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DIGR: A Defense Independent Rating of NHL Goaltenders using Spatially Smoothed Save Percentage Maps

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1. Summary

Current methodology for Evaluation NHL Goaltenders is Save Percentage (S%)
- Drawback is each goaltender faces different distribution of shots
- Heavily dependent on quality of defense in front of goaltender
- Shot Quality Adjusted (Krzywicki, 2010) compares SP% for average goalie

New Methodology given below
- Using data downloaded from ESPN for every NHL shot in 2009-10 regular season
- Create goal probability maps (See Figures 1 and 2) for each NHL goaltender across
  - shot types (*w*=backhand, deflection, slap, snap, tip-in, wrap and wrist)
  - opponents strength (*v*=shorthanded, even or power play)
  - on-ice location of shot (x,y) [*adjusted for Madison Square Garden bias*]

DIGR = predicted save percentage if all goalies faced identical distribution of shots

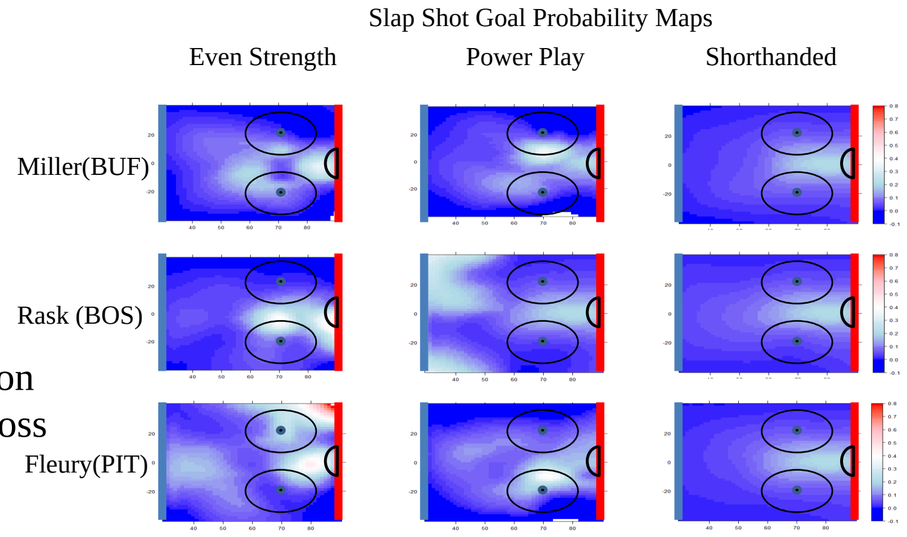

Figure 1: Goal Probability Maps of Slap Shots at Different Opponent Strengths for Selected Goalies
Scale is Blue (low) to Red (high)

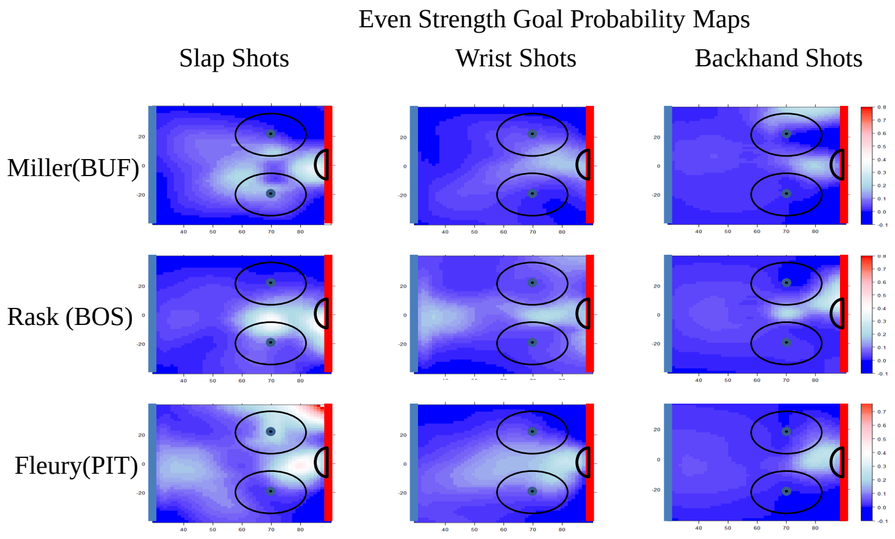

Figure 2: Goal Probability Maps at Even Strength of Different Shot Types for Selected Goalies
Scale is Blue (low) to Red (high)

2. Notation and Mathematical Framework

See Conference Proceedings Paper for details

Essential insight:

$$S\%_i = \sum_s GoaliePerformance_i(s)\,ShotDensity_i(s)$$

where s = (shot type, opposition strength, x-location, y-location)

$$DIGR_i = \sum_s GoaliePerformance_i^*(s)\,\overline{ShotDensity}(s)$$

Goalie Performance*$_i$(s) is performance of goalie i predicted by spatial smoothing

$\overline{ShotDensity}(s)$ is average shot density across the entire NHL regular season

Spatial smoothing of goal probabilities done using non-parametric LOWESS regression for each shot type and opponents strength (21 for each goalie)

Hence, Defense Independent Goalie Rating (DIGR)
- does NOT depend on the Shot Density for the ith goalie
- does depend on league average shot density across shot types and location

3. Application and Results

Data: 74300 NHL shots 2009-10 regular season
Downloaded from ESPN GameCast
Mapped shots to single offensive zone
Created goal probability maps (red is high, blue is low)
All goalies facing more than 600 shots
Table I has Top 20 goalies
- Miller (BUF), Conklin (STL), Halak (MTL) = Top 3

Goalies hurt by their defense
- Smith (TBL), Biron (NYI), Roloson (NYI)

Goalies helped by their defense
- Howard (DET), Rask (BOS), Thomas (BOS)

Rank	Player (Team)	DIGR Rating (G_i^*)	Save Percentage (G_i)
1	Ryan Miller (BUF)	0.9285	0.9285
2	Ty Conklin (STL)	0.9280	0.9215
3	Jaroslav Halak (MTL)	0.9269	0.9242
4	Jonas Hiller (ANA)	0.9243	0.9183
5	Henrik Lundqvist (NYR)	0.9237	0.9208
6	Evgeni Nabokov (SJS)	0.9227	0.9216
7	Ilya Bryzgalov (PHX)	0.9226	0.9204
8	Tuukka Rask (BOS)	0.9218	0.9312
9	Antti Niemi (CHI)	0.9215	0.9124
10	Tomas Vokoun (FLA)	0.9191	0.9246
11	Johan Hedberg (ATL)	0.9190	0.9151
12	Roberto Luongo (VAN)	0.9186	0.9128
13	Jose Theodore (WSH)	0.9185	0.9105
14	Cam Ward (CAR)	0.9185	0.9155
15	Dwayne Roloson (NYI)	0.9182	0.9068
16	Miikka Kiprusoff (CGY)	0.9178	0.9199
17	Semyon Varlamov (WSH)	0.9163	0.9095
18	Ondrej Pavelec (ATL)	0.9159	0.9061
19	Chris Mason (STL)	0.9158	0.9129
20	Manny Legace (CAR)	0.9155	0.9129

Note that DIGR ranks Miller (BUF) 1st, Rask (BOS) 8th, and Fleury (PIT) 39th for 2009-10 NHL Regular Season