STAT 345 Midterm Project

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“Our offense is like the Pythagorean Theorem. There is no answer!”

-*Shaquille O’Neal*

The following code develops shot charts for the Milwaukee Bucks using data from 1997-2023 NBA seasons:

#import necessary packages  
library(devtools)  
library(ggplot2)  
library(tidyverse)  
library(maps)  
library(mapdata)  
library(ggthemes)  
library(dplyr)  
  
#Import the nbastatR dataset from github:  
#Sys.setenv(GITHUB\_PAT = "ghp\_vKvLHhlVYuE6DvdPbBz28YRasLbfgF0ecqvI")  
devtools::install\_github("abresler/nbastatR")  
library(nbastatR)

#usethis::create\_github\_token()  
  
#this makes sure buffer is big enough  
Sys.setenv("VROOM\_CONNECTION\_SIZE" = 131072 \* 2)  
  
#tibbles of each year's shots (a tibble is basically a dataframe- a collection of data)  
shots97 <- teams\_shots(teams = "Milwaukee Bucks", seasons = 1997)

## Milwaukee Bucks 1996-97 shot data

shots98 <- teams\_shots(teams = "Milwaukee Bucks", seasons = 1998)

## Milwaukee Bucks 1997-98 shot data

shots99 <- teams\_shots(teams = "Milwaukee Bucks", seasons = 1999)

## Milwaukee Bucks 1998-99 shot data

shots00 <- teams\_shots(teams = "Milwaukee Bucks", seasons = 2000)

## Milwaukee Bucks 1999-00 shot data

shots01 <- teams\_shots(teams = "Milwaukee Bucks", seasons = 2001)

## Milwaukee Bucks 2000-01 shot data

shots02 <- teams\_shots(teams = "Milwaukee Bucks", seasons = 2002)

## Milwaukee Bucks 2001-02 shot data

shots03 <- teams\_shots(teams = "Milwaukee Bucks", seasons = 2003)

## Milwaukee Bucks 2002-03 shot data

shots04 <- teams\_shots(teams = "Milwaukee Bucks", seasons = 2004)

## Milwaukee Bucks 2003-04 shot data

shots05 <- teams\_shots(teams = "Milwaukee Bucks", seasons = 2005)

## Milwaukee Bucks 2004-05 shot data

shots06 <- teams\_shots(teams = "Milwaukee Bucks", seasons = 2006)

## Milwaukee Bucks 2005-06 shot data

shots07 <- teams\_shots(teams = "Milwaukee Bucks", seasons = 2007)

## Milwaukee Bucks 2006-07 shot data

shots08 <- teams\_shots(teams = "Milwaukee Bucks", seasons = 2008)

## Milwaukee Bucks 2007-08 shot data

shots09 <- teams\_shots(teams = "Milwaukee Bucks", seasons = 2009)

## Milwaukee Bucks 2008-09 shot data

shots10 <- teams\_shots(teams = "Milwaukee Bucks", seasons = 2010)

## Milwaukee Bucks 2009-10 shot data

shots11 <- teams\_shots(teams = "Milwaukee Bucks", seasons = 2011)

## Milwaukee Bucks 2010-11 shot data

shots12 <- teams\_shots(teams = "Milwaukee Bucks", seasons = 2012)

## Milwaukee Bucks 2011-12 shot data

shots13 <- teams\_shots(teams = "Milwaukee Bucks", seasons = 2013)

## Milwaukee Bucks 2012-13 shot data

shots14 <- teams\_shots(teams = "Milwaukee Bucks", seasons = 2014)

## Milwaukee Bucks 2013-14 shot data

shots15 <- teams\_shots(teams = "Milwaukee Bucks", seasons = 2015)

## Milwaukee Bucks 2014-15 shot data

shots16 <- teams\_shots(teams = "Milwaukee Bucks", seasons = 2016)

## Milwaukee Bucks 2015-16 shot data

shots17 <- teams\_shots(teams = "Milwaukee Bucks", seasons = 2017)

## Milwaukee Bucks 2016-17 shot data

shots18 <- teams\_shots(teams = "Milwaukee Bucks", seasons = 2018)

## Milwaukee Bucks 2017-18 shot data

shots19 <- teams\_shots(teams = "Milwaukee Bucks", seasons = 2019)

## Milwaukee Bucks 2018-19 shot data

shots20 <- teams\_shots(teams = "Milwaukee Bucks", seasons = 2020)

## Milwaukee Bucks 2019-20 shot data

shots21 <- teams\_shots(teams = "Milwaukee Bucks", seasons = 2021)

## Milwaukee Bucks 2020-21 shot data

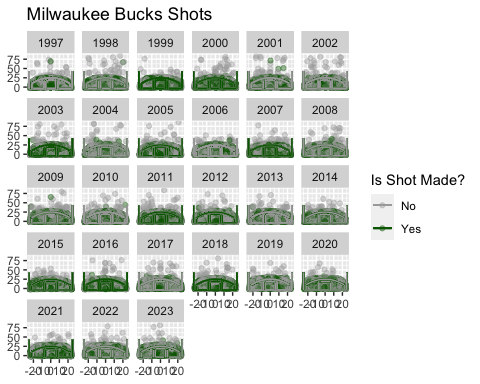
shots22 <- teams\_shots(teams = "Milwaukee Bucks", seasons = 2022)

## Milwaukee Bucks 2021-22 shot data

shots23 <- teams\_shots(teams = "Milwaukee Bucks", seasons = 2023)

## Milwaukee Bucks 2022-23 shot data

#combine each year's shot data into one tibble  
MKE.shots<- bind\_rows(shots97, shots98, shots99, shots00, shots01, shots02, shots03, shots04, shots05, shots06, shots07, shots08, shots09, shots10, shots11, shots12, shots13, shots14, shots15, shots16, shots17, shots18, shots19, shots20, shots21, shots22, shots23)  
  
  
###########court design#############  
  
#creating a court by first using the dataset created above  
shot.chart <- MKE.shots %>%   
 #divide location coordinates by 10, color by make/miss  
 ggplot(mapping=aes(locationX/10, locationY/10, color=isShotMade)) +   
 #makes points more transparent  
 geom\_point(alpha=.4) +   
   
 #Lines of court  
 geom\_segment(aes(22,-4,xend=22, yend=10)) +   
 geom\_segment(aes(-25, -4, xend=25, yend=-4)) +  
 geom\_segment(aes(-22, -4, xend= -22, yend=10))+  
 geom\_segment(aes(-6,-4, xend=-6, yend=19)) +   
 geom\_segment(aes(6, -4, xend=6, yend=19)) +   
 geom\_segment(aes(-25,-4,xend=-25, yend=43)) +   
 geom\_segment(aes(25,-4, xend=25, yend=43)) +   
 geom\_segment(aes(-8, 19, xend=8, yend=19)) +   
 geom\_segment(aes(-8, -4, xend=-8, yend=19)) +   
 geom\_segment(aes(8,-4, xend=8, yend=19)) +   
 #free throw to 3 pt arch  
 geom\_curve(aes(-8, 19, xend=8, yend=19), curvature=-0.35) +   
 #3 pt arch  
 geom\_curve(aes(-22, 10, xend=22, yend=10), curvature= -0.3)+  
 #renames legend title, labels, and colors  
 scale\_color\_discrete(name="Is Shot Made?", labels = c("No","Yes"), type=c("dark gray", "dark green")) +  
 #delete x label  
 xlab(NULL) +  
 #delete y label  
 ylab(NULL) +   
 #set title of graph  
 ggtitle("Milwaukee Bucks Shots") +   
 #display a graph of shot data for each year  
 facet\_wrap(~yearSeason, nrow=5)  
  
#prints shot chart  
shot.chart



The following code develops shot charts for Giannis Antetokounmpo using data from 2018-2023 NBA seasons:

giannis18 <- teams\_shots(teams= "Milwaukee Bucks", seasons=2018) %>%   
 filter(., namePlayer=="Giannis Antetokounmpo")

## Milwaukee Bucks 2017-18 shot data

giannis19 <- teams\_shots(teams= "Milwaukee Bucks", seasons=2019) %>%   
 filter(., namePlayer=="Giannis Antetokounmpo")

## Milwaukee Bucks 2018-19 shot data

giannis20 <- teams\_shots(teams= "Milwaukee Bucks", seasons=2020) %>%   
 filter(., namePlayer=="Giannis Antetokounmpo")

## Milwaukee Bucks 2019-20 shot data

giannis21 <- teams\_shots(teams= "Milwaukee Bucks", seasons=2021) %>%   
 filter(., namePlayer=="Giannis Antetokounmpo")

## Milwaukee Bucks 2020-21 shot data

giannis22 <- teams\_shots(teams= "Milwaukee Bucks", seasons=2022) %>%   
 filter(., namePlayer=="Giannis Antetokounmpo")

## Milwaukee Bucks 2021-22 shot data

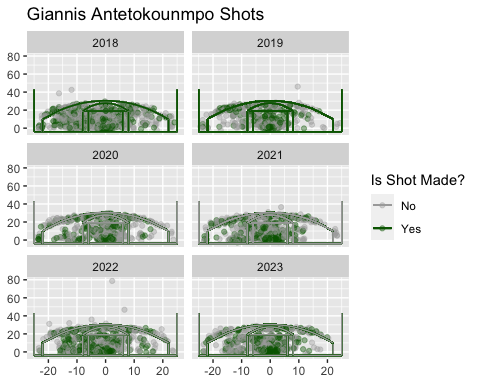
giannis23 <- teams\_shots(teams= "Milwaukee Bucks", seasons=2023) %>%   
 filter(., namePlayer=="Giannis Antetokounmpo")

## Milwaukee Bucks 2022-23 shot data

#combine each year's shot data into one tibble  
giannis.shots<- bind\_rows(giannis18, giannis19, giannis20, giannis21, giannis22, giannis23)

#create Giannis’s shot chart

giannis.chart <- giannis.shots %>%   
 #divide location coordinates by 10, color by make/miss, shape by make/miss  
 ggplot(mapping=aes(locationX/10, locationY/10, color=isShotMade)) +   
 #makes points more transparent  
 geom\_point(alpha=.4) +   
   
 #Lines of court  
 geom\_segment(aes(22,-4,xend=22, yend=10)) +   
 geom\_segment(aes(-25, -4, xend=25, yend=-4)) +  
 geom\_segment(aes(-22, -4, xend= -22, yend=10))+  
 geom\_segment(aes(-6,-4, xend=-6, yend=19)) +   
 geom\_segment(aes(6, -4, xend=6, yend=19)) +   
 geom\_segment(aes(-25,-4,xend=-25, yend=43)) +   
 geom\_segment(aes(25,-4, xend=25, yend=43)) +   
 geom\_segment(aes(-8, 19, xend=8, yend=19)) +   
 geom\_segment(aes(-8, -4, xend=-8, yend=19)) +   
 geom\_segment(aes(8,-4, xend=8, yend=19)) +   
 #free throw to 3 pt arch  
 geom\_curve(aes(-8, 19, xend=8, yend=19), curvature=-0.35) +   
 #3 pt arch  
 geom\_curve(aes(-22, 10, xend=22, yend=10), curvature= -0.3)+  
 #renames legend title, entries, and colors  
   
 scale\_color\_discrete(name="Is Shot Made?", labels = c("No","Yes"), type=c("dark gray", "dark green")) +  
 #delete x label  
 xlab(NULL) +  
 #delete y label  
 ylab(NULL) +   
 #set title of graph  
 ggtitle("Giannis Antetokounmpo Shots") +   
 #display shot data by year  
 facet\_wrap(~yearSeason, nrow=5)  
  
giannis.chart



Analyzing Giannis Antetokounmpo’s shots from 2018-2023, it appears that his game shifted from shooting a variety of mid-range jumpers to focusing heavily on driving to the hoop to shoot layups or dunk. This trend of Giannis’s appears to be the driving reason behind the Bucks’s overall increase in made layups in 2023. Another trend in Giannis’s shots is that he makes more shots on the right-hand side of the court. This is because he is right-handed, so it is natural that his right hand would be his better ball-handling hand, especially for a forward that doesn’t have the strongest ball-handling abilities. Thus, the Bucks can expect that defense will try to force Giannis to go to the left side of the court, since that’s where he is historically weakest.