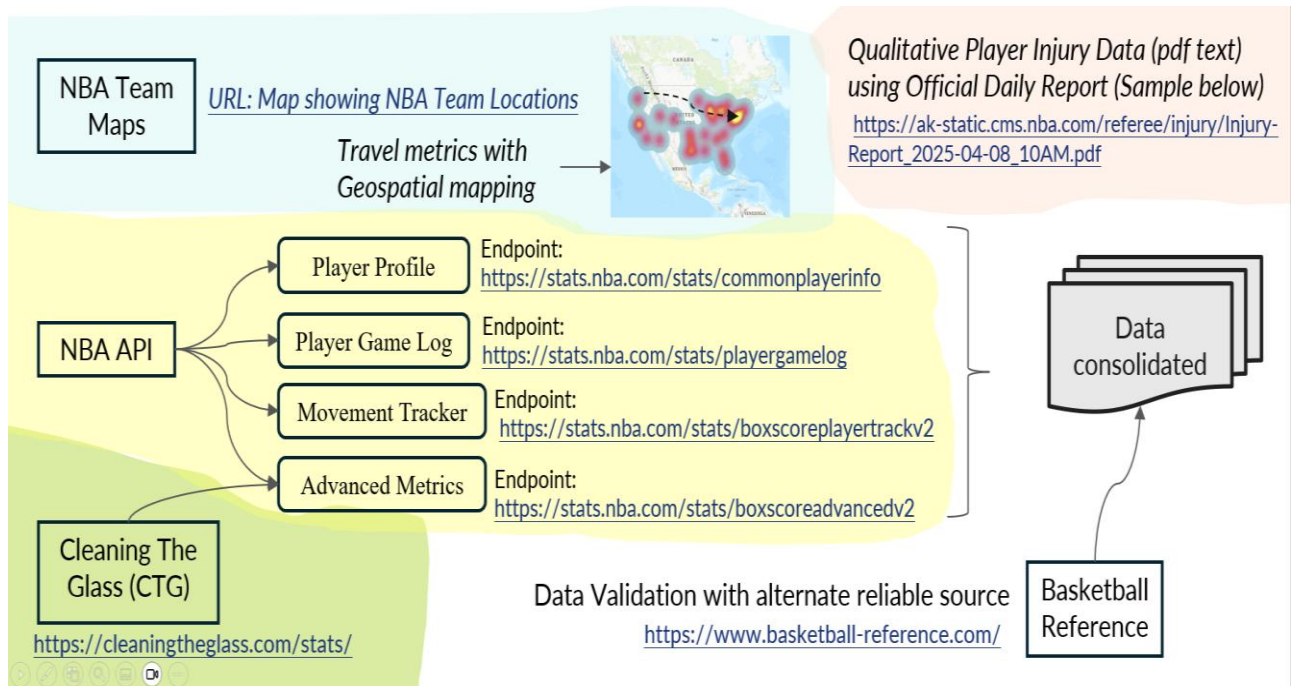# NBA Analytics Data Pipelines and Schema Description

Figure 1

Quantitative and Qualitative Data using NBA API for Player, Game log, Advanced Performance & Movement Metrics, NBA Daily bulletins and NBA Teams travel data from NBA Maps.

Figure 2

NBA city arena and airport latitude, longitude, timezone and elevation (altitude) data

Team	Arena_lat	Arena_lng	city	state_id	state_name	airport_lat	airport_lng	timezone	Elevation (in ft)
ATL	33.757222	-84.396389	Atlanta	GA	Georgia	33.640411	-84.419853	Eastern	1023
BOS	42.366303	-71.062228	Boston	MA	Massachusetts	42.365589	-71.010025	Eastern	6
BKN	40.682661	-73.975225	Brooklyn	NY	New York	40.641766	-73.780968	Eastern	49
CHA	35.225	-80.839167	Charlotte	NC	North Carolina	35.21389	-80.943054	Eastern	721
CHI	41.880556	-87.674167	Chicago	IL	Illinois	41.978611	-87.904724	Central	593
CLE	41.496389	-81.688056	Cleveland	OH	Ohio	41.4058	-81.8539	Eastern	669
DAL	32.790556	-96.810278	Dallas	TX	Texas	32.89748	-97.040443	Central	426

Figure 3

Data schema for the quantitative metrics acquired from official APIs
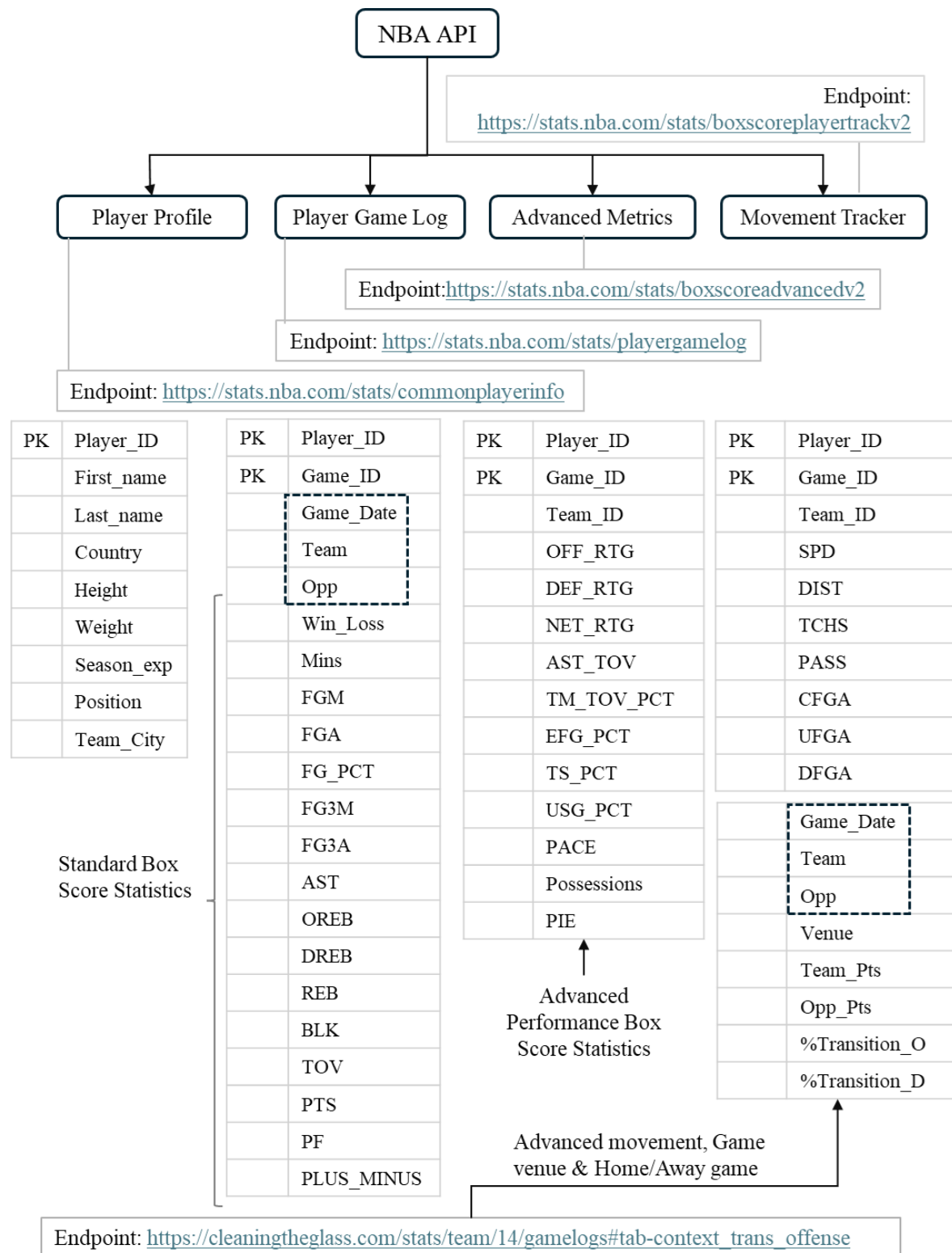
Figure 4:

Qualitative Player Injury Data using Official Daily Report - Data from URL (Sample shown)

https://ak-static.cms.nba.com/referee/injury/Injury-Report_2025-04-08_10AM.pdf

Game

Text Data on

Injury Report: 04/08/25 10:30 AM

Game Date	Game Time	Matchup	Team	Player Name	Current Status	Reason
04/08/2025	07:00 (ET)	ATL@ORL	Atlanta Hawks	Bufkin, Kobe	Out	Injury/Illness - Right Shoulder; Surgery
				Capela, Clint	Out	Injury/Illness - Left Fourth Metacarpal; Ligament Sprain
				Johnson, Jalen	Out	Injury/Illness - Left Shoulder; Surgery
				Nance Jr., Larry	Out	Injury/Illness - Right Medial Femoral Condyle; Fracture
				Toppin, Jacob	Out	Injury/Illness - Left Calf; Strain
				Young, Trae	Probable	Injury/Illness - Right Achilles; Tendinitis
			Orlando Magic	McClung, Mac	Out	G League - Two-Way
				Suggs, Jalen	Out	Injury/Illness - Left Knee; Trochlea cartilage tear
				Thompson, Ethan	Out	G League - Two-Way
				Wagner, Moritz	Out	Injury/Illness - Left Knee; Torn ACL
		CHI@CLE	Chicago Bulls	Ball, Lonzo	Out	Injury/Illness - Right Wrist; Sprain
				Dosunmu, Ayo	Out	Injury/Illness - Left Shoulder; Surgery
				Giddey, Josh	Questionable	Injury/Illness - Right Flexor Carpi Ulnaris; Teninopathy
				Huerter, Kevin	Out	Injury/Illness - Right Cervical; Strain

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| GAME_DATE	last_name	first_name	Injury_Status	Reason
2024-10-25	Bogdanovic	Bojan	Out	Injury/Illness-LeftFoot;InjuryRecovery
2024-10-25	Sharpe	Day'Ron	Out	Injury/Illness-LeftHamstring;Strain
2024-10-25	Watford	Trendon	Out	Injury/Illness-LeftHamstring;Strain
2024-10-25	Isaac	Jonathan	Questionable	Injury/Illness-LeftHip;Contusion
2024-10-25	Embiid	Joel	Out	Injury/Illness-LeftKnee;InjuryManagement
2024-10-25	George	Paul	Out	Injury/Illness-LeftKnee;BoneBruise
2024-10-25	Martin	Caleb	Probable	Injury/Illness-RightCalf;Contusion
2024-10-25	Barrett	RJ	Doubtful	Injury/Illness-RightShoulder;ACJoint;Sprain
2024-10-25	Brown	Bruce	Out	Injury/Illness-RightKnee;ArthroscopicSurgicalProcedure
2024-10-25	Olynyk	Kelly	Out	Injury/Illness-Back;Lumbar;Strain

Figure 5:

Inter-city travel data analyzed and tabulated for future analysis

From	To	FlightDist_km	FlightTime_hr	BusTime_hr	TZ_Offset_hr	ElevationDelta_ft	TotalTravel_hr	NonRest_hr	AdjustedRest_hr
LAL	LAL	0	0	1	0	0	1	3	-3
LAL	ATL	3133.4	5.22	0.45	3	784	5.67	8.17	-5.17
LAL	BOS	4202	7	0.15	3	233	7.15	9.65	-6.65
LAL	BKN	3982.9	6.64	0.58	3	190	7.22	9.72	-6.72
LAL	CHA	3420.2	5.7	0.33	3	482	6.03	8.53	-5.53
LAL	CHI	2807.8	4.68	0.82	2	354	5.5	8	-6
LAL	CLE	3303.2	5.51	0.59	3	430	6.1	8.6	-5.6
LAL	DAL	1987.3	3.31	0.84	2	187	4.15	6.65	-4.65
LAL	DEN	1386.5	2.31	1.05	1	5041	3.36	5.86	-4.86
LAL	DET	3184.7	5.31	0.97	3	729	6.28	8.78	-5.78
LAL	HOU	2219.1	3.7	0.92	2	194	4.62	7.12	-5.12

**Figure 6:**

Injury distribution by Status.
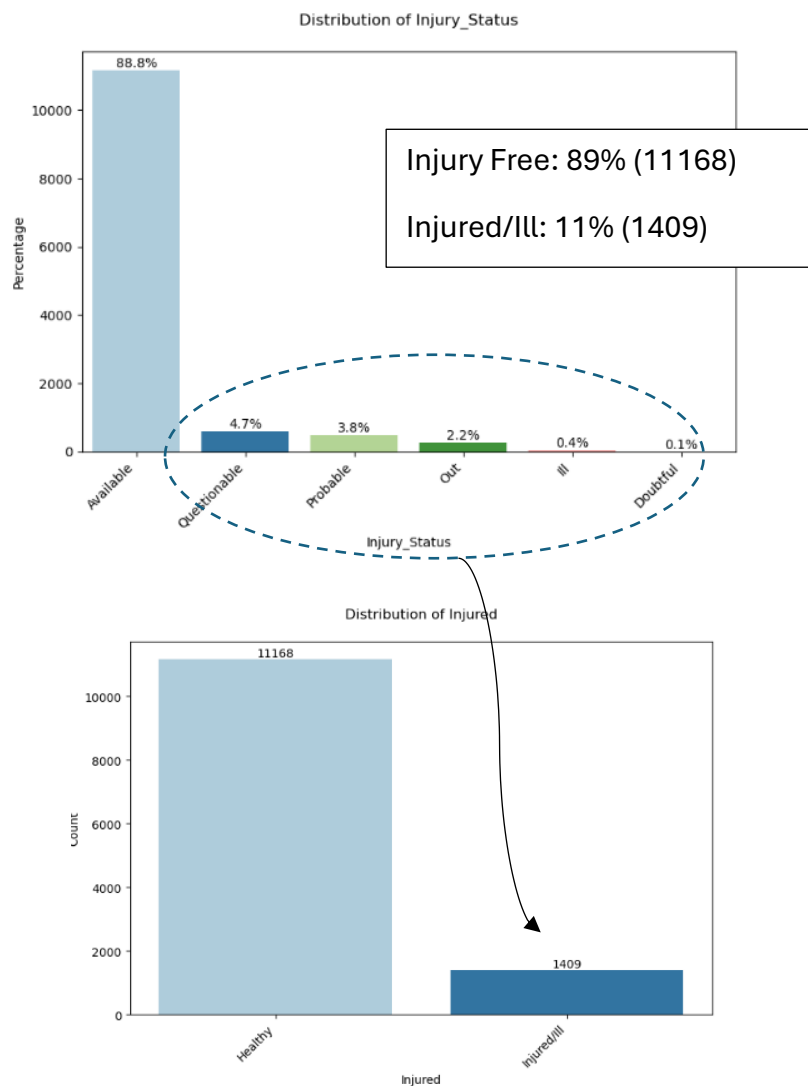
Feature Development Indices:

Player Performance Index:

$$PPI = 0.5 * GmSc + 0.14 * PLUSMINUSTSPCT_{interact} + 0.12$$
$$* PLUSMINUSNETRTG_{G_{interact}} + 0.09 * NETRTG + 0.05 * ASTTOV - 0.03$$
$$* TMTOVPCT + 0.02 * PACE + 0.02 * PLUSMINUS + 0.02 * PIE + 0.01$$
$$* TS_{PCT}$$

Fatigue Index:

Figure 7:

Sample Distances and speeds for Kinetic energy calculations and fatigue index estimation:

Updated Estimated Distance by Movement Type in an NBA Game
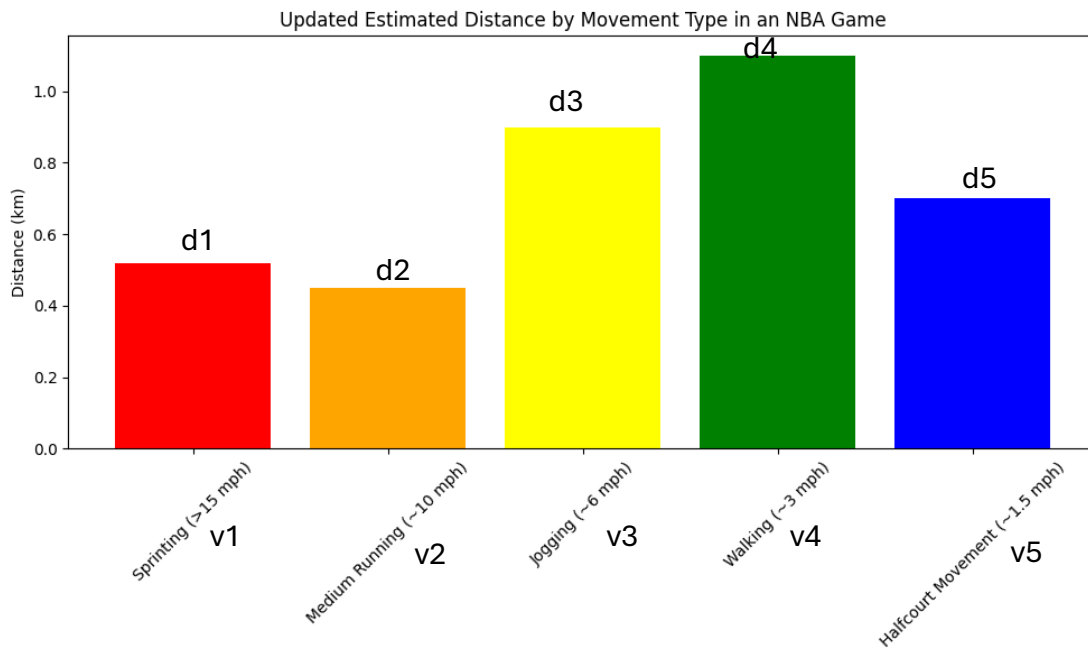
$$Net\ Kinetic\ Energy\ (KE)_{game} by\ player\ j = \sum_{i=1}^{5} \frac{1}{2} * weight_j * (v_i{}^2)_j * (\frac{d_i}{v_i})_j$$

$$Jump\ energy\ by\ player\ (JE)_j = weight_j * maxleap_{height_j} * g * (\#\ of\ jumps)_j$$

Where # $of\ effective\ jumps = (\alpha * rebounds + \beta * blocks + \gamma * FGattempts +$

$\delta * DFGattempts),\ \alpha, \beta, \gamma\ and\ \delta \rightarrow leap\ params$

Stress multipliers for player j, **CAF (Cognitive Amplification Factor)$_j$ = 1 + σ * (Usage %)$_j$**

Similarly, **TSF (Travel Stress factor)$_j$ = 1 + λ *(TSI)$_j$**, where TSI is the Travel Stress Index

calculated in next section.

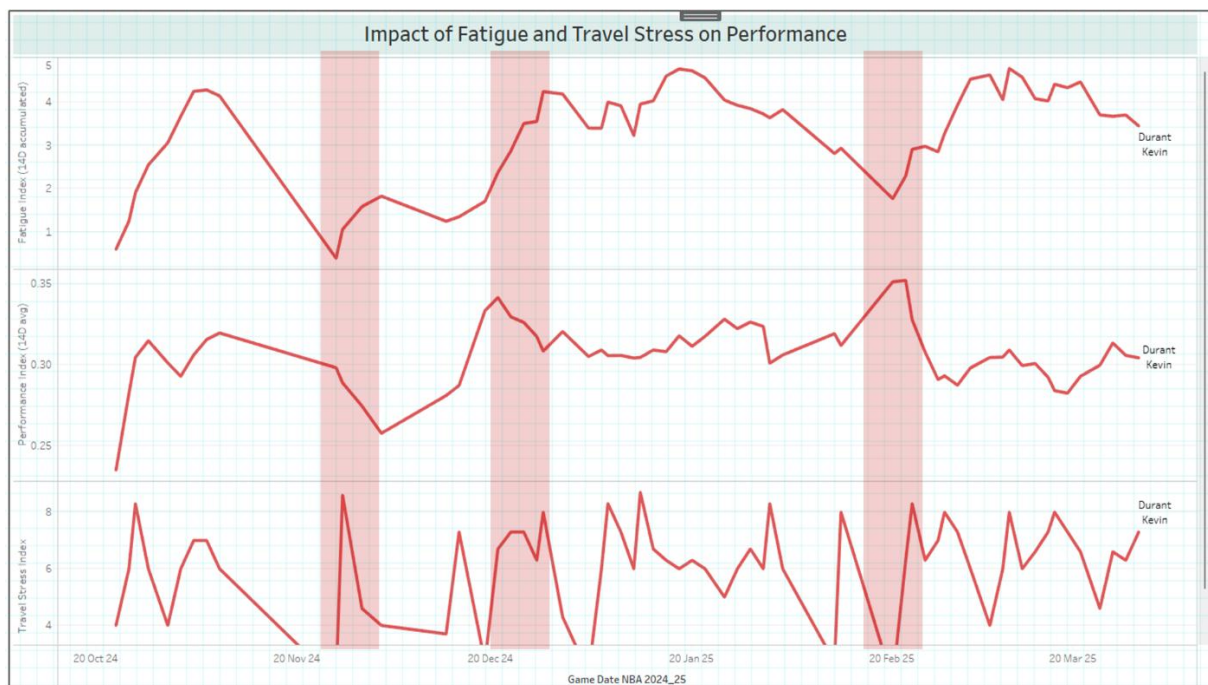**Net Fatigue load** is calculated as for **player j = (KE+JE)$_j$*CAF$_j$*TSF$_j$**

and is then normalized for Fatigue index.

This is then aggregated as 7-day and 14-day rolling sum prior to each game

(FI_normalized_7D_sum and FI_normaized_14D_sum).

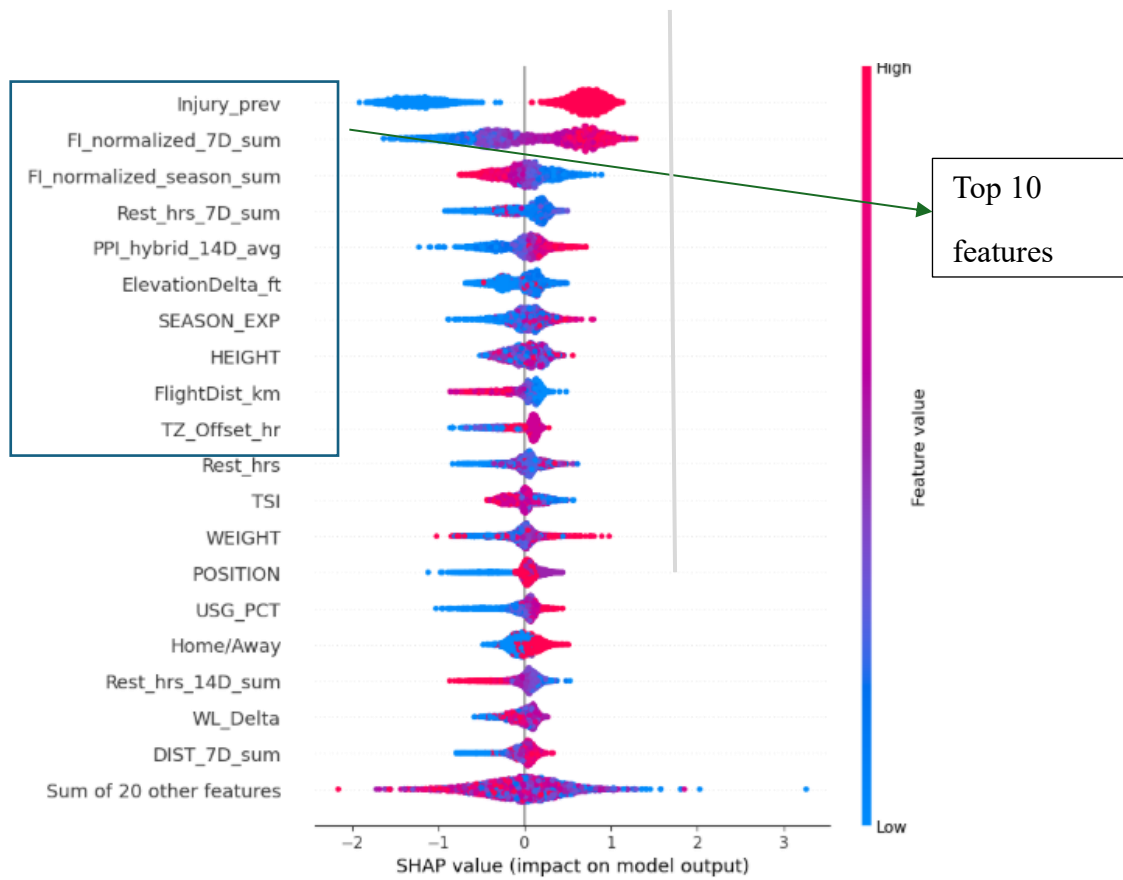**Figure 8 (Sample Tableau Image demonstrating the 3 indices)**

Fatigue, Travel Stress and Performance trends for a player (star: Kevin Durant)

Included in "NBA_analytics.twb" Tableau workbook

Figure 9.

SHAP factor analysis for Injury prediction using XGBoost classifier

Figure 10:

Time series Model using Transformers