



Measuring Team-Level Defensive Court Coverage

Brielle Smith, Matilda Sorić, Eric Tran



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Why evaluate NBA defenses?

- Basketball analysts are generally better at evaluating offensive tendencies and metrics for individuals and teams
- Team defense vs individual defense
 - “... average defensive ‘matchup usage’ was between 18-22% for 90% of players, while only 1 in 4 offensive usage ranges are in a similarly narrow range, demonstrating that defense is almost inherently more collaborative than offense in today’s NBA” *Seth Partnow, The Midrange Theory*
- 3pt defense vs rim protection

Data Processing

Read in and clean data

- Merge datasets
- Clean null values for (x, y, z) tracking data
- Filter out garbage time*
- Group dataframe by sets of rows to parse as a single frame

Develop functions

- Parse, plot, and analyze location data
 - setFrame
 - buildConvexHull
 - plotHull
 - getIntersectArea
 - getSituation
 - getClosestDef

Filter relevant frames

- Analyze half court situations only
- Want scenarios where defense is established
 - Ignoring fast breaks, TOs, and long rebound situations

Metric Building

Paint Coverage

- Given the defensive team convex Hull, return the area of intersection of the defense and paint

Primary Defender

- Given coordinates for a frame of a possession, determine the closest defender to each offensive player

Combined Coverage

- Linear combination with weights of inverted closest defender distance and paint coverage

Evaluating the utility of our metric

Based on Franks et. al's *Meta-analytics: tools for understanding the statistical properties of sports metrics*

1 Stability

- Does the metric measure the same thing over time?

2 Discrimination

- Does the metric differentiate between teams?

3 Independence

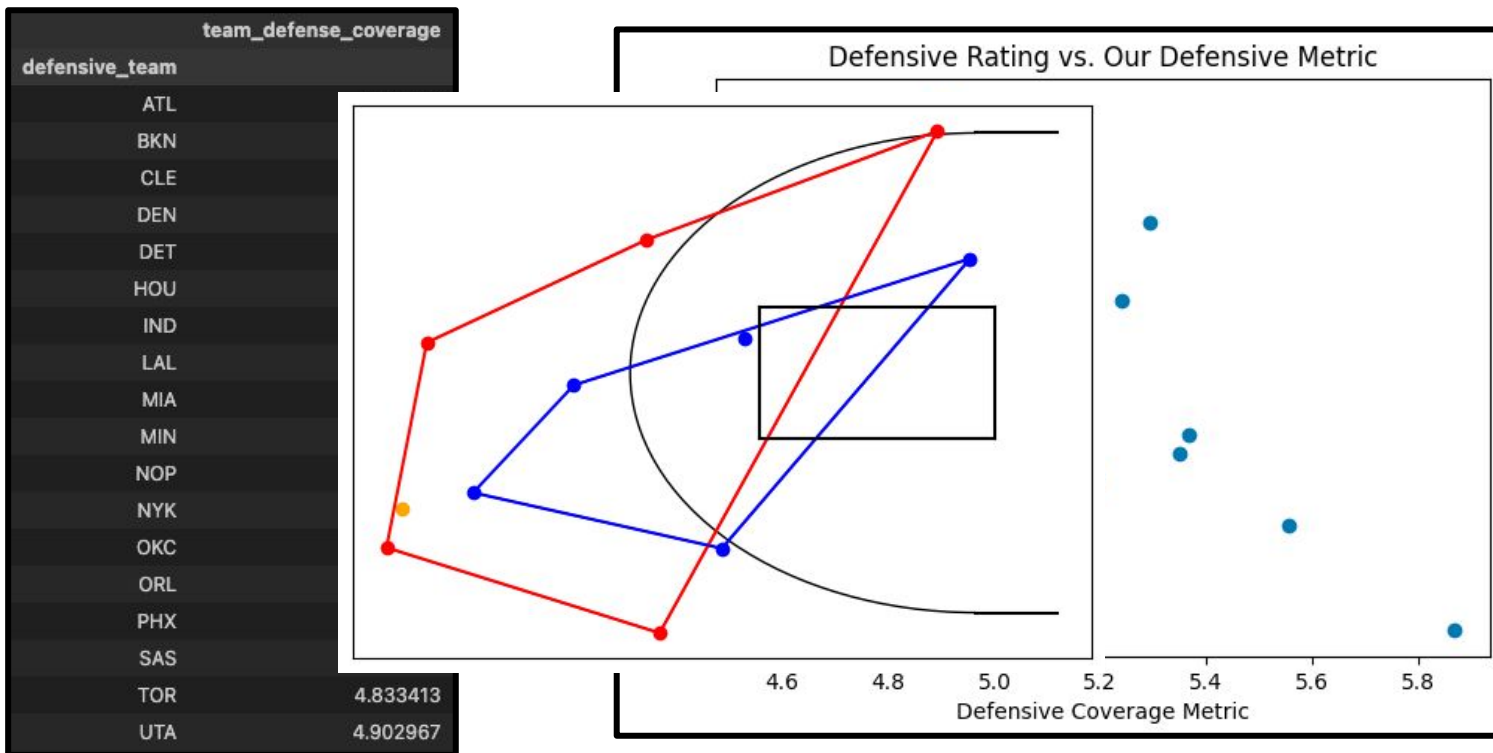
- Does the metric provide new information?

Overall Evaluation

- Strong stability assuming consistent defensive schemes, good discrimination

Analysis

Goal: evaluate how teams defensively control the perimeter and paint areas



Future Considerations

- **Improvement:** Filter out garbage time to improve evaluation
- **Improvement:** Incorporate player wingspan and pose data to improve individual defensive context
- **Alternative:** Use Voronoi tessellations instead of convex hulls to better interpret areas that each player on the defense “controls”



Thank you!