|  |
| --- |
| title: "260Project\_Chen" |
| output: html\_document |

library(ggplot2)  
library(dslabs)  
library(tidyverse)

## ── Attaching packages ──────────────────────────────────────────────────────── tidyverse 1.2.1 ──

## ✔ tibble 1.3.4 ✔ purrr 0.2.4  
## ✔ tidyr 0.7.2 ✔ dplyr 0.7.4  
## ✔ readr 1.1.1 ✔ stringr 1.2.0  
## ✔ tibble 1.3.4 ✔ forcats 0.2.0

## ── Conflicts ─────────────────────────────────────────────────────────── tidyverse\_conflicts() ──  
## ✖ dplyr::filter() masks stats::filter()  
## ✖ dplyr::lag() masks stats::lag()

library(dplyr)  
library(knitr)  
library(readr)  
ds\_theme\_set()  
  
#game <- read.csv(file = file.choose()) #4999 20  
#iqgame <- read.csv('bgg\_db\_2017\_04.csv', header = TRUE)  
  
# clean and recoded data  
game <- read.csv("game\_recode.txt", header = T, sep = "|")   
names(game) # 4999 26

## [1] "rank" "bgg\_url" "game\_id" "names"   
## [5] "min\_players" "max\_players" "avg\_time" "min\_time"   
## [9] "max\_time" "year" "avg\_rating" "geek\_rating"   
## [13] "num\_votes" "image\_url" "age" "mechanic"   
## [17] "owned" "category" "designer" "weight"   
## [21] "single\_player" "multi\_player" "party\_player" "cate\_avgtime"   
## [25] "cate\_weight" "cate\_mintime"

dim(game)

## [1] 4999 26

Modeling: (due by Nov 26)

1）Mechanic and category plot modification - Chen (done) 2）Table -top 10 rated for each age group ( 3 in total) - Chen 3）Table -top 10 rated for each player group ( 3 groups in total) - Chen 4) Plot min, mean, max players and time over year (Chen) 5）Try knn (Chen), svm (Shimin, Chen) 6）Cross validation to choose parameters

# EDA

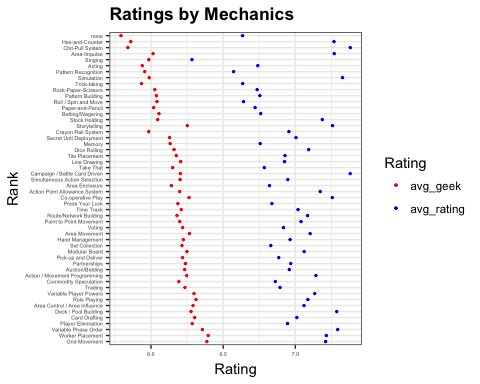
### 1 ) missting value?

missing(game) #none

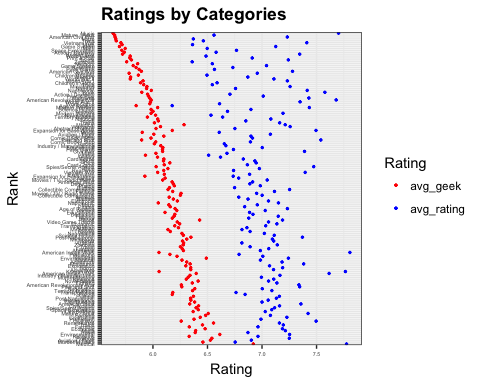
## [1] FALSE

### 1）Mechanic and category plot modification

library(purrr)  
library(stringr)  
# Functions  
split\_into\_multiple <- function(column, pattern = ", ", into\_prefix){  
 cols <- str\_split\_fixed(column, pattern, n = Inf)  
 cols[which(cols == "")] <- NA  
 cols <- as.tibble(cols)  
 m <- dim(cols)[2]  
 names(cols) <- paste(into\_prefix, 1:m, sep = "\_")  
 return(cols)  
}  
  
#Splitting   
game <- game %>% bind\_cols(split\_into\_multiple(game$category,',','category')) %>%  
 bind\_cols(split\_into\_multiple(game$mechanic,',','mechanic'))  
  
#Cleaning  
game <- game %>% select(-category, -mechanic, -designer, -image\_url)  
  
#Tidying  
tidydata <- game %>% gather(key, categories, category\_1:category\_11, na.rm = TRUE) %>% select(-key) %>%  
 gather(key, mechanics, mechanic\_1:mechanic\_18, na.rm = TRUE) %>% select(-key)  
  
tidydata$mechanics <- trimws(tidydata$mechanics)  
tidydata$categoires <- trimws(tidydata$categories)  
  
  
#Mechanics vs ratings  
tidydata %>% group\_by(mechanics) %>% summarize(avgrating = mean(avg\_rating), avggeek = mean(geek\_rating), avgrank = mean(rank)) %>%   
 ggplot() +  
 geom\_point(aes(avggeek, reorder(mechanics, avgrank), color = 'avg\_geek'), size = 0.5) +  
 geom\_point(aes(avgrating, mechanics, color = 'avg\_rating'), size = 0.5) +  
 scale\_colour\_manual(name="Rating", values=c(avg\_geek="red", avg\_rating="blue")) +  
 theme(axis.text=element\_text(size=4)) +  
 ylab("Rank") +  
 xlab("Rating") +  
 ggtitle("Ratings by Mechanics")



#Categories vs ratings  
tidydata %>% group\_by(categories) %>% summarize(avgrating = mean(avg\_rating), avggeek = mean(geek\_rating), avgrank = mean(rank)) %>% ggplot() +  
 geom\_point(aes(avggeek, reorder(categories, avgrank), color = 'avg\_geek'), size = 0.5) +  
 geom\_point(aes(avgrating, categories, color = 'avg\_rating'), size = 0.5) +   
 scale\_colour\_manual(name="Rating", values=c(avg\_geek="red", avg\_rating="blue")) +  
 theme(axis.text=element\_text(size=4)) +  
 ylab("Rank") +  
 xlab("Rating") +  
 ggtitle("Ratings by Categories")

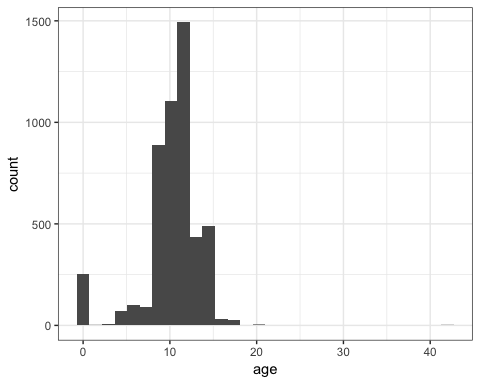


### 2）Table -top 10 rated for each age group (3 in total) - Chen

* Distribution of age

game %>% ggplot(aes(age)) +  
 geom\_histogram()

## `stat\_bin()` using `bins = 30`. Pick better value with `binwidth`.



* generate 3 age groups based on interquartile

Q1 <- quantile(game$age, 0.25)   
Q3 <- quantile(game$age, 0.75)   
game <- game %>% mutate(agecat = ifelse (age %in% range(0,Q1), 1, ifelse(age %in% range(Q1, Q3), 2, 3)))

* top 10 rated (avg\_rating) for each age group

# agecat == 1 when age %in% range(0,Q1)  
game %>%   
 select(avg\_rating, geek\_rating, rank, age, agecat, game\_id, names) %>%  
 filter(agecat == 1) %>%   
 arrange(desc(avg\_rating)) %>%   
 head(10) %>% kable

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| avg\_rating | geek\_rating | rank | age | agecat | game\_id | names |
| 8.74356 | 5.98863 | 2021 | 0 | 1 | 68820 | Enemy Action: Ardennes |
| 8.59714 | 5.68432 | 4007 | 0 | 1 | 39939 | The Battle of Fontenoy: 11 May, 1745 |
| 8.50652 | 5.66641 | 4257 | 0 | 1 | 223619 | Shadow War: Armageddon |
| 8.50000 | 5.63690 | 4786 | 0 | 1 | 193238 | Tunisia II |
| 8.49597 | 5.67612 | 4118 | 0 | 1 | 185380 | Exceed: Red Horizon ? Satoshi & Mei Lien vs. Baelkhor & Morathi |
| 8.46923 | 5.84305 | 2693 | 0 | 1 | 99358 | Stonewall Jackson's Way II |
| 8.46140 | 5.78569 | 3069 | 0 | 1 | 149620 | Advanced Squad Leader: Starter Kit Historical Module 1 ? Decision at Elst |
| 8.44687 | 5.71536 | 3639 | 0 | 1 | 183578 | Wing Leader: Supremacy 1943-1945 |
| 8.42061 | 5.79244 | 3018 | 8 | 1 | 108018 | Riichi Mahjong |
| 8.41032 | 5.67778 | 4096 | 0 | 1 | 176596 | The Great Battles of Alexander: Macedonian Art of War |

# agecat == 2 when age %in% range(Q1,Q3)  
game %>%   
 select(avg\_rating, geek\_rating, rank, age, agecat, game\_id, names) %>%  
 filter(agecat == 2) %>%   
 arrange(desc(avg\_rating)) %>%   
 head(10) %>% kable

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| avg\_rating | geek\_rating | rank | age | agecat | game\_id | names |
| 9.08970 | 8.15151 | 5 | 12 | 2 | 174430 | Gloomhaven |
| 8.91346 | 5.66261 | 4334 | 12 | 2 | 220308 | Gaia Project |
| 8.85597 | 6.48439 | 868 | 12 | 2 | 192135 | Too Many Bones |
| 8.77167 | 5.75141 | 3319 | 12 | 2 | 173504 | The Greatest Day: Sword, Juno, and Gold Beaches |
| 8.52372 | 5.71214 | 3672 | 12 | 2 | 199904 | Pericles: The Peloponnesian Wars |
| 8.45000 | 5.63642 | 4795 | 12 | 2 | 174298 | Napoleon's Last Gamble |
| 8.43974 | 5.70077 | 3796 | 12 | 2 | 163399 | Infinity: Operation Icestorm |
| 8.41381 | 5.66988 | 4203 | 12 | 2 | 193867 | 1822: The Railways of Great Britain |
| 8.40513 | 6.94830 | 373 | 12 | 2 | 200680 | Agricola (revised edition) |
| 8.40132 | 5.95793 | 2142 | 12 | 2 | 32989 | Axis Empires: Totaler Krieg! |

# agecat == 3 when age %in% range(Q3,)  
game %>%   
 select(avg\_rating, geek\_rating, rank, age, agecat, game\_id, names) %>%  
 filter(agecat == 3) %>%   
 arrange(desc(avg\_rating)) %>%   
 head(10) %>% kable

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| avg\_rating | geek\_rating | rank | age | agecat | game\_id | names |
| 9.33167 | 5.79078 | 3026 | 14 | 3 | 186751 | Mythic Battles: Pantheon |
| 9.14646 | 5.64691 | 4591 | 14 | 3 | 198985 | Day Night Z |
| 8.89899 | 7.28089 | 150 | 17 | 3 | 55690 | Kingdom Death: Monster |
| 8.85900 | 5.76596 | 3194 | 15 | 3 | 144574 | Last Chance for Victory |
| 8.82781 | 5.65702 | 4425 | 14 | 3 | 168537 | Pandemonium |
| 8.82278 | 5.70251 | 3771 | 13 | 3 | 178896 | Last Blitzkrieg |
| 8.72977 | 8.30744 | 2 | 14 | 3 | 182028 | Through the Ages: A New Story of Civilization |
| 8.71368 | 5.98688 | 2025 | 16 | 3 | 63170 | 1817 |
| 8.66905 | 8.48904 | 1 | 13 | 3 | 161936 | Pandemic Legacy: Season 1 |
| 8.60654 | 5.78242 | 3091 | 16 | 3 | 85424 | La Bataille de la Moscowa (third edition) |

* top 10 rated (avg\_geek) each age group

# agecat == 1 when age %in% range(0,Q1)  
game %>%   
 select(avg\_rating, geek\_rating, rank, age, agecat, game\_id, names) %>%  
 filter(agecat == 1) %>%   
 arrange(desc(geek\_rating)) %>%   
 head(10) %>% kable

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| avg\_rating | geek\_rating | rank | age | agecat | game\_id | names |
| 7.82454 | 7.69242 | 44 | 8 | 1 | 163412 | Patchwork |
| 8.05321 | 7.58639 | 61 | 8 | 1 | 194655 | Santorini |
| 7.67105 | 7.58506 | 62 | 8 | 1 | 30549 | Pandemic |
| 7.80825 | 7.57058 | 65 | 8 | 1 | 521 | Crokinole |
| 7.64090 | 7.50156 | 78 | 8 | 1 | 123260 | Suburbia |
| 7.59141 | 7.48291 | 84 | 8 | 1 | 14996 | Ticket to Ride: Europe |
| 7.66681 | 7.41349 | 102 | 8 | 1 | 31627 | Ticket to Ride: Nordic Countries |
| 7.67240 | 7.41118 | 104 | 8 | 1 | 188 | Go |
| 7.53092 | 7.39187 | 107 | 8 | 1 | 10630 | Memoir '44 |
| 7.48190 | 7.38916 | 109 | 8 | 1 | 9209 | Ticket to Ride |

# agecat == 2 when age %in% range(Q1,Q3)  
game %>%   
 select(avg\_rating, geek\_rating, rank, age, agecat, game\_id, names) %>%  
 filter(agecat == 2) %>%   
 arrange(desc(geek\_rating)) %>%   
 head(10) %>% kable

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| avg\_rating | geek\_rating | rank | age | agecat | game\_id | names |
| 8.29627 | 8.15458 | 4 | 12 | 2 | 120677 | Terra Mystica |
| 9.08970 | 8.15151 | 5 | 12 | 2 | 174430 | Gloomhaven |
| 8.37791 | 8.06267 | 8 | 12 | 2 | 167791 | Terraforming Mars |
| 8.17949 | 8.00663 | 10 | 12 | 2 | 102794 | Caverna: The Cave Farmers |
| 8.11355 | 7.99721 | 11 | 12 | 2 | 84876 | The Castles of Burgundy |
| 8.08780 | 7.98030 | 12 | 12 | 2 | 3076 | Puerto Rico |
| 8.05431 | 7.96041 | 14 | 12 | 2 | 31260 | Agricola |
| 8.08381 | 7.92190 | 17 | 12 | 2 | 25613 | Through the Ages: A Story of Civilization |
| 8.29052 | 7.86813 | 19 | 12 | 2 | 193738 | Great Western Trail |
| 7.94284 | 7.86145 | 21 | 12 | 2 | 2651 | Power Grid |

# agecat == 3 when age %in% range(Q3,)  
game %>%   
 select(avg\_rating, geek\_rating, rank, age, agecat, game\_id, names) %>%  
 filter(agecat == 3) %>%   
 arrange(desc(geek\_rating)) %>%   
 head(10) %>% kable

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| avg\_rating | geek\_rating | rank | age | agecat | game\_id | names |
| 8.66905 | 8.48904 | 1 | 13 | 3 | 161936 | Pandemic Legacy: Season 1 |
| 8.72977 | 8.30744 | 2 | 14 | 3 | 182028 | Through the Ages: A New Story of Civilization |
| 8.35745 | 8.22021 | 3 | 13 | 3 | 12333 | Twilight Struggle |
| 8.53049 | 8.15037 | 6 | 14 | 3 | 187645 | Star Wars: Rebellion |
| 8.32419 | 8.08622 | 7 | 14 | 3 | 169786 | Scythe |
| 8.18761 | 8.02304 | 9 | 10 | 3 | 173346 | 7 Wonders Duel |
| 8.38607 | 7.96376 | 13 | 13 | 3 | 115746 | War of the Ring (Second Edition) |
| 8.13872 | 7.93931 | 15 | 14 | 3 | 96848 | Mage Knight Board Game |
| 8.14718 | 7.92347 | 16 | 14 | 3 | 170216 | Blood Rage |
| 8.19903 | 7.89284 | 18 | 14 | 3 | 164153 | Star Wars: Imperial Assault |

# 3）Table -top 10 rated for each player group ( 3 groups in total) - Chen

### top 10 rated (avg\_rating) for each player group  
  
#single\_player  
game %>%   
 select(avg\_rating, geek\_rating, rank, single\_player, game\_id, names) %>%  
 filter(single\_player == 1) %>%   
 arrange(desc(avg\_rating)) %>%   
 head(10) %>% kable

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| avg\_rating | geek\_rating | rank | single\_player | game\_id | names |
| 9.33167 | 5.79078 | 3026 | 1 | 186751 | Mythic Battles: Pantheon |
| 9.14646 | 5.64691 | 4591 | 1 | 198985 | Day Night Z |
| 9.08970 | 8.15151 | 5 | 1 | 174430 | Gloomhaven |
| 8.91346 | 5.66261 | 4334 | 1 | 220308 | Gaia Project |
| 8.89899 | 7.28089 | 150 | 1 | 55690 | Kingdom Death: Monster |
| 8.85597 | 6.48439 | 868 | 1 | 192135 | Too Many Bones |
| 8.82781 | 5.65702 | 4425 | 1 | 168537 | Pandemonium |
| 8.74356 | 5.98863 | 2021 | 1 | 68820 | Enemy Action: Ardennes |
| 8.60267 | 5.68950 | 3938 | 1 | 204472 | Sub Terra |
| 8.59714 | 5.68432 | 4007 | 1 | 39939 | The Battle of Fontenoy: 11 May, 1745 |

#multi\_player  
game %>%   
 select(avg\_rating, geek\_rating, rank, multi\_player, game\_id, names) %>%  
 filter(multi\_player == 1) %>%   
 arrange(desc(avg\_rating)) %>%   
 head(10) %>% kable

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| avg\_rating | geek\_rating | rank | multi\_player | game\_id | names |
| 8.85900 | 5.76596 | 3194 | 1 | 144574 | Last Chance for Victory |
| 8.82278 | 5.70251 | 3771 | 1 | 178896 | Last Blitzkrieg |
| 8.72977 | 8.30744 | 2 | 1 | 182028 | Through the Ages: A New Story of Civilization |
| 8.66905 | 8.48904 | 1 | 1 | 161936 | Pandemic Legacy: Season 1 |
| 8.59789 | 5.66709 | 4241 | 1 | 163097 | Beyond the Rhine |
| 8.53049 | 8.15037 | 6 | 1 | 187645 | Star Wars: Rebellion |
| 8.50652 | 5.66641 | 4257 | 1 | 223619 | Shadow War: Armageddon |
| 8.50219 | 6.50294 | 839 | 1 | 179803 | Arcadia Quest: Inferno |
| 8.49597 | 5.67612 | 4118 | 1 | 185380 | Exceed: Red Horizon ? Satoshi & Mei Lien vs. Baelkhor & Morathi |
| 8.46140 | 5.78569 | 3069 | 1 | 149620 | Advanced Squad Leader: Starter Kit Historical Module 1 ? Decision at Elst |

#party\_player  
game %>%   
 select(avg\_rating, geek\_rating, rank, party\_player, game\_id, names) %>%  
 filter(party\_player == 1) %>%   
 arrange(desc(avg\_rating)) %>%   
 head(10) %>% kable

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| avg\_rating | geek\_rating | rank | party\_player | game\_id | names |
| 8.89899 | 7.28089 | 150 | 1 | 55690 | Kingdom Death: Monster |
| 8.82781 | 5.65702 | 4425 | 1 | 168537 | Pandemonium |
| 8.77167 | 5.75141 | 3319 | 1 | 173504 | The Greatest Day: Sword, Juno, and Gold Beaches |
| 8.71368 | 5.98688 | 2025 | 1 | 63170 | 1817 |
| 8.60654 | 5.78242 | 3091 | 1 | 85424 | La Bataille de la Moscowa (third edition) |
| 8.60267 | 5.68950 | 3938 | 1 | 204472 | Sub Terra |
| 8.47239 | 5.62707 | 4979 | 1 | 178754 | Z War One: Damnation |
| 8.43849 | 6.43910 | 927 | 1 | 131111 | Codex: Card-Time Strategy ? Deluxe Set |
| 8.41381 | 5.66988 | 4203 | 1 | 193867 | 1822: The Railways of Great Britain |
| 8.38253 | 6.51317 | 823 | 1 | 184424 | Mega Civilization |

* top 10 rated (avg\_geek) each player group

#single\_player  
game %>%   
 select(avg\_rating, geek\_rating, rank, single\_player, game\_id, names) %>%  
 filter(single\_player == 1) %>%   
 arrange(desc(geek\_rating)) %>%   
 head(10) %>% kable

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| avg\_rating | geek\_rating | rank | single\_player | game\_id | names |
| 9.08970 | 8.15151 | 5 | 1 | 174430 | Gloomhaven |
| 8.32419 | 8.08622 | 7 | 1 | 169786 | Scythe |
| 8.37791 | 8.06267 | 8 | 1 | 167791 | Terraforming Mars |
| 8.17949 | 8.00663 | 10 | 1 | 102794 | Caverna: The Cave Farmers |
| 8.05431 | 7.96041 | 14 | 1 | 31260 | Agricola |
| 8.13872 | 7.93931 | 15 | 1 | 96848 | Mage Knight Board Game |
| 8.30689 | 7.86329 | 20 | 1 | 205059 | Mansions of Madness: Second Edition |
| 8.39843 | 7.84010 | 24 | 1 | 205637 | Arkham Horror: The Card Game |
| 8.01272 | 7.83866 | 25 | 1 | 121921 | Robinson Crusoe: Adventures on the Cursed Island |
| 7.93099 | 7.80765 | 30 | 1 | 35677 | Le Havre |

#multi\_player  
game %>%   
 select(avg\_rating, geek\_rating, rank, multi\_player, game\_id, names) %>%  
 filter(multi\_player == 1) %>%   
 arrange(desc(geek\_rating)) %>%   
 head(10) %>% kable

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| avg\_rating | geek\_rating | rank | multi\_player | game\_id | names |
| 8.66905 | 8.48904 | 1 | 1 | 161936 | Pandemic Legacy: Season 1 |
| 8.72977 | 8.30744 | 2 | 1 | 182028 | Through the Ages: A New Story of Civilization |
| 8.35745 | 8.22021 | 3 | 1 | 12333 | Twilight Struggle |
| 8.53049 | 8.15037 | 6 | 1 | 187645 | Star Wars: Rebellion |
| 8.18761 | 8.02304 | 9 | 1 | 173346 | 7 Wonders Duel |
| 8.11355 | 7.99721 | 11 | 1 | 84876 | The Castles of Burgundy |
| 8.38607 | 7.96376 | 13 | 1 | 115746 | War of the Ring (Second Edition) |
| 8.14718 | 7.92347 | 16 | 1 | 170216 | Blood Rage |
| 8.08381 | 7.92190 | 17 | 1 | 25613 | Through the Ages: A Story of Civilization |
| 8.29052 | 7.86813 | 19 | 1 | 193738 | Great Western Trail |

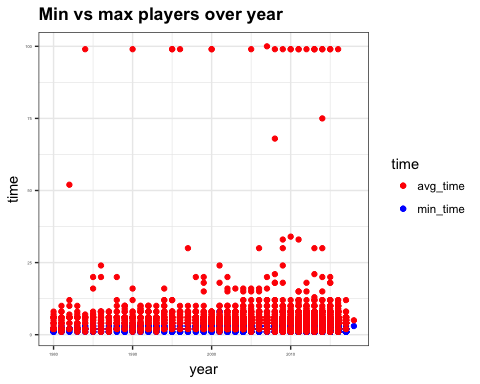
#party\_player  
game %>%   
 select(avg\_rating, geek\_rating, rank, party\_player, game\_id, names) %>%  
 filter(party\_player == 1) %>%   
 arrange(desc(geek\_rating)) %>%   
 head(10) %>% kable

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| avg\_rating | geek\_rating | rank | party\_player | game\_id | names |
| 8.29627 | 8.15458 | 4 | 1 | 120677 | Terra Mystica |
| 8.32419 | 8.08622 | 7 | 1 | 169786 | Scythe |
| 8.37791 | 8.06267 | 8 | 1 | 167791 | Terraforming Mars |
| 8.17949 | 8.00663 | 10 | 1 | 102794 | Caverna: The Cave Farmers |
| 8.08780 | 7.98030 | 12 | 1 | 3076 | Puerto Rico |
| 8.05431 | 7.96041 | 14 | 1 | 31260 | Agricola |
| 8.19903 | 7.89284 | 18 | 1 | 164153 | Star Wars: Imperial Assault |
| 8.30689 | 7.86329 | 20 | 1 | 205059 | Mansions of Madness: Second Edition |
| 7.94284 | 7.86145 | 21 | 1 | 2651 | Power Grid |
| 8.00981 | 7.85384 | 23 | 1 | 72125 | Eclipse |

### 4) Plot min, mean, max players and time over year (Chen)

#plot min, max, players over years  
game %>% filter(year >=1980 & rank != which.max(game$max\_players)) %>% #drop the 999 maximum point  
 select(min\_players, max\_players, year) %>%  
 group\_by(year) %>%  
 ggplot() +   
 geom\_point(aes(year,min\_players, color= 'min\_time')) +  
 geom\_point(aes(year, max\_players, color= 'avg\_time')) +  
 scale\_colour\_manual(name="time", values=c(min\_time='blue', avg\_time="red", max\_time = 'yellow')) +  
 theme(axis.text=element\_text(size=3)) +  
 ylab("time") +  
 xlab("year") +  
 ggtitle("Min vs max players over year")

## Warning: Removed 5 rows containing missing values (geom\_point).



# plot min, max, mean, time over years  
game %>% filter(year >=1980) %>%  
 select(min\_time, avg\_time, max\_time, year) %>%  
 group\_by(year) %>%  
 ggplot() +   
 geom\_point(aes(year, min\_time, color= 'min\_time')) +  
 geom\_point(aes(year, avg\_time, color= 'avg\_time')) +  
 geom\_point(aes(year, max\_time, color= 'max\_time')) +  
 scale\_colour\_manual(name="time", values=c(min\_time='blue', avg\_time="red", max\_time = 'yellow')) +  
 theme(axis.text=element\_text(size=3)) +  
 ylab("time") +  
 xlab("year") +  
 ggtitle("Min, avg, max time over years")

## Warning: Removed 76 rows containing missing values (geom\_point).

## Warning: Removed 36 rows containing missing values (geom\_point).

## Warning: Removed 76 rows containing missing values (geom\_point).

