

1 Goal

The goal is to delineate the distinct eras of each NBA franchise. Taking a player-centric approach, this is equivalent to determining which players define the history of each franchise. I've chosen to quantify a player's worth based on his win share¹ percentage² (WS%), because a player with a large percentage of his team's win shares in a given season is likely to be crucial to that era of the franchise. Other metrics could be used to gain different perspectives on a team's history.

The method used to select these "franchise-definers" should keep the number of chosen players to a minimum, in order to weed out those who were not true flagships of any particular era. But of course, the obvious superstar players should not be excluded either.

2 Method

Consider an arbitrary team X . We would like to determine the set of franchise-defining players for X . Let:

P_j = the set of players on team X in season j .

$$w_j(p) = \begin{cases} \text{WS\% of player } p \text{ in season } j & p \in P_j \\ 0 & \text{otherwise} \end{cases}$$

As a preprocessing step, I use the following algorithm to exclude a number of players that clearly did not have a high enough impact:

Algorithm 1: Preprocess(T)

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for each season  $j$  do
    Sort  $P_j$  in descending order of WS%;
     $V' := V' \cup \{v'\}$ ;
    for each  $u \in V$  such that  $(u, v) \in E$  (undirected) do
         $E' := E' \cup (u, v')$ ;
    end
end
return ( $G', k + 1$ );
```

To make the problem more tractable and interesting, I impose the following constraints:

¹A measure that tries to quantify how many regular-season wins an individual accounted for. Complete explanation here.

²Simply calculated by dividing an individual's win shares by the sum of the win shares of all members of his team.

1. $\forall_j P_j \neq \emptyset$ ³.
2. $\forall_j \sum_{p \in P} w_j(p) \geq t$, where t is a tweakable parameter

Taking that one step further: to ascertain that every season is well-represented, I'll select FDs in a way that ensures $t\%$ of the total win shares are accounted for each season, where t is a tweakable parameter.

3 IP-Formulation

$$r_{ij} = \begin{cases} 1 & \text{reign } i \text{ is selected} \\ 0 & \text{otherwise} \end{cases}$$

$$w_{ij} = \begin{cases} \text{WS\% of player in reign } i \text{ during season } j & j \in R_i \\ 0 & \text{otherwise} \end{cases}$$

³I do this because it means JaVale McGee could possibly show up on the Wizard's list of franchise-definers. Unsuccessful eras of franchises need to be remembered, and I never want to forget JaVale's stint in Washington.