There have been a series of articles and studies in both mainstream media and analytics sources questioning the play calling of NFL coaches, particularly their choice to run verses pass. In this talk, we will use all individual plays in 2018 and decision forest and partial dependency approaches to analyze this question in more detail. Combining these approaches with the expected points added in each play will allow us to quantify the value of run versus pass in a variety of situations, including down, distance to go, game margin, etc. To compliment this analysis we will use a similar approach to evaluate the factors that influence this decision to run versus pass and compare their current decisions with the expected benefits. Finally, we will use a matching approach to further investigate key situations discovered by the partial dependency analysis, including goal to go from inside the opponents’ 3 yard line, first and ten and inside the opponent’s red zone. (Received September 09, 2019)