27	2	3	3	3	3	3	2	1.666667	3	3135	344	53	6	5	13	7	5	6.38			
GIANXT PiVeni LUA Gamir		0	0	0	1	0	0	0	2	4	766	772	15	3	2	4	3	2	3	3.5	1.666667	674	-30	-8	4	2	6	3	2	4	5.125			
UCAM Espo Ramboot		0	1	0	0	0	0	1	2	2	-196	-382	-17	0	0	0	0	0	0	0	0	-566	-1314	-22	1	1	0	1	1	1	1			
Bulldog FVerdant		0	0	0	0	1	0	0	4	7	-2	395	5	4	4	5	3	4	4	4	2.25	1.75	-1550	-1079	2	6	8	9	9	8	6	1.875	2.833333	
Movistar Guasones		1	0	0	0	1	0	1	1	6	3	667	1276	46	0	1	0	1	1	0	0	2	2704	2262	47	6	4	19	8	4	6	6.25		
Lundqvist Los Rotor		0	0	0	0	0	0	0	2	2	-1896	-1998	-18	1	4	2	11	4	1	0.75	15	-2149	-1866	-34	4	9	6	20	9	4	1.111111			
Veni VidoLlos Heret		0	0	0	0	0	0	0	0	11	-2505	-2145	-48	0	2	0	5	2	0	0	7	-5695	-3272	-74	1	3	2	7	3	1	1	1		
Verdant NORD Espo		0	1	0	0	1	0	1	1	3	4	675	406	0	3	2	4	1	2	3	3.5	1.434	-260	-12	5	5	8	7	5	5	2.6			
Barça eSp ZETA		1	0	0	1	0	0	1	1	8	2	1462	1116	15	3	0	4	0	0	3	7	0	6864	6564	80	9	0	18	0	0	9	27	0	
Bulldog Lundqvist		1	1	1	1	1	0	0	2	8	-2293	105	-11	1	7	1	10	7	2	0.285714	8.5	-4968	-997	-20	3	11	8	21	11	4	1			
DN Freecs OKSavings		1	0	1	0	1	1	1	1	4	-18	595																						571429
DN Freecs Nongshin		1	0	1	0	1	1	1	1	2	-18	595																						571429
DRX ChallOKSavings		1	0	0	1	1	1	1	6	4	1156	1245																					5	
DRX ChallNongshin		1	0	0	0	1	1	1	6	2	1156	1245																					5	
KT Rolste Hanwha Li		1	1	1	1	0	0	0	1	6	4	-242	-585																				1	
OKSavings DN Freecs		0	1	0	1	0	0	0	0	2	6	-650	-877																				6.25	
Nongshin DRX Chall		0	1	0	0	0	0	0	0	2	7	-334	-475																				11	
Hanwha Li KT Rolste		0	0	0	0	0	0	0	0	3	2	-315	-329																				333333	
BNK FEAR! BNK Rolste		0	1	0	0	0	0	0	0	3	2	-1066	-1507																				6.666667	
BNK FEAR! BNK Rolste		1	1	0	1	1	1	1	3	1	656	140																					1.2	
KT Rolste BNK FEAR!		1	1	1	1	1	0	1	1	3	-487	-576																					4.5	

collected a total of 20,170 matches

# MODEL DATA

## In-game prediction model

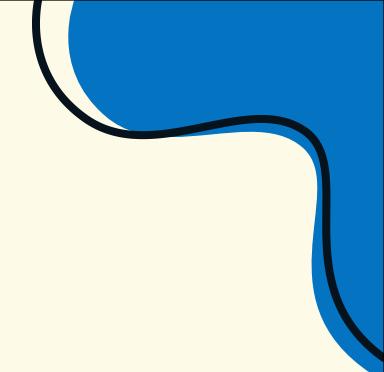
Model	Features	Label
Early Game (10-min)	'golddiffat10', 'xpdiffat10', 'csdiffat10', 'team1_kdaat10', 'team2_kdaat10'	result
Mid Game (15-min)	'golddiffat15', 'xpdiffat15', 'csdiffat15', 'team1_kdaat15', 'team2_kdaat15', 'team1turretplates', 'team2turretplates', <b>'firstblood', 'firstdragon', 'firstrerald', 'firstattower'</b>	result
Late Game	'golddiffat15', 'xpdiffat15', 'csdiffat15', 'team1_kdaat15', 'team2_kdaat15', <b>'firstblood', 'firstdragon', 'firstrerald', 'firstattower', 'team1turretplates', 'team2turretplates', 'firstbaron', 'firstmidtower'</b>	result



## **03.**

# **PREDICT MODEL**

## **—Random Forest**



# Pre-Game

```
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.1, random_state=42)

# 使用随机森林模型
rf_model = RandomForestClassifier(
    n_estimators=500, # 树的数量
    max_depth=10,     # 限制树深度
    min_samples_split=10, # 最小分裂样本数
    class_weight="balanced", # 处理类别不平衡
    random_state=42
)

# 训练模型
rf_model.fit(X_train, y_train)

# 评估模型
rf_train_score = rf_model.score(X_train, y_train)
rf_test_score = rf_model.score(X_test, y_test)

print(f'Random Forest Train Accuracy: {rf_train_score:.5f}')
print(f'Random Forest Test Accuracy: {rf_test_score:.5f}'')
```

Pregame Model - Train Accuracy: 0.74225  
Pregame Model - Test Accuracy: 0.63699

## Classification Report:

	precision	recall	f1-score	support
0	0.60	0.63	0.62	738
1	0.67	0.64	0.65	857
accuracy			0.64	1595
macro avg	0.64	0.64	0.64	1595
weighted avg	0.64	0.64	0.64	1595

# Early Game (10-min)

```
# 固定比例划分（保持时序性）
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.25, shuffle=False)
```

```
# 训练模型
```

```
model1 = RandomForestClassifier(
    n_estimators=100, # 树的数量
    max_depth=7,      # 限制树深度
    min_samples_split=10, # 最小分裂样本数
    class_weight="balanced", # 处理类别不平衡
    random_state=42
)
model1.fit(X_train, y_train)
```

```
# 预测
```

```
y_pred = model1.predict(X_test)
```

```
Random Forest Train Accuracy: 0.7111786871157533
Random Forest Test Accuracy:: 0.701368233194527

Classification Report:
precision    recall   f1-score   support
          0       0.68     0.68     0.68     2333
          1       0.72     0.72     0.72     2710

accuracy                           0.70     5043
macro avg       0.70     0.70     0.70     5043
weighted avg    0.70     0.70     0.70     5043
```

# Mid Game (15-min)

```
# 固定比例划分 (保持时序性)
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, shuffle=False)
```

```
# 训练模型
```

```
model2 = RandomForestClassifier(
    n_estimators=100, # 树的数量
    max_depth=10,     # 限制树深度
    min_samples_split=10, # 最小分裂样本数
    class_weight="balanced", # 处理类别不平衡
    random_state=42
)
model2.fit(X_train, y_train)
```

```
# 预测
y_pred = model2.predict(X_test)
```

```
Random Forest Train Accuracy: 0.813708477937531
Random Forest Test Accuracy: 0.7476450173525038
```

```
Classification Report:
```

	precision	recall	f1-score	support
0	0.72	0.73	0.72	1836
1	0.77	0.76	0.77	2198
accuracy			0.75	4034
macro avg	0.75	0.75	0.75	4034
weighted avg	0.75	0.75	0.75	4034

# Late Game

```
# 划分数据
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.3, shuffle=False)

# 训练模型
model3 = RandomForestClassifier(
    n_estimators=100,
    max_depth=10,
    min_samples_split=10,
    class_weight="balanced",
    random_state=42
)
model3.fit(X_train, y_train)
```

Random Forest Train Accuracy: 0.8771867696012465  
Random Forest Test Accuracy:: 0.8472979672781359

Classification Report:

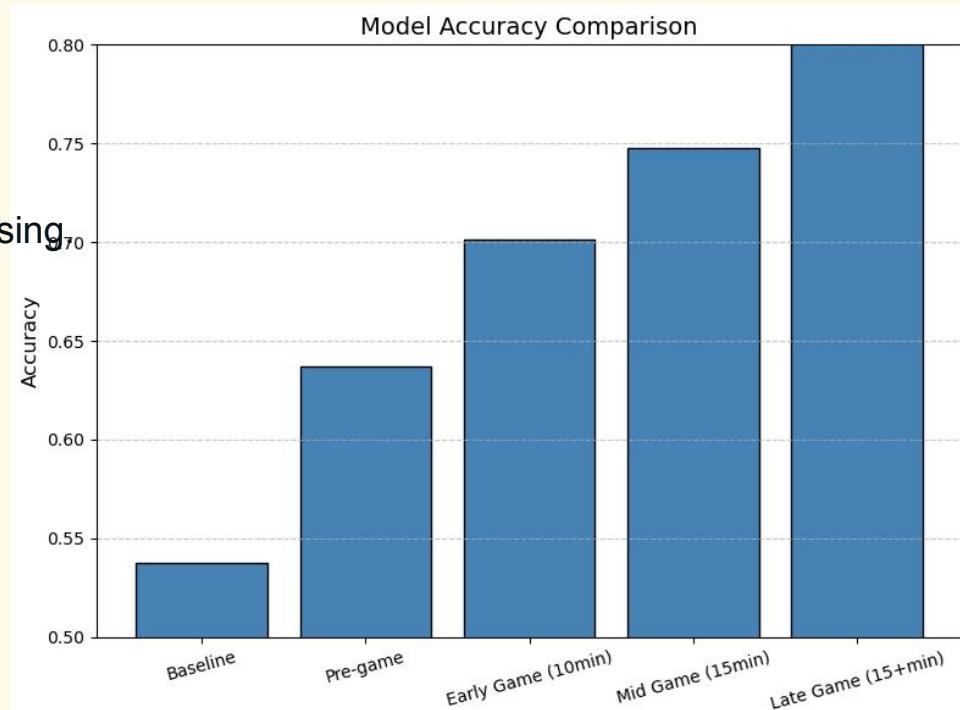
	precision	recall	f1-score	support
0	0.84	0.83	0.84	2831
1	0.85	0.86	0.86	3220
accuracy			0.85	6051
macro avg	0.85	0.85	0.85	6051
weighted avg	0.85	0.85	0.85	6051

# Accuracy Comparison

## Compare with Baseline Model

- Baseline Model: a naive classifier that always predicts the most frequent class
- Accuracy: significantly exceed this baseline performance, accuracy higher than random guessing

Model	Accuracy
Baseline	0.537304
Pre-game	0.636991
Early Game (10min)	0.701368
Mid Game (15min)	0.747645
Late Game (15+min)	0.847298

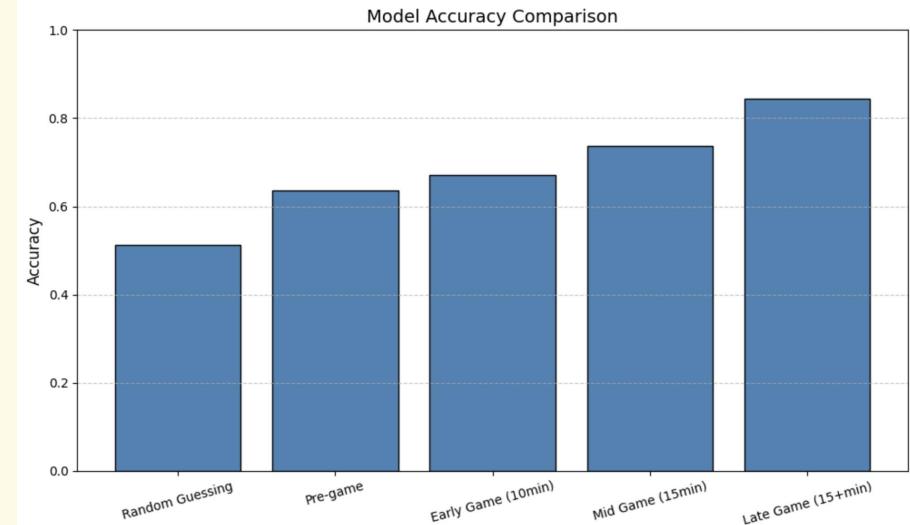


# Accuracy Comparison

## Compare with Random Guessing Accuracy

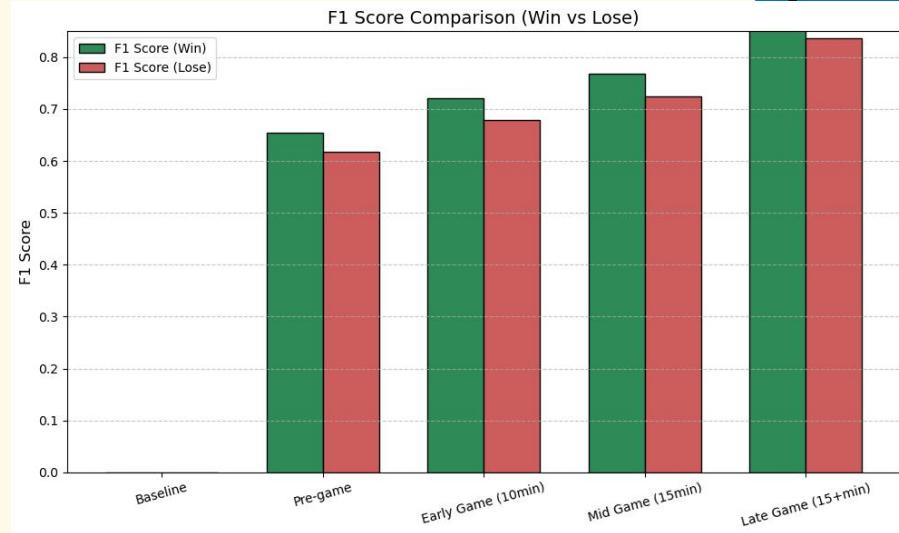
- Random guess model: A simple benchmark model that makes predictions by random selection, with accuracy based on the distribution of actual classes.
- Accuracy: significantly exceeds the benchmark performance of this random guess.

Model	Accuracy
Random Guessing	0.513480
Pre-game	0.636991
Early Game (10min)	0.672021
Mid Game (15min)	0.735994
Late Game (15+min)	0.843332

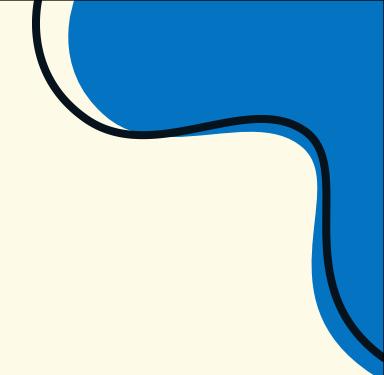


# Accuracy Comparison

F1-score: balanced F1-scores for both winning and losing outcomes, demonstrating its ability to handle class imbalance and make fair predictions.



Model	Accuracy	F1 Score (Win)	F1 Score (Lose)
Baseline	0.537304	0.000000	0.000000
Pre-game	0.636991	0.654328	0.617822
Early Game (10min)	0.701368	0.721111	0.678617
Mid Game (15min)	0.747645	0.767580	0.723970
Late Game (15+min)	0.847298	0.857231	0.835879

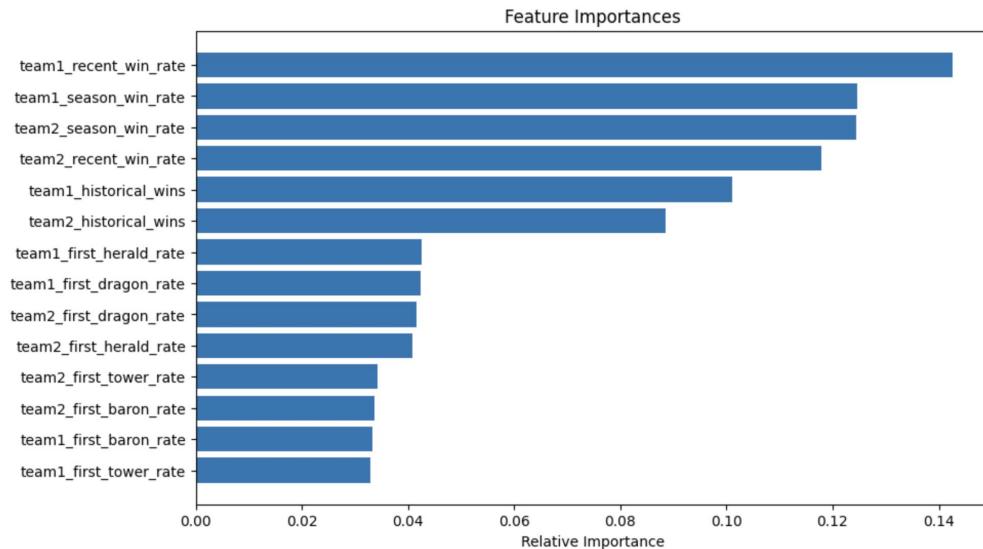


## 04. Result Visualization

# Pre-Game

## Feature Importance

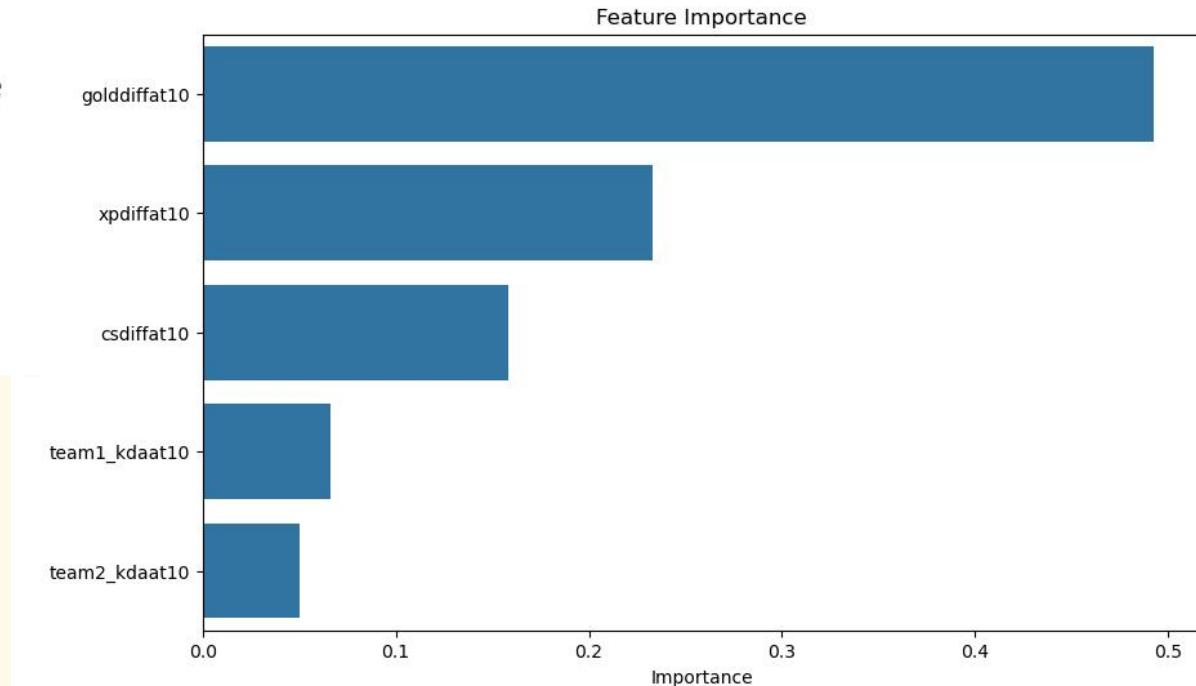
	Feature	Importance
2	team1_recent_win_rate	0.142566
4	team1_season_win_rate	0.124579
5	team2_season_win_rate	0.124359
3	team2_recent_win_rate	0.117817
0	team1_historical_wins	0.101156
1	team2_historical_wins	0.088422
9	team1_first_herald_rate	0.042471
8	team1_first_dragon_rate	0.042347
11	team2_first_dragon_rate	0.041515
13	team2_first_herald_rate	0.040755
12	team2_first_tower_rate	0.034162
7	team2_first_baron_rate	0.033698
6	team1_first_baron_rate	0.033244
10	team1_first_tower_rate	0.032908



# Early Game (10-min)

特征重要性：

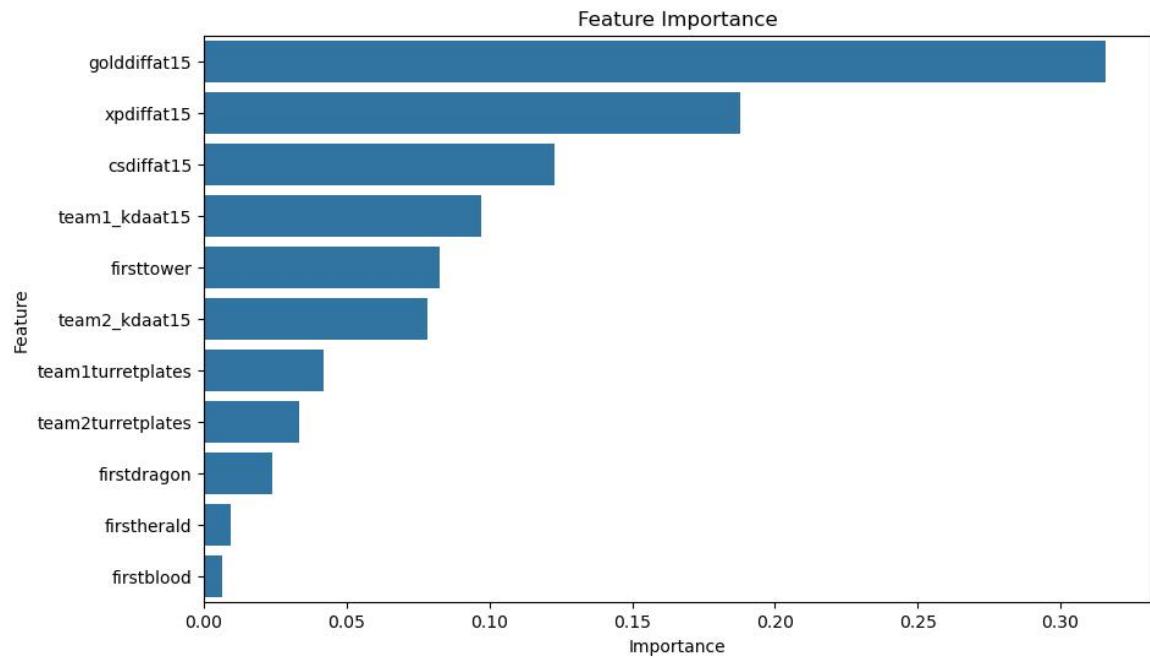
	Feature	Importance
0	golddiffat10	0.492442
1	xpdiffat10	0.232880
2	csdiffat10	0.158326
3	team1_kdaat10	0.066097
4	team2_kdaat10	0.050255



# Mid Game (15-min)

特征重要性:

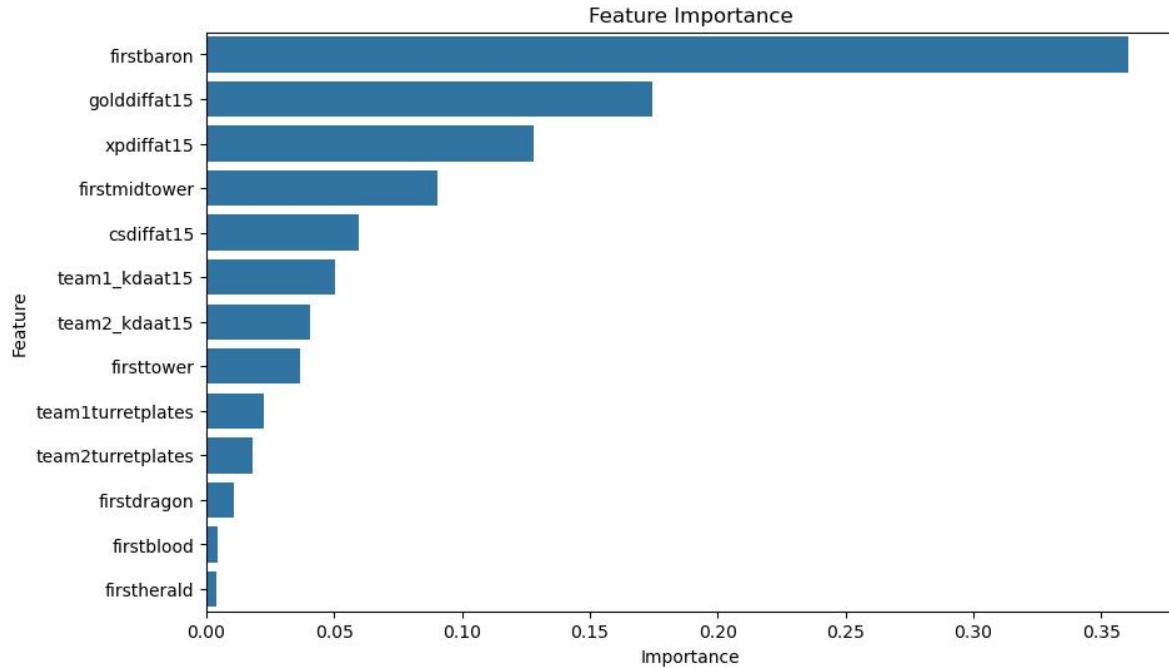
	Feature	Importance
0	golddiffat15	0.315833
1	xpdiffat15	0.187906
2	csdiffat15	0.122682
3	team1_kdaat15	0.096987
8	firsttower	0.082755
4	team2_kdaat15	0.078372
9	team1turretplates	0.041976
10	team2turretplates	0.033450
6	firstdragon	0.024079
7	firstherald	0.009506
5	firstblood	0.006453



# Late Game

特征重要性:

	Feature	Importance
11	firstbaron	0.360707
0	golddiffat15	0.174362
1	xpdiffat15	0.128194
12	firstmidtower	0.090541
2	csdiffat15	0.059752
3	team1_kdaat15	0.050154
4	team2_kdaat15	0.040326
8	firsttower	0.036679
9	team1turretplates	0.022400
10	team2turretplates	0.018020
6	firstdragon	0.010615
5	firstblood	0.004422
7	firstherald	0.003828



The background features abstract, organic shapes in a light cream color. A large, solid blue circle is positioned in the center-right area. Smaller, irregular blue and cream shapes are scattered around the perimeter.

**THANKS!**