

Data Generation Tools



Team HELIOS2024

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Introduction and Background

RoboCup Soccer

- Primary objective
 - Development of soccer robots that win against human champions
- Secondary objectives
 - Development of physical robots
 - Development of decision making

Most contributing part
of 2D league



Introduction and Background



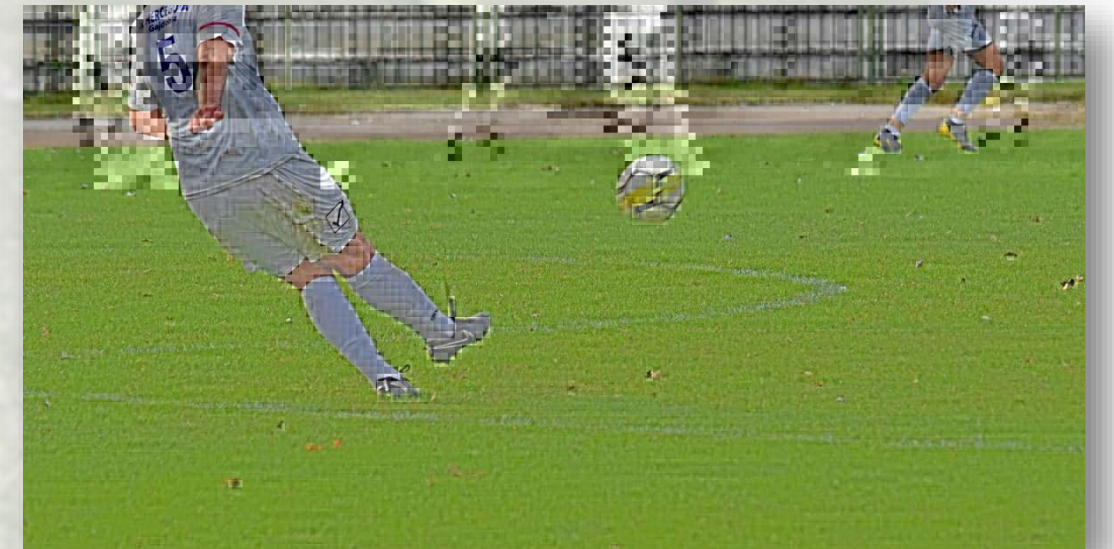
Development of decision making

- Tactics

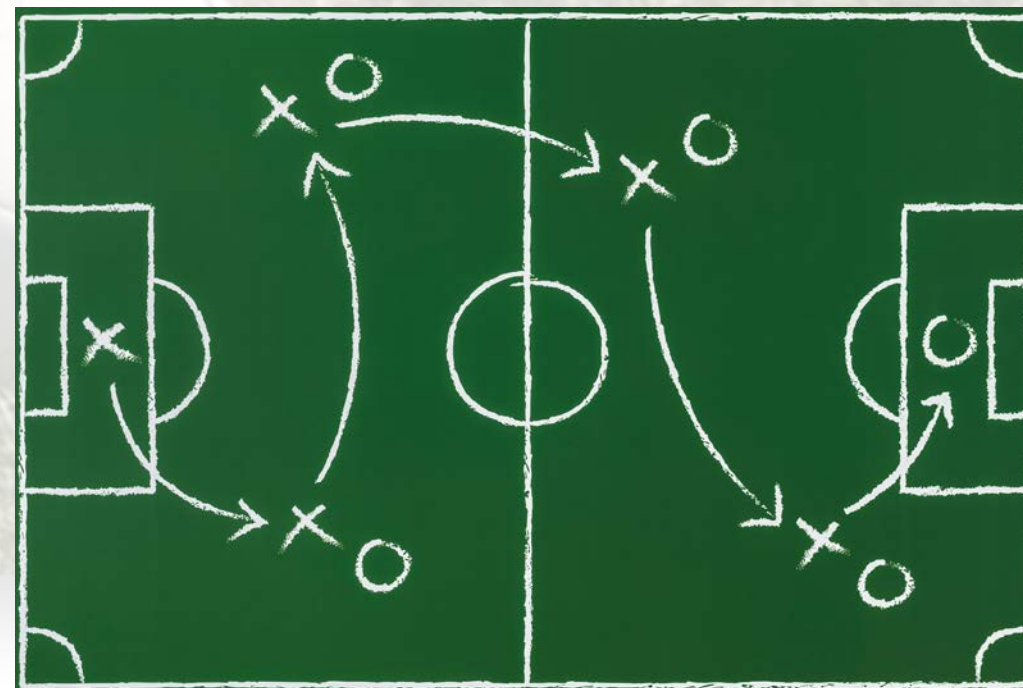


Pass

Dribble



- Strategies

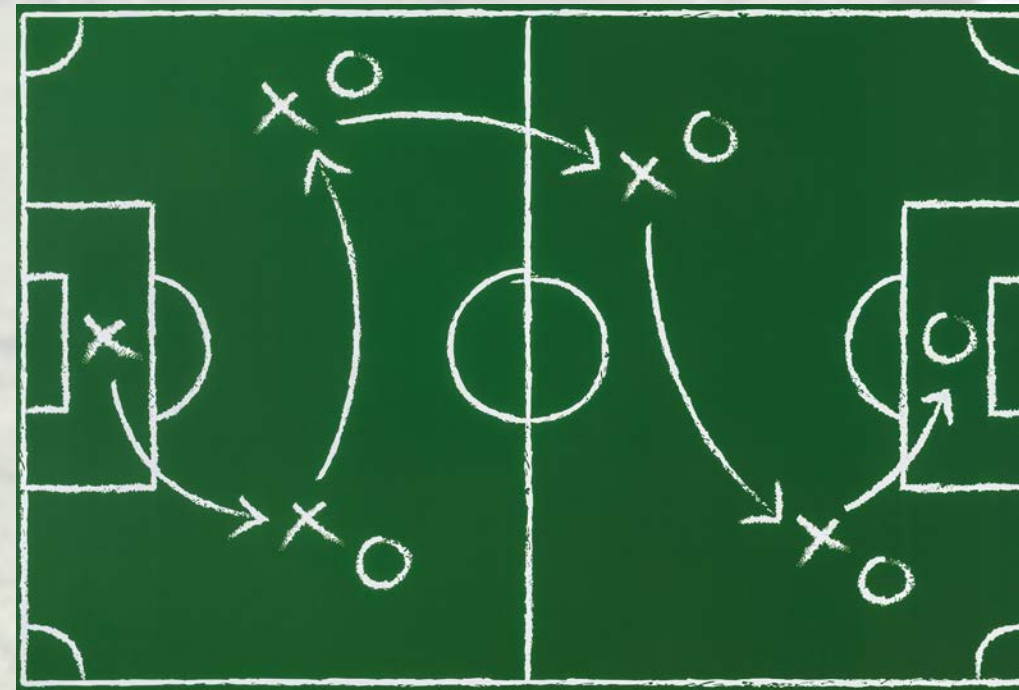


Team play

Introduction and Background



Strategies



Team play

Analyze/Develop team's strategies by AI

Machine learning, Statistics, Simulation, etc.

Strength of Soccer Simulation 2D

- High compatibility with data analysis
 - Strategy-oriented team development
- Repeatability
 - Agents play as long as electricity lasts

We need a
lot of data!



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 - Strategy-oriented team development
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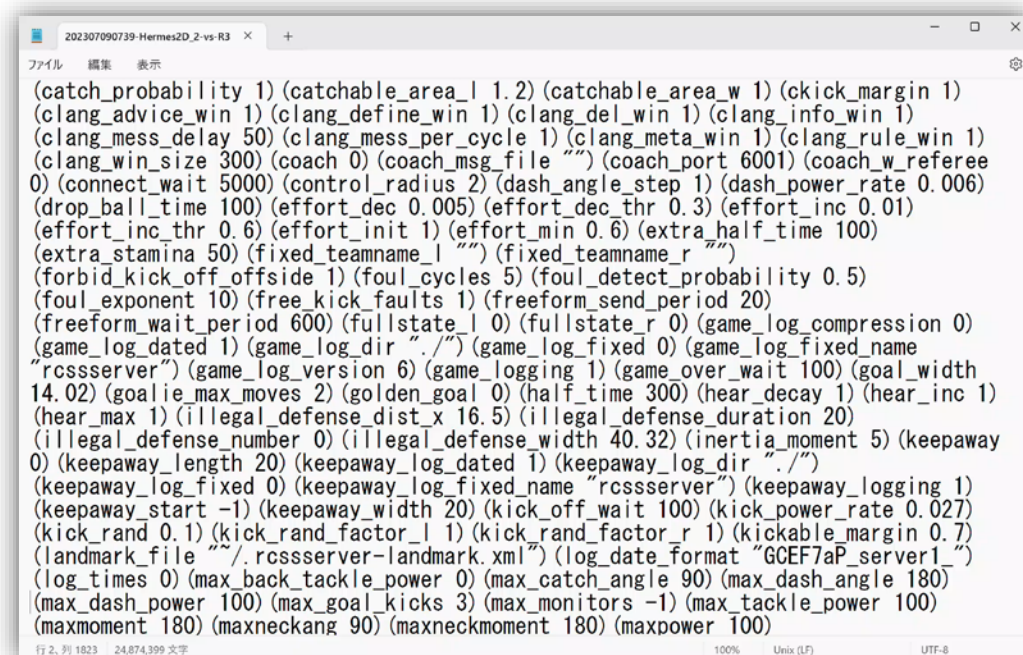
You can make
a lot of data!



Logs Are Just Not Enough

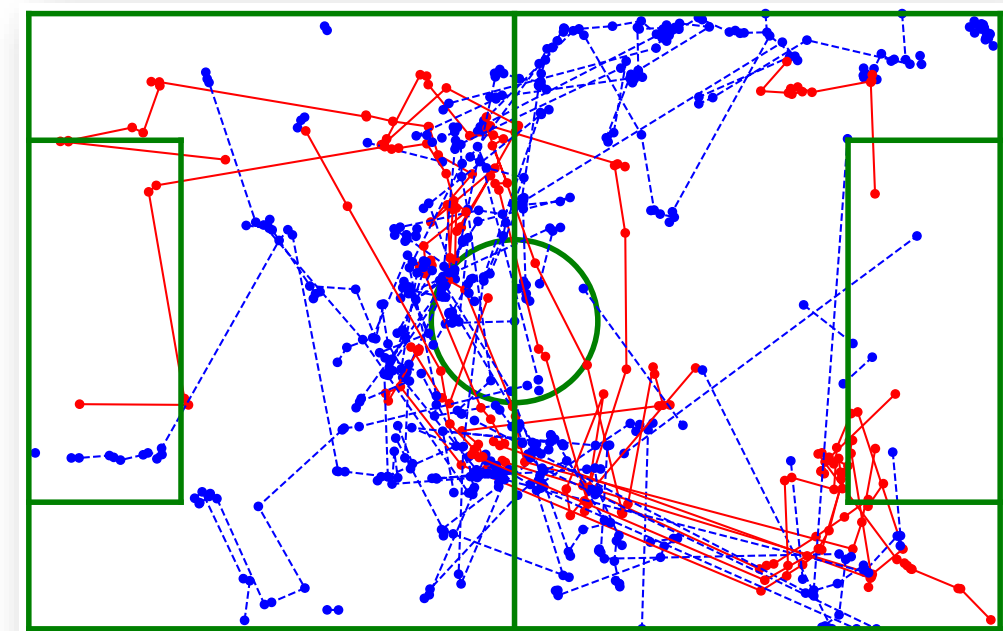
Game logs have **No event information**

- Only actions are included
- Tools are necessary for extracting events such as pass, dribble, etc.



```
(catch_probability 1) (catchable_area_l 1.2) (catchable_area_w 1) (ckick_margin 1)
(ciang_advice_win 1) (clang_define_win 1) (clang_del_win 1) (clang_info_win 1)
(ciang_mess_delay 50) (clang_mess_per_cycle 1) (clang_meta_win 1) (clang_rule_win 1)
(ciang_win_size 300) (coach 0) (coach_msg_file "") (coach_port 6001) (coach_w_referee
0) (connect_wait 5000) (control_radius 2) (dash_angle_step 1) (dash_power_rate 0.006)
(drop_ball_time 100) (effort_dec 0.005) (effort_dec_thr 0.3) (effort_inc 0.01)
(effort_inc_thr 0.6) (effort_init 1) (effort_min 0.6) (extra_half_time 100)
(extra_stamina 50) (fixed_teamname_l "") (fixed_teamname_r "")
(forbid_kick_off_offside 1) (foul_cycles 5) (foul_detect_probability 0.5)
(foul_exponent 10) (free_kick_faults 1) (freeform_send_period 20)
(freeform_wait_period 600) (fullstate_l 0) (fullstate_r 0) (game_log_compression 0)
(game_log_dated 1) (game_log_dir ".") (game_log_fixed 0) (game_log_fixed_name
"rcssserver") (game_log_version 6) (game_logging 1) (game_over_wait 100) (goal_width
14.02) (goalie_max_moves 2) (golden_goal 0) (half_time 300) (hear_decay 1) (hear_inc 1)
(hear_max 1) (illegal_defense_dist_x 16.5) (illegal_defense_duration 20)
(illegal_defense_number 0) (illegal_defense_width 40.32) (inertia_moment 5) (keepaway
0) (keepaway_length 20) (keepaway_log_dated 1) (keepaway_log_dir ".")
(keepaway_log_fixed 0) (keepaway_log_fixed_name "rcssserver") (keepaway_logging 1)
(keepaway_start -1) (keepaway_width 20) (kick_off_wait 100) (kick_power_rate 0.027)
(kick_rand 0.1) (kick_rand_factor_l 1) (kick_rand_factor_r 1) (kickable_margin 0.7)
(landmark_file "~/rcssserver-landmark.xml") (log_date_format "GDEF7aP_server1")
(log_times 0) (max_back_tackle_power 0) (max_catch_angle 90) (max_dash_angle 180)
(max_dash_power 100) (max_goal_kicks 3) (max_monitors -1) (max_tackle_power 100)
(maxmoment 180) (maxneckang 90) (maxneckmoment 180) (maxpower 100)
```

How?



Aim of Our Open-Source Development

- Instead of just providing datasets, we provide **tools for generating datasets**
- Two tools for: **data generation** and **data analysis**
- Provide datasets of RoboCup soccer simulation 2D

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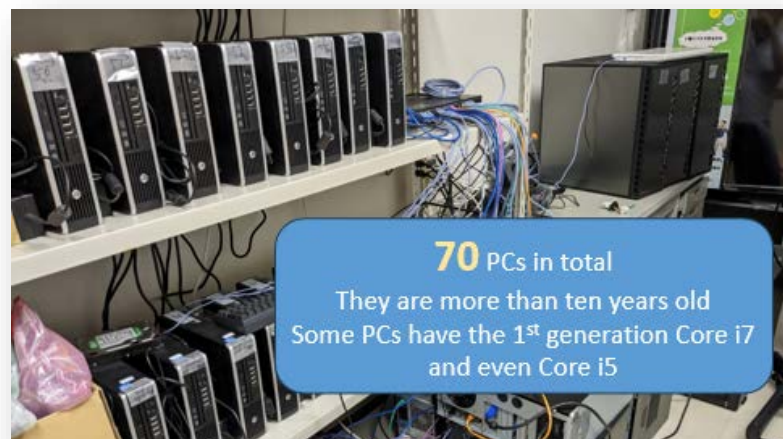
Aim of Our Open-Source Development

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Developed Tools

rcgamestats

- Distributed execution of soccer games
- Match scheduling
 - Any teams in team pool with any number of games
- Result aggregation: Results database
- Summary visualization



検索

グループ検索:

チーム検索:

チーム検索:

開始日時: 迄

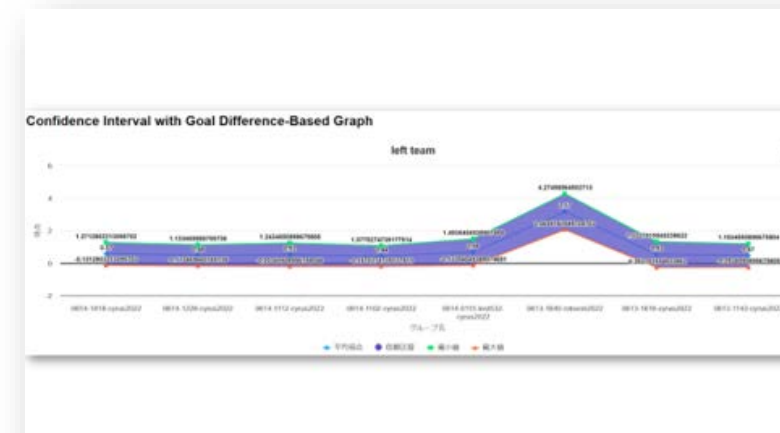
終了日時: 迄

グループ検索またはワード検索

グループごとの統計

共有スプレッドシート、リンクを共有

Group ID	Group Name	Group Start	Group End	Left Name	Right Name	Total Members	Wins	Losses	Draws	Auto Connected	Win Rate	Loss Rate	Draw Rate	Auto Connected Rate	Win Rate	Loss Rate	Draw Rate	Auto Connected Rate	Win Rate	Loss Rate	Draw Rate	Auto Connected Rate	Group Memo	
1	グループ1	2023/06/18 13:40:00	2023/06/18 18:00:00	グループ1のメンバー	グループ2のメンバー	100	50	14	30	95	30	0.5000	0.1400	0.3000	0.9500	1	0	0	2	5	0	0	0	メンバーごとの勝敗、スコアを共有
2	グループ2	2023/06/18 13:40:00	2023/06/18 18:00:00	グループ2のメンバー	グループ3のメンバー	100	50	13	17	94	21	0.5000	0.1300	0.3700	0.9400	0	0	0	0	0	0	0	0	メンバーごとの勝敗、スコアを共有
3	グループ3	2023/06/18 13:40:00	2023/06/18 18:00:00	グループ3のメンバー	グループ4のメンバー	100	51	12	26	98	36	0.5100	0.1200	0.3600	0.9800	0	0	0	0	0	0	0	0	メンバーごとの勝敗、スコアを共有

[illegible]

Developed Tools

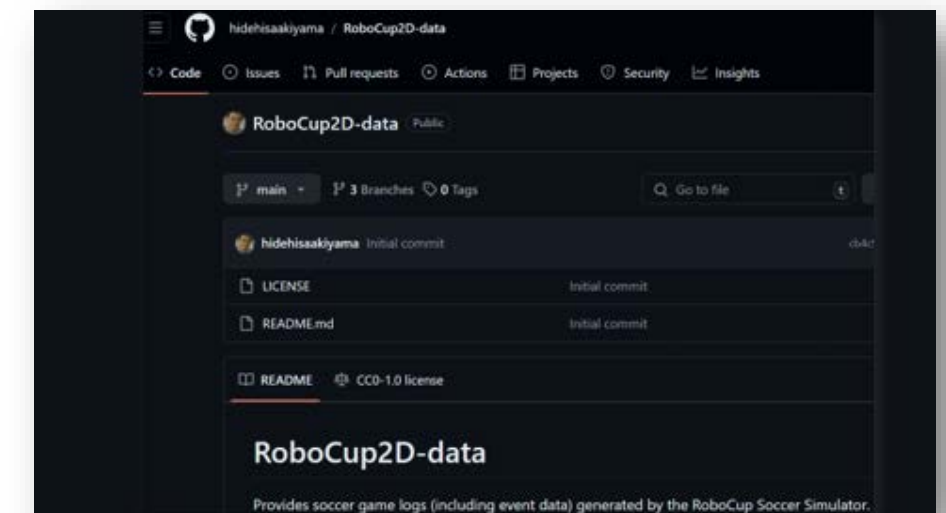
rcg2data

- Game log conversion to CSV
- Event extraction (passes, interceptions, shots)

Type	Side1	Unum1	Time1	X1	Y1	Side2	Unum2	Time2	X2	Y2	Success
Pass	left	10	105	11.0433	32.3346	left	5	113	-2.7	30.9469	true
Pass	left	5	125	4.4467	29.5977	left	10	128	9.2386	31.489	true
Pass	left	10	143	16.6419	31.1778	left	5	152	0.0918	26.3957	true
Pass	left	5	161	4.2961	25.8656	left	6	169	2.7422	12.9022	true
Interception	left	6	173	4.7946	15.0694	right	7	174	6.834	15.8583	true
Pass	right	7	176	6.5191	16.1724	right	9	182	3.9038	24.3288	true
Pass	right	9	183	3.6503	24.2566	right	7	187	3.1349	19.623	true
Pass	right	7	188	3.1646	19.682	right	9	191	3.0246	25.26	true
Pass	right	9	204	-7.1198	24.3199	right	11	208	-10.6632	17.1693	true
Pass	right	11	209	-10.9034	17.1474	right	9	212	-8.9923	22.7204	true
Pass	right	9	212	-8.9923	22.7204	right	11	216	-12.6582	18.0909	true
Pass	right	11	227	-16.2424	16.4082	right	6	234	-15.0141	2.6168	true
Pass	right	6	234	-15.0141	2.6168	right	8	243	-13.1596	-17.0355	true
Pass	left	7	297	-24.0591	-22.1905	left	6	301	-19.5139	-14.1352	true
Pass	left	6	310	-14.5264	-14.1491	left	7	312	-16.7063	-18.5533	true












Provided Dataset

- **13 teams** from RoboCup 2021
 - Alice2021, CYRUS, FRA-UNited, HELIOS2021, HfutEngine2021, ITAndroids, Jyo_sen2021, MT2021, Oxy, Persepolis, RoboCin, ThunderLeague, and YuShan2021
- **1,000 round-robins**
- **78,000 matches** in total
- About 780,000 minutes in total
 - Equivalent to **8,667 human soccer matches**
- 500GB data size (zip-compressed)



Saved Data (on a temporary server)




















Index of /robocupdata/rc2021-roundrobin

Name	Last modified	Size	Description
 Parent Directory		-	
 anonymous/	2021-12-06 10:33	-	
 check-cycle.log	2021-12-06 03:02	32K	
 check-cycle.log.tar	2021-12-06 18:59	40K	
 check-cycle.sh	2021-12-05 19:47	221	
 count-files.sh	2021-12-06 20:28	159	
 mkdirs.sh	2021-12-02 12:33	227	
 normal-archived/	2023-12-22 17:22	-	
 normal-csv/	2023-12-25 17:56	-	
 normal/	2022-11-22 15:22	-	
 teams	2021-12-02 12:33	151	

Apache/2.4.52 (Ubuntu) Server at alab.ise.ous.ac.jp Port 80

Saved Data (on a temporary server)

Index of /robocupdata/rc2021-roundrobin/normal-archived

<u>Name</u>	<u>Last modified</u>	<u>Size</u>	<u>Description</u>
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 alice2021-cyrus2021.tar	2021-12-06 17:34	2.9G	
 alice2021-fraunited2021.tar	2021-12-06 17:38	3.2G	
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 alice2021-ruloxin2021.tar	2021-12-06 18:08	2.8G	
 alice2021-yushan2021.tar	2021-12-06 18:12	2.7G	
 aras2021-alice2021.tar	2021-12-06 18:16	2.9G	
 aras2021-cyrus2021.tar	2021-12-06 18:20	3.0G	
 aras2021-fraunited2021.tar	2021-12-06 18:24	3.3G	
 aras2021-helios2021.tar	2021-12-06 18:27	2.8G	
 aras2021-hfutengine2021.tar	2021-12-06 18:31	2.8G	
 aras2021-itanroids2021.tar	2021-12-06 18:35	2.9G	
 aras2021-jyo_sen2021.tar	2021-12-06 18:38	2.9G	

Sav

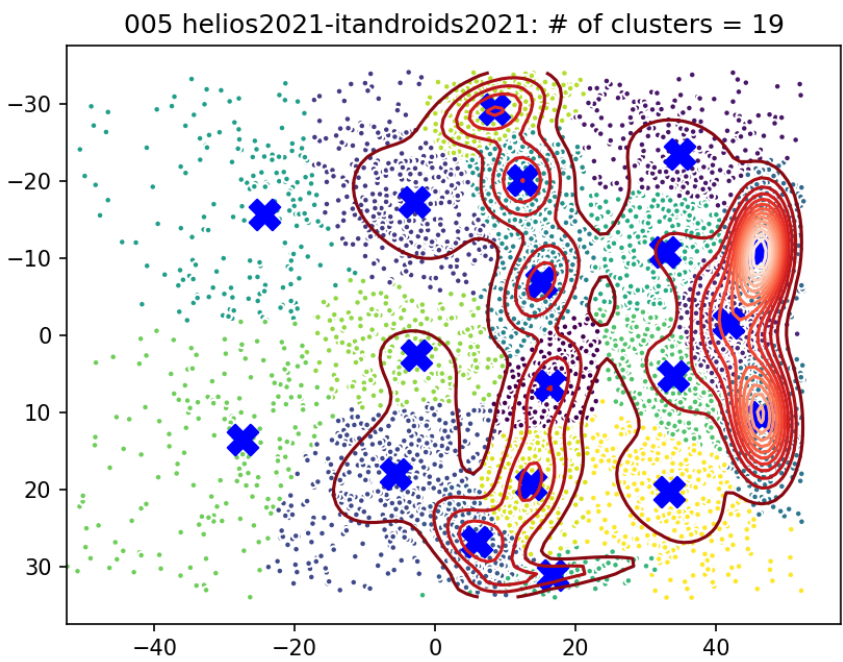
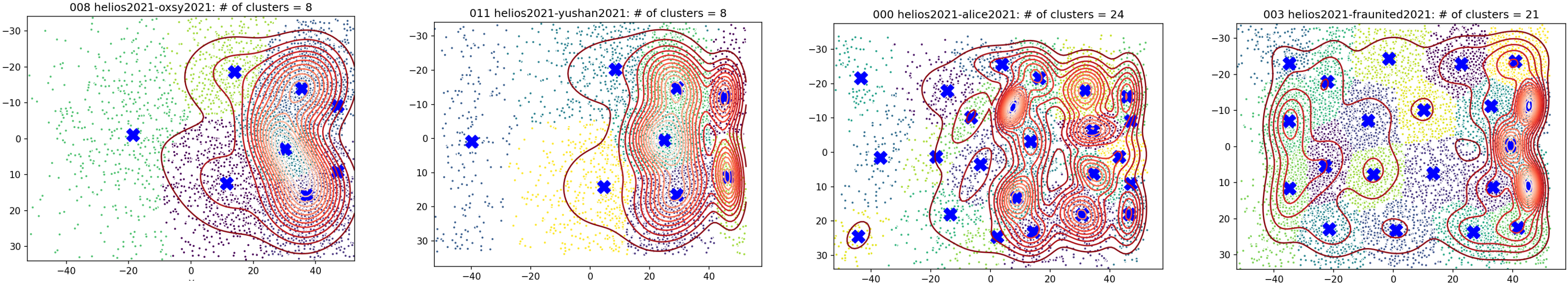
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	yushan2021-persepolis2021.tar	2021-12-07 04:07 2.8G

Case Study: Ball Interception Analysis

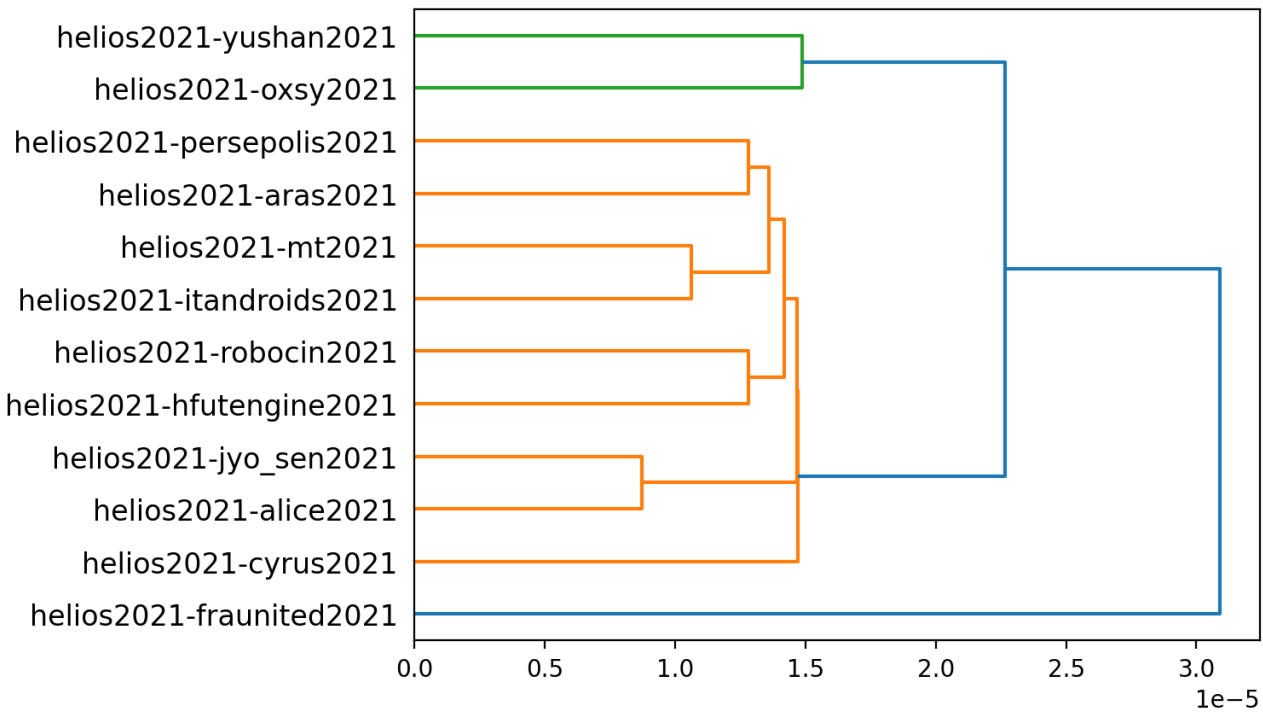
Example Analysis 1

Utilization of event data to estimate probability distributions of ball interceptions



Example Analysis 2

Clustering of the estimated distribution



Conclusion

- Software tools were developed for **data generation**
- Large dataset was provided
- Analytical potential was shown as examples

Game dataset will be available after competition