A New Look at an Old xG

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xG

xG stands for Expected Goals

Refers to weighting shots by probability they are goals

In statistics, expected Values of 0's and 1's are probabilities

Some Old xG's

1. **An Expected Goals Model for Evaluating NHL Teams and Players** by Brian Macdonald

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2. **Evaluating NHL Goalies, Skaters, and Teams Using Weighted Shots** by Brian Macdonald, Craig Lennon, Rodney Sturdivant

Total Hockey Ratings

Some Details for the Math/Stat Folks

- Response = NP_k, here $k = 20$
- Covariates/Predictors= Yes
- Model form = Linear
- Link function = Identity
- Estimation (OLS, Lasso, Ridge) = Ridge

Implement using

Total Hockey Ratings(THoR)

NP_k = P(Goal for Home team in next k secs after event)
-P(Goal for Away team in next k secs after even)
= xG_{HOME}-xG_{AWAY}

Exceptions: SHOT and PENL
SHOT value = xG + P(Goal in k seconds after the shot)
PENL value = PP score rate per min $\times$ length of penalty

Been using k=20

NP_{20} for THoR

Event	Shot Type (if relevant)	Location	NP20
SHOT	Backhand	Off	0.1348
SHOT	Wrist	Off	0.1096
SHOT	Slap	Off	0.0697
TURN (to Home Team)		Off	0.0362
FAC		Off	0.0167
MISS	Wrist	Off	0.0159
HIT (by Home)		Off	0.0039
FAC		Neu	0.0026
HIT (by Home)		Neu	-0.0008
TURN (to Home Team)		Neu	0.0264
FAC		Def	0.0005
HIT (by Home)		Def	-0.0060

THoR

Terms in model:

- Home Ice
- Rink Effect
- Zone Start
- Score Effect
- Home Players
- Away Players
- PP, PK & interactions

THoR Validity

Probability of Winning Given Out ___ Your Opponent
Data from 2009 to 2013

Conditions	THoR*	Corsi	Fenwick	Shots
5v5	0.519	0.530	0.461	0.406
5v5 within 2	0.537	0.568	0.520	0.452
5v5 within 1	0.573	0.591	0.580	0.493
5v5 tied	0.589	0.607	0.620	0.538

* Note that THoR uses additional information on RHS of model

THoR Reliability

Year to Year Corr Player Ratings
from 2009 to 2014 Seasons

Model	1 Yr	2 Yr	3 Yr
Even Strength			
Adj Corsi	0.28	0.26	0.27
Adj Fenwick	0.47	0.41	0.41
THoR	0.49	0.48	0.48
Even Strength & Special Teams			
Adj Corsi	0.33	0.32	0.28
Adj Fenwick	0.47	0.41	0.41
THoR	0.80	0.76	0.77

Using THoR Framework with Corsi and Fenwick as 1,-1 response

Get from THoR models

Model parameters/terms give ratings which are the value contributed by that player accounting for teammates, opponents, score effects, etc.

E.g THoR-si, average effect of a zone start on CORSI at even strength is about 3.57%

E.g THoR-wick, average effect of E. Karlsson (1D) on FENWICK is about 2.77%

E.g. THoR, effect of home ice is about 0.31 goals

Results Data

NHL Seasons 2013/14, 2014/15, 2015/16 (through 1/10/16)

Even Strength & Special Teams (PP, PK)
Total Plays: 768,597
Total Corsi's: 332,790
Total Fenwick's: 247,839

$>$ 1800 players, approx 3 GB of data

about 5 hours run-time implementation in Python using sparse matrices (Jake Hurlbut) with 1 TB RAM

Top 10 Forwards Total Value 2013-16

THoR-si:
J Thornton, P Bergeron, C Kunitz, D Backes, R Getzlaf, S Crosby, G Landeskog, A Ovechkin, A Kopitar, L Eriksson

THoR-wick:
J Thornton, P Bergeron, A Ovechkin, E Staal, C Kunitz, A Kopitar, J Toews, J Staal, J Voracek, J Jagr

THoR:
J Voracek, J Pavelski, C Kunitz, P Kane, J Thornton, B Wheeler, T Toffoli, J Toews, V Tarasenko, A Ovechkin

None of these include SH%

Top 10 Defencemen Total Value 2013-16

THoR-si:
J Boychuk, E Karlsson, S Weber, C Tanev, R Mcdonagh, N Hjalmarsson, M Giordano, M-E Vlasic, B Jackman, M Niskanen

THoR-wick:
E Karlsson, P.K. Subban, M Giordano, M-E Vlasic, A Stralman, J Muzzin, J Demers, A Goligoski, M Niskanen, D Keith

THoR:
T Barrie, O Ekman-Larsson, H Lindholm, P.K. Subban, R Suter, M Niskanen, M Giordano, J Demers, R Ellis, E Johnson

None of these include SH%

Thank You

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