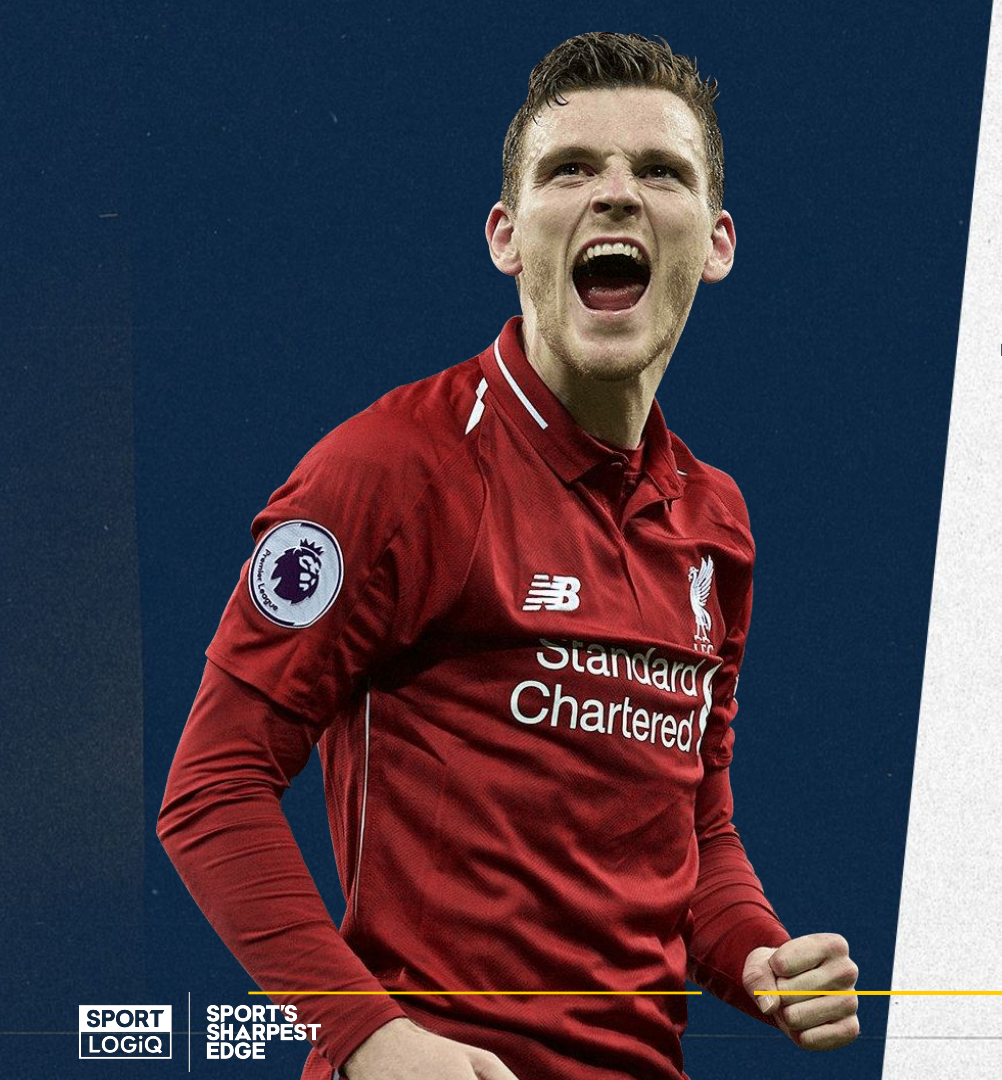

Sport Analytics: Turn Visual Data Into Insights

Mehrsan Javan
CTO

sportlogiq.com
sliqlabs.ai

SPORT LOGiQ
SPORT'S SHARPEST EDGE

Content

1. Introduction
2. Visual Perception and Data Collection
3. Turn Data Into Insights
    a. Physical metrics
    b. Contextual Metrics

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AI TECHNOLOGY FOR RELIABLE INSIGHTS

TRUSTED BY HOCKEY AND FOOTBALL CLUBS

NHL · SHL · NFL · NCAA

WORLD LEADING AI TEAM

14 AI Researchers

180+ Published research papers & patents

4000+ Citations

BUILT ON SOLID TECH FOUNDATION

- 12 Research Labs in Leading Canadian Universities
- 20+ Patents
- Internationally Renowned Advisors and Investors
- 100+ Full Time Employees

CORE TEAM OF 100 FULL TIME EMPLOYEES

- Montreal (Head Office)
- Waterloo (AI Lab)
- Vancouver (Sports Betting Lab)

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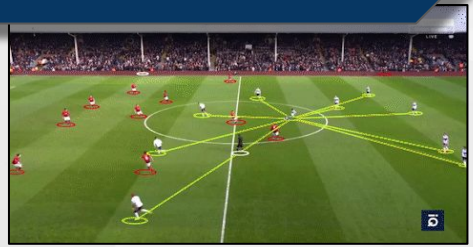
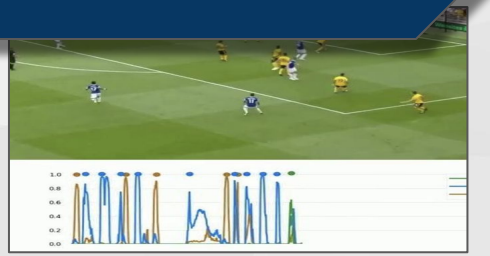
CORE TECHNOLOGIES: FROM VIDEOS TO INSIGHTS

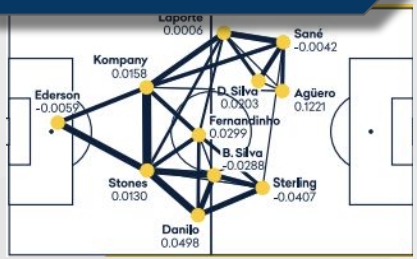
Player Tracking



Activity Detection



Game Models



Analytics, Metrics, Insights

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Visual Perception

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PART 1: VISUAL PERCEPTION

Player Tracking: Translate pixel data into players and ball/puck location

Player Tracking

Activity Detection

2D/3D Pose Data

- Self Camera Calibration and Map Building
- Player/Object Detection
- Player/Team Identification and Re-Identification
- State Estimation and Data Association

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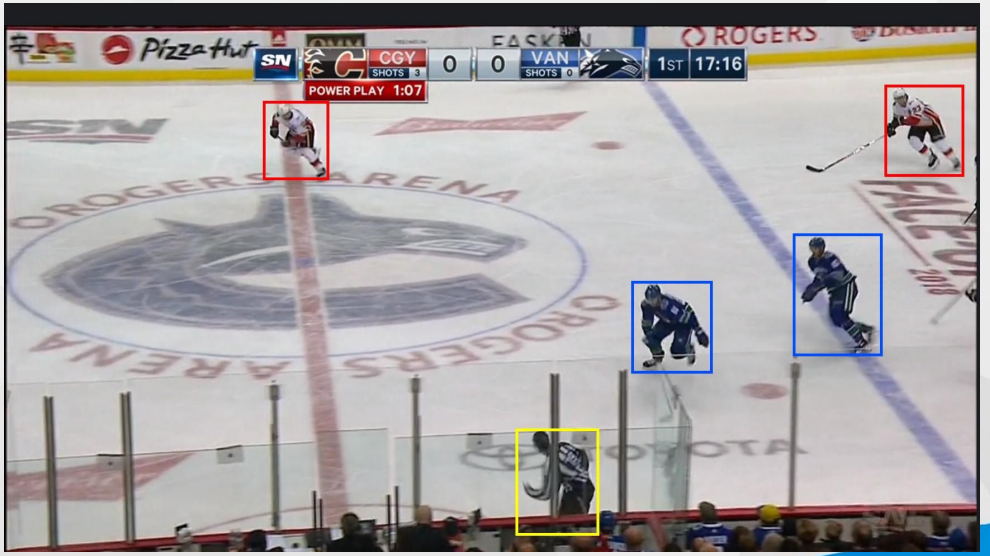

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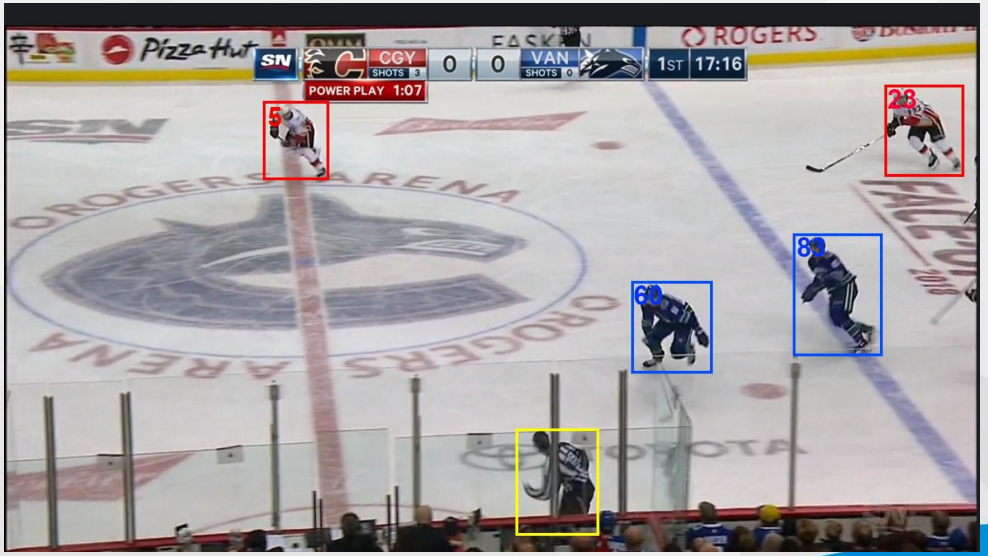

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Player Tracking: Translate pixel data into players and ball/puck location

Player Tracking

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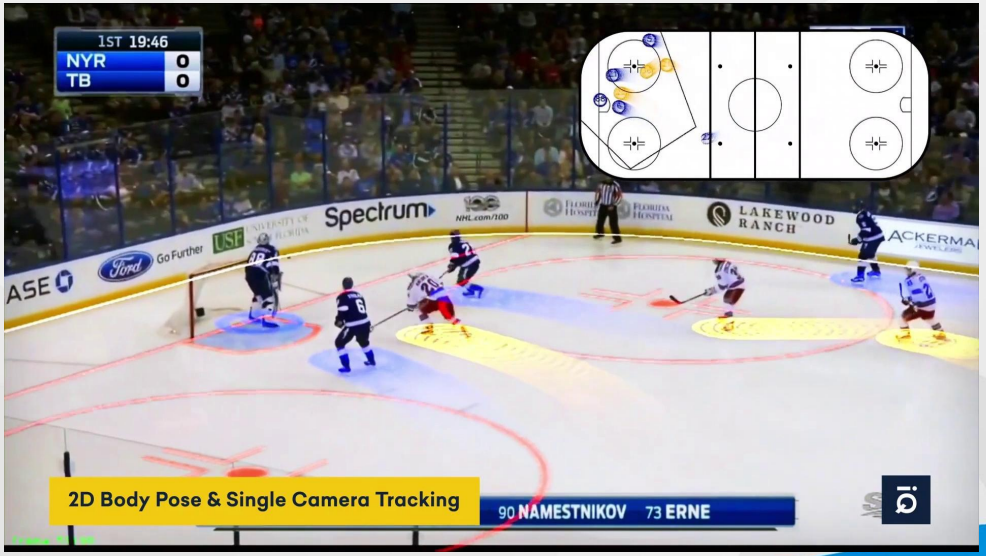


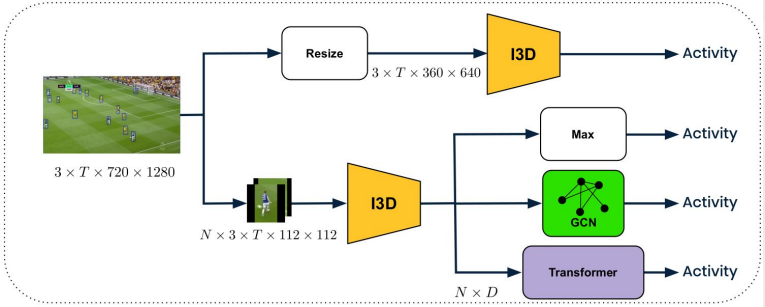
PART 1: VISUAL PERCEPTION

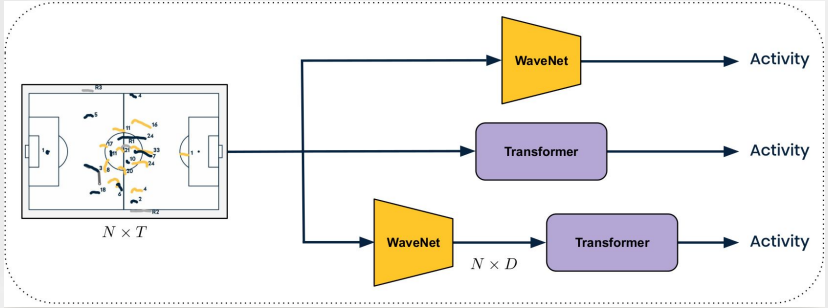
Multi-Stream Activity Detection

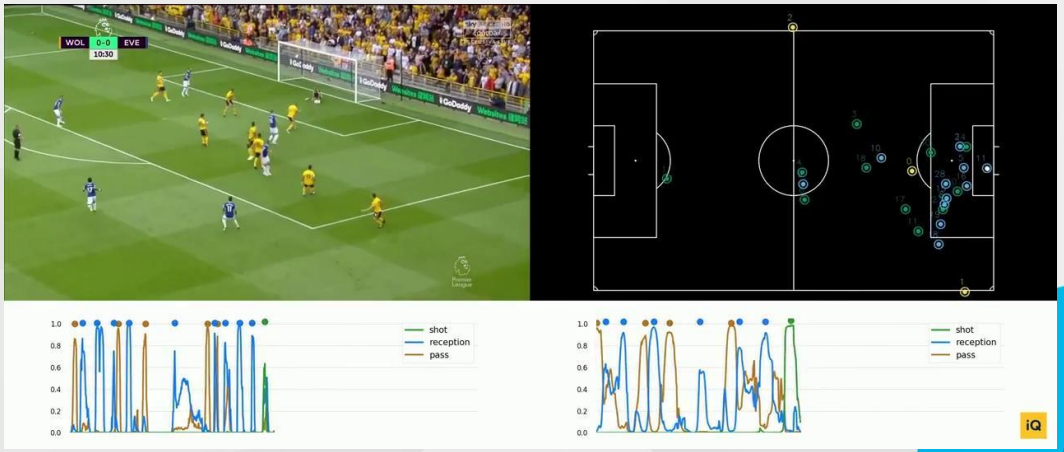
Player Tracking

Activity Detection

2D/3D Pose Data







CVPRW'20; SSAC'18
Patent pending, US 16/388,588; US 63/000,560

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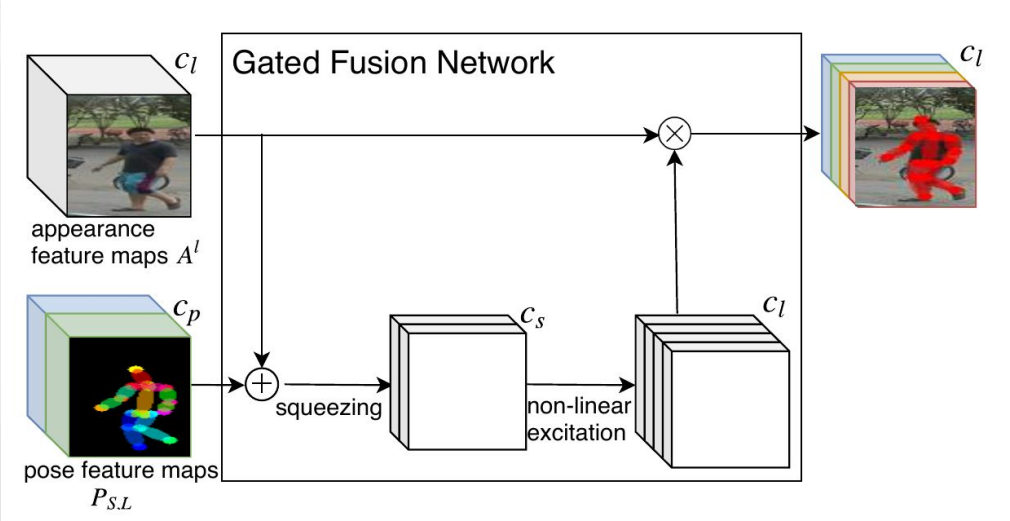
PART 1: VISUAL PERCEPTION

Pose Guided Re-Identification

- Player Tracking
- Activity Detection
- 2D/3D Pose Data



WACV'20
Patent pending, PCT/CA2021/050020

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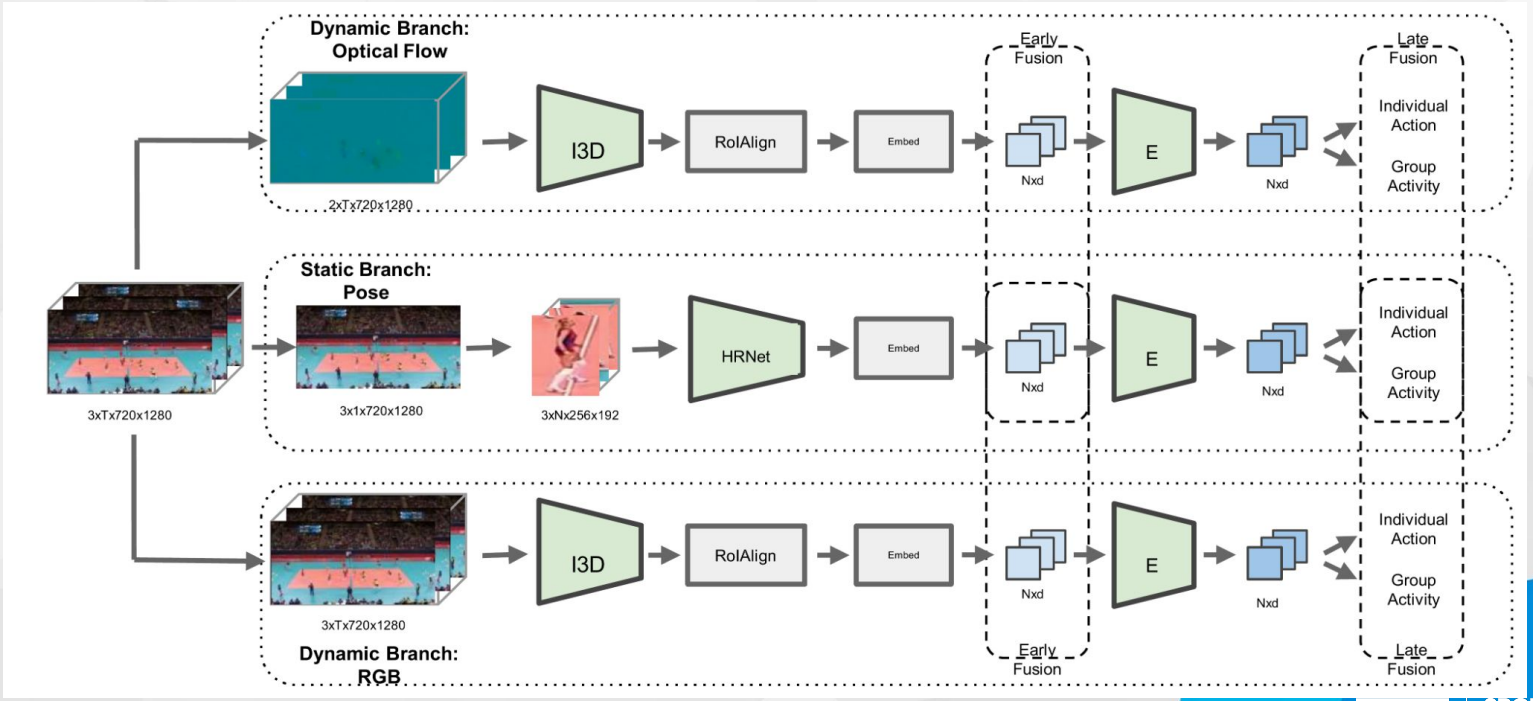
PART 1: VISUAL PERCEPTION

Pose for Event Detection

Player Tracking

Activity Detection

2D/3D Pose Data



CVPR'20
Patent pending, PCT/CA2021/050391

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PART 1: VISUAL PERCEPTION

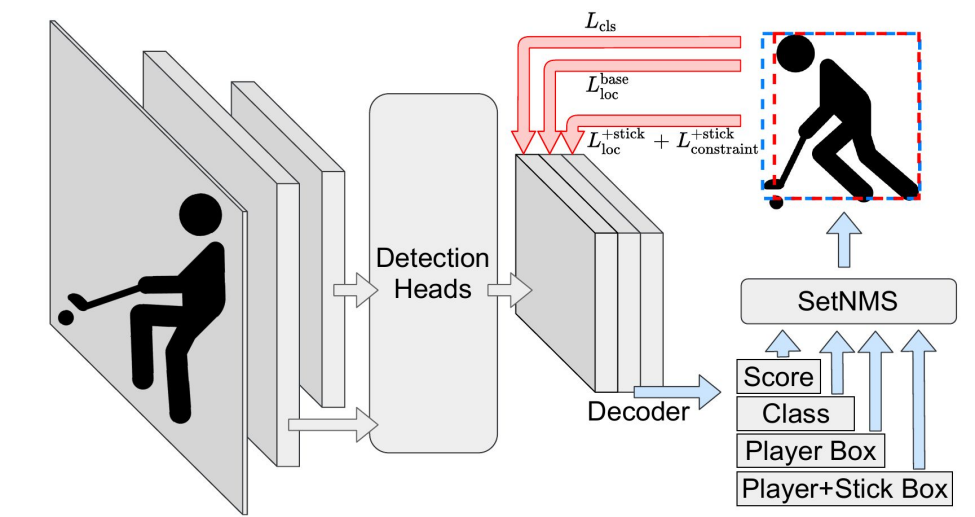
Pose Shall Include Player's Stick

- Single Proposal multiple detection

Player Tracking

Activity Detection

2D/3D Pose Data



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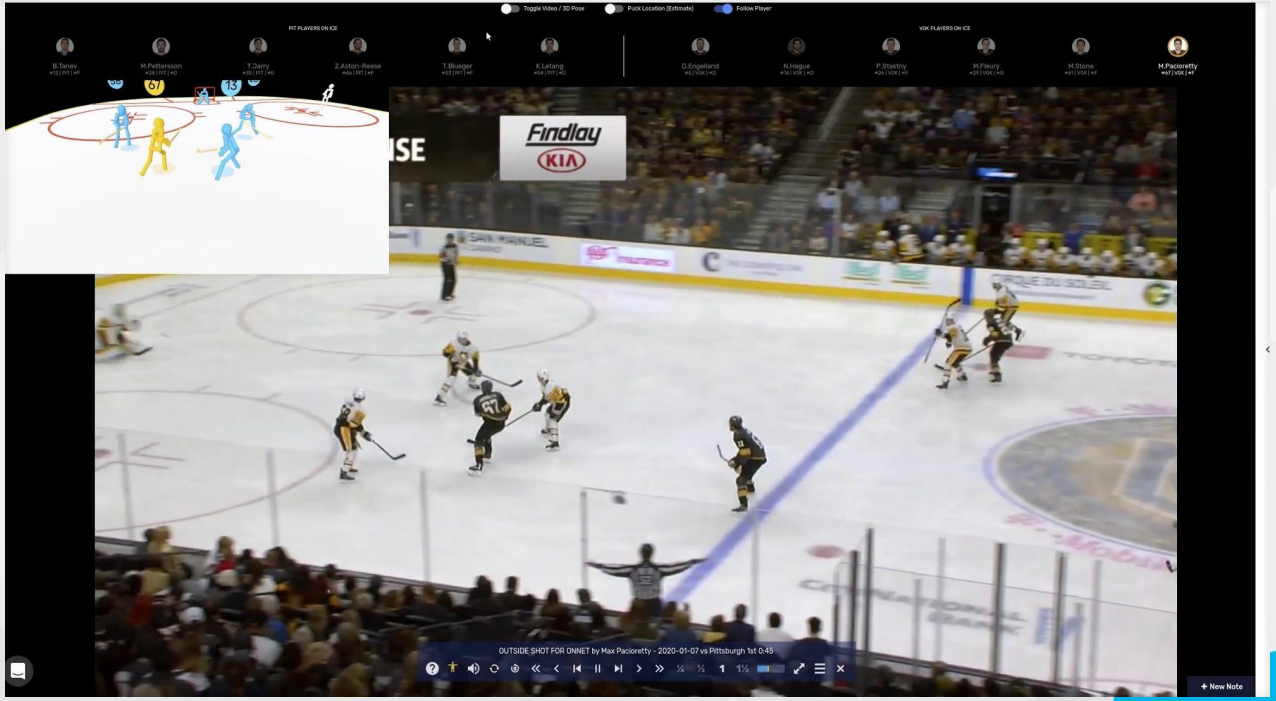
REAL-TIME SPORTS DATA COLLECTION

- Player Tracking
- Activity Detection
- 2D/3D Pose Data



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Turn Data Into Insights

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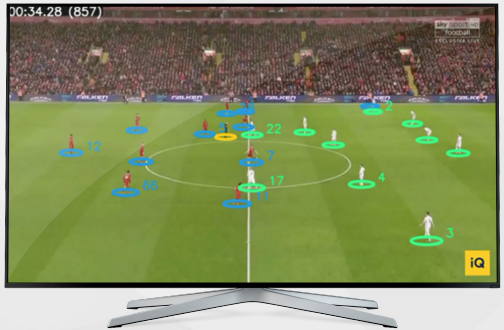
DATA ACQUISION

From Standard Broadcast Footage, We Create:

- Tracking Data
- Game Events, Player Actions



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DATA DRIVEN INSIGHTS

Physical metrics

- Top speed
- Total distance
- Jog distance
- Jog count
- Low speed run distance
- Low speed run count
- High speed run distance
- High speed run count
- Sprint distance
- Sprint count

Contextual Data

- Phases of play
- Defensive pressure intensity
- Clear passing options
- Clear line breaking options
- Players bypassed with pass/carry
- Line breaking carries
- Receiving context
- Shot clarity
- Passing lanes blocked
- Defensive lines held or broken
- Closest defender distance
- Shot lane blocks by defender

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PHYSICAL METRICS FROM [COMPLETE] DATA

Complete tracking data

- Player location (x, y)
- Distance covered (metres)
- Duration of interval (seconds)

Compute the player speed in each frame

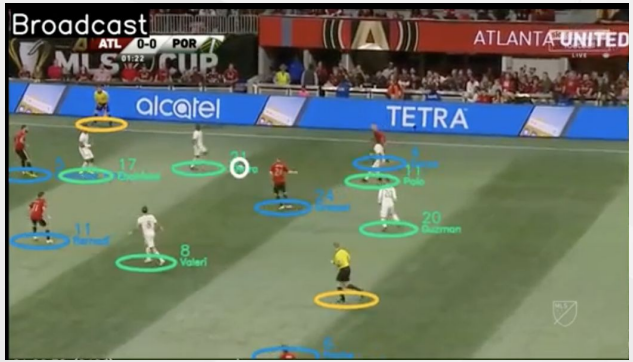
Aggregate into segments in speed bands

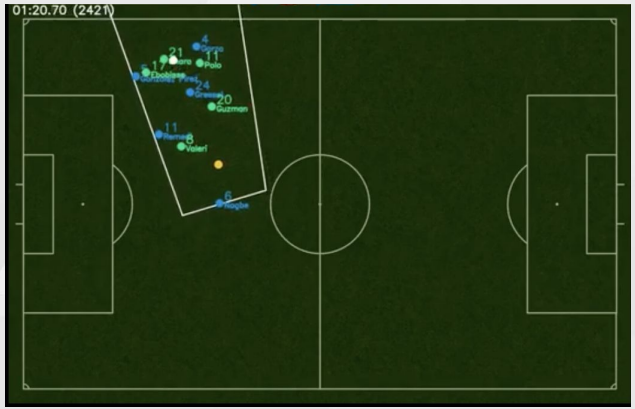
Aggregate into Physical Metrics

(Per 90) High Speed Distance in game

SPORT LOGiQ SPORT'S SHARPEST EDGE

PHYSICAL METRICS FROM [INCOMPLETE] DATA





Need to estimate speed and distance covered for players when they are 'off-screen'

Broadcast tracking data

- Player location (x, y)
- Distance covered (metres)
- Duration of interval (seconds)

Compute the player speed in each frame

Aggregate into segments in speed bands

Aggregate into Physical Metrics

(Per 90) High Speed Distance in game

Players are not always in the camera's view

Player Tracks are 'noisy'

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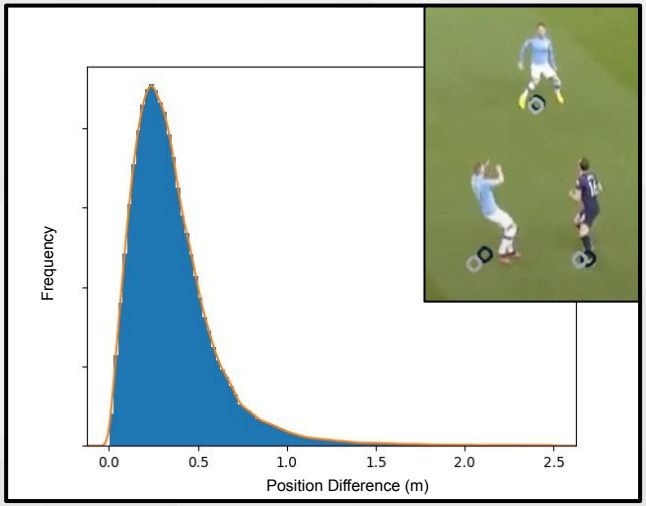
WHY IT IS DIFFICULT

Broadcast Data Is Noisy

Broadcast Data Is Incomplete



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SPORT'S SHARPEST EDGE

WHY IT IS DIFFICULT

Broadcast Data Is Noisy
Broadcast Data Is Incomplete

The players are not always in the camera's view

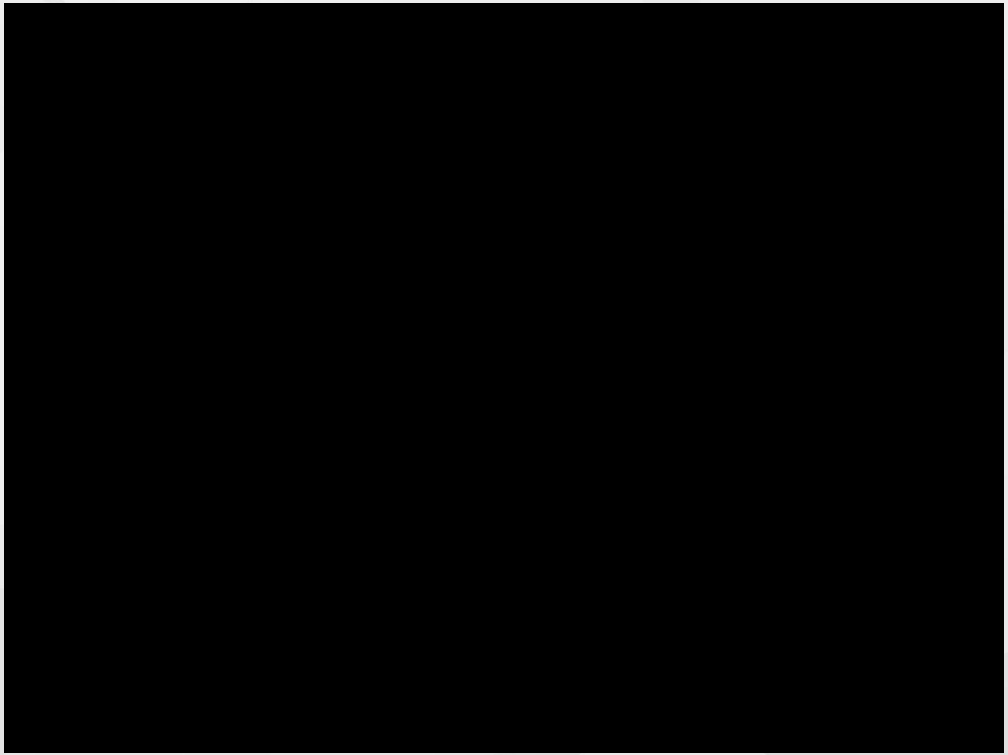
We want to estimate off-camera player ***locations*** and ***speeds***

There are some clues....

- ***In track:*** Use the most recent and next observations of the player to estimate the current location
- ***In frame:*** Use the relative locations of the on-camera players

TRAJECTORY CREATION

Constraint: Formation Shall be Loosely Preserved



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ADDING CONTEXT

- Identify tactical actions during key phases
- Anchored to possession and spatial criteria
- Can occur on- or off-camera

iQ

- Possession
- Counter-attacks
- **Recovery runs**
- Overlapping runs
- Re-pressure (Genpres)

ADDING CONTEXT

- Identify tactical actions during key phases
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iQ

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- **Overlapping runs**
- Re-pressure (Genpres)

PHYSICAL METRICS FOR PLAYER RANKING

Sprint Distance

Rank 1 →

10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240
1	11	32	16		49				7														
4		34						48															
11	9		12																				
8	2	25					27						44										
3	36	41									19												
10	40		24	37			46																
31	15	38			42		22			26													
29	39	21	17										20										
14	35	50	47																				
6	30	43	33			5		45	18														

← Rank 240

High Speed Distance

Rank 1 →

10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240
1	40	32	21						41									22					
2	13	5	19	37				11															
4	10	29	20									48											
7	28	27	24	46		18																	
3	31	15	26		45	17			6														
42	30		34	47																			
8	35	23	44						49														
12	25		43	50																			
9	39	36																					
16	39	33			38																		

← Rank 240

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Broadcast insights are quite powerful for teams and media because of the coverage, however

Data is imperfect

Data is incomplete

And generating insights is not easy

Thank you!

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www.sportlogiq.com

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