

Stanford Men's Varsity Golf Team Performance Analysis: Informing Putting and Approach Shots Practice and Strategy on a Risk-Reward Basis

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Stanford Men's Varsity Golf Team



Viraat
Badhwar



David Boote



Dominic
Francks



Patrick
Grimes



Franklin
Huang



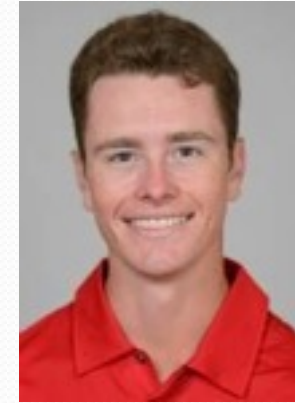
Jim Liu



Bradley
Knox



Maverick
McNealy



Jeffrey
Swegle

What is Shots To Hole?

PlayerName	RoundDate	HoleNumb	Shot1Distance	Shot1Lie	Shot1ClubUsed	Shot1Difficulty	Shot1ResultLeftRight	Shot1ResultShortPast	Shot2Distance	Shot2Lie	Shot2Club	Shot2Diffic	Shot2Resu	Shot2Resu
Bradley Knox	9/24/2014	1	520	Tee	Driver		Middle		220	Fairway	4 Iron		Left	
			Shot3Dist:	Shot3Lie	Putt1Distance	Putt1Difficulty	Putt1Break	Putt1Slope	Putt1ResultLeftRight	Putt1ResultShortPast	Putt2Distance	Putt2Difficulty	Putt2Breal	Putt2Slope
			40	Rough	12		Break right	Uphill	Left	Past		1		



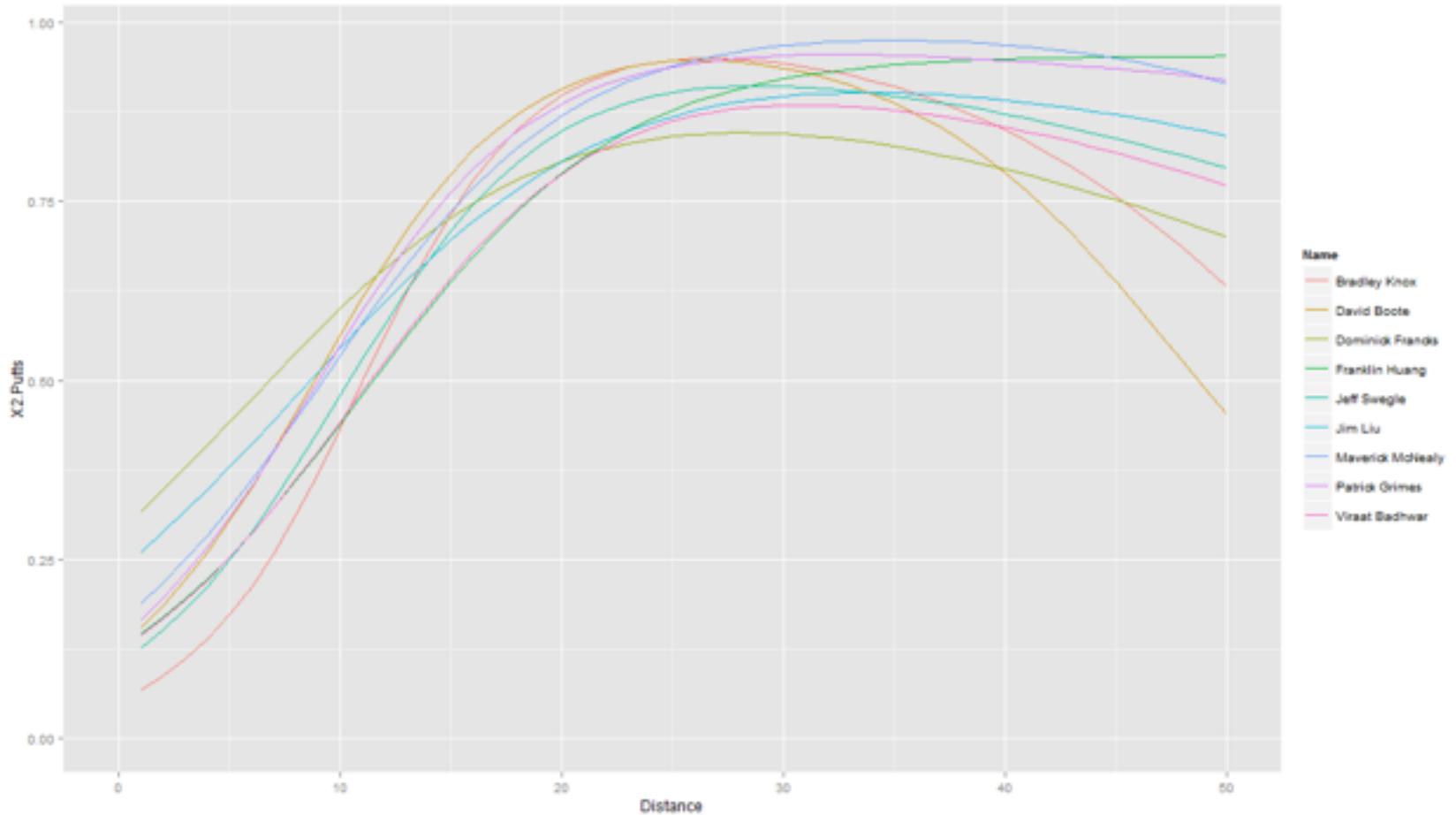
Predicted Putting Probability Using A Multinomial Logistic Regression

Sample Data

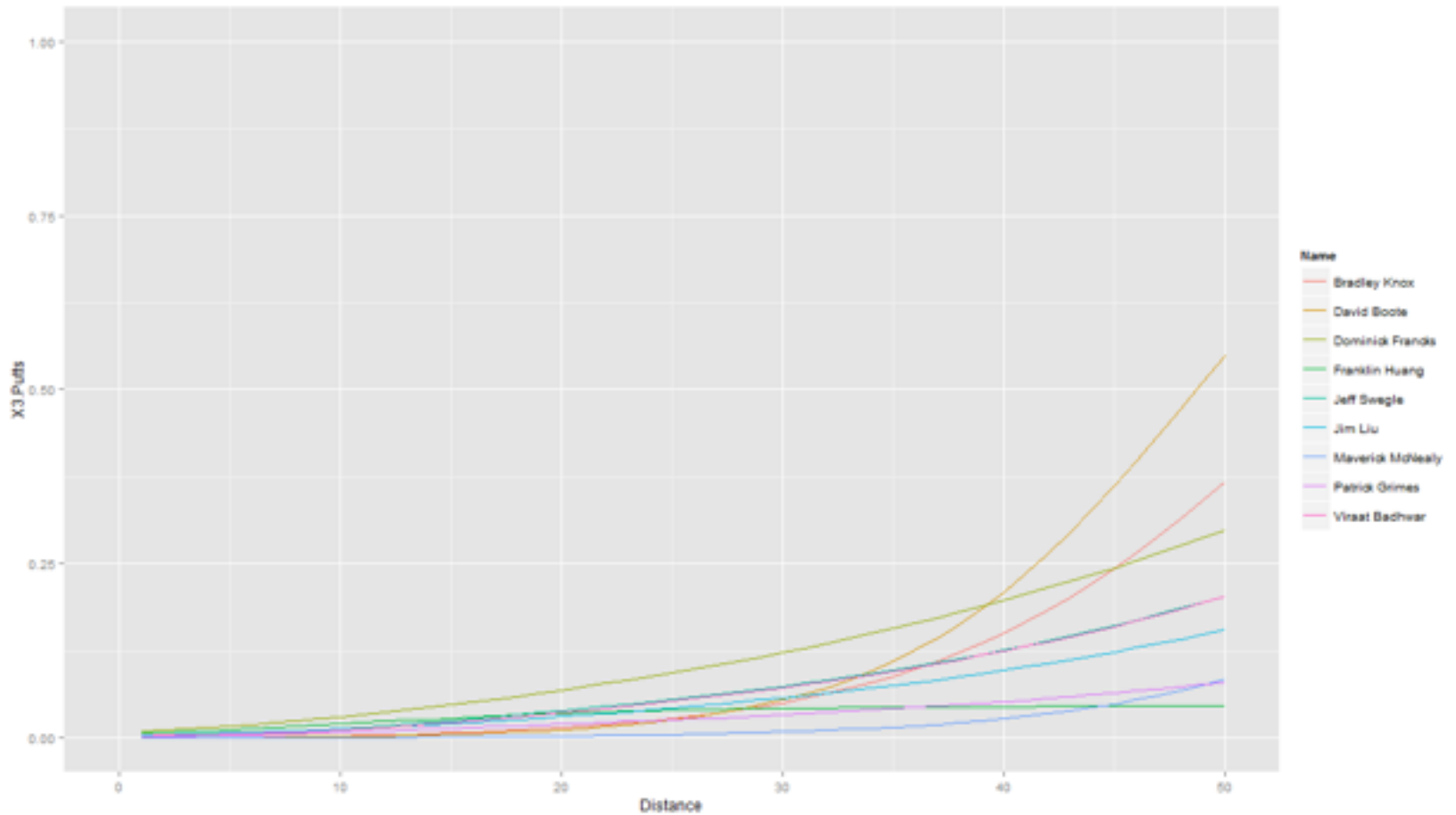
Multinomial Logistic Regression Putting Probability Estimates for the first 5 feet of first putt distance to the hole for player Bradley Knox

Distance (feet)	1 Putt	2 Putts	3 Putts	4 Putts	Probability Sum
1	0.9315	0.0684	0.0001	0.0000	1
2	0.9129	0.0869	0.0002	0.0000	1
3	0.8898	0.1010	0.0002	0.0000	1
4	0.8615	0.1381	0.0003	0.0000	1
5	0.8274	0.1722	0.0005	0.0000	1

Two Putts



Three Putts

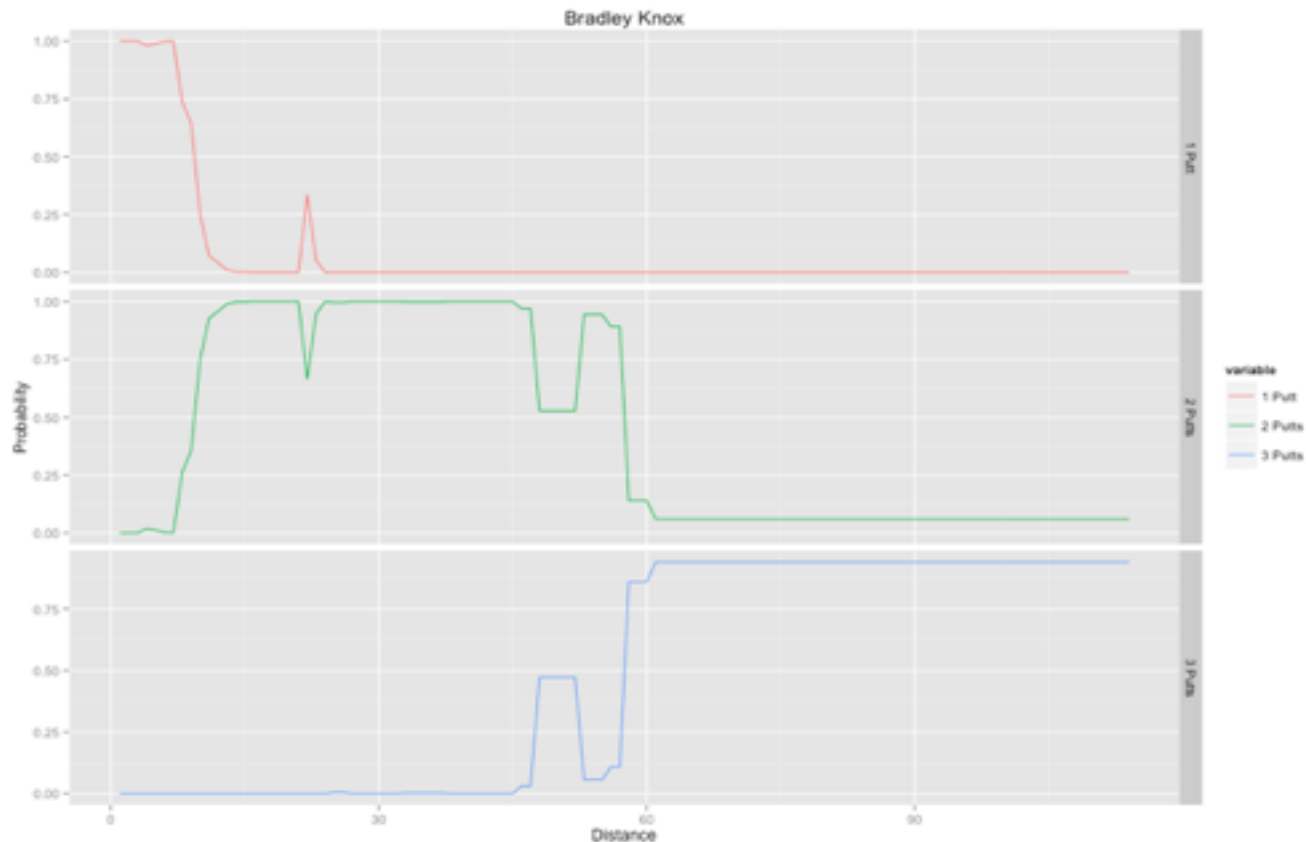




Other Models

Random Forest Model

Random Forest Probabilistic Classification Predicted Putting Probability Function for Bradley Knox *Observed over-fitting



10-Fold Cross-Validation Misclassification Error Rates

Player Name	Multinomial Logistic	Random Forest
<i>Bradley Knox</i>	16.20%	16.76%
<i>David Boote</i>	21.07%	23.06%
<i>Dominick Francks</i>	27.27%	30.42%
<i>Franklin Huang</i>	23.94%	28.19%
<i>Jeff Swegle</i>	22.22%	22.78%
<i>Jim Liu</i>	20.26%	26.29%
<i>Maverick McNealy</i>	22.59%	23.59%
<i>Patrick Grimes</i>	19.21%	17.22%
<i>Viraat Badhwar</i>	21.73%	20.61%



Putting Ability Metrics

3 Metrics

Player Name	Strokes Gained	Average First Putt	Average Number of Putts
<i>Franklin Huang</i>	1.020109413	18.05792	1.656370656
<i>Bradley Knox</i>	0.547945187	19.21229	1.709497207
<i>Viraat Badhwar</i>	0.510772366	17.62953	1.699164345
<i>Maverick McNealy</i>	0.371290794	15.88704	1.637873754
<i>Jeff Swegle</i>	0.248766885	17.44111	1.688888889
<i>Patrick Grimes</i>	0.002671094	16.00662	1.665562914
<i>Jim Liu</i>	-0.14262183	18.65517	1.711206897
<i>David Boote</i>	-0.327432108	15.94632	1.701789264
<i>Dominick Francks</i>	-1.766484383	18.70979	1.807692308

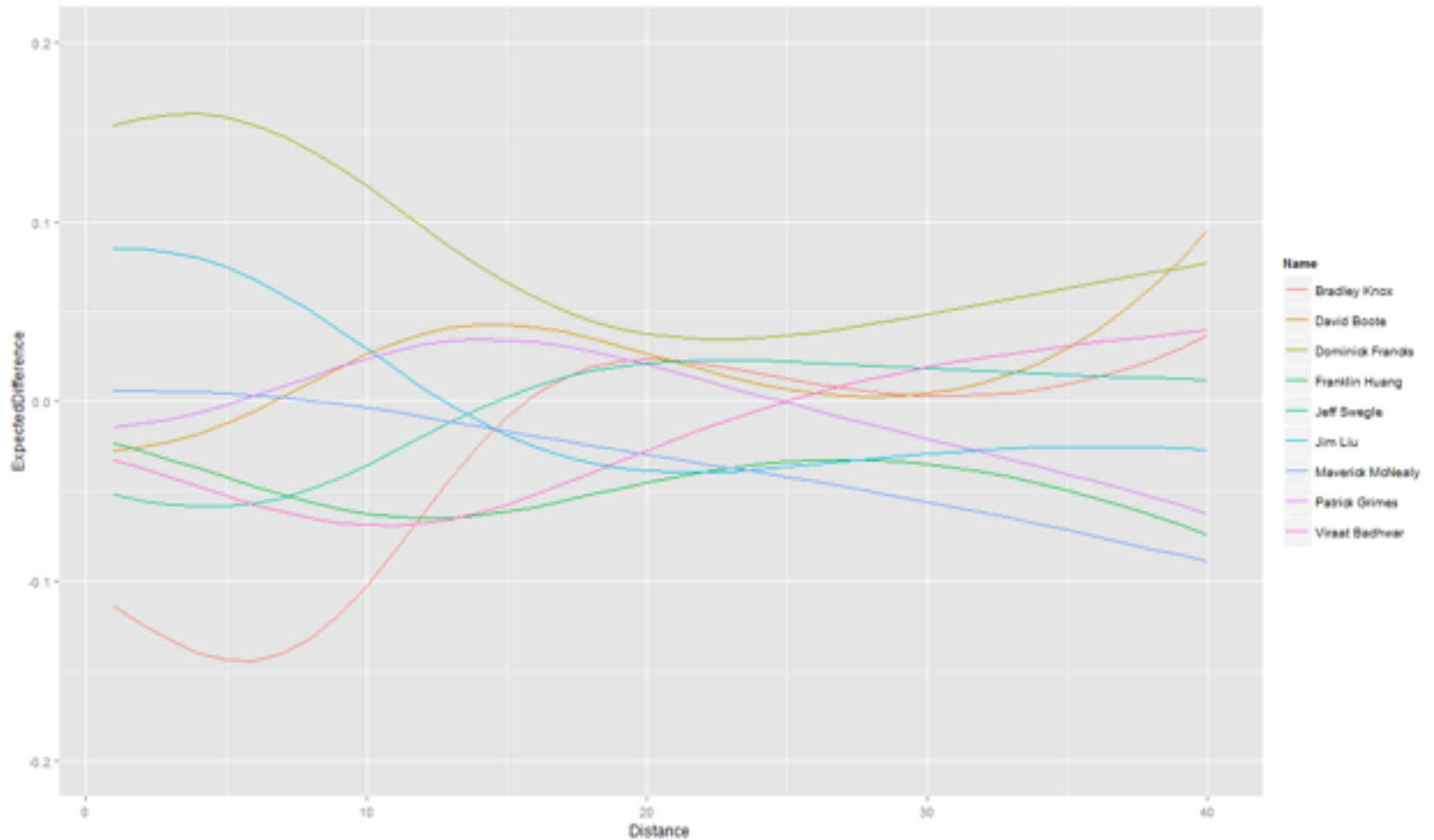
Player Rankings

Rank	Player's Strokes Gained	Players Average Putts
1	<i>Franklin Huang</i>	<i>Maverick McNealy</i>
2	<i>Bradley Knox</i>	<i>Franklin Huang</i>
3	<i>Viraat Badhwar</i>	<i>Patrick Grimes</i>
4	<i>Maverick McNealy</i>	<i>Jeff Swegle</i>
5	<i>Jeff Swegle</i>	<i>Viraat Badhwar</i>
6	<i>Patrick Grimes</i>	<i>David Boote</i>
7	<i>Jim Liu</i>	<i>Bradley Knox</i>
8	<i>David Boote</i>	<i>Jim Liu</i>
9	<i>Dominick Francks</i>	<i>Dominick Francks</i>

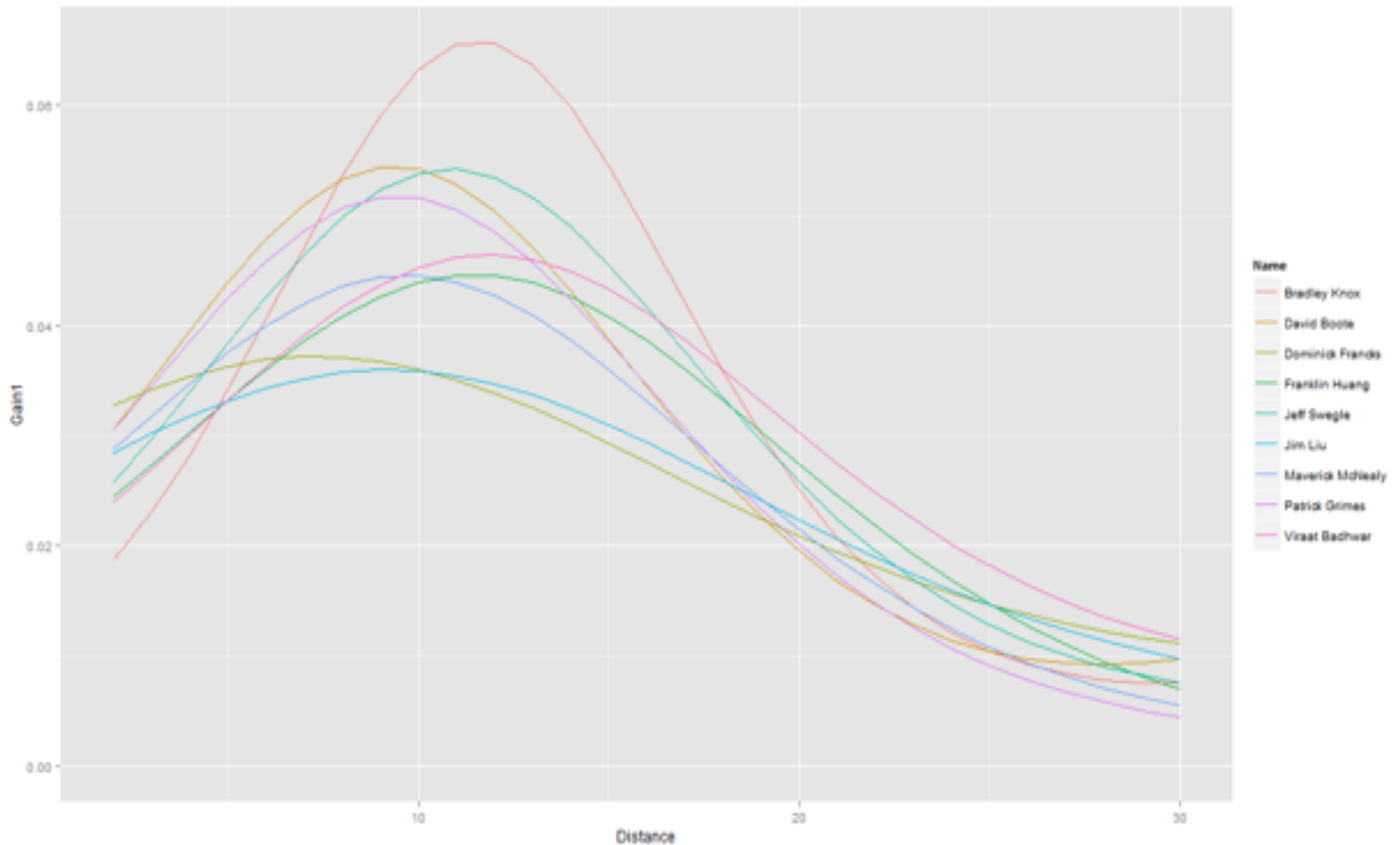


Other Interesting Findings

Expected Difference Putting



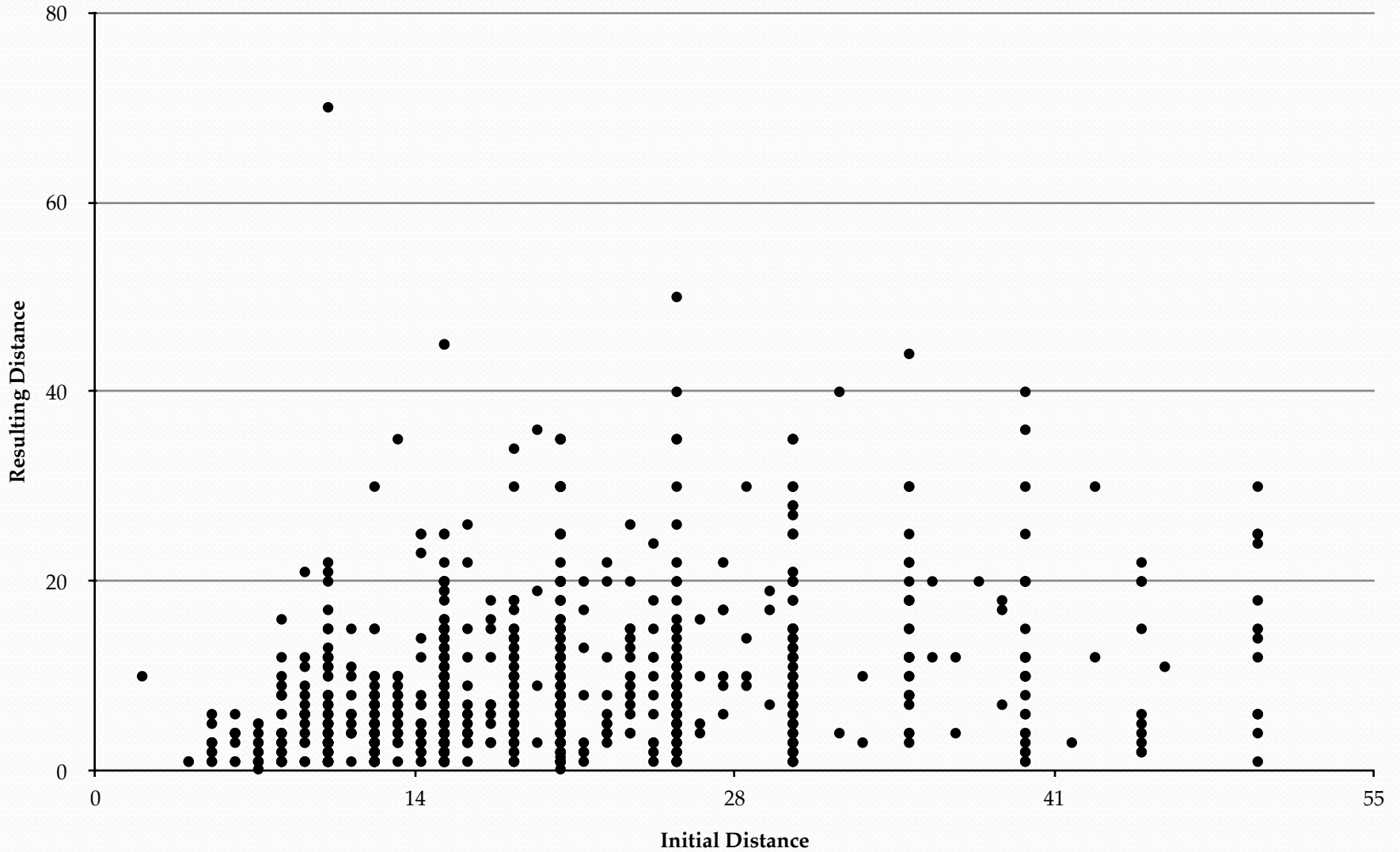
Putting One-Foot Closer



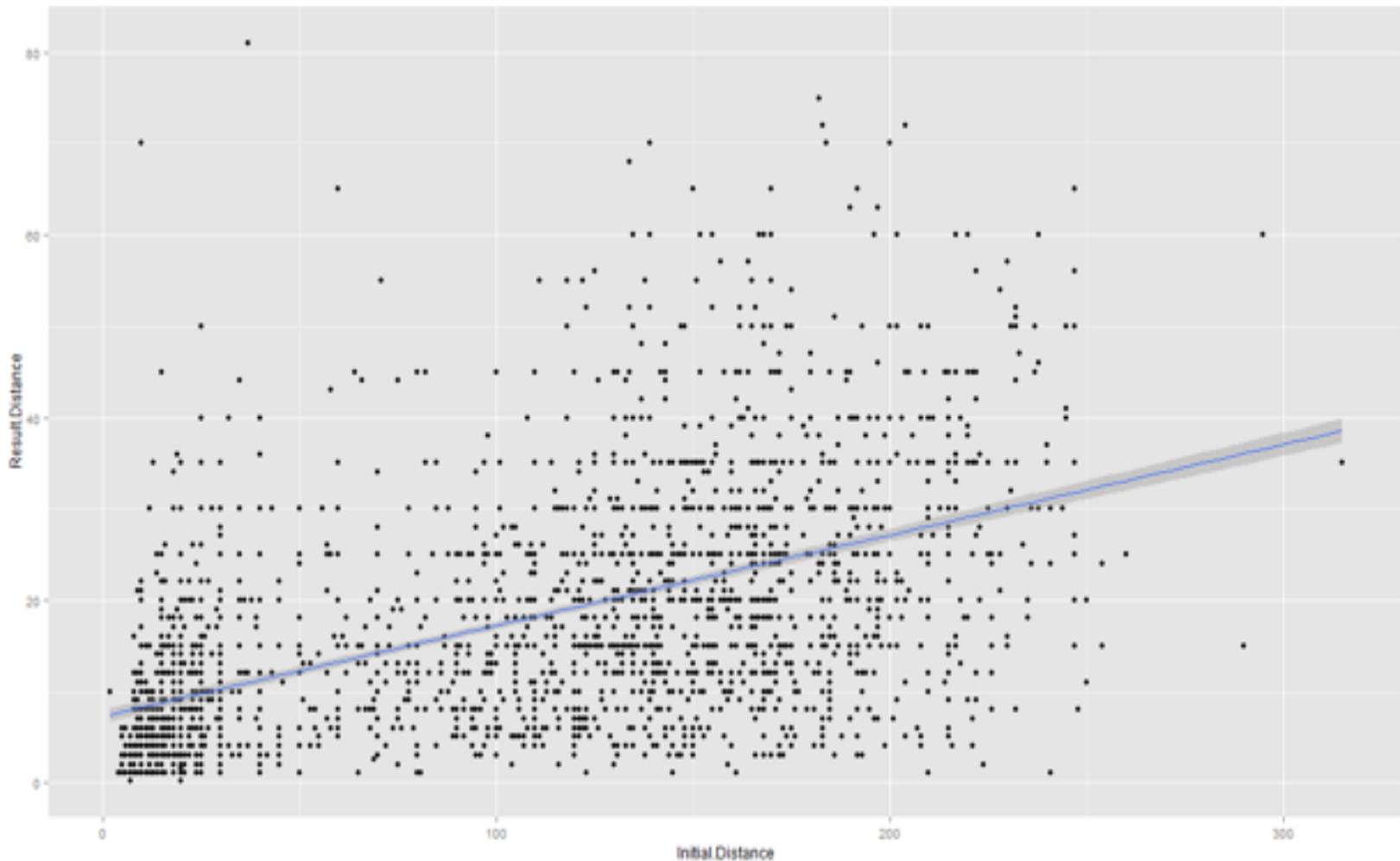


Short Game and Approach Shots

Short Game



Distance to Distance Mapping



Regression Results

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	7.280399	0.373947	19.47	<2e-16 ***
d\$Initial.Distance	0.099280	0.003037	32.69	<2e-16 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 11.09 on 2598 degrees of freedom

(1 observation deleted due to missingness)

Multiple R-squared: 0.2915, Adjusted R-squared: 0.2912

F-statistic: 1069 on 1 and 2598 DF, p-value: < 2.2e-16



Limitations and Looking to the Future