Identifying Player Roles in Ice Hockey

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Outline

- Motivation
- Identified roles
- Comparing salaries
- Team composition

Motivation

The question

Coach:
Good player within his role
Not clear in traditional stats

How to evaluate the performance of this player?

How to compare to other players?

The question(s)

- What are the different roles in a team for ice hockey players?
  - Only skaters: defenders, forwards (centers and wings)
  - Based on data
  - Players can have a combination of roles

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  - Compare players to the most similar players in their roles
- Is there a successful team composition based on roles?
  - Compare playoff teams vs non-playoff teams

Earlier work on roles

- Other sports
- In ice hockey:
  - k-means → player can have only 1 role
  - few performance metrics
  - Game has changed

Data

- NHL season 2021-2022

- Play-by-play data from www.nhl.com (events)
  - Shots, goals, penalties, hits, faceoffs, giveaways, takeaways
- Shift data from www.nhl.com (which players on the ice at particular time)
- Salary data from www.capfriendly.com

Roles

Roles - Method

- Only players with at least 200 min played over the season
  - 263 defenders, 485 forwards
- Derive stats/performance metrics from the data (circa 40)
- PCA
  - 8 for defenders, 9 for forwards
- Fuzzy clustering (fuzzy c-means)
  - 3 clusters for defenders, 4 clusters for forwards

Identified roles - defenders

- D1: (*offensively-oriented defenders*): most goals, assists, expected goals, takeaways, play powerplay, often start in offensive zone

  Examples: Adam Larsson, Rasmus Ristolainen, Radko Gudas

- D2: (*defensive specialists?)* few goals, penalty minutes, hits, often play close to own net, shortest, lowest weight

  Examples: Roman Josi, Victor Hedman, Cale Makar

- D3: (*defensively-oriented defenders*) play physically, heaviest, most hits, penalty minutes, play boxplay

  Examples: Ivan Provorov, Christopher Tanev, Brian Dumoulin

Identified roles - forwards

- F1: (*two-way forwards*) skate most, play boxplay, often start in defensive zone
  Examples: Nick Bonino, Colton Sissons, Barclay Goodrow
- F2: (*offensively-oriented forwards*) many goals, assists, highest expected goal percentage
  Examples: Anze Kopitar, Jamie Benn, Tyler Seguin
- F3: (*offensive specialists*) most goals, assists, highest expected goals, provoke penalties, block shots
  Examples: Sidney Crosby, Auston Matthews, Connor McDavid
- F4: (*defensively-oriented forwards*) play physically, heaviest, most hits, penalty minutes
  Examples: Tanner Jeannot, Ryan Reaves, Pat Maroon

Comparing salaries

Comparing salaries - Method

- For a given player:
  - Ten nearest neighbors (Euclidean distance, fuzzy membership)
  - Compare cap hits

Comparing salaries

(a) Underpaid defenders.

Rank	Player	Avg. Rel. Diff.
1	Oliver Kylington	-1.060
2	Evan Bouchard	-0.812
3	Adam Fox	-0.750
4	Adam Boqvist	-0.726
5	Erik Gustafsson	-0.688
6	Anthony DeAngelo	-0.663
7	Moritz Seider	-0.654
8	Bowen Byram	-0.636
9	Noah Dobson	-0.636
10	Alexandre Carrier	-0.584
11	Rasmus Sandin	-0.565
12	Kale Clague	-0.551
13	Calle Rosen	-0.548
14	Gabriel Carlsson	-0.541
15	Jaycob Megna	-0.536

(b) Overpaid defenders.

Rank	Player	Avg. Rel. Diff.
1	Oliver Ekman-Larsson	0.484
2	Esa Lindell	0.416
3	Ryan McDonagh	0.410
4	Marc-Edouard Vlasic	0.402
5	Jeff Petry	0.382
6	Anton Strålman	0.380
7	Nick Leddy	0.375
8	T.J. Brodie	0.374
9	Darnell Nurse	0.367
10	Danny DeKeyser	0.357
11	P.K. Subban	0.352
12	Duncan Keith	0.352
13	Tyler Myers	0.348
14	Rasmus Ristolainen	0.348
15	Ryan Pulock	0.345

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Comparing salaries

(c) Underpaid forwards.

Rank	Player	Avg. Rel. Diff.
1	Trevor Zegras	-0.927
2	Mason Marchment	-0.889
3	Jason Robertson	-0.869
4	Joshua Norris	-0.837
5	Jack Hughes	-0.800
6	Matthew Boldy	-0.795
7	Anton Lundell	-0.779
8	Martin Necas	-0.759
9	Tim Stützle	-0.744
10	Michael Bunting	-0.717
11	Carter Verhaeghe	-0.715
12	Nathan Walker	-0.703
13	Nick Suzuki	-0.673
14	Cole Caufield	-0.672
15	Lucas Raymond	-0.655

(d) Overpaid forwards.

Rank	Player	Avg. Rel. Diff.
1	Sean Monahan	0.483
2	Milan Lucic	0.438
3	Brady Tkachuk	0.418
4	Jonathan Drouin	0.418
5	Antohy Beauvillier	0.397
6	Tyler Johnson	0.394
7	Jamie Benn	0.392
8	Kevin Hayes	0.387
9	Andrew Ladd	0.385
10	Alexander Radulov	0.374
11	Dustin Brown	0.373
12	Colton Sissons	0.371
13	Christian Dvorak	0.356
14	Nick Foligno	0.356
15	Niklas Bäckstrom	0.353

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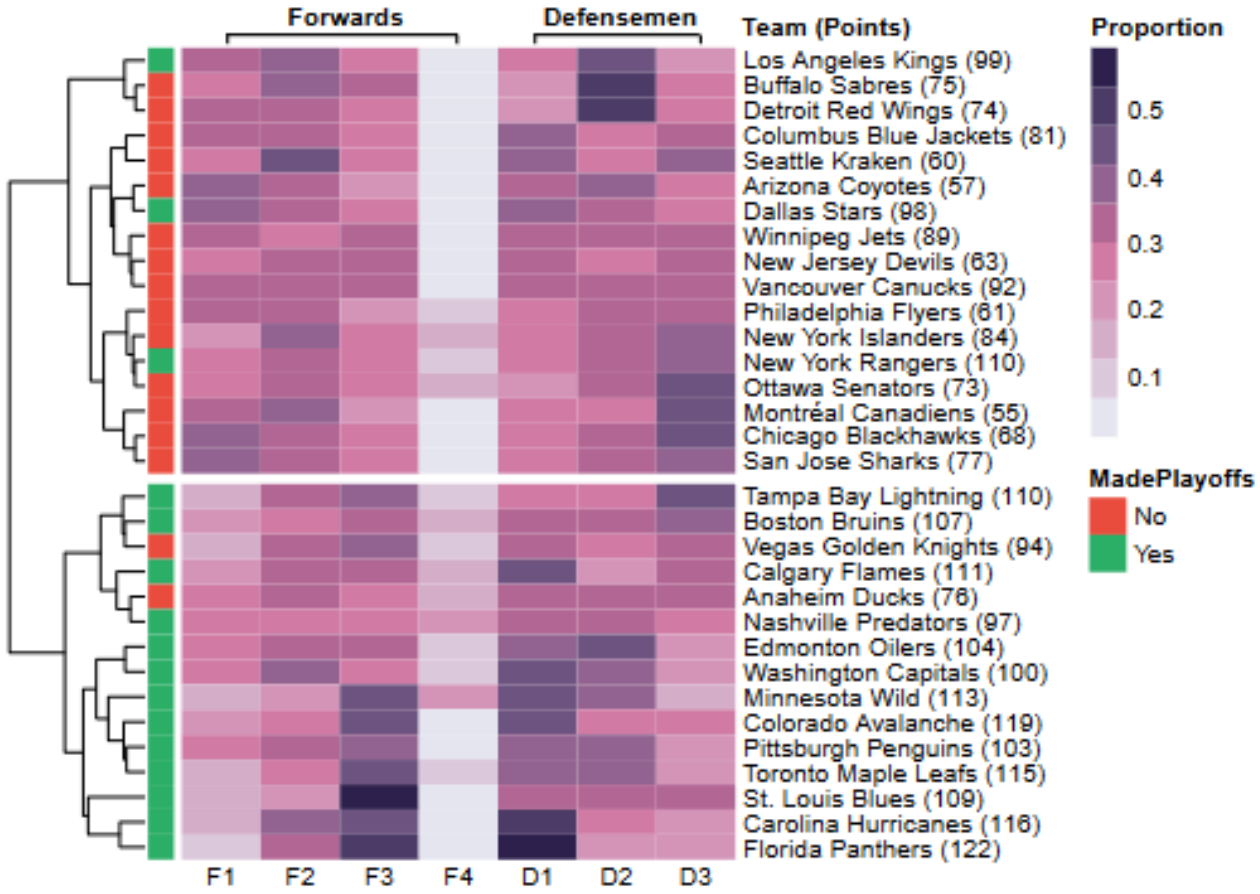
Team composition

Team composition



For each team: 18 skaters with most minutes played

Higher proportion of forwards from role F3 and **lower** proportion of forwards from roles F1 and F2 for playoff teams than for non-playoff teams

Higher proportion of defenders from role D1 and **lower** proportion of defenders from roles D2 and D3 for playoff teams than for non-playoff teams

Limitations

- Data not perfect
- Not all events
- Player's team may influence player's playing style/performance

Conclusion

- Method for clustering skaters
- Salary comparison
- Team composition