Characterizing Playing Styles for Ice Hockey Players

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Loosing a key player

- Loosing key players is a challenge all teams face.
- In a thin market players are often hard to replace.
- For example, Färjestad lost one of their best defenders Carl Dahlström
- This challenge is one thing our paper will address

Outline

01 Introduction

02 Methodology

03 Results

04 Conclusion

05 Future work

01

Introduction

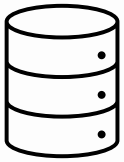
Motivation and objective

- Identifying player skills and styles
- Scouting
- Roster creation
- Objective: Characterize playing styles

02

Methodology

Data



Event data

Data from AHL, SHL, HockeyAllsvenskan

Seasons used

21/22, 22/23, and half of 23/24

Players

Only players with more than 200 minutes on ice

Playing style

- A player's playing style is defined by a player vector.
- A player vector has 13 skill features for defenders and 18 for forwards.
- Each skill is evaluated by the frequency of 2-7 actions.

Defenders

Skills
Passing
Skating
Shooting
Defensive Stickwork
Puck Moving
Point Producing
Powerplay Playmaking
Powerplay Scoring
Physical Play
Slot Defense
Stay at Home
Penalty Killing
Penalty Killing Slot Defense

Forwards

Skills	
Passing	Forechecking
Skating	Cycling the Puck
Powerplay Playmaking	Neutral Zone
Powerplay Slot Engagement	Puck Moving
Powerplay Scoring	Offensive Zone Play
Defensive Puck Control	Shooting
Defensive Zone Play	
Defensive Positioning	
Slot Defense	
Penalty Killing	
Slot Engagement	
Heavy Game	
Forechecking	

Construction of player vectors

Defenders Passing Vector:

Outlet pass	Stretch pass	NZ pass	Pass for 1-timer	OZ pass	Assist

Construction of player vectors

Defenders Passing Vector:

Outlet pass	Stretch pass	NZ pass	Pass for 1-timer	OZ pass	Assist
115	98	127	23	75	16

Construction of player vectors

Normalization:

Outlet pass	Stretch pass	NZ pass	Pass for 1-timer	OZ pass	Assist
0.85	0.67	0.89	0.45	0.63	0.37

1. Normalize by ice time

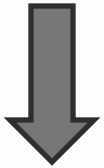
$$\frac{Action\ Frequency}{Time\ on\ ice} \times 60$$

2. Standardize by applying MinMax Scaler

Construction of player vectors

Dimensionality reduction:

Outlet pass	Stretch pass	NZ pass	Pass for 1-timer	OZ pass	Assist
0.85	0.67	0.89	0.45	0.63	0.37



NMF

Player Vector:

Passing	Skating	Shooting
0.87	0.63	0.47

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Clustering

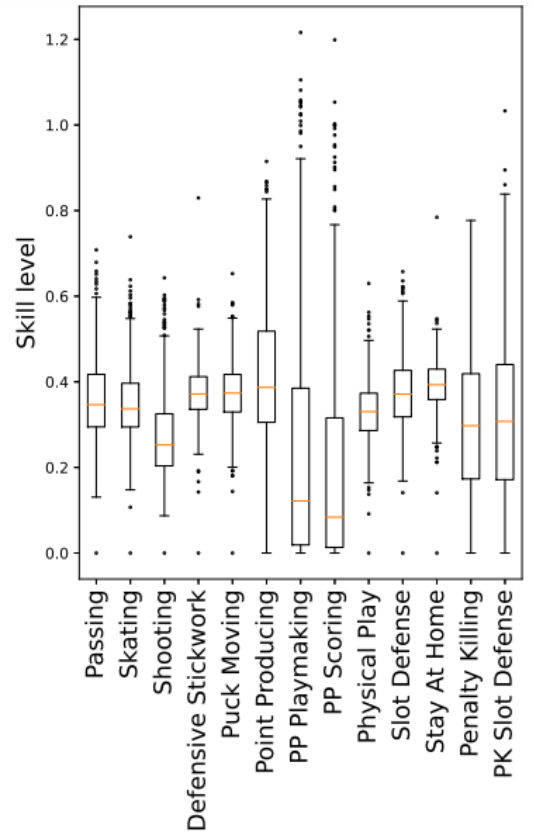
- Fuzzy C-Means.
- Each player can belong to more than one player type.
- Each cluster explains a typical player for the specific player type.
- Previous work used hard clustering.
- Five player types each for defenders and forwards.

03

Results

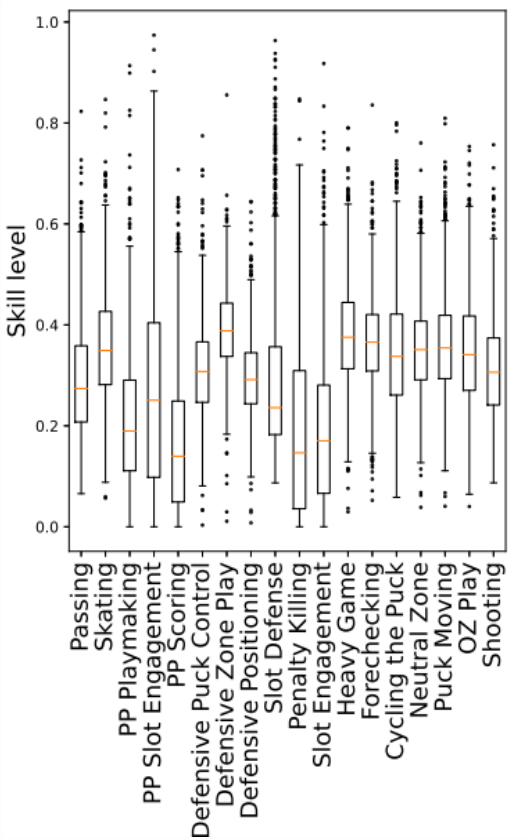
Defenders skill distribution

- Skill distribution across the defensive skills
- Broad range of skill levels among the players
- Some skills have more consistent values
- Special teams
- Outliers



Forwards skill distribution

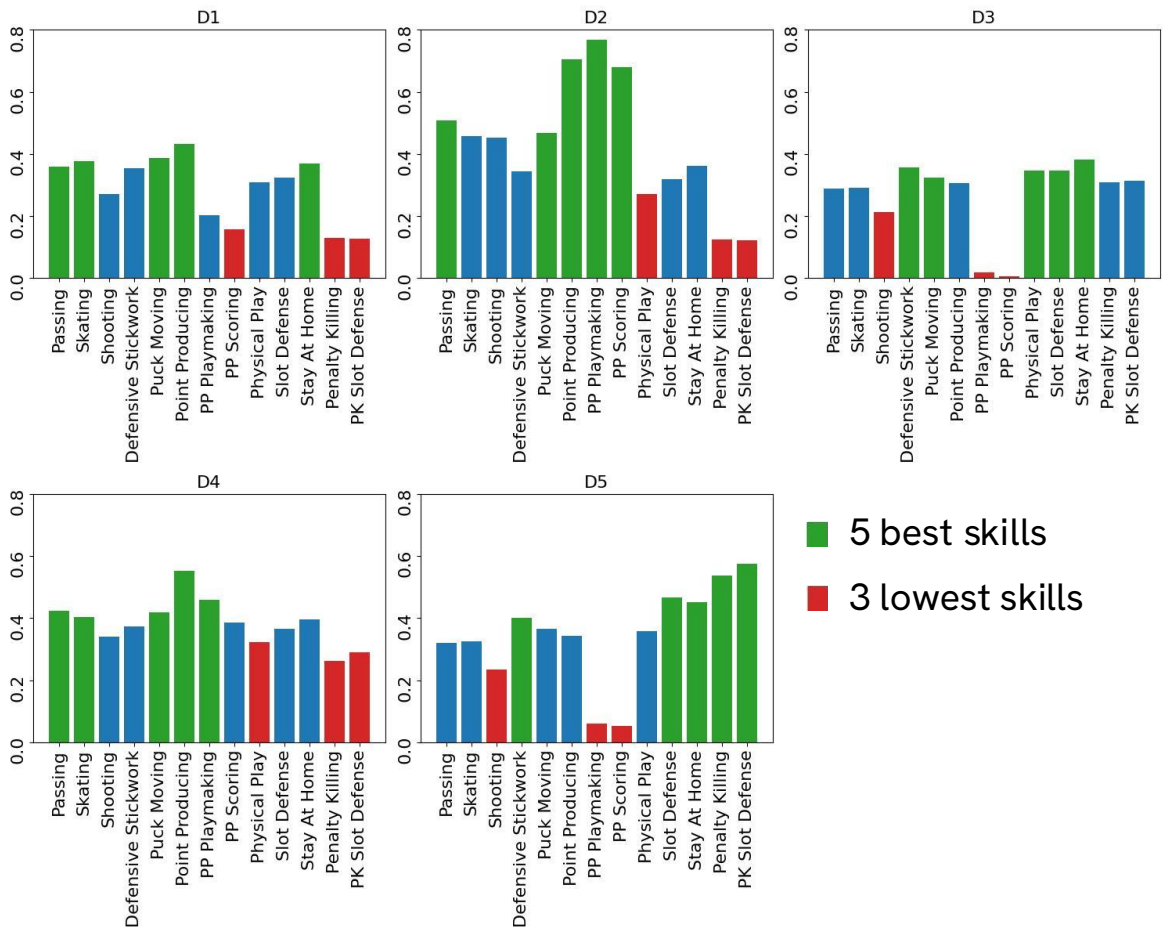
- Skill distribution among the forwards
- Broad level of skill in all the skills
- Some skills values are more evenly distributed
- Numerous outliers indicating variability



Defender Player Types

Cluster D1 (91 players)	Cluster D2 (229 players)	Cluster D3 (188 players)
S Forsmark (SHL)	R Murphy (AHL)	J Nyberg (SHL)
H Skinner (AHL)	L Cormier (AHL)	A Söderberg (HA)
W Wallinder (SHL/AHL)	T Smith (AHL)	Y Kuznetsov (AHL)
J Andersson (SHL)	L Mailloux (AHL)	K Lowe (SHL)
H Gabrielsson (HA)	C Carrick (AHL)	P Tischke (AHL)
A Brandhammar (HA)	T Niemelä (AHL)	V Pulli (AHL)
H Styf (HA)	A Lindelöf (HA)	J Lundegård (SHL)
C.J Lerby (SHL/HA)	J Laleggia (SHL)	L Jardeskog (HA)
Q Schmiemann (AHL)	A Kniazev (AHL)	H Falk (HA)
J Brook (AHL)	J Pudas (SHL)	I Heens (SHL/HA)

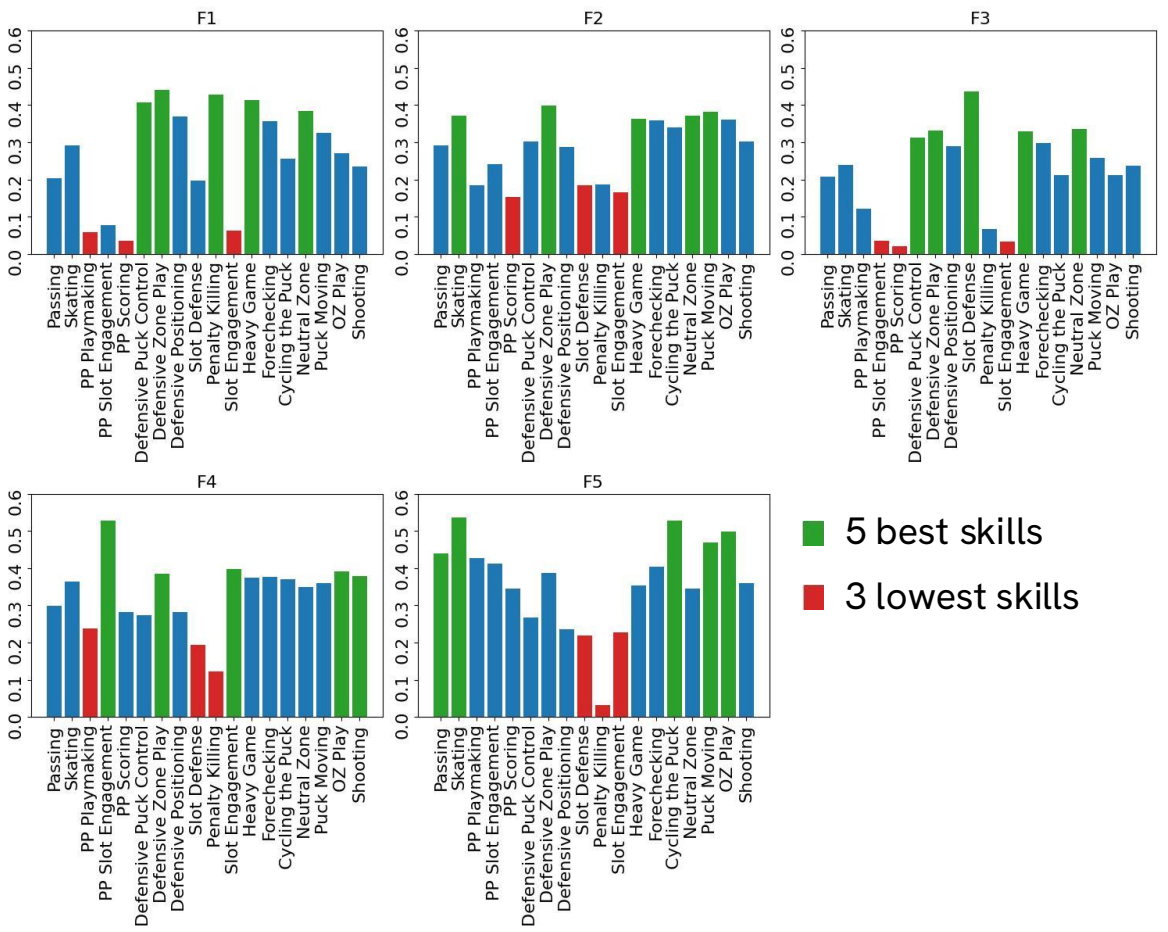
Cluster D4 (128 players)	Cluster D5 (142 players)
D Brickley (SHL/HA)	B Pachal (AHL)
F Kral (AHL)	A Strand (AHL)
E Sjöström (SHL/HA)	D Samorukov (AHL)
M Setkov (HA)	I Solovyov (AHL)
S Åkerström (HA)	G Brisebois (AHL)
M Björk (AHL/SHL)	M Kokkonen (AHL)
K Johansson (HA)	W Aamodt (AHL)
J Jansson (HA)	M Karow (AHL)
J McIsaac (AHL)	D Helleson (AHL)
O Nilsson (SHL)	S Santini (AHL)



Forward Player Types

Cluster F1 (302 players)	Cluster F2 (359 players)	Cluster F3 (255 players)
T Barron (AHL)	L Larsson (SHL)	J Grönhagen (HA)
M Westfält (SHL)	O Sillinger (AHL)	F Nilsson (SHL)
N Caamano (AHL)	R Elie (SHL)	F Barklund (HA)
N Jones (AHL)	A Räty (AHL)	J Devane (AHL)
K MacLean (AHL)	J Kellman (SHL)	R Clune (AHL)
M Marushev (AHL)	J Lauko (AHL)	R Muzik (SHL)
M O'Leary (AHL)	A Poganski (AHL)	O Pettersson (SHL)
B Maxwell (SHL)	G Meireles(AHL)	J Joshua (AHL)
T Kaspick(AHL)	P Carlsson (SHL)	K Gabriel (AHL)
J Labate (AHL)	E Desnoyers (AHL)	I McKinnon (AHL)

Cluster F4 (243 players)	Cluster F5 (250 players)
R Damiani (AHL)	M Strömwall (AHL/SHL)
S Walker (AHL)	O Palve (SHL)
N Todd (AHL)	M Ruohomaa (SHL)
R Marenis (HA)	D Holloway (AHL)
A Beckman (AHL)	D Tomasek (SHL)
C Conacher (AHL)	J Looke (SHL/HA)
A Andreoff (AHL)	A Petersson (SHL)
J Doan (AHL)	A Louis (AHL)
B McCartney (AHL)	M Modigs (HA)
S Wright (AHL)	L Bristedt (SHL)



Finding replacement for Carl Dahlström

Players	Similarity to C. Dahlström
Fredrik Claesson	89 %
Casey Fitzgerald	88 %
Brandon Scanlin	88 %
Steven Santini	87 %
Austin Strand	87 %
Filip Windlert	87 %
Didrik Strömberg	86 %

Conclusion

Represented playing styles for ice hockey defenders and forwards

Constructed numerical vectors based on skill sets that represented an ice hockey player’s playing style

Derived player types for ice hockey defenders and forwards

With the use of fuzzy clustering, we defined five player types each for defenders and forwards together with typical skill levels and players for these player types.

Future work

New representation of player similarities

As future work, we will define a new similarity between players based on their membership values to the playing style clusters.

Investigate other clustering methods

Other clustering methods will be investigated such as Gaussian Mixture Models.

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