KID
Function

Fabian Blasch

18.08.2021

Packages

```
# Packages
get.package <- function(package){

  lapply(package, \(x){
    # check if packages are installed and if not install them
    if(!require(x, character.only = T)){
       install.packages(x)
    }
    # call package
    library(x, character.only = T)
  })

}

# exec
get.package(c("png", "jpeg", "tabulizer", "pdftools", "raster", "rgdal", "sp",
              "cluster"))




# since I will use Map() / lapply() alot for plotting I will wrap them in invisible()
invis.Map <- function(f, ...) invisible(Map(f, ...))
invis.lapply <- function(x, f, ...) invisible(lapply(x, f, ...))
```

Actual SRRI

We can obtain the actual SRRI from the file name. Later this data will be utilized to evaluate the classification accuracy of the applied methods.

```
# set
setwd("C:/Users/blasc/OneDrive/Documents/GitHub/KID/KIDs")

# files
file_names <- list.files(pattern = ".pdf", recursive = T)

# create df
dat.valid.SRRI <- as.data.frame(cbind("KID" = file_names,
                        "SRRI" = sapply(strsplit(sapply(strsplit(file_names, "_", fixed = T),
```

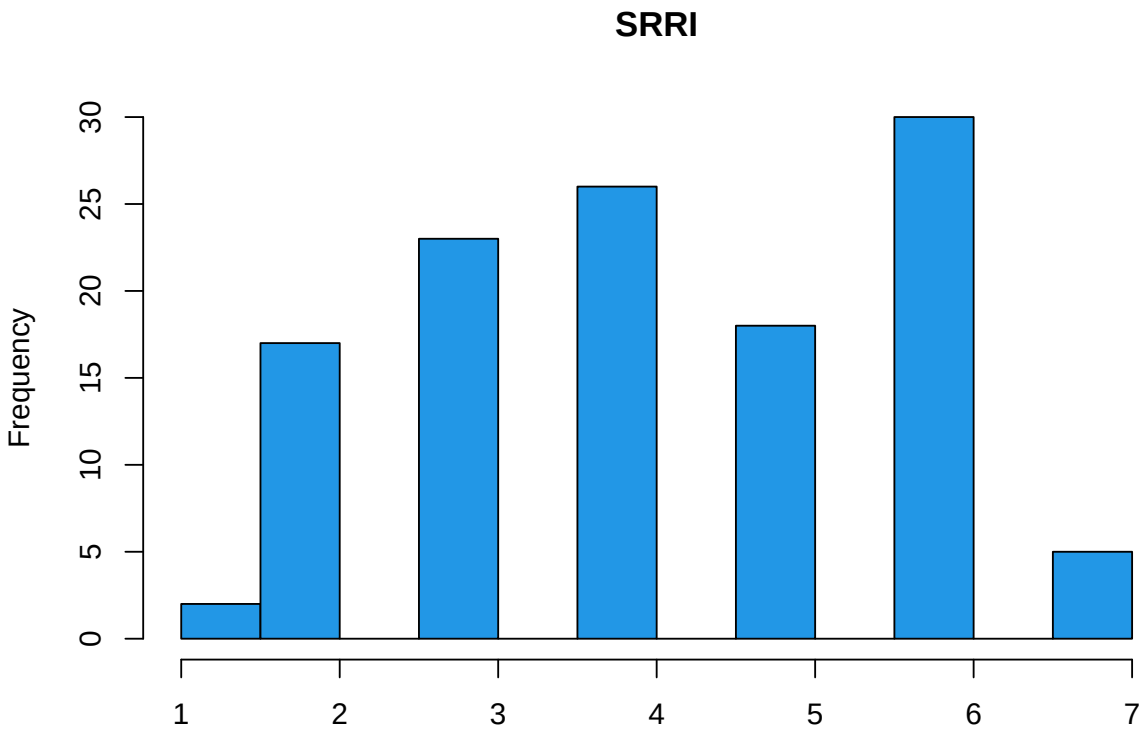
```
                                        function(x) x[length(x)]), ".", fixed = T), "[", 1)))

# split first col
dat.valid.SRRI[, "KAG"] <- sapply(strsplit(dat.valid.SRRI[, 1], "/"), "[", 1)
dat.valid.SRRI[, "KID"] <- sapply(strsplit(dat.valid.SRRI[, 1], "/"), "[", 2)

# order
dat.valid.SRRI <- dat.valid.SRRI[, c(3, 1, 2)]

# glimpse
head(dat.valid.SRRI, 7)
```

```
##       KAG             KID SRRI
## 1 Allianz ki-allakt_6.pdf    6
## 2 Allianz  ki-allap_6.pdf    6
## 3 Allianz ki-alleur_2.pdf    2
## 4 Allianz  ki-allna_6.pdf    6
## 5 Allianz ki-allnar_2.pdf    2
## 6 Allianz ki-allore_3.pdf    3
## 7 Allianz ki-allost_6.pdf    6
```

```
# dim
dim(dat.valid.SRRI)
```

```
## [1] 121   3
```

```
# Hist
hist(as.numeric(dat.valid.SRRI[, "SRRI"]), breaks = 10, main = "SRRI", col = 4, xlab = "")
```



Shade Color

To extract the SRRI the following colors are required and need to be converted to hex.

```
# set
setwd("C:/Users/blasc/OneDrive/Documents/GitHub/KID/KIDs/Auxiliary")

# import
dat.col.KAG <- read.table(list.files(pattern = "RGB"),
                          col.names = c("KAG", "R", "G", "B"))

# add hex
sapply(as.data.frame(t(dat.col.KAG[, -1])),
       function(x) do.call( rgb, as.list(c(x, maxColorValue = 255)))) -> HEX

# bind
dat.col.KAG <- cbind(dat.col.KAG, "HEX" = HEX)

# display
dat.col.KAG
```

```
##               KAG   R   G   B     HEX
## V1     Raiffeisen   0  82 140 #00528C
## V2        Allianz 166 166 166 #A6A6A6
## V3         Amundi 204 210 219 #CCD2DB
## V4          Erste 166 166 166 #A6A6A6
```

```
## V5           IQAM 128 128 128 #808080
## V6         Kepler 204 204 204 #CCCCCC
## V7   Masterinvest  99 177 229 #63B1E5
## V8  Schoellerbank 217 217 217 #D9D9D9
## V9       Security 193 193 193 #C1C1C1
## V10         Union 196 197 199 #C4C5C7
```

SRRI Extraction Function

Given a KID document this function aims to extract the SRRI from the standard graph usually located on the first of two pages.

```
# doc ... path to file
# col ... HEX code of color shade

SRRI.ext <- function(doc, col){

  ## FIND PAGE ##

  # convert pdf to text and identify line of interest
  pdf.text <- strsplit(pdftools::pdf_text(doc), "\n")

  # obtain relative line on page
  sapply(pdf.text, function(y){
    # id
    tmp1 <- grep("Risiko- und Ertragsprofil", y) / length(y)

    # return
    if(length(tmp1) == 0){
      return(NA)
    } else {
      return(tmp1)
    }
  }) -> pos.vec

  # ERROR if both pages yield a value different to NA
  if(sum(is.na(pos.vec)) > 1) stop("Error: Could not uniquely identify position of SRRI.")

  ##  BITMAP  ##

  # identify Page
  page.SRRI <- which(!is.na(pos.vec))

  # generate bitmap
  bit.map <- pdftools::pdf_render_page(doc, page = page.SRRI, dpi = 50)

  # subset array
  ind.page.len <- round(dim(bit.map)[3] * (pos.vec[page.SRRI] - 0.1))

  # return
  bit.map.sub <- bit.map[ , , -c(ind.page.len:1)]

  ## COLOR ##

  # split HEX
```

```r
col.split <- unlist(strsplit(gsub("(.{2})", "\\1 ",
                            unlist(strsplit(dat.col.KAG[4, 5], "#"))[[2]]), " "))

# convert to lower case
col.split <- tolower(col.split)

## COORDINATES ##

# Shade
coo <- which(bit.map.sub[1,,] == col.split[1] & bit.map.sub[2,,] == col.split[2] &
             bit.map.sub[3,,] == col.split[3], arr.ind = T)

# stopif no pixels of desired color detected
if(nrow(coo) < 1) stop("Error: No pixels of given color detected.")

# margin
coob <- which(bit.map[1,,] == "00" & bit.map[2,,] == "00" & bit.map[3,,] == "00",
              arr.ind = T)

# lsm / rsm
lsm <- min(coob[, 1])
rsm <- max(coob[, 1])

# scale
int_leng <- (rsm - lsm) / 7

# midpoints
scale <- setNames(cumsum(c(lsm + int_leng / 2, rep(int_leng, 6))), 1:7)

## CLASSIFICATIOn ##

# p = 5, method = "average"

# get grouping
grps <- agnes(coo, method = "average", diss = F)

# restrict amnt of groups
grps <- cutree(grps, k = 5)

# bind
dat.grps <- as.data.frame(cbind(coo, grps))

## IDENTIFY CLUSTER ##

# identify cluster with minimum sum of variance
        # which.min(rowSums(aggregate(dat.grps[, 1:2], by = dat.grps[, 3, drop = F],
        #                             var))) -> rect.grp

# horizontal variance scaled (alt decision rule)
which.min(tapply(dat.grps[, 1], dat.grps[, 3],
                 function(x) var(x) / length(x))) -> rect.grp

# median
```

```
  med.rect.grp <- median(dat.grps[, 1][which(dat.grps[, 3] == rect.grp)])

  # return minimum absolute difference
  dif <- abs(med.rect.grp - scale)

  # which
  SRRI <- which.min(dif)

  # return
  list(dif,
       SRRI,
       dat.grps,
       med.rect.grp,
       scale)
}

# TEST
# SRRI.ext(doc = "C:/Users/blasc/OneDrive/Documents/GitHub/KID/KIDs/Erste/kid-eb-147-t2957-at_de-de_en_
#                  col = dat.col.KAG[4, 5])
```

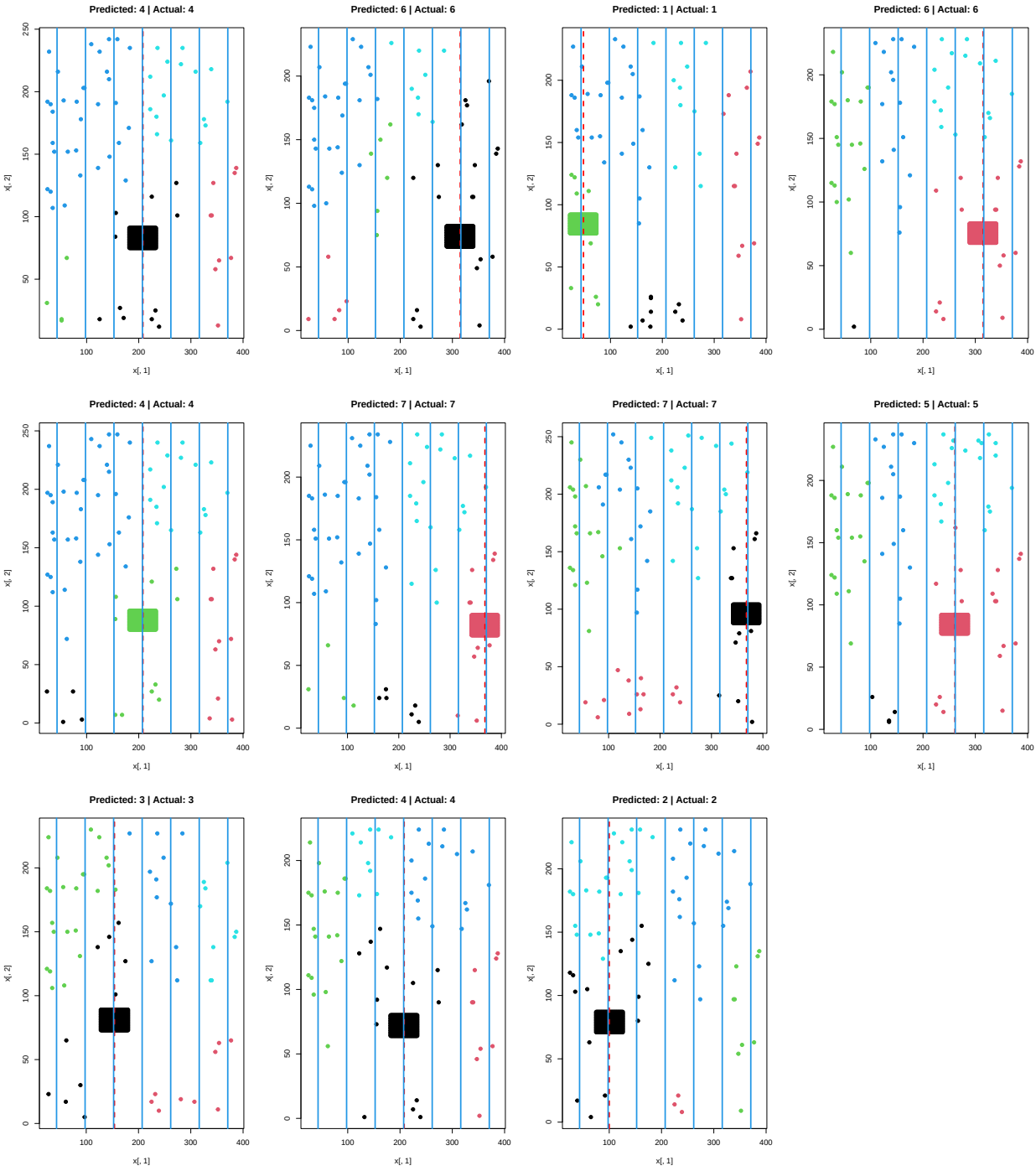
Result of First Test

One Pixel of the predicted scale, it does not get much better than that. Lets hope this works close to as well for all the other documents.

Further Tests

```
# set wd to file that contains
setwd("C:/Users/blasc/OneDrive/Documents/GitHub/KID/KIDs")

# safe dirs
dirs <- list.dirs()[-c(1, 4)] # remove hardcode later

# colors
col <- dat.col.KAG[order(dat.col.KAG[, "KAG"]), c("KAG", "HEX")]

#
Map(function(x, y){

  # set
  {setwd("C:/Users/blasc/OneDrive/Documents/GitHub/KID/KIDs")
   setwd(x)

  # ,pdfs
  file_nom <- list.files(pattern = ".pdf")}

   # FUN over all .pdfs
  lapply(file_nom, function(z){
    SRRI.ext(doc = z, col = y)
  })


}, dirs[3], col[3, 2]) -> erste.test
```

```r
# extracted SRRI
cbind(dat.valid.SRRI[dat.valid.SRRI[, "KAG"] == "Erste", ],
      "Extracted" = sapply(erste.test[[1]], "[[", 2)) -> res

par(mfrow = c(3, 4))

# plot
invis.Map(function(x, y, z, l, k){

  {plot(x[, 1], x[, 2], col = x[, ncol(x)], pch = 19, main = paste("Predicted:", z, "| Actual:", l))
  abline(v = y, col = "red", lty = 2, lwd = 2)
  lapply(k, function(x) abline(v = x, col = 4, lwd = 2))}

}, lapply(erste.test[[1]], "[[", 3), sapply(erste.test[[1]], "[[", 4), res[, 4], res[, 3],
   lapply(erste.test[[1]], "[[", 5))
```


Predicted: 4 | Actual: 4
Predicted: 6 | Actual: 6
Predicted: 1 | Actual: 1
Predicted: 6 | Actual: 6
Predicted: 4 | Actual: 4
Predicted: 7 | Actual: 7
Predicted: 7 | Actual: 7
Predicted: 5 | Actual: 5
Predicted: 3 | Actual: 3
Predicted: 4 | Actual: 4
Predicted: 2 | Actual: 2
x[, 1]
x[, 2]