

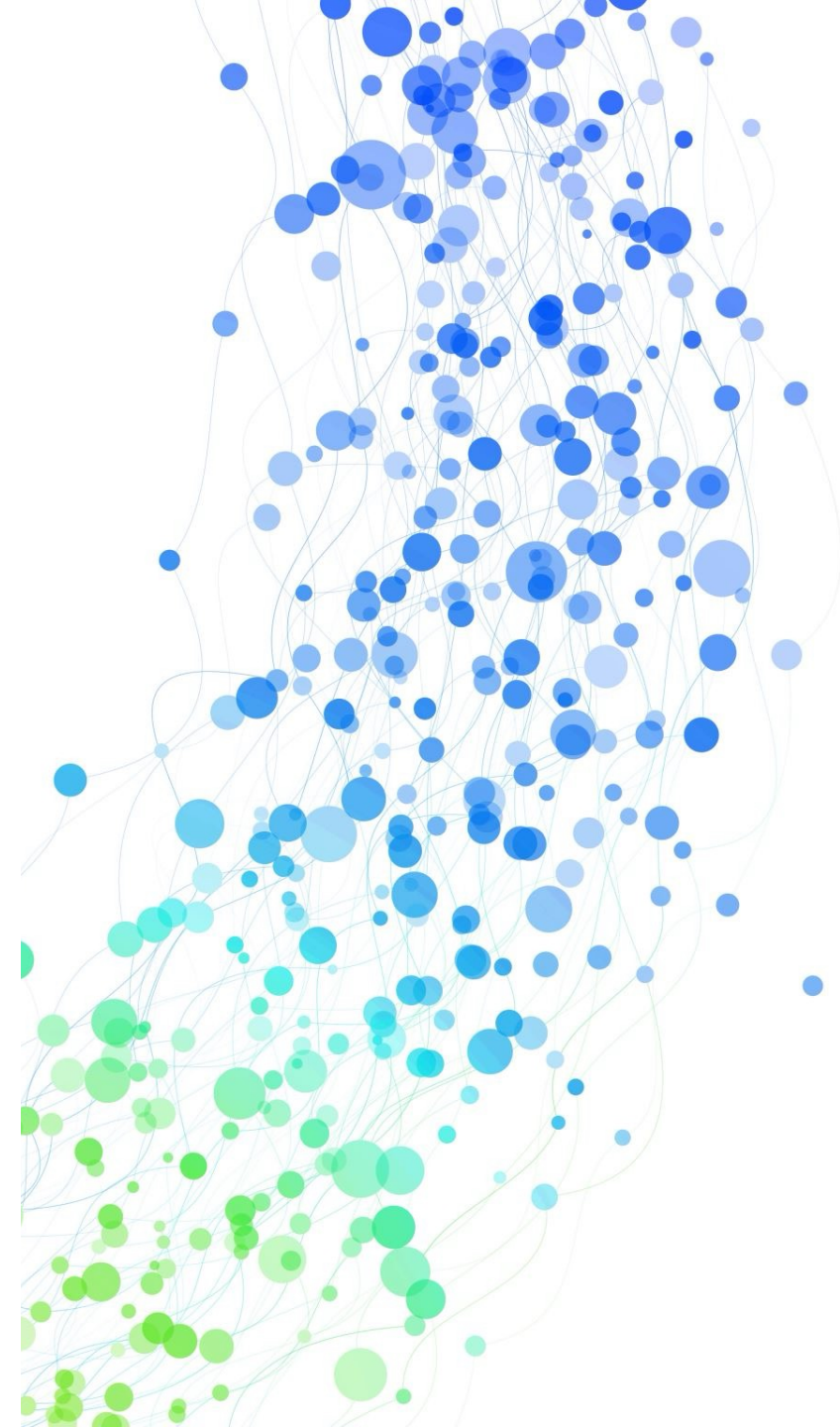
INSTANTANEOUS PRELIMINARY KICK RETURN ANALYSIS

The Importance of Performance Before the Kick is Received

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Github:

<https://github.com/Emr89/Instantaneous-Preliminary-Kick-Return-Analysis>



INTRODUCTION& QUESTION:

Background:

- Majority of kick return analysis tends to be heavily focused on performance after the kick is received
- Forgotten importance of performance before kick return develops
- Foundation of success encourages further success... but how do we determine success before the kick return develops?

Research Question:

What factors influence the length of the kick return before the return develops? And how predict its impact?

METHODOLOGY:

Data subset:

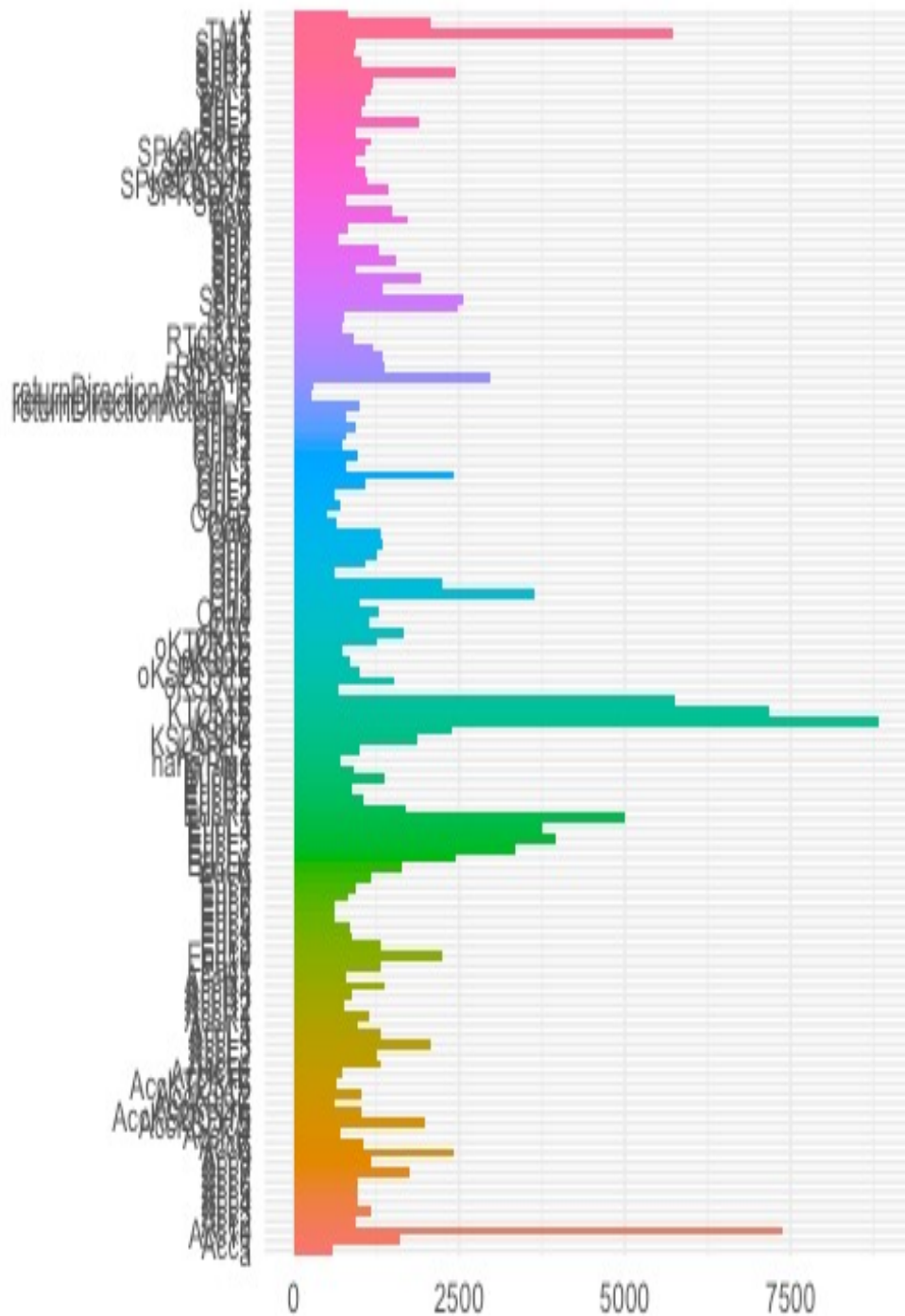
- Tracking data subset to only kick off/return, no penalties, and at the instantaneous moment the returner had received the ball
- Combination of factors analyzed:
 - Placement of individual player statistics (wide vs long orientation)
 - Pure tracking data, Euclidean distances, and statistical representation of player subsets within each unique play (mean, sd, etc.)
 - Response variable of either kick return yardage (plays data set), or "x" position at the moment of tackle (only final model has x position response variable)

MODELING TECHNIQUES & PERFORMANCE:

- Random Forest
- Neural Network (Traditional & Deep Learning in Keras)
- Elastic-Net Regularized Generalized Linear Models
- Elastic net regularization
- Ridge Regression
- Linear Models

<u>Type KRY Regr</u>	<u>R2</u>
<u>Type:</u>	<u>Value:</u>
Random Forest	0.35
Neural Network	0.298
General Elastic Net	0.297
Elastic Net Regularization	0.3
Ridge Regression	0.296
Linear Model	0.35

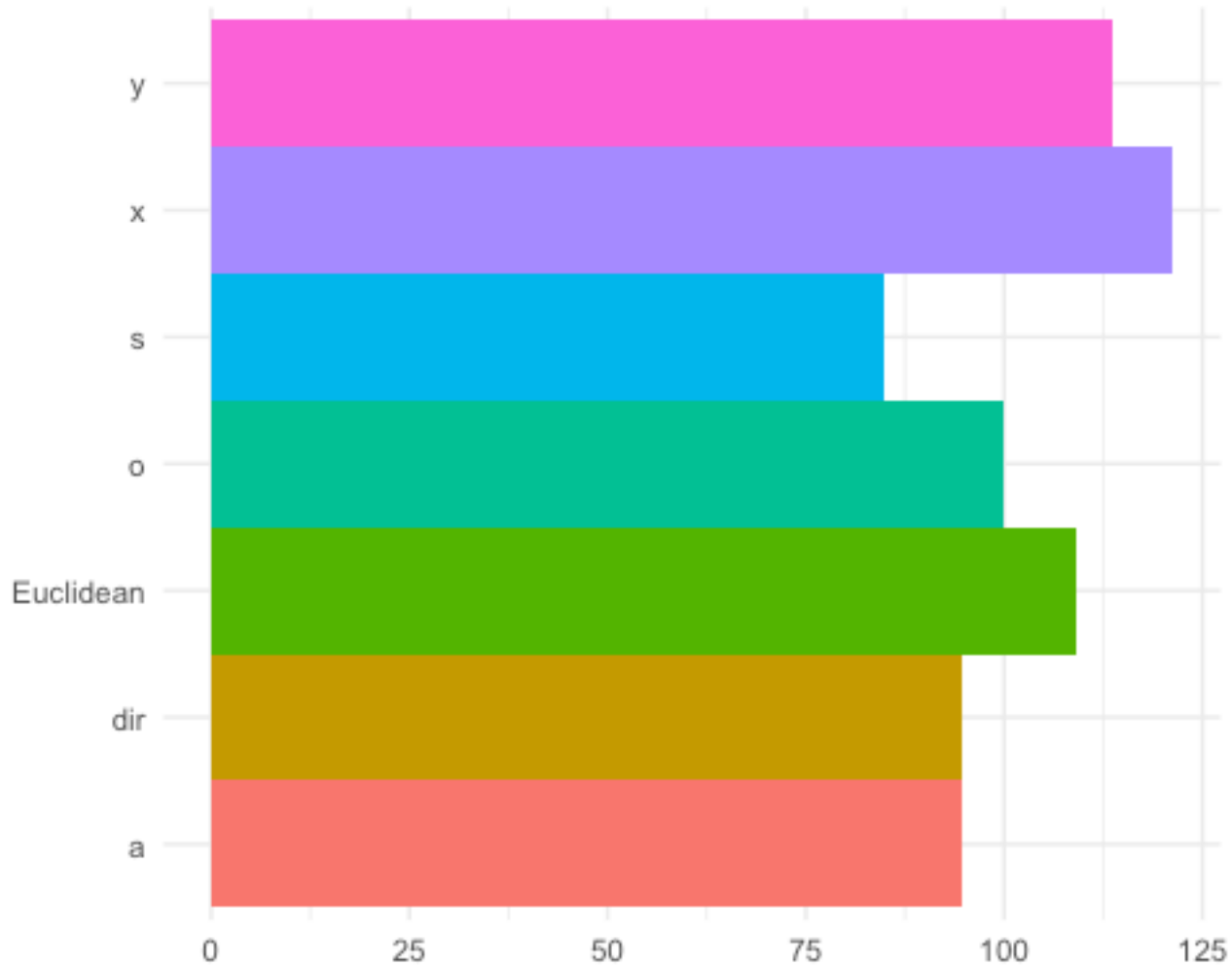
Above are the highest R2 values with the with the kick return yardage response variable.



BEST KRY MODEL:

- Random Forest Model with an R^2 Value = 0.35 with response variable kick return yardage
- most influential variable = mean distance front 2 kicking players
- Euclidean distance is a stronger predictor than raw tracking position
- R5,L5,R4,R5 distance to the returner, and mean distance amongst these positions, are important, meaning cohesive movement to bridge open gaps is important.

BEST RESULTING MODEL:



- Random Forest Model with an R^2 Value = 0.529, with 7 predictor variables
- Response variable “x” value for returner when ball is received.
- Created with spacetime folds in Cast package
 - purpose = measure location dependent impacts on the model to optimize hyperparameters

FINAL NOTES:

- Using best model overall to obtain relatively high R^2 value of 0.529 reveals the importance of performance before the kick is returned
- Using the best “explainable” model, performance metrics of importance can be stated specifically, such as:
 - Influential role of closest team players on kicking team
 - Importance of L5,L4,R5,R4 players and the mean of their Euclidean distances
 - Importance of Euclidean distances