Tecnológico Nacional De México

Instituto Tecnológico De Tijuana

Subdirección Académica

Departamento de Sistemas y Computación

Semestre Enero - Junio 2022

Ingeniería Informática

Mineria De Datos

Práctica 4

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Tijuana, B.C. a 16 de Marzo de 2022.

-Tiros libres Se le han proporcionado datos para dos estadísticas adicionales en el juego:

- Tiros libres
- Intento de tiros libres

Necesita crear tres diagramas que representen las siguientes ideas:

- Intentos de Trows Gratis por juego
- Precisión de tiros libres
- Estilo de juego del jugador (preferencia de 2 contra 3 puntos) excluyendo tiros libres

-Cada Tiro Libre vale 1 Punto

-Los datos se han suministrado en forma de vectores. Tendrá que crear las matrices antes de continuar con el análisis.

#Seasons

Seasons<-c("2005","2006","2007","2008","2009","2010","2011","2012","2013","2014")

#Players

Players<-c("KobeBryant","JoeJohnson","LeBronJames","CarmeloAnthony","DwightHoward", "ChrisBosh","ChrisPaul","KevinDurant","DerrickRose","DwayneWade")

```
> Seasons<-c("2005","2006","2007","2008","2009","2010","201
1","2012","2013","2014")
> #Players
> Players<-c("KobeBryant","JoeJohnson","LeBronJames","CarmeloAn
thony","DwightHoward","ChrisBosh","ChrisPaul","KevinDurant","De
rrickRose","DwayneWade")
```

Free Throws

KobeBryant_FT <- c(696,667,623,483,439,483,381,525,18,196)

JoeJohnson_FT <- c(261,235,316,299,220,195,158,132,159,141)

LeBronJames_FT <- c(601,489,549,594,593,503,387,403,439,375)

CarmeloAnthony_FT <- c(573,459,464,371,508,507,295,425,459,189)

DwightHoward_FT <- c(356,390,529,504,483,546,281,355,349,143)

ChrisBosh_FT <- c(474,463,472,504,470,384,229,241,223,179)

ChrisPaul_FT <- c(394,292,332,455,161,337,260,286,295,289)

KevinDurant_FT <- c(209,209,391,452,756,594,431,679,703,146)

DerrickRose_FT <- c(146,146,146,197,259,476,194,0,27,152)

DwayneWade_FT <- c(629,432,354,590,534,494,235,308,189,284)

```
> KobeBryant_FT <- c(696,667,623,483,439,483,381,525,18,196)
> JoeJohnson_FT <- c(261,235,316,299,220,195,158,132,159,141)
> LeBronJames_FT <- c(601,489,549,594,593,503,387,403,439,375)
> CarmeloAnthony_FT <- c(573,459,464,371,508,507,295,425,459,18
9)
> DwightHoward_FT <- c(356,390,529,504,483,546,281,355,349,143)
> ChrisBosh_FT <- c(474,463,472,504,470,384,229,241,223,179)
> ChrisPaul_FT <- c(394,292,332,455,161,337,260,286,295,289)
> KevinDurant_FT <- c(209,209,391,452,756,594,431,679,703,146)
> DerrickRose_FT <- c(146,146,146,197,259,476,194,0,27,152)
> DwayneWade_FT <- c(629,432,354,590,534,494,235,308,189,284)
```

Matrix

FreeThrows <- rbind(KobeBryant_FT, JoeJohnson_FT, LeBronJames_FT, CarmeloAnthony_FT, DwightHoward_FT, ChrisBosh_FT, ChrisPaul_FT, KevinDurant_FT, DerrickRose_FT, DwayneWade_FT)

rm(KobeBryant_FT, JoeJohnson_FT, LeBronJames_FT, CarmeloAnthony_FT, DwightHoward_FT, ChrisBosh_FT, ChrisPaul_FT, KevinDurant_FT, DerrickRose_FT, DwayneWade_FT)

colnames(FreeThrows) <- Seasons

rownames(FreeThrows) <- Players

FreeThrows

```
> FreeThrows <- rbind(KobeBryant_FT, JoeJohnson_FT, LeBronJames_FT, C
armeloAnthony_FT, DwightHoward_FT, ChrisBosh_FT, ChrisPaul_FT, KevinD
urant_FT, DerrickRose_FT, DwayneWade_FT)
>
> rm(KobeBryant_FT, JoeJohnson_FT, LeBronJames_FT, CarmeloAnthony_FT,
 DwightHoward_FT, ChrisBosh_FT, ChrisPaul_FT, KevinDurant_FT, Derrick
Rose_FT, DwayneWade_FT)
>
> colnames(FreeThrows) <- Seasons
> rownames(FreeThrows) <- Players
> FreeThrows
               2005 2006 2007 2008 2009 2010 2011 2012 2013 2014
KobeBryant      696  667  623  483  439  483  381  525   18  196
JoeJohnson      261  235  316  299  220  195  158  132  159  141
LeBronJames     601  489  549  594  593  503  387  403  439  375
CarmeloAnthony  573  459  464  371  508  507  295  425  459  189
DwightHoward    356  390  529  504  483  546  281  355  349  143
ChrisBosh       474  463  472  504  470  384  229  241  223  179
ChrisPaul       394  292  332  455  161  337  260  286  295  289
KevinDurant     209  209  391  452  756  594  431  679  703  146
DerrickRose     146  146  146  197  259  476  194    0   27  152
DwayneWade      629  432  354  590  534  494  235  308  189  284
```

Free Throw Attempts

KobeBryant_FTA <- c(819,768,742,564,541,583,451,626,21,241)

JoeJohnson_FTA <- c(330,314,379,362,269,243,186,161,195,176)

LeBronJames_FTA <- c(814,701,771,762,773,663,502,535,585,528)

CarmeloAnthony_FTA <- c(709,568,590,468,612,605,367,512,541,237)

DwightHoward_FTA <- c(598,666,897,849,816,916,572,721,638,271)

ChrisBosh_FTA <- c(581,590,559,617,590,471,279,302,272,232)

ChrisPaul_FTA <- c(465,357,390,524,190,384,302,323,345,321)

KevinDurant_FTA <- c(256,256,448,524,840,675,501,750,805,171)

DerrickRose_FTA <- c(205,205,205,250,338,555,239,0,32,187)

DwayneWade_FTA <- c(803,535,467,771,702,652,297,425,258,370)

```
> KobeBryant_FTA <- c(819,768,742,564,541,583,451,626,21,241)
> JoeJohnson_FTA <- c(330,314,379,362,269,243,186,161,195,176)
> LeBronJames_FTA <- c(814,701,771,762,773,663,502,535,585,528)
> CarmeloAnthony_FTA <- c(709,568,590,468,612,605,367,512,541,237)
> DwightHoward_FTA <- c(598,666,897,849,816,916,572,721,638,271)
> ChrisBosh_FTA <- c(581,590,559,617,590,471,279,302,272,232)
> ChrisPaul_FTA <- c(465,357,390,524,190,384,302,323,345,321)
> KevinDurant_FTA <- c(256,256,448,524,840,675,501,750,805,171)
> DerrickRose_FTA <- c(205,205,205,250,338,555,239,0,32,187)
> DwayneWade_FTA <- c(803,535,467,771,702,652,297,425,258,370)
```

Matrix

FreeThrowsAttempts <- rbind(KobeBryant_FTA, JoeJohnson_FTA, LeBronJames_FTA, CarmeloAnthony_FTA, DwightHoward_FTA, ChrisBosh_FTA, ChrisPaul_FTA, KevinDurant_FTA, DerrickRose_FTA, DwayneWade_FTA)

rm(KobeBryant_FTA, JoeJohnson_FTA, LeBronJames_FTA, CarmeloAnthony_FTA, DwightHoward_FTA, ChrisBosh_FTA, ChrisPaul_FTA, KevinDurant_FTA, DerrickRose_FTA, DwayneWade_FTA)

colnames(FreeThrowsAttempts) <- Seasons

rownames(FreeThrowsAttempts) <- Players

FreeThrowsAttempts

```
> FreeThrowsAttempts <- rbind(KobeBryant_FTA, JoeJohnson_FTA, LeBronJ
ames_FTA, CarmeloAnthony_FTA, DwightHoward_FTA, ChrisBosh_FTA, ChrisP
aul_FTA, KevinDurant_FTA, DerrickRose_FTA, DwayneWade_FTA)
>
> rm(KobeBryant_FTA, JoeJohnson_FTA, LeBronJames_FTA, CarmeloAnthony_
FTA, DwightHoward_FTA, ChrisBosh_FTA, ChrisPaul_FTA, KevinDurant_FTA,
 DerrickRose_FTA, DwayneWade_FTA)
>
> colnames(FreeThrowsAttempts) <- Seasons
> rownames(FreeThrowsAttempts) <- Players
> FreeThrowsAttempts
               2005 2006 2007 2008 2009 2010 2011 2012 2013 2014
KobeBryant      819  768  742  564  541  583  451  626   21  241
JoeJohnson      330  314  379  362  269  243  186  161  195  176
LeBronJames     814  701  771  762  773  663  502  535  585  528
CarmeloAnthony  709  568  590  468  612  605  367  512  541  237
DwightHoward    598  666  897  849  816  916  572  721  638  271
ChrisBosh       581  590  559  617  590  471  279  302  272  232
ChrisPaul       465  357  390  524  190  384  302  323  345  321
KevinDurant     256  256  448  524  840  675  501  750  805  171
DerrickRose     205  205  205  250  338  555  239    0   32  187
DwayneWade      803  535  467  771  702  652  297  425  258  370
```

Games

KobeBryant_G <- c(80,77,82,82,73,82,58,78,6,35)

JoeJohnson_G <- c(82,57,82,79,76,72,60,72,79,80)

LeBronJames_G <- c(79,78,75,81,76,79,62,76,77,69)

CarmeloAnthony_G <- c(80,65,77,66,69,77,55,67,77,40)

DwightHoward_G <- c(82,82,82,79,82,78,54,76,71,41)

ChrisBosh_G <- c(70,69,67,77,70,77,57,74,79,44)

ChrisPaul_G <- c(78,64,80,78,45,80,60,70,62,82)

KevinDurant_G <- c(35,35,80,74,82,78,66,81,81,27)

DerrickRose_G <- c(40,40,40,81,78,81,39,0,10,51)

DwayneWade_G <- c(75,51,51,79,77,76,49,69,54,62)

```
> KobeBryant_G <- c(80,77,82,82,73,82,58,78,6,35)
> JoeJohnson_G <- c(82,57,82,79,76,72,60,72,79,80)
> LeBronJames_G <- c(79,78,75,81,76,79,62,76,77,69)
> CarmeloAnthony_G <- c(80,65,77,66,69,77,55,67,77,40)
> DwightHoward_G <- c(82,82,82,79,82,78,54,76,71,41)
> ChrisBosh_G <- c(70,69,67,77,70,77,57,74,79,44)
> ChrisPaul_G <- c(78,64,80,78,45,80,60,70,62,82)
> KevinDurant_G <- c(35,35,80,74,82,78,66,81,81,27)
> DerrickRose_G <- c(40,40,40,81,78,81,39,0,10,51)
> DwayneWade_G <- c(75,51,51,79,77,76,49,69,54,62)
```

Matrix

Games <- rbind(KobeBryant_G, JoeJohnson_G, LeBronJames_G, CarmeloAnthony_G, DwightHoward_G, ChrisBosh_G, ChrisPaul_G, KevinDurant_G, DerrickRose_G, DwayneWade_G)

rm(KobeBryant_G, JoeJohnson_G, CarmeloAnthony_G, DwightHoward_G, ChrisBosh_G, LeBronJames_G, ChrisPaul_G, DerrickRose_G, DwayneWade_G, KevinDurant_G)

colnames(Games) <- Seasons

rownames(Games) <- Players

```
> Games <- rbind(KobeBryant_G, JoeJohnson_G, LeBronJames_G, CarmeloAn
thony_G, DwightHoward_G, ChrisBosh_G, ChrisPaul_G, KevinDurant_G, Der
rickRose_G, DwayneWade_G)
>
> rm(KobeBryant_G, JoeJohnson_G, CarmeloAnthony_G, DwightHoward_G, Ch
risBosh_G, LeBronJames_G, ChrisPaul_G, DerrickRose_G, DwayneWade_G, K
evinDurant_G)
>
> colnames(Games) <- Seasons
> rownames(Games) <- Players
```

Field Goals

KobeBryant_FG <- c(978,813,775,800,716,740,574,738,31,266)

JoeJohnson_FG <- c(632,536,647,620,635,514,423,445,462,446)

LeBronJames_FG <- c(875,772,794,789,768,758,621,765,767,624)

CarmeloAnthony_FG <- c(756,691,728,535,688,684,441,669,743,358)

DwightHoward_FG <- c(468,526,583,560,510,619,416,470,473,251)

ChrisBosh_FG <- c(549,543,507,615,600,524,393,485,492,343)

ChrisPaul_FG <- c(407,381,630,631,314,430,425,412,406,568)

KevinDurant_FG <- c(306,306,587,661,794,711,643,731,849,238)

DerrickRose_FG <- c(208,208,208,574,672,711,302,0,58,338)

DwayneWade_FG <- c(699,472,439,854,719,692,416,569,415,509)

```
> KobeBryant_FG <- c(978,813,775,800,716,740,574,738,31,266)
> JoeJohnson_FG <- c(632,536,647,620,635,514,423,445,462,446)
> LeBronJames_FG <- c(875,772,794,789,768,758,621,765,767,624)
> CarmeloAnthony_FG <- c(756,691,728,535,688,684,441,669,743,358)
> DwightHoward_FG <- c(468,526,583,560,510,619,416,470,473,251)
> ChrisBosh_FG <- c(549,543,507,615,600,524,393,485,492,343)
> ChrisPaul_FG <- c(407,381,630,631,314,430,425,412,406,568)
> KevinDurant_FG <- c(306,306,587,661,794,711,643,731,849,238)
> DerrickRose_FG <- c(208,208,208,574,672,711,302,0,58,338)
> DwayneWade_FG <- c(699,472,439,854,719,692,416,569,415,509)
```

Matrix

FieldGoals <- rbind(KobeBryant_FG, JoeJohnson_FG, LeBronJames_FG,

CarmeloAnthony_FG, DwightHoward_FG, ChrisBosh_FG, ChrisPaul_FG, KevinDurant_FG,

DerrickRose_FG, DwayneWade_FG)

rm(KobeBryant_FG, JoeJohnson_FG, LeBronJames_FG, CarmeloAnthony_FG,

DwightHoward_FG, ChrisBosh_FG, ChrisPaul_FG, KevinDurant_FG, DerrickRose_FG,

DwayneWade_FG)

colnames(FieldGoals) <- Seasons

rownames(FieldGoals) <- Players

```
> FieldGoals <- rbind(KobeBryant_FG, JoeJohnson_FG, LeBronJames_FG, Car
meloAnthony_FG, DwightHoward_FG, ChrisBosh_FG, ChrisPaul_FG, KevinDuran
t_FG, DerrickRose_FG, DwayneWade_FG)
>
> rm(KobeBryant_FG, JoeJohnson_FG, LeBronJames_FG, CarmeloAnthony_FG, D
wightHoward_FG, ChrisBosh_FG, ChrisPaul_FG, KevinDurant_FG, DerrickRose
_FG, DwayneWade_FG)
>
> colnames(FieldGoals) <- Seasons
> rownames(FieldGoals) <- Players
```

Field Goal Attempts

KobeBryant_FGA <- c(2173,1757,1690,1712,1569,1639,1336,1595,73,713)

JoeJohnson_FGA <- c(1395,1139,1497,1420,1386,1161,931,1052,1018,1025)

LeBronJames_FGA <- c(1823,1621,1642,1613,1528,1485,1169,1354,1353,1279)

CarmeloAnthony_FGA <- c(1572,1453,1481,1207,1502,1503,1025,1489,1643,806)

DwightHoward_FGA <- c(881,873,974,979,834,1044,726,813,800,423)

ChrisBosh_FGA <- c(1087,1094,1027,1263,1158,1056,807,907,953,745)

ChrisPaul_FGA <- c(947,871,1291,1255,637,928,890,856,870,1170)

KevinDurant_FGA <- c(647,647,1366,1390,1668,1538,1297,1433,1688,467)

DerrickRose_FGA <- c(436,436,436,1208,1373,1597,695,0,164,835)

DwayneWade_FGA <- c(1413,962,937,1739,1511,1384,837,1093,761,1084)

```
> KobeBryant_FGA <- c(2173,1757,1690,1712,1569,1639,1336,1595,73,713)
> JoeJohnson_FGA <- c(1395,1139,1497,1420,1386,1161,931,1052,1018,1025)
> LeBronJames_FGA <- c(1823,1621,1642,1613,1528,1485,1169,1354,1353,127
9)
> CarmeloAnthony_FGA <- c(1572,1453,1481,1207,1502,1503,1025,1489,1643,
806)
> DwightHoward_FGA <- c(881,873,974,979,834,1044,726,813,800,423)
> ChrisBosh_FGA <- c(1087,1094,1027,1263,1158,1056,807,907,953,745)
> ChrisPaul_FGA <- c(947,871,1291,1255,637,928,890,856,870,1170)
> KevinDurant_FGA <- c(647,647,1366,1390,1668,1538,1297,1433,1688,467)
> DerrickRose_FGA <- c(436,436,436,1208,1373,1597,695,0,164,835)
> DwayneWade_FGA <- c(1413,962,937,1739,1511,1384,837,1093,761,1084)
```

Matrix

FieldGoalAttempts <- rbind(KobeBryant_FGA, JoeJohnson_FGA, LeBronJames_FGA,

CarmeloAnthony_FGA, DwightHoward_FGA, ChrisBosh_FGA, ChrisPaul_FGA,

KevinDurant_FGA, DerrickRose_FGA, DwayneWade_FGA)

rm(KobeBryant_FGA, JoeJohnson_FGA, LeBronJames_FGA, CarmeloAnthony_FGA,

DwightHoward_FGA, ChrisBosh_FGA, ChrisPaul_FGA, KevinDurant_FGA,

DerrickRose_FGA, DwayneWade_FGA)

colnames(FieldGoalAttempts) <- Seasons

rownames(FieldGoalAttempts) <- Players

```
> FieldGoalAttempts <- rbind(KobeBryant_FGA, JoeJohnson_FGA, LeBronJame
s_FGA, CarmeloAnthony_FGA, DwightHoward_FGA, ChrisBosh_FGA, ChrisPaul_F
GA, KevinDurant_FGA, DerrickRose_FGA, DwayneWade_FGA)
>
> rm(KobeBryant_FGA, JoeJohnson_FGA, LeBronJames_FGA, CarmeloAnthony_FG
A, DwightHoward_FGA, ChrisBosh_FGA, ChrisPaul_FGA, KevinDurant_FGA, Der
rickRose_FGA, DwayneWade_FGA)
>
> colnames(FieldGoalAttempts) <- Seasons
> rownames(FieldGoalAttempts) <- Players
```

Points

KobeBryant_PTS <- c(2832,2430,2323,2201,1970,2078,1616,2133,83,782)

JoeJohnson_PTS <- c(1653,1426,1779,1688,1619,1312,1129,1170,1245,1154)

LeBronJames_PTS <- c(2478,2132,2250,2304,2258,2111,1683,2036,2089,1743)

CarmeloAnthony_PTS <- c(2122,1881,1978,1504,1943,1970,1245,1920,2112,966)

DwightHoward_PTS <- c(1292,1443,1695,1624,1503,1784,1113,1296,1297,646)

ChrisBosh_PTS <- c(1572,1561,1496,1746,1678,1438,1025,1232,1281,928)

ChrisPaul_PTS <- c(1258,1104,1684,1781,841,1268,1189,1186,1185,1564)

KevinDurant_PTS <- c(903,903,1624,1871,2472,2161,1850,2280,2593,686)

DerrickRose_PTS <- c(597,597,597,1361,1619,2026,852,0,159,904)

DwayneWade_PTS <- c(2040,1397,1254,2386,2045,1941,1082,1463,1028,1331)

```
> KobeBryant_PTS <- c(2832,2430,2323,2201,1970,2078,1616,2133,83,782)
> JoeJohnson_PTS <- c(1653,1426,1779,1688,1619,1312,1129,1170,1245,1154)
> LeBronJames_PTS <- c(2478,2132,2250,2304,2258,2111,1683,2036,2089,1743)
> CarmeloAnthony_PTS <- c(2122,1881,1978,1504,1943,1970,1245,1920,2112,966)
> DwightHoward_PTS <- c(1292,1443,1695,1624,1503,1784,1113,1296,1297,646)
> ChrisBosh_PTS <- c(1572,1561,1496,1746,1678,1438,1025,1232,1281,928)
> ChrisPaul_PTS <- c(1258,1104,1684,1781,841,1268,1189,1186,1185,1564)
> KevinDurant_PTS <- c(903,903,1624,1871,2472,2161,1850,2280,2593,686)
> DerrickRose_PTS <- c(597,597,597,1361,1619,2026,852,0,159,904)
> DwayneWade_PTS <- c(2040,1397,1254,2386,2045,1941,1082,1463,1028,1331)
```

Matrix

Points <- rbind(KobeBryant_PTS, JoeJohnson_PTS, LeBronJames_PTS,

CarmeloAnthony_PTS, DwightHoward_PTS, ChrisBosh_PTS, ChrisPaul_PTS,

KevinDurant_PTS, DerrickRose_PTS, DwayneWade_PTS)

rm(KobeBryant_PTS, JoeJohnson_PTS, LeBronJames_PTS, CarmeloAnthony_PTS,

DwightHoward_PTS, ChrisBosh_PTS, ChrisPaul_PTS, KevinDurant_PTS,

DerrickRose_PTS, DwayneWade_PTS)

colnames(Points) <- Seasons

rownames(Points) <- Players

```
> Points <- rbind(KobeBryant_PTS, JoeJohnson_PTS, LeBronJames_PTS, Carm
eloAnthony_PTS, DwightHoward_PTS, ChrisBosh_PTS, ChrisPaul_PTS, KevinDu
rant_PTS, DerrickRose_PTS, DwayneWade_PTS)
>
> rm(KobeBryant_PTS, JoeJohnson_PTS, LeBronJames_PTS, CarmeloAnthony_PT
S, DwightHoward_PTS, ChrisBosh_PTS, ChrisPaul_PTS, KevinDurant_PTS, Der
rickRose_PTS, DwayneWade_PTS)
>
> colnames(Points) <- Seasons
> rownames(Points) <- Players
```
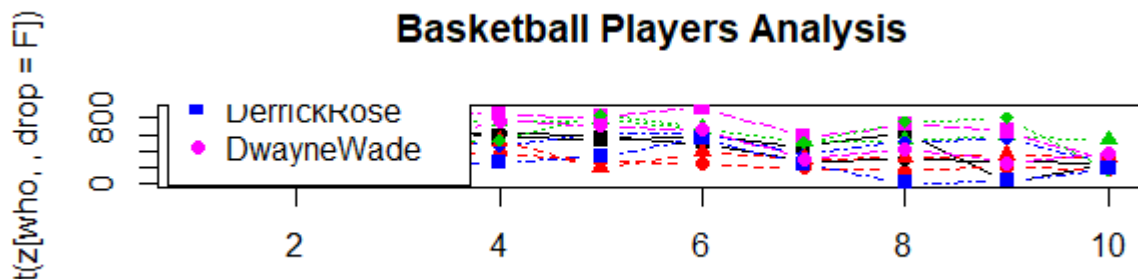
Re-create the plotting function

```
myplot <- function(z, who=1:10) {
  matplot(t(z[who,,drop=F]), type="b", pch=15:18, col=c(1:4,6), main="Basketball Players
Analysis")
  legend("bottomleft", inset=0.01, legend=Players[who], col=c(1:4,6), pch=15:18, horiz=F)
}
```

Visualize the new matrices

myplot(FreeThrows)

myplot(FreeThrowsAttempts)

```
> myplot <- function(z, who=1:10) {
+   matplot(t(z[who,,drop=F]), type="b", pch=15:18, col=c(1:4,6), main
="Basketball Players Analysis")
+   legend("bottomleft", inset=0.01, legend=Players[who], col=c(1:4,6),
 pch=15:18, horiz=F)
+ }
```
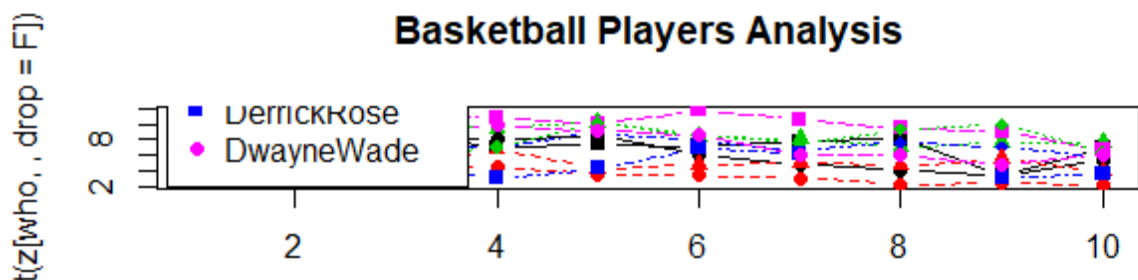

Part 1 - Free Throw Attempts Per Game (You will need the Games matrix)

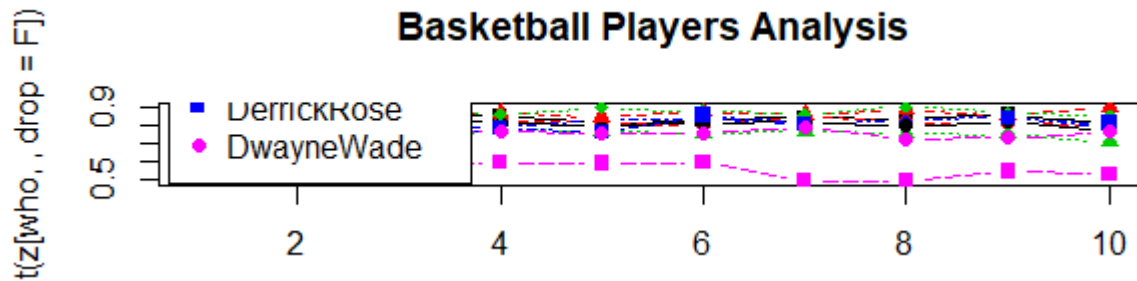myplot (FreeThrowsAttempts / Games)

Notice how Chris Paul gets few attempts per game

Part 2 - Free Throw Accuracy
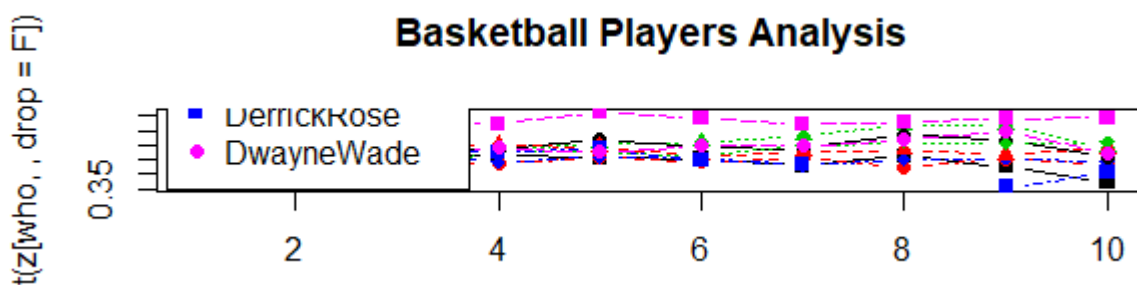
myplot (FreeThrows / FreeThrowsAttempts)

- And yet Chris Paul's accuracy is one of the highest
- Chances are his team would get more points if he had more FTA's
- Also notice that Dwight Howard's FT Accuracy is extremely poor
- compared to other players. If you recall, Dwight Howard's

Field Goal Accuracy was exceptional:

myplot(FieldGoals/FieldGoalAttempts)

How could this be? Why is there such a drastic difference? #We will see just now…

Part 3 - Player Style Patterns Excluding Free Throws

myplot ((Points-FreeThrows) / FieldGoals)

Because we have excluded free throws, this plot now shows us #the true representation of player style change. We can verify #that this is the case because all the marks without exception #on this plot are between 2 and 3. That is because Field Goals #can only be for either 2 points or 3 points.

Basketball Players Analysis