

Archetypal Ballers and Ternary Plots

A look at the 2018 WNBA season

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<https://znmeb.github.io/dfstools/>

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Archetypal analysis (Eugster and Leisch 2009)

- Goal:
 - ▶ Dimensionality reduction
 - ▶ Reduce a dataset with 17 box score metrics to three archetypes
 - ▶ Represent players' skills in terms of the archetypes
- Inputs:
 - ▶ Player box scores for the 2018 WNBA season
 - ▶ About 160 players
- Outputs:
 - ▶ Archetype table
 - ▶ Player table

The three archetypes

- Each archetype represents a skill set
 - ▶ Floor Spacing (Shea 2014, chap. 5):
 - skills for a backcourt player (Guard)
 - dominated by three-point shooting
 - ▶ Rim Protection (Shea 2014, chap. 6):
 - skills for a frontcourt player (Center, Forward)
 - dominated by rebounding
 - ▶ Bench: the “bad” archetype - players with low overall skills
 - the best players have a “Bench” value near zero

The archetype table

- Rows are archetypes, columns are box score metrics
- Metrics can be raw or scaled
- For this analysis I used raw metrics - season totals

Sample archetype table

	tot	x3p	a	st	to	bl	pts	min
Rim	352.1	13.6	87.1	40.7	-88.9	71.4	683.2	1226.4
Floor	123.3	77.8	179.3	48.1	-87.9	3.8	563.1	1303.6
Bench	17.1	0.0	2.9	0.9	-4.0	1.2	16.8	84.1

- tot = total rebounds (offensive + defensive)
- x3p = three-point shots made

The player table

- Rows are players, columns are archetypes
- For each archetype
 - ▶ the *archetypal player* has the largest value for the archetype
 - ▶ this value is usually very close to 1.0
 - ▶ the other values for an archetypal player will be very close to zero
- For other players
 - ▶ a fraction of the archetypal player's value in each archetype
- For all players
 - ▶ $\text{Floor} + \text{Rim} + \text{Bench} = 1$
 - ▶ $\text{Floor} + \text{Rim} = (1 - \text{Bench})$ is a measure of overall skill

Sample player table

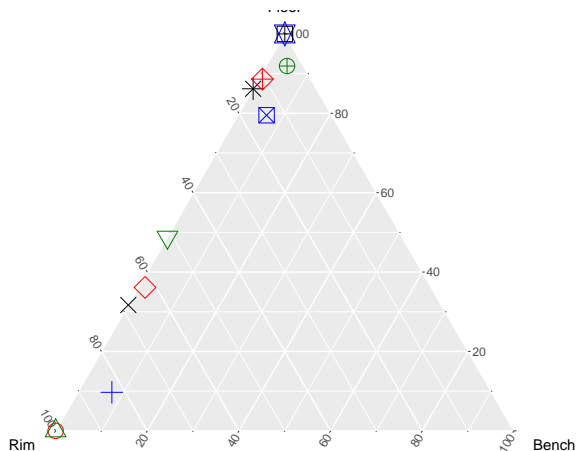
Player	Rim	Floor	Bench
Breanna Stewart	0.6830	0.3171	0.0000
Brittney Griner	1.0000	0.0000	0.0000
Courtney Vandersloot	0.1382	0.8617	0.0000
DeWanna Bonner	0.5121	0.4878	0.0000
Diana Taurasi	0.0000	1.0000	0.0000
Kristi Toliver	0.0000	0.9999	0.0000
Sylvia Fowles	1.0000	0.0000	0.0000
Jewell Loyd	0.1057	0.8860	0.0082
Candace Parker	0.6241	0.3613	0.0144
Sue Bird	0.0355	0.9190	0.0454
Skylar Diggins-Smith	0.1422	0.7950	0.0627
Natasha Howard	0.8287	0.0970	0.0741

Ternary plots (Hamilton and Ferry 2018)

- Floor, Rim and Bench sum to 1.0
- So we can plot them on a ternary plot
 - ▶ equilateral triangle with the corners labeled Rim, Floor and Bench
 - ▶ The poor players cluster near “Bench”
 - ▶ The good rebounders cluster near “Rim”
 - ▶ The good three-point shooters cluster near “Floor”
 - ▶ And the All-Stars are near the Rim - Floor line

Who are the archetypal floor spacers and rim protectors in the WNBA?

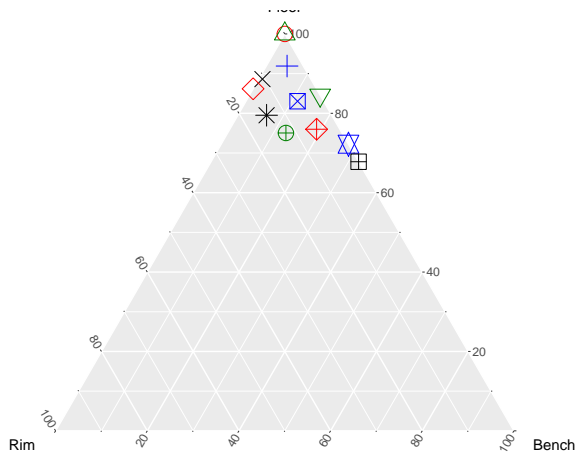
2018 WNBA top twelve overall - the All-Stars



Player

- Brittney Griner: Rin 1.0000, Floor 0.0000
- △ Sylvia Fowles: Rin 1.0000, Floor 0.0000
- + Natasha Howard: Rin 0.8287, Floor 0.0970
- × Breanna Stewart: Rin 0.6830, Floor 0.3171
- ◇ Candace Parker: Rin 0.6241, Floor 0.3613
- ▽ DeWanna Bonner: Rin 0.5121, Floor 0.4878
- ⊠ Skylar Diggins-Smith: Rin 0.1422, Floor 0.7951
- ✱ Courtney Vandersloot: Rin 0.1382, Floor 0.8611
- ⊠ Jewell Loyd: Rin 0.1057, Floor 0.8860
- ⊕ Sue Bird: Rin 0.0355, Floor 0.9190
- ⊠ Diana Taurasi: Rin 0.0000, Floor 1.0000
- ⊠ Kristi Toliver: Rin 0.0000, Floor 0.9999

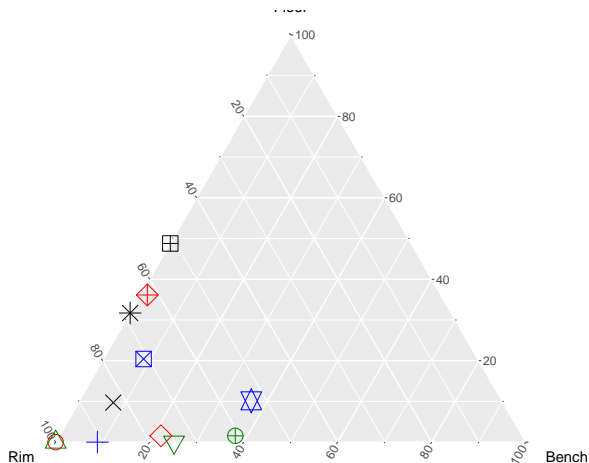
2018 WNBA top twelve floor spacers



Player

- Diana Taurasi: Rim 0.0000, Floor 1.0000
- △ Kristi Toliver: Rim 0.0000, Floor 0.9999
- + Sue Bird: Rim 0.0355, Floor 0.9190
- × Jewell Loyd: Rim 0.1057, Floor 0.8860
- ◇ Courtney Vandersloot: Rim 0.1382, Floor 0.8611
- ▽ Renee Montgomery: Rim 0.0000, Floor 0.8456
- ⊠ Chelsea Gray: Rim 0.0569, Floor 0.8303
- ✱ Skylar Diggins-Smith: Rim 0.1422, Floor 0.7951
- ◊ Jasmine Thomas: Rim 0.0506, Floor 0.7598
- ⊕ Maya Moore: Rim 0.1223, Floor 0.7503
- ⊠ Alex Bentley: Rim 0.0000, Floor 0.7221
- ⊠ Briann January: Rim 0.0000, Floor 0.6779

2018 WNBA top twelve rim protectors



Player

- Brittney Griner: Rin 1.0000, Floor 0.0000
- △ Sylvia Fowles: Rin 1.0000, Floor 0.0000
- + Liz Cambage: Rin 0.9111, Floor 0.0000
- × Natasha Howard: Rin 0.8287, Floor 0.0970
- ◇ Jessica Breland: Rin 0.7681, Floor 0.0156
- ▽ A'ja Wilson: Rin 0.7480, Floor 0.0000
- ⊠ Elena Delle Donne: Rin 0.7107, Floor 0.204
- * Breanna Stewart: Rin 0.6830, Floor 0.3171
- ◊ Candace Parker: Rin 0.6241, Floor 0.3613
- ⊕ Elizabeth Williams: Rin 0.6100, Floor 0.0156
- ⊗ LaToya Sanders: Rin 0.5331, Floor 0.1014
- ⊞ DeWanna Bonner: Rin 0.5121, Floor 0.4878

References

Eugster, Manuel J. A., and Friedrich Leisch. 2009. "From Spider-Man to Hero – Archetypal Analysis in R." *Journal of Statistical Software* 30 (8): 1–23. <http://www.jstatsoft.org/v30/i08/>.

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