NFL PROSPECT EVALUATION WITH COMBINE DATA

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MOTIVATION

The National Football League (NFL) is one of the largest professional sports organizations in the United States. Currently, there are 32 NFL teams and each year, each attempting to maximize performance to win the Super Bowl.

Because of this, the annual NFL draft is highly anticipated as it allows teams to select players eligible to leave college football in the hopes of adding talented, young individuals on team-friendly (cheap) contracts. However, there is a great deal of uncertainty in predicting professional performance.

NFL coaches and executives' jobs depend on accurate evaluation. Good draft picks are thought to be a key factor in team success. Teams use a combination of scouting reports, player measurements, and watching player tape to give themselves a better chance of selecting players that will do well in the NFL.

OUR APPROACH AND GOALS

One of the key objective measures in player evaluation is the NFL combine, where prospects attend and perform various athletic drills.

We attempted to model some of the variation in prospect success as well as draft position by using the eight combine statistics listed.

We broke the data down by player position.

Combine Statistics

- Height
- Weight
- Forty Yard Dash Time
- Vertical Jump Height
- Bench Press Reps
- Broad Jump Distance
- Cone Drill Time
- Shuttle Drill Time

Position Groups

- Quarterback
- Running back
- Wide Receiver
- Tight End
- Offensive Line
- Defensive End
- Defensive Tackle
- Linebacker
- Defensive Back

KEY METRICS

Our main metrics were:

- SRS, which measures team performance in the years after the player was drafted, adjusted for strength of schedule, and scoring randomness.
- DrAV, which measures a players career contribution to the team that drafted him.

Both metrics were sourced from ProFootballReference's databases.

DATA PREPROCESSING

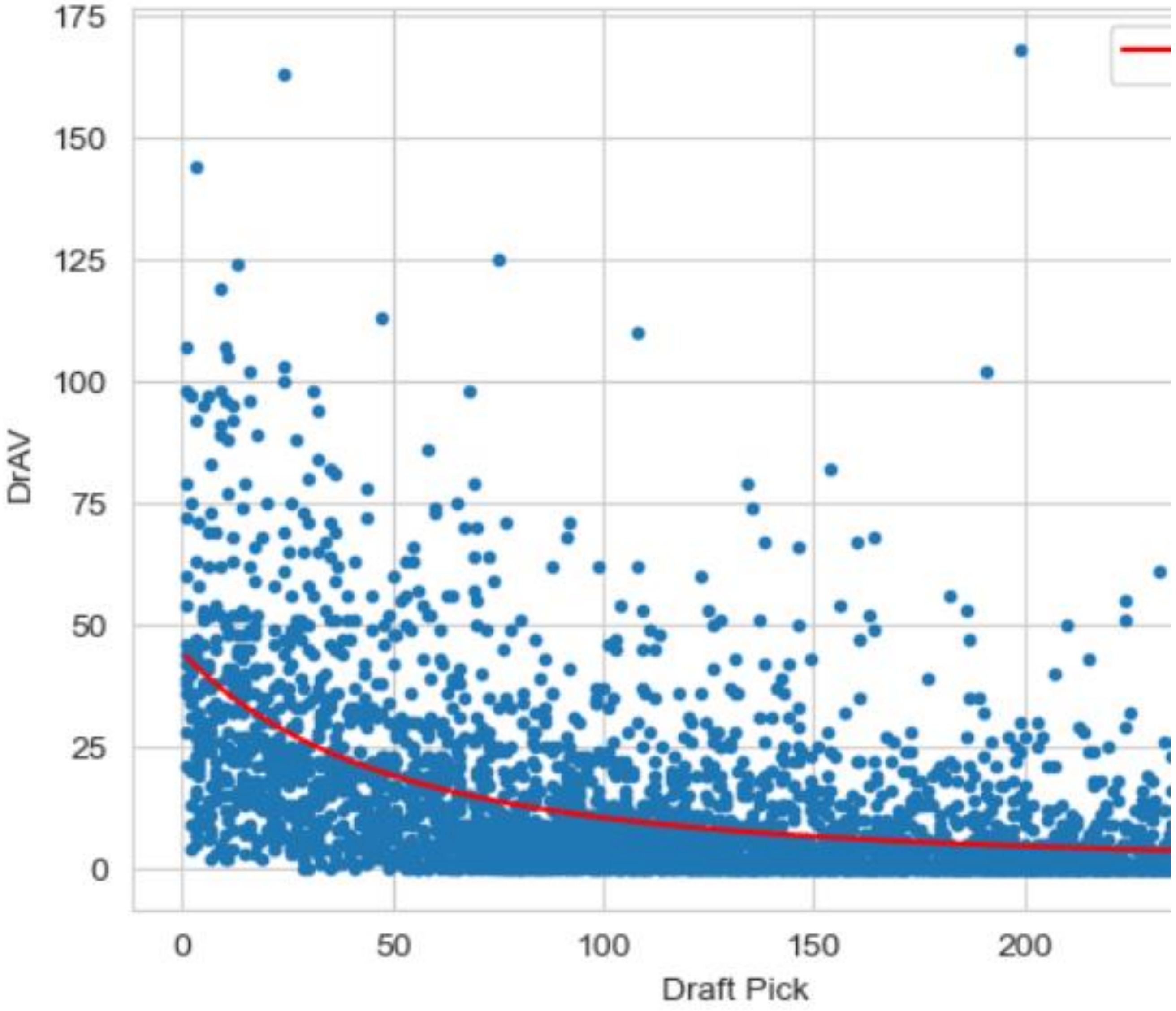
The combine data set contained most desired metrics already. The following steps were taken to clean the data.

- Standardizing team names.
- Adding data from 2019 and 2020.
- Removing duplicates and undrafted players.
- Combining positions into the 9 listed and removing kicking positions.
- Adding the data on DrAV and SRS into the data set for the combine by player.
- Filling missing combine data with the averages for each position.

In total we had 2885 players. One third of the years were split off as testing data.

PRELIMINARY MODELS

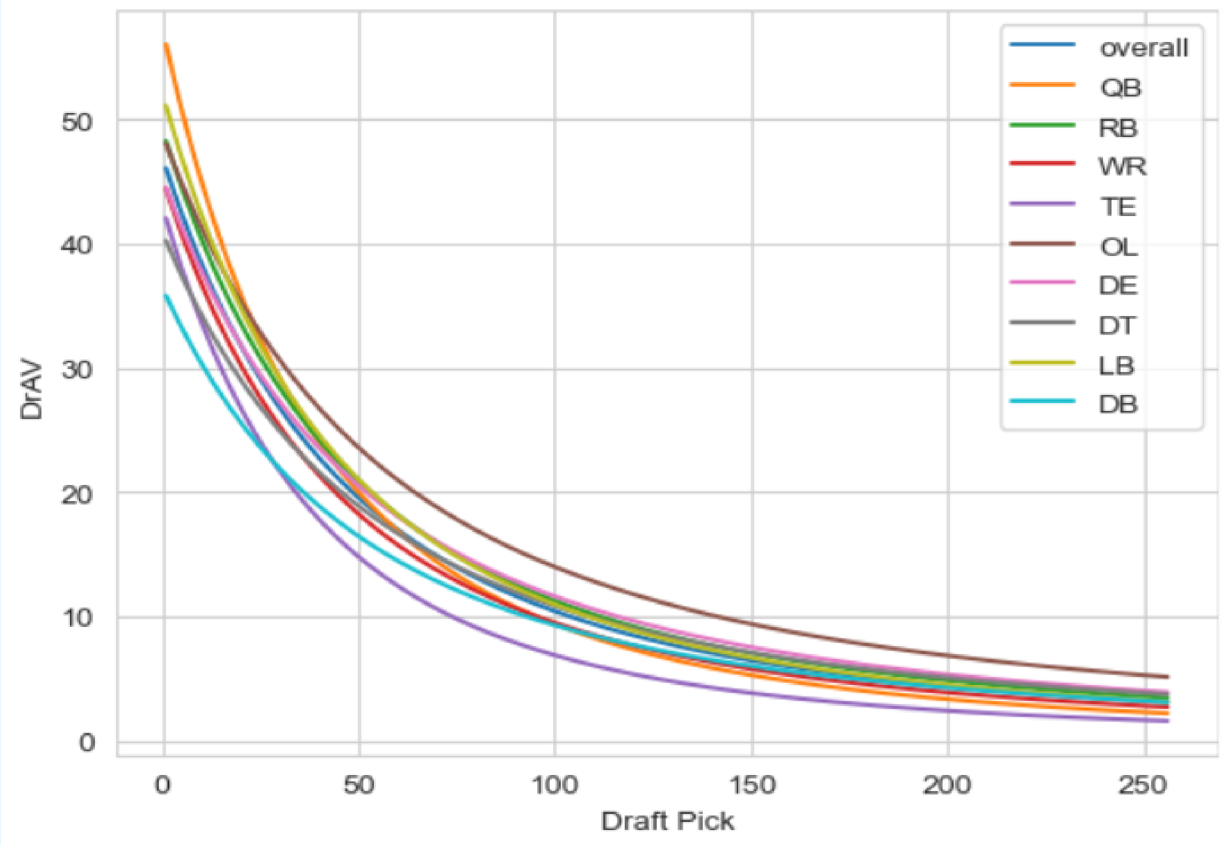
- We started by exploring the relationship between draft position and DrAV. We determined that the correlation was approximately linear in (x+180)^(-0.5). The parameters were determined with hyperparameter tuning.
- Based on the shape of the data, we decided to use Poisson regression for DrAV models.



COMPARISON BY POSITION

We observed some amount of variation by position.

In particular, quarterbacks have the highest value in the early round. Offensive linemen overperform, while tight ends and defensive backs underperform their position.



PLAYER PERFORMANCE MODEL

Our main model for player performance (DrAV) was a Poisson regression for each position on the eight combine variables given. We used cross validation to eliminate irrelevant statistics. We compared to a base model, which predicted the mean DrAV for every player. The performance, measured by MPD on the testing data broken down by position was:

	QB	RB	WR	TE	OL	DE	DT	LB	DB
Base	26.2	13.2	15.1	8.1	11.3	18.9	12.5	11.7	7.4
Constructed	25.5	12.9	14.9	8.0	10.6	13.1	11.4	11.5	7.4

While this model performed better than the control model, it is by a small enough margin that it is dubious that this effect is significant.

DRAFT POSITION MODEL

Our model for draft position was a kNN regression with k=30 for each position on the eight combine variables given. Before fitting we scaled the data and transformed the draft position by the function for player value we had found. We compared to a base model, which predicted the mean draft position for every player. The performance, measured by MSE on the testing data broken down by position was:

Position	QB	RB	WR	TE	OL	DE	DT	LB	DB
Base	7.15	4.93	5.24	4.61	5.44	5.99	5.71	4.84	4.84
Constructed	7.16	4.01	5.10	3.96	5.11	5.24	5.52	4.43	4.31

The model for draft position was better, however it still only explained less than 10% of the variation in draft position.

POTENTIAL IMPROVEMENTS

- Since we were forced to break down our models by position, the data sets were smaller than we hoped for. We expect that a larger data set would allow us to create a better model, especially due to the large amount of noise in the data.
- A significant proportion of the players did not take all drills, which likely contributed to the weakness of the model.
- Adding college stats may allow us to form a more accurate model.