Representing the Players
ABCDEFG[*]

NFLPA | 2024 Analytics Case Competition
UCLA + Bruin Sports Analytics Entry

Kevin Baer
UCLA
kevinbaer@ucla.edu

Steven Lu Chen
UCLA
stevenchen@ucla.edu

Abhinav Madabhushi
UCLA
abhinavm@ucla.edu

Trent Bellinger
UCLA
trentbellinger@ucla.edu

ABSTRACT Space: the final frontier. These are the voyages of the starship *Enterprise*. Its continuing mission: to explore strange new worlds. To seek out new life and new civilizations. To boldly go where no one has gone before!

`summarise()` has grouped output by '.pred_cluster'. You can override using the `.groups` argument.

1 Segmentation of Contracts

NFL contracts are complicated. We are not lawyers. But a contract's salary cap implications are a bit easier to parse. Using a great tool, Arjun Menon and Brad Spielberger's Expected Contract Value Calculator (Menon & Spielberger, 2024), We can see that there are 3 main inputs to all contracts: Years, Total, and % Guaranteed.

---

[*]Quarto template from Andrew Heiss https://github.com/andrewheiss/hikmah-academic-quarto.

Justin Madubuike's Contract Info

	TEAM	YEARS	TOTAL	APY	% GTD	CONTRACT TYPE	AGE
		4	$98,000,000	$24,500,000	49.49%	UFA	26

Table: Arjun Menon

Figure 1: Sample Player Contract Details on Expected Contract Value Calculator

APY (Average per Year) is simply just Total divided by Years, so we can quickly get to two variables: How much is the player making per year, and how much money does the player know they are going to make (via guarantees)? Indeed, when reading about extension disputes, they typically focus on these two amounts.

When trying to create compensation tiers, one could just use heuristics, but we prefer a more scientific method of K-Means Clustering. Since we have simplified a players contract down to 2 metrics (APY and Guaranteed), we can algo-organize the contracts into distinct groups. See Section 3 for more details on the computational decisions. Since we'll be comparing players from two different eras (10 years ago vs. Present) and the salary cap has changed greatly, OverTheCap has inflated apy and inflated guaranteed to adjust for this. More on inflating values to match differing salary caps later.
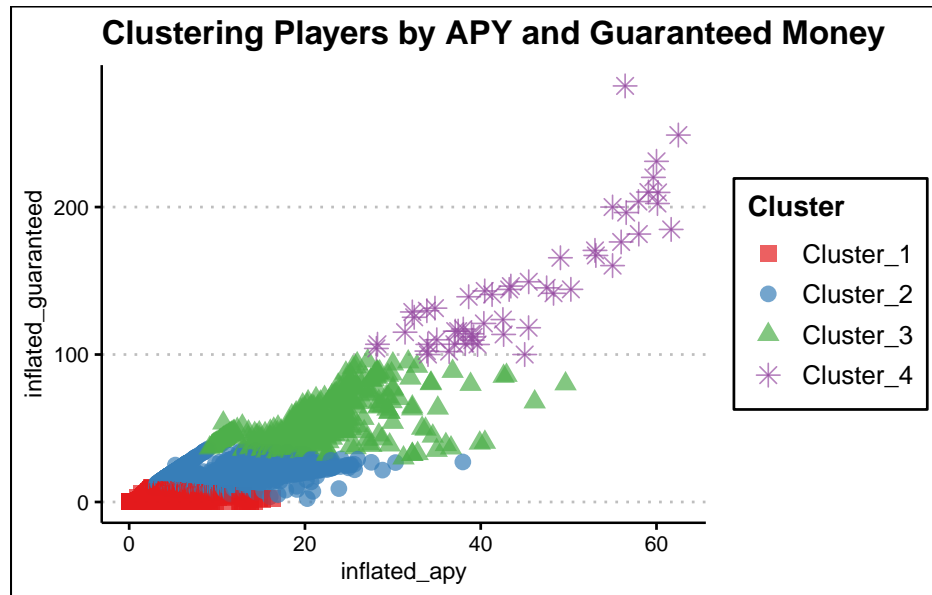

Figure 2: K-Means Clustering

We have four clusters! It's difficult to tell how big each is, but we can clearly tell that there are fairly distinct borders between the four clusters. Let's look more closely at the different clusters.

Breakdown of Clusters

TIME	MEAN_APY	MEAN_GUARANTEED	MEDIAN_APY	MEDIAN_GUARANTEED
Cluster_1				
Current 2022-2024	1.52	0.73	1.12	0.06
Past 2015-2017	1.43	0.54	0.95	0.00
Cluster_2				
Current 2022-2024	9.41	17.00	8.52	15.46
Past 2015-2017	9.64	17.46	8.91	16.06
Cluster_3				
Current 2022-2024	22.10	54.32	22.00	48.29
Past 2015-2017	18.99	49.81	18.35	44.48
Cluster_4				
Current 2022-2024	52.48	179.50	55.00	184.82
Past 2015-2017	35.97	114.51	37.10	109.70

Figure 3: Mean and Median per Cluster

From this table, we can see a lot of interesting things, many that we'll get to later. For now though, it looks like Cluster 1 players make about 1 million dollars per year, Cluster 2 players 10 million, Cluster 3 players 20 million, and Cluster 4 players about 50 million. I think this matches up well with a heuristic approach, but we're also factoring in guaranteed money, as this financial stability is one of the things that differentiates contracts. As the Menon & Spielberger contract value calculator demonstrates, players who have more guaranteed money make a larger percentage of their contracts total value. Teams love to sign players to be APY deals knowing that they'll cut them before they get the large back-end contract value. Nothing wrong with that since all agents and players know this when they sign the contract.

Note that inflated guaranteed is over the whole contract (this helps give weight to those who have longer contracts) and each player is only listed in each era once

to prevent Cluster 1 from being over-weighted with players who are cut and signed multiple times per season.

---

2 References

Arnold, J. B. (2024). *Ggthemes: Extra themes, scales and geoms for 'ggplot2'.* https://CRAN.R-project.org/package=ggthemes

Hvitfeldt, E., & Bodwin, K. (2024). *Tidyclust: A common API to clustering.* https://CRAN.R-project.org/package=tidyclust

Iannone, R., Cheng, J., Schloerke, B., Hughes, E., Lauer, A., Seo, J., Brevoort, K., & Roy, O. (2024). *Gt: Easily create presentation-ready display tables.* https://CRAN.R-project.org/package=gt

Menon, A., & Spielberger, B. (2024). *Expected contract value calculator.* PFF. https://arjunmenon.shinyapps.io/ExpectedContractValue/

Mock, T. (2023). *gtExtras: Extending 'gt' for beautiful HTML tables.* https://CRAN.R-project.org/package=gtExtras

Neuwirth, E. (2022). *RColorBrewer: ColorBrewer palettes.* https://CRAN.R-project.org/package=RColorBrewer

R Core Team. (2024). *R: A language and environment for statistical computing.* R Foundation for Statistical Computing. https://www.R-project.org/

Ram, K., & Wickham, H. (2023). *Wesanderson: A wes anderson palette generator.* https://CRAN.R-project.org/package=wesanderson

Wickham, H., Averick, M., Bryan, J., Chang, W., McGowan, L. D., François, R., Grolemund, G., Hayes, A., Henry, L., Hester, J., Kuhn, M., Pedersen, T. L., Miller, E., Bache, S. M., Müller, K., Ooms, J., Robinson, D., Seidel, D. P., Spinu, V., … Yutani, H. (2019). Welcome to the tidyverse. *Journal of Open Source Software*, *4*(43), 1686. https://doi.org/10.21105/joss.01686

3 Appendix A: