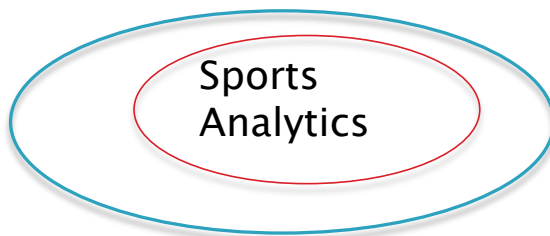


# A Markov Game Model for Valuing Player Actions in Ice Hockey

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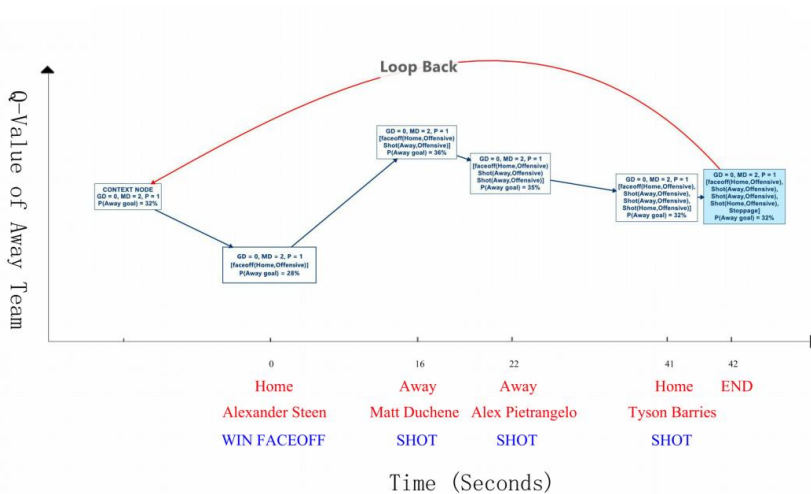
Reinforcement Learning



- We built Markov game model for NHL.
- Big Data, Big Model:
  - 2.8 M Events.
  - 1.3 M States.
- Learn Q-function (expected value of action in state).

# Player Ranking

- ▶ Q-based Action Impact Score
- ▶ Rank Players based on total action impact



Name	Position	Goal Impact	Goals	Points	+/-	Takeaways	Salary
Jori Lehtera	C	17.29	8	25	13	21	\$3,250,000
Henrik Zetterberg	LW	14.54	7	30	-1	21	\$7,500,000
Jason Spezza	C	14.33	6	25	-11	25	\$4,000,000
Vladimir Tarasenko	RW	12.78	20	37	18	20	\$900,000
Jonathan Toews	C	12.60	13	29	9	19	\$6,500,000
Joe Pavelski	C	12.22	16	29	5	22	\$6,000,000
Kyle Okposo	RW	11.79	8	29	-4	18	\$3,500,000
Brent Burns	D	11.56	10	27	-3	16	\$5,760,000
Gustav Nyquist	RW	11.47	14	22	-7	15	\$1,050,000
Joe Thornton	C	11.44	8	30	2	28	\$6,750,000
Ryan Kesler	C	10.99	12	27	-1	20	\$5,000,000
Tomas Plekanec	C	10.50	10	23	6	15	\$5,000,000
Sidney Crosby	C	10.43	10	37	12	18	\$12,000,000
Patrick Marleau	LW	9.96	7	27	-2	19	\$7,000,000
Martin Hanzal	C	9.76	6	17	1	16	\$3,250,000
Jaden Schwartz	LW	9.57	11	27	10	21	\$2,000,000
Pavel Datsyuk	C	9.51	13	25	4	16	\$10,000,000
Steven Stamkos	C	9.44	16	33	-2	14	\$8,000,000
Alex Ovechkin	RW	9.43	16	28	5	18	\$10,000,000
Rick Nash	LW	9.35	23	36	16	32	\$7,900,000
Sean Monahan	C	8.92	11	22	6	23	\$925,000
Phil Kessel	RW	8.70	17	38	-4	14	\$10,000,000
Jaromir Jagr	RW	8.68	5	20	-12	25	\$3,500,000
Frans Nielsen	C	8.64	6	17	-1	23	\$3,000,000
Nikita Kucherov	RW	8.60	14	31	20	13	\$743,000