In professional tennis the rankings are typically based on set parameters. Throughout the year there are tournaments that are worth different numbers of points. There are four tiers of events, Grand Slams, Masters 1000, ATP 500 and ATP 250. You receive the most points in your [ATP rankings](https://en.wikipedia.org/wiki/ATP\_rankings) from winning a Grand Slam, and the least from winning an ATP 250 tournament. In the data that we will be using, the provider has calculated an Elo ranking. This ranking considers what the tournaments are, as well as who each player is playing. So, playing a "harder" opponent in a Grand Slam counts for more than playing an "easy" opponent. For instance, if number 9 Elo ranked Casper Ruud plays number 1 Elo ranked Jannik Sinner and wins, it will be worth more than if Ruud played number 111 Elo ranked Stan Wawrinka.

In Tennis, there are also three different types of surfaces that are played on. The options are Grass, Hard, and Clay. This dataset contains information for each player on each surface.

In this worksheet, we will look at the data including this Elo ranking and look at distributions, shapes, and a multiple linear regression model. There will be questions about each of these, some of them being more open ended than others.

1. A graph of different sizes and colors

   Description automatically generated with medium confidenceWhat is the shape, center, and spread of each distribution? Is there a big difference between the three surfaces?
2. A graph with different colored squares

   Description automatically generatedCalculate the median, IQR, and range of the distribution for each surface.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Min | Q1 | Med | Q3 | Max |
| 0.000 | 0.400 | 0.500 | 0.600 | 0.833 |
| Min | | Q1 | Med | Q3 | Max |
| 0.167 | | 0.429 | 0.583 | 0.683 | 1.000 |
| Min | | Q1 | Med | Q3 | Max |
| 0.000 | | 0.349 | 0.435 | 0.557 | 0.893 |

1. Interpret the coefficients for return points won percentage and grass and clay surfaces.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Term** | **Coef** | **SE Coef** | **T-Value** | **P-Value** |
| Constant | -0.1898 | 0.0994 | -1.91 | 0.057 |
| ReturnPointsWonPercentage | 2.079 | 0.253 | 8.23 | 0.000 |
| EloRank | -0.001332 | 0.000120 | -11.07 | 0.000 |
| Surface |  |  |  |  |
| Grass | 0.1016 | 0.0209 | 4.85 | 0.000 |
| Hard | 0.0269 | 0.0166 | 1.62 | 0.106 |

1. Interpret the R-Squared value and decide if you think that this is a good model.

|  |  |  |
| --- | --- | --- |
| **S** | **R-sq** | **R-sq(adj)** |
| 0.125993 | 48.20% | 47.57% |

1. Based off of the following plots, do you believe that this model meets the assumptions of a multiple linear regression model?

A graph with blue dots

Description automatically generatedA graph with a line

Description automatically generated