

Human Resources Employee Attrition

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Human Resources Employee Attrition

Introduction

- Employee attrition refers to the phenomenon of employees leaving an organization voluntarily or involuntarily.
- High turnover rate is huge issues for organisations.
- Predicting employee attrition can help organizations proactively identify and address factors that contribute to employee turnover.
- High cost of hiring, training and time-consuming for recruitment.
- Building a predictive model for employee attrition can provide valuable insights to optimize employee retention strategies.

Problem Statement

- Challenge in retaining current workforce

Aim and Objectives

Aim:

- To develop a machine learning algorithm for accurate and efficient detection of employee attrition.

Objectives:

- To investigate the key features affect employee attrition.

Let's look into what are all the installed libraries we have

```
installed.packages()
```

```
##          Package      LibPath
## backports  "backports" "C:/Users/ATTULAYA/AppData/Local/R/win-
library/4.3"
## base64enc  "base64enc"  "C:/Users/ATTULAYA/AppData/Local/R/win-
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## bitops     "bitops"     "C:/Users/ATTULAYA/AppData/Local/R/win-
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## cachem library/4.3"	"cachem"	"C:/Users/ATTULAYA/AppData/Local/R/win-
## caret library/4.3"	"caret"	"C:/Users/ATTULAYA/AppData/Local/R/win-
## caTools library/4.3"	"caTools"	"C:/Users/ATTULAYA/AppData/Local/R/win-
## checkmate library/4.3"	"checkmate"	"C:/Users/ATTULAYA/AppData/Local/R/win-
## cli library/4.3"	"cli"	"C:/Users/ATTULAYA/AppData/Local/R/win-
## clipr library/4.3"	"clipr"	"C:/Users/ATTULAYA/AppData/Local/R/win-
## clock library/4.3"	"clock"	"C:/Users/ATTULAYA/AppData/Local/R/win-
## colorspace library/4.3"	"colorspace"	"C:/Users/ATTULAYA/AppData/Local/R/win-
## commonmark library/4.3"	"commonmark"	"C:/Users/ATTULAYA/AppData/Local/R/win-
## cowplot library/4.3"	"cowplot"	"C:/Users/ATTULAYA/AppData/Local/R/win-
## cpp11 library/4.3"	"cpp11"	"C:/Users/ATTULAYA/AppData/Local/R/win-
## crayon library/4.3"	"crayon"	"C:/Users/ATTULAYA/AppData/Local/R/win-
## curl library/4.3"	"curl"	"C:/Users/ATTULAYA/AppData/Local/R/win-
## data.table library/4.3"	"data.table"	"C:/Users/ATTULAYA/AppData/Local/R/win-
## DataExplorer library/4.3"	"DataExplorer"	"C:/Users/ATTULAYA/AppData/Local/R/win-
## diagram library/4.3"	"diagram"	"C:/Users/ATTULAYA/AppData/Local/R/win-
## digest library/4.3"	"digest"	"C:/Users/ATTULAYA/AppData/Local/R/win-
## dplyr library/4.3"	"dplyr"	"C:/Users/ATTULAYA/AppData/Local/R/win-
## e1071 library/4.3"	"e1071"	"C:/Users/ATTULAYA/AppData/Local/R/win-
## ellipsis library/4.3"	"ellipsis"	"C:/Users/ATTULAYA/AppData/Local/R/win-
## entropy library/4.3"	"entropy"	"C:/Users/ATTULAYA/AppData/Local/R/win-
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## withr library/4.3"	"withr"	"C:/Users/ATTULAYA/AppData/Local/R/win-
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## datasets	"datasets"	"C:/Program Files/R/R-4.3.0/library"
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## grid	"grid"	"C:/Program Files/R/R-4.3.0/library"
## KernSmooth	"KernSmooth"	"C:/Program Files/R/R-4.3.0/library"
## lattice	"lattice"	"C:/Program Files/R/R-4.3.0/library"
## MASS	"MASS"	"C:/Program Files/R/R-4.3.0/library"
## Matrix	"Matrix"	"C:/Program Files/R/R-4.3.0/library"
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## nlme	"nlme"	"C:/Program Files/R/R-4.3.0/library"
## nnet	"nnet"	"C:/Program Files/R/R-4.3.0/library"
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## spatial	"spatial"	"C:/Program Files/R/R-4.3.0/library"
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## survival	"survival"	"C:/Program Files/R/R-4.3.0/library"
## tcltk	"tcltk"	"C:/Program Files/R/R-4.3.0/library"
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## bit64	"4.0.5"	NA
## bitops	"1.0-7"	NA
## bslib	"0.6.1"	NA
## cachem	"1.0.8"	NA
## caret	"6.0-94"	NA
## caTools	"1.18.2"	NA
## checkmate	"2.3.1"	NA
## cli	"3.6.1"	NA
## clipr	"0.8.0"	NA
## clock	"0.7.0"	NA
## colorspace	"2.1-0"	NA
## commonmark	"1.9.0"	NA
## cowplot	"1.1.3"	NA
## cpp11	"0.4.7"	NA

## crayon	"1.5.2"	NA
## curl	"5.2.0"	NA
## data.table	"1.14.10"	NA
## DataExplorer	"0.8.3"	NA
## diagram	"1.6.5"	NA
## digest	"0.6.34"	NA
## dplyr	"1.1.4"	NA
## e1071	"1.7-14"	NA
## ellipsis	"0.3.2"	NA
## entropy	"1.3.1"	NA
## evaluate	"0.23"	NA
## fansi	"1.0.4"	NA
## farver	"2.1.1"	NA
## fastmap	"1.1.1"	NA
## fontawesome	"0.5.2"	NA
## forcats	"1.0.0"	NA
## foreach	"1.5.2"	NA
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## fs	"1.6.3"	NA
## FSelector	"0.34"	NA
## future	"1.33.1"	NA
## future.apply	"1.11.1"	NA
## gdata	"3.0.0"	NA
## generics	"0.1.3"	NA
## ggplot2	"3.4.4"	NA
## globals	"0.16.2"	NA
## glue	"1.6.2"	NA
## gmodels	"2.18.1.1"	NA
## gower	"1.0.1"	NA
## gridExtra	"2.3"	NA
## gtable	"0.3.3"	NA
## gtools	"3.9.5"	NA
## hardhat	"1.3.0"	NA
## highr	"0.10"	NA
## hms	"1.1.3"	NA
## htmltools	"0.5.7"	NA
## htmlwidgets	"1.6.4"	NA
## igraph	"1.6.0"	NA
## ipred	"0.9-14"	NA
## isoband	"0.2.7"	NA
## iterators	"1.0.14"	NA
## jquerylib	"0.1.4"	NA
## jsonlite	"1.8.8"	NA
## kableExtra	"1.4.0"	NA
## knitr	"1.45"	NA
## labeling	"0.4.2"	NA
## lava	"1.7.3"	NA
## lifecycle	"1.0.3"	NA
## listenv	"0.9.0"	NA
## lobster	"1.1.2"	NA

## lubridate	"1.9.3"	NA
## magick	"2.8.2"	NA
## magrittr	"2.0.3"	NA
## markdown	"1.12"	NA
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## memoise	"2.0.1"	NA
## mime	"0.12"	NA
## ModelMetrics	"1.2.2.2"	NA
## munsell	"0.5.0"	NA
## networkD3	"0.4"	NA
## numDeriv	"2016.8-1.1"	NA
## pander	"0.6.5"	NA
## parallelly	"1.36.0"	NA
## pastecs	"1.3.21"	NA
## pillar	"1.9.0"	NA
## pkgconfig	"2.0.3"	NA
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## prettyunits	"1.1.1"	NA
## pROC	"1.18.5"	NA
## prodlim	"2023.08.28"	NA
## progress	"1.2.2"	NA
## progressr	"0.14.0"	NA
## proxy	"0.4-27"	NA
## pryr	"0.1.6"	NA
## purrr	"1.0.2"	NA
## R6	"2.5.1"	NA
## randomForest	"4.7-1.1"	NA
## rappdirs	"0.3.3"	NA
## rapportools	"1.1"	NA
## RColorBrewer	"1.1-3"	NA
## Rcpp	"1.0.11"	NA
## readr	"2.1.4"	NA
## recipes	"1.0.9"	NA
## repr	"1.1.6"	NA
## reshape2	"1.4.4"	NA
## rlang	"1.1.1"	NA
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## vctrs "0.6.5" NA
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## xfun "0.41" NA
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## grid "4.3.0" "base"
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## MASS "7.3-58.4" "recommended"
## Matrix "1.5-4" "recommended"
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## nlme "3.1-162" "recommended"
## nnet "7.3-18" "recommended"
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## splines "4.3.0" "base"
## stats "4.3.0" "base"
## stats4 "4.3.0" "base"
## survival "3.5-5" "recommended"
## tcltk "4.3.0" "base"
## tools "4.3.0" "base"
## translations "4.3.0" NA
## utils "4.3.0" "base"
## Depends
## backports "R (>= 3.0.0)"
## base64enc "R (>= 2.9.0)"
## bit "R (>= 2.9.2)"
## bit64 "R (>= 3.0.1), bit (>= 4.0.0), utils, methods, stats"
## bitops NA

```

```
## bslib          "R (>= 2.10)"
## cachem         NA
## caret          "ggplot2, lattice (>= 0.20), R (>= 3.2.0)"
## caTools        "R (>= 3.6.0)"
## checkmate      "R (>= 3.0.0)"
## cli            "R (>= 3.4)"
## clipr          NA
## clock          "R (>= 3.5.0)"
## colorspace     "R (>= 3.0.0), methods"
## commonmark     NA
## cowplot        "R (>= 3.5.0)"
## cpp11          "R (>= 3.5.0)"
## crayon         NA
## curl           "R (>= 3.0.0)"
## data.table     "R (>= 3.1.0)"
## DataExplorer  "R (>= 3.6)"
## diagram        "R (>= 2.01), shape"
## digest         "R (>= 3.3.0)"
## dplyr          "R (>= 3.5.0)"
## e1071          NA
## ellipsis       "R (>= 3.2)"
## entropy        "R (>= 3.0.2)"
## evaluate       "R (>= 3.0.2)"
## fansi          "R (>= 3.1.0)"
## farver         NA
## fastmap        NA
## fontawesome    "R (>= 3.3.0)"
## forcats        "R (>= 3.4)"
## foreach        "R (>= 2.5.0)"
## formatR        "R (>= 3.2.3)"
## fs             "R (>= 3.4)"
## FSelector      NA
## future         NA
## future.apply   "R (>= 3.2.0), future (>= 1.28.0)"
## gdata          NA
## generics       "R (>= 3.2)"
## ggplot2        "R (>= 3.3)"
## globals        "R (>= 3.1.2)"
## glue           "R (>= 3.4)"
## gmodels        "R (>= 1.9.0)"
## gower          NA
## gridExtra      NA
## gtable         "R (>= 3.5)"
## gtools         "methods, stats, utils"
## hardhat        "R (>= 3.5.0)"
## highr          "R (>= 3.3.0)"
## hms            NA
## htmltools      "R (>= 2.14.1)"
## htmlwidgets    NA
## igrapht        "methods, R (>= 3.5.0)"
```

```
## ipred      "R (>= 2.10)"
## isoband    NA
## iterators  "R (>= 2.5.0), utils"
## jquerylib  NA
## jsonlite   "methods"
## kableExtra "R (>= 3.1.0)"
## knitr      "R (>= 3.3.0)"
## labeling   NA
## lava       "R (>= 3.5.0)"
## lifecycle  "R (>= 3.4)"
## listenv    "R (>= 3.1.2)"
## lobster    "R (>= 3.2)"
## lubridate   "methods, R (>= 3.2)"
## magick     NA
## magrittr   "R (>= 3.4.0)"
## markdown   "R (>= 2.11.1)"
## matrixStats "R (>= 2.12.0)"
## memoise    NA
## mime       NA
## ModelMetrics "R (>= 3.2.2)"
## munsell    NA
## networkD3  "R (>= 3.0.0)"
## numDeriv    "R (>= 2.11.1)"
## pander      "R (>= 2.15.0)"
## parallelly  NA
## pastecs     NA
## pillar     NA
## pkgconfig   NA
## plyr        "R (>= 3.1.0)"
## prettyunits NA
## pROC        "R (>= 2.14)"
## prodlim     "R (>= 2.9.0)"
## progress    NA
## progressr   "R (>= 3.5.0)"
## proxy       "R (>= 3.4.0)"
## pryr        "R (>= 3.1.0)"
## purrr       "R (>= 3.5.0)"
## R6          "R (>= 3.0)"
## randomForest "R (>= 4.1.0), stats"
## rappdirs    "R (>= 3.2)"
## rapportools NA
## RColorBrewer "R (>= 2.0.0)"
## Rcpp        NA
## readr       "R (>= 3.5)"
## recipes     "dplyr (>= 1.1.0), R (>= 3.6)"
## repr        "R (>= 3.0.1)"
## reshape2    "R (>= 3.1)"
## rlang       "R (>= 3.5.0)"
## rmarkdown   "R (>= 3.0)"
## rstudioapi  NA
```

```

## RWeka      "R (>= 2.6.0)"
## RWekajars  NA
## sass       NA
## scales     "R (>= 3.2)"
## shape      "R (>= 2.01)"
## SQUAREM    "R (>= 3.0)"
## stringi    "R (>= 3.1)"
## stringr    "R (>= 3.3)"
## summarytools "R (>= 2.10)"
## svglite    "R (>= 3.5.0)"
## systemfonts "R (>= 3.2.0)"
## tibble     "R (>= 3.4.0)"
## tidyr      "R (>= 3.6)"
## tidyselect "R (>= 3.4)"
## timechange  "R (>= 3.3)"
## timeDate   "R (>= 3.6.0), methods"
## tinytex    NA
## tzdb       "R (>= 3.5.0)"
## utf8       "R (>= 2.10)"
## vctrs      "R (>= 3.5.0)"
## viridisLite "R (>= 2.10)"
## vroom      "R (>= 3.4)"
## withr      "R (>= 3.2.0)"
## xfun       NA
## xml2       "R (>= 3.6.0)"
## yaml       NA
## base       NA
## boot       "R (>= 3.0.0), graphics, stats"
## class      "R (>= 3.0.0), stats, utils"
## cluster    "R (>= 3.5.0)"
## codetools  "R (>= 2.1)"
## compiler   NA
## datasets   NA
## foreign    "R (>= 4.0.0)"
## graphics   NA
## grDevices  NA
## grid       NA
## KernSmooth "R (>= 2.5.0), stats"
## lattice    "R (>= 4.0.0)"
## MASS       "R (>= 4.3.0), grDevices, graphics, stats, utils"
## Matrix     "R (>= 3.5.0), methods"
## methods    NA
## mgcv       "R (>= 3.6.0), nlme (>= 3.1-64)"
## nlme       "R (>= 3.5.0)"
## nnet       "R (>= 3.0.0), stats, utils"
## parallel   NA
## rpart      "R (>= 2.15.0), graphics, stats, grDevices"
## spatial    "R (>= 3.0.0), graphics, stats, utils"
## splines    NA
## stats      NA

```

```

## stats4      NA
## survival    "R (>= 3.5.0)"
## tcltk       NA
## tools       NA
## translations NA
## utils       NA
##             Imports
## backports   NA
## base64enc   NA
## bit         NA
## bit64       NA
## bitops      NA
## bslib       "base64enc, cachem, grDevices, htmltools (>= 0.5.7),
jquerylib\n(>= 0.1.3), jsonlite, lifecycle, memoise (>= 2.0.1), mime,\nrlang,
sass (>= 0.4.0)"
## cachem      "rlang, fastmap (>= 1.1.1)"
## caret       "e1071, foreach, grDevices, methods, ModelMetrics (>=
1.2.2.2),\nnlme, plyr, pROC, recipes (>= 0.1.10), reshape2, stats,
stats4,\nutils, withr (>= 2.0.0)"
## caTools     "bitops"
## checkmate   "backports (>= 1.1.0), utils"
## cli         "utils"
## clipr       "utils"
## clock       "cli (>= 3.6.1), lifecycle (>= 1.0.3), rlang (>= 1.1.0),
tzdb\n(>= 0.4.0), vctrs (>= 0.6.1)"
## colorspace  "graphics, grDevices, stats"
## commonmark  NA
## cowplot     "ggplot2 (>= 3.4.0), grid, gtable, grDevices, methods,
rlang,\n scales"
## cpp11       NA
## crayon      "grDevices, methods, utils"
## curl        NA
## data.table  "methods"
## DataExplorer "data.table (>= 1.13.4), reshape2 (>= 1.4.3), scales
(>=\n1.1.0), ggplot2, gridExtra, rmarkdown (>= 2.5), networkD3 (>=\n0.4),
stats, utils, tools, parallel"
## diagram     "stats, graphics"
## digest      "utils"
## dplyr       "cli (>= 3.4.0), generics, glue (>= 1.3.2), lifecycle
(>=\n1.0.3), magrittr (>= 1.5), methods, pillar (>= 1.9.0), R6,\nrlang (>=
1.1.0), tibble (>= 3.2.0), tidyselect (>= 1.2.0),\nutils, vctrs (>= 0.6.4)"
## e1071       "graphics, grDevices, class, stats, methods, utils, proxy"
## ellipsis    "rlang (>= 0.3.0)"
## entropy     NA
## evaluate    "methods"
## fansi       "grDevices, utils"
## farver      NA
## fastmap     NA
## fontawesome "rlang (>= 1.0.6), htmltools (>= 0.5.1.1)"
## forcats     "cli (>= 3.4.0), glue, lifecycle, magrittr, rlang (>=

```

```

1.0.0),\ntibble"
## foreach      "codetools, utils, iterators"
## formatR      NA
## fs           "methods"
## FSelector    "digest, entropy, randomForest, RWeka"
## future       "digest, globals (>= 0.16.1), listenv (>= 0.8.0),
parallel,\nparallelly (>= 1.34.0), utils"
## future.apply "globals (>= 0.16.1), parallel, utils"
## gdata        "gtools, methods, stats, utils"
## generics     "methods"
## ggplot2      "cli, glue, grDevices, grid, gtable (>= 0.1.1),
isoband,\nlifecycle (> 1.0.1), MASS, mgcv, rlang (>= 1.1.0), scales
(>=\n1.2.0), stats, tibble, vctrs (>= 0.5.0), withr (>= 2.5.0)"
## globals     "codetools"
## glue         "methods"
## gmodels      "MASS, gdata"
## gower        NA
## gridExtra    "gtable, grid, grDevices, graphics, utils"
## gtable       "cli, glue, grid, lifecycle, rlang (>= 1.1.0)"
## gtools       NA
## hardhat      "cli (>= 3.6.0), glue (>= 1.6.2), rlang (>= 1.1.0), tibble
(>=\n3.2.1), vctrs (>= 0.6.0)"
## highr        "xfun (>= 0.18)"
## hms          "lifecycle, methods, pkgconfig, rlang (>= 1.0.2), vctrs
(>=\n0.3.8)"
## htmltools    "base64enc, digest, ellipsis, fastmap (>= 1.1.0),
grDevices,\nrlang (>= 1.0.0), utils"
## htmlwidgets "grDevices, htmltools (>= 0.5.7), jsonlite (>= 0.9.16),
knitr\n(>= 1.8), rmarkdown, yaml"
## igraph       "cli, graphics, grDevices, lifecycle, magrittr,
Matrix,\nnpkgconfig (>= 2.0.0), rlang, stats, utils"
## ipred        "rpart (>= 3.1-8), MASS, survival, nnet, class, prodlim"
## isoband      "grid, utils"
## iterators    NA
## jquerylib    "htmltools"
## jsonlite     NA
## kableExtra   "knitr (>= 1.33), magrittr, stringr (>= 1.0), xml2 (>=
1.1.1),\nrmarkdown (>= 1.6.0), scales, viridisLite, stats,
grDevices,\nhtmltools, rstudioapi, tools, digest, graphics, svglite"
## knitr        "evaluate (>= 0.15), highr, methods, tools, xfun (>=
0.39),\nyaml (>= 2.1.19)"
## labeling     "stats, graphics"
## lava         "future.apply, grDevices, graphics, methods,
numDeriv,\nprogressr, stats, survival, SQUAREM, utils"
## lifecycle    "cli (>= 3.4.0), glue, rlang (>= 1.0.6)"
## listenv      NA
## lobstr       "crayon, methods, prettyunits, rlang (>= 1.0.0)"
## lubridate    "generics, timechange (>= 0.1.1)"
## magick       "Rcpp (>= 0.12.12), magrittr, curl"
## magrittr     NA

```

```

## markdown      "utils, commonmark (>= 1.9.0), xfun (>= 0.38)"
## matrixStats   NA
## memoise       "rlang (>= 0.4.10), cachem"
## mime          "tools"
## ModelMetrics  "Rcpp, data.table"
## munsell       "colorspace, methods"
## networkD3     "htmlwidgets (>= 0.3.2), igraph, magrittr"
## numDeriv      NA
## pander        "grDevices, graphics, methods, utils, stats, digest,
tools,\nRcpp"
## parallelly    "parallel, tools, utils"
## pastecs       "boot, stats, graphics, utils, grDevices"
## pillar        "cli (>= 2.3.0), fansi, glue, lifecycle, rlang (>= 1.0.2),
utf8\n(>= 1.1.0), utils, vctrs (>= 0.5.0)"
## pkgconfig     "utils"
## plyr          "Rcpp (>= 0.11.0)"
## prettyunits   NA
## pROC          "methods, plyr, Rcpp (>= 0.11.1)"
## prodlim       "Rcpp (>= 0.11.5), stats, data.table, grDevices,
graphics,\ndiagram, survival, KernSmooth, lava"
## progress      "hms, prettyunits, R6, crayon"
## progressr     "digest, utils"
## proxy         "stats, utils"
## pryr          "codetools, lobster, methods, Rcpp (>= 0.11.0), stringr"
## purrr         "cli (>= 3.6.1), lifecycle (>= 1.0.3), magrittr (>=
1.5.0),\nrlang (>= 1.1.1), vctrs (>= 0.6.3)"
## R6            NA
## randomForest  NA
## rappdirs      NA
## rapportools   "plyr, pander, reshape2, MASS"
## RColorBrewer  NA
## Rcpp          "methods, utils"
## readr         "cli (>= 3.2.0), clipr, crayon, hms (>= 0.4.1), lifecycle
(>=\n0.2.0), methods, R6, rlang, tibble, utils, vroom (>= 1.6.0)"
## recipes       "cli, clock (>= 0.6.1), ellipsis, generics (>= 0.1.2),
glue,\ngower, hardhat (>= 1.3.0), ipred (>= 0.9-12), lifecycle (>=\n1.0.3),
lubridate (>= 1.8.0), magrittr, Matrix, purrr (>=\n1.0.0), rlang (>= 1.1.0),
stats, tibble, tidyr (>= 1.0.0),\ntidysselect (>= 1.2.0), timeDate, utils,
vctrs (>= 0.5.0), withr"
## repr         "utils, grDevices, htmltools, jsonlite, pillar (>=
1.4.0),\nbase64enc"
## reshape2     "plyr (>= 1.8.1), Rcpp, stringr"
## rlang        "utils"
## rmarkdown     "bslib (>= 0.2.5.1), evaluate (>= 0.13), fontawesome
(>=\n0.5.0), htmltools (>= 0.5.1), jquerylib, jsonlite, knitr (>=\n1.22),
methods, stringr (>= 1.2.0), tinytex (>= 0.31), tools,\nutils, xfun (>=
0.36), yaml (>= 2.1.19)"
## rstudioapi    NA
## RWeka         "RWekaJars (>= 3.9.3-1), rJava (>= 0.6-3), graphics,
stats,\nutils, grid"

```



```

## Rwekajars      "rJava (>= 0.6-3)"
## sass          "fs (>= 1.2.4), rlang (>= 0.4.10), htmltools (>= 0.5.1),
R6,\nrappdirs"
## scales        "farver (>= 2.0.3), labeling, lifecycle, munsell (>= 0.5),
R6,\nRColorBrewer, rlang (>= 1.0.0), viridisLite"
## shape         "stats, graphics, grDevices"
## SQUAREM      NA
## stringi       "tools, utils, stats"
## stringr       "cli, glue (>= 1.6.1), lifecycle (>= 1.0.3), magrittr,
rlang\n(>= 1.0.0), stringi (>= 1.5.3), vctrs"
## summarytools  "base64enc, checkmate, dplyr, grDevices, htmltools,
lubridate,\nmagick, matrixStats, methods, pander, pryr, rapportools,
stats,\ntcltk, tibble, tidyr, utils"
## svglite       "systemfonts (>= 1.0.0)"
## systemfonts   NA
## tibble        "fansi (>= 0.4.0), lifecycle (>= 1.0.0), magrittr,
methods,\npillar (>= 1.8.1), pkgconfig, rlang (>= 1.0.2), utils, vctrs\n(>=
0.4.2)"
## tidyr         "cli (>= 3.4.1), dplyr (>= 1.0.10), glue, lifecycle (>=
1.0.3),\nmagrittr, purrr (>= 1.0.1), rlang (>= 1.1.1), stringr (>= 1.5.0),
tibble (>= 2.1.1), tidyselect (>= 1.2.0), utils, vctrs\n(>= 0.5.2)"
## tidyselect    "cli (>= 3.3.0), glue (>= 1.3.0), lifecycle (>= 1.0.3),
rlang\n(>= 1.0.4), vctrs (>= 0.4.1), withr"
## timechange     NA
## timeDate      "graphics, utils, stats"
## tinytex       "xfun (>= 0.29)"
## tzdb          NA
## utf8          NA
## vctrs         "cli (>= 3.4.0), glue, lifecycle (>= 1.0.3), rlang (>=
1.1.0)"
## viridisLite   NA
## vroom         "bit64, cli (>= 3.2.0), crayon, glue, hms, lifecycle
(>= 1.0.3), methods, rlang (>= 0.4.2), stats, tibble (>=
2.0.0),\ntidyselect, tzdb (>= 0.1.1), vctrs (>= 0.2.0), withr"
## withr         "graphics, grDevices, stats"
## xfun          "stats, tools"
## xml2          "cli, methods, rlang (>= 1.1.0)"
## yaml         NA
## base          NA
## boot          NA
## class         "MASS"
## cluster       "graphics, grDevices, stats, utils"
## codetools     NA
## compiler      NA
## datasets      NA
## foreign       "methods, utils, stats"
## graphics      "grDevices"
## grDevices     NA
## grid          "grDevices, utils"
## KernSmooth    NA

```

```
## lattice      "grid, grDevices, graphics, stats, utils"
## MASS         "methods"
## Matrix       "graphics, grid, lattice, stats, utils"
## methods      "utils, stats"
## mgcv         "methods, stats, graphics, Matrix, splines, utils"
## nlme         "graphics, stats, utils, lattice"
## nnet         NA
## parallel     "tools, compiler"
## rpart        NA
## spatial      NA
## splines      "graphics, stats"
## stats        "utils, grDevices, graphics"
## stats4       "graphics, methods, stats"
## survival     "graphics, Matrix, methods, splines, stats, utils"
## tcltk        "utils"
## tools        NA
## translations NA
## utils        NA
##              LinkingTo
## backports    NA
## base64enc    NA
## bit          NA
## bit64        NA
## bitops       NA
## bslib        NA
## cachem       NA
## caret        NA
## caTools      NA
## checkmate    NA
## cli          NA
## clipr        NA
## clock        "cpp11 (>= 0.4.3), tzdb (>= 0.4.0)"
## colorspace   NA
## commonmark   NA
## cowplot      NA
## cpp11        NA
## crayon       NA
## curl         NA
## data.table   NA
## DataExplorer NA
## diagram      NA
## digest       NA
## dplyr        NA
## e1071        NA
## ellipsis     NA
## entropy      NA
## evaluate     NA
## fansi        NA
## farver       NA
## fastmap      NA
```

```
## fontawesome NA
## forcats NA
## foreach NA
## formatR NA
## fs NA
## FSelector NA
## future NA
## future.apply NA
## gdata NA
## generics NA
## ggplot2 NA
## globals NA
## glue NA
## gmodels NA
## gower NA
## gridExtra NA
## gtable NA
## gtools NA
## hardhat NA
## highr NA
## hms NA
## htmltools NA
## htmlwidgets NA
## igraph "cpp11 (>= 0.4.7)"
## ipred NA
## isoband NA
## iterators NA
## jquerylib NA
## jsonlite NA
## kableExtra NA
## knitr NA
## labeling NA
## lava NA
## lifecycle NA
## listenv NA
## lobstr "cpp11 (>= 0.4.2)"
## lubridate NA
## magick "Rcpp"
## magrittr NA
## markdown NA
## matrixStats NA
## memoise NA
## mime NA
## ModelMetrics "Rcpp"
## munsell NA
## networkD3 NA
## numDeriv NA
## pander "Rcpp"
## parallelly NA
## pastecs NA
```

```
## pillar          NA
## pkgconfig       NA
## plyr            "Rcpp"
## prettyunits     NA
## pROC            "Rcpp"
## prodlim         "Rcpp"
## progress        NA
## progressr       NA
## proxy           NA
## pryr            "Rcpp"
## purrr           "cli"
## R6              NA
## randomForest    NA
## rappdirs        NA
## rapportools     NA
## RColorBrewer    NA
## Rcpp            NA
## readr           "cpp11, tzdb (>= 0.1.1)"
## recipes         NA
## repr           NA
## reshape2       "Rcpp"
## rlang          NA
## rmarkdown      NA
## rstudioapi     NA
## RWeka          NA
## RWekajars      NA
## sass           NA
## scales         NA
## shape          NA
## SQUAREM        NA
## stringi        NA
## stringr        NA
## summarytools   NA
## svglite        "cpp11, systemfonts"
## systemfonts    "cpp11 (>= 0.2.1)"
## tibble         NA
## tidyr          "cpp11 (>= 0.4.0)"
## tidyselect     NA
## timechange     "cpp11 (>= 0.2.7)"
## timeDate       NA
## tinytex        NA
## tzdb           "cpp11 (>= 0.4.2)"
## utf8           NA
## vctr           NA
## viridisLite    NA
## vroom          "cpp11 (>= 0.2.0), progress (>= 1.2.1), tzdb (>= 0.1.1)"
## withr         NA
## xfun          NA
## xml2          NA
## yaml          NA
```

```

## base      NA
## boot      NA
## class     NA
## cluster   NA
## codetools NA
## compiler  NA
## datasets  NA
## foreign   NA
## graphics  NA
## grDevices NA
## grid       NA
## KernSmooth NA
## lattice   NA
## MASS       NA
## Matrix     NA
## methods    NA
## mgcv        NA
## nlme        NA
## nnet        NA
## parallel   NA
## rpart       NA
## spatial    NA
## splines     NA
## stats       NA
## stats4      NA
## survival    NA
## tcltk       NA
## tools       NA
## translations NA
## utils       NA
##            Suggests
## backports    NA
## base64enc     NA
## bit           "testthat (>= 0.11.0), roxygen2, knitr,
rmarkdown,\nmicrobenchmark, bit64 (>= 4.0.0), ff (>= 4.0.0)"
## bit64        NA
## bitops       NA
## bslib        "bsicons, curl, fontawesome, ggplot2, knitr,
magrittr,\nrappdirs, rmarkdown (>= 2.7), shiny (>= 1.8.0),
testthat,\nthematic, withr"
## cachem       "testthat"
## caret        "BradleyTerry2, covr, Cubist, dplyr, earth (>= 2.2-
3),\nellipse, fastICA, gam (>= 1.15), ipred, kernlab, klaR, knitr,\nMASS,
Matrix, mda, mgcv, mlbench, MLmetrics, nnet, pamr, party\n(>= 0.9-99992),
pls, proxy, randomForest, RANN, rmarkdown,\nrpart, spls, subselect, superpc,
testthat (>= 0.9.1), themis\n(>= 0.1.3)"
## caTools      "MASS, rpart"
## checkmate    "R6, fastmatch, data.table (>= 1.9.8), devtools,
ggplot2,\nknitr, magrittr, microbenchmark, rmarkdown, testthat (>=\n3.0.4),
tinytest (>= 1.1.0), tibble"

```

```

## cli          "callr, covr, crayon, digest, glue (>= 1.6.0),
grDevices,\nhtmltools, htmlwidgets, knitr, methods, mockery, processx,
ps\n(>= 1.3.4.9000), rlang (>= 1.0.2.9003), rmarkdown,
rprojroot,\nrstudioapi, testthat, tibble, whoami, withr"
## clipr        "covr, knitr, rmarkdown, rstudioapi (>= 0.5), testthat
(>=\n2.0.0)"
## clock        "covr, knitr, magrittr, pillar, rmarkdown, slider (>=
0.3.0),\ntestthat (>= 3.0.0), withr"
## colorspace   "datasets, utils, KernSmooth, MASS, kernlab, mvtnorm,
vcd,\ntcltk, shiny, shinyjs, ggplot2, dplyr, scales, grid, png, jpeg,\nknitr,
rmarkdown, RColorBrewer, rcartocolor, scico, viridis,\nwesanderson"
## commonmark   "curl, testthat, xml2"
## cowplot      "Cairo, covr, dplyr, forcats, gridGraphics (>= 0.4-0),
knitr,\nlattice, magick, maps, PASWR, patchwork, rmarkdown, ragg,\ntestthat
(>= 1.0.0), tidyr, vdiffR (>= 0.3.0), VennDiagram"
## cpp11        "bench, brio, callr, cli, covr, decor, desc, ggplot2,
glue,\nknitr, lobstr, mockery, progress, rmarkdown, scales, Rcpp,\ntestthat
(>= 3.2.0), tibble, utils, vctrs, withr"
## crayon       "mockery, rstudioapi, testthat, withr"
## curl         "spelling, testthat (>= 1.0.0), knitr, jsonlite,
later,\nrmarkdown, magrittr, httpuv (>= 1.4.4), webutils"
## data.table   "bit64 (>= 4.0.0), bit (>= 4.0.4), curl, R.utils,
xts,\nnanotime, zoo (>= 1.8-1), yaml, knitr, rmarkdown"
## DataExplorer "testthat, covr, knitr, jsonlite, nycflights13"
## diagram      NA
## digest       "tinytest, simplermarkdown"
## dplyr        "bench, broom, callr, covr, DBI, dbplyr (>= 2.2.1),
ggplot2,\nknitr, Lahman, lobstr, microbenchmark, nycflights13,
purrr,\nrmarkdown, RMySQL, RPostgreSQL, RSQLite, stringi (>=
1.7.6),\ntestthat (>= 3.1.5), tidyr (>= 1.3.0), withr"
## e1071        "cluster, mlbench, nnet, randomForest, rpart, SparseM,
xtable,\nMatrix, MASS, slam"
## ellipsis     "covr, testthat"
## entropy      ""
## evaluate     "covr, ggplot2, lattice, rlang, testthat (>= 3.0.0), withr"
## fansi        "unitizer, knitr, rmarkdown"
## farver       "covr, testthat (>= 3.0.0)"
## fastmap      "testthat (>= 2.1.1)"
## fontawesome  "covr, dplyr (>= 1.0.8), knitr (>= 1.31), testthat (>=
3.0.0),\nrsvg"
## forcats      "covr, dplyr, ggplot2, knitr, readr, rmarkdown, testthat
(>=\n3.0.0), withr"
## foreach      "randomForest, doMC, doParallel, testthat, knitr, rmarkdown"
## formatR      "rstudioapi, shiny, testit, rmarkdown, knitr"
## fs           "covr, crayon, knitr, pillar (>= 1.0.0), rmarkdown,
spelling,\ntestthat (>= 3.0.0), tibble (>= 1.1.0), vctrs (>= 0.3.0), withr"
## FSelector    "mlbench, rpart"
## future        "methods, RhpCBLASctl, R.rsp, markdown"
## future.apply "datasets, stats, tools, listenv (>= 0.8.0), R.rsp, markdown"
## gdata        "RUnit"

```

```

## generics      "covr, pkgload, testthat (>= 3.0.0), tibble, withr"
## ggplot2       "covr, dplyr, ggplot2movies, hexbin, Hmisc, knitr,
lattice,\nmapproj, maps, multcomp, munsell, nlme, profvis, quantreg,\nragg,
RColorBrewer, rmarkdown, rpart, sf (>= 0.7-3), svglite\n(>= 1.2.0.9001),
testthat (>= 3.1.2), vdiffR (>= 1.0.0), xml2"
## globals      NA
## glue          "covr, crayon, DBI, dplyr, forcats, ggplot2, knitr,
magrittr,\nmicrobenchmark, R.utils, rmarkdown, rprintf, RSQLite,
stringr,\ntestthat (>= 3.0.0), vctrs (>= 0.3.0), waldo (>= 0.3.0), withr"
## gmodels       "gplots, gtools, Matrix, nlme, lme4 (>= 0.999999-0)"
## gower         "tinytest (>= 0.9.3),"
## gridExtra     "ggplot2, egg, lattice, knitr, testthat"
## gtable        "covr, ggplot2, knitr, profvis, rmarkdown, testthat (>=
3.0.0)"
## gtools        "car, gplots, knitr, rstudioapi, SGP, taxize"
## hardhat       "covr, crayon, devtools, knitr, Matrix, modeldata (>=
0.0.2),\nrecipes (>= 1.0.5), rmarkdown (>= 2.3), roxygen2, testthat
(>=\n3.0.0), usethis (>= 2.1.5)"
## highr         "knitr, markdown, testit"
## hms           "crayon, lubridate, pillar (>= 1.1.0), testthat (>= 3.0.0)"
## htmltools     "Cairo, markdown, ragg, shiny, testthat, withr"
## htmlwidgets  "testthat"
## igraph        "ape (>= 5.7-0.1), callr, decor, digest, graph,
igraphdata,\nknitr, rgl, rmarkdown, scales, stats4, tcltk, testthat,
vdiffR,\nwithr"
## ipred         "mvtnorm, mlbench, TH.data, randomForest, party"
## isoband       "covr, ggplot2, knitr, magick, microbenchmark, rmarkdown,
sf,\ntestthat, xml2"
## iterators     "RUnit, foreach"
## jquerylib     "testthat"
## jsonlite      "httr, vctrs, testthat, knitr, rmarkdown, R.rsp, sf"
## kableExtra    "testthat, magick, tinytex, formattable, sparkline, webshot2"
## knitr         "bslib, codetools, DBI (>= 0.4-1), digest, formatR,
gifski,\ngridSVG, htmlwidgets (>= 0.7), curl, jpeg, JuliaCall (>=\n0.11.1),
magick, markdown (>= 1.3), png, ragg, reticulate (>=\n1.4), rgl (>=
0.95.1201), rlang, rmarkdown, sass, showtext,\nstyler (>= 1.2.0), targets (>=
0.6.0), testit, tibble,\ntikzDevice (>= 0.10), tinytex (>= 0.46), webshot,
rstudioapi,\nsvglite, xml2 (>= 1.2.0)"
## labeling      NA
## lava          "KernSmooth, Matrix, Rgraphviz, data.table, ellipse,
fields,\ngeepack, graph, knitr, bookdown, rmarkdown, igraph (>=
0.6),\nlavaSearch2, lme4, mets (>= 1.1), nlme, optimx, polycor,\nquantreg,
rgl, R.rsp (>= 0.40), targeted (>= 0.2), testthat (>=\n0.11), visNetwork,
zoo"
## lifecycle     "covr, crayon, knitr, lintr, rmarkdown, testthat (>=
3.0.1),\ntibble, tidyverse, tools, vctrs, withr"
## listenv       "R.utils, R.rsp, markdown"
## lobstr        "covr, pillar, pkgdown, testthat (>= 3.0.0)"
## lubridate     "covr, knitr, rmarkdown, testthat (>= 2.1.0), vctrs (>=
0.5.0)"

```

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## magick      "av (>= 0.3), spelling, jsonlite, methods, knitr,
rmarkdown,\nrsvg, webp, pdftools, ggplot2, gapminder, IRdisplay,
tesseract\n(>= 2.0), gifski"
## magrittr    "covr, knitr, rlang, rmarkdown, testthat"
## markdown    "knitr, rmarkdown (>= 2.18), yaml, RCurl"
## matrixStats "base64enc, ggplot2, knitr, markdown,
microbenchmark,\nR.devices, R.rsp"
## memoise     "digest, aws.s3, covr, googleAuthR, googleCloudStorageR,
httr,\ntestthat"
## mime        NA
## ModelMetrics "testthat"
## munsell     "ggplot2, testthat"
## networkD3   "htmltools (>= 0.2.6), jsonlite,"
## numDeriv     NA
## pander      "grid, lattice, ggplot2 (>= 0.9.2), sylly, sylly.en,
logger,\nsurvival, microbenchmark, zoo, nlme, descr, MASS, knitr,\nrmarkdown,
tables, reshape, memisc, Epi, randomForest, tseries,\ngtable, rms, forecast,
data.table"
## parallelly  NA
## pastecs     "svUnit, covr"
## pillar      "bit64, DBI, debugme, DiagrammeR, dplyr, formattable,
ggplot2,\nknitr, lubridate, nanotime, nycflights13,
palmerpenguins,\nrmarkdown, scales, stringi, survival, testthat (>=
3.1.1),\ntibble, units (>= 0.7.2), vdiff, withr"
## pkgconfig   "covr, testthat, disposables (>= 1.0.3)"
## plyr        "abind, covr, doParallel, foreach, iterators,
itertools,\ntcltk, testthat"
## prettyunits "codetools, covr, testthat"
## pROC        "microbenchmark, tcltk, MASS, logcondens,
doParallel,\ntestthat, vdiff, ggplot2, rlang"
## prodlim     NA
## progress    "Rcpp, testthat, withr"
## progressr   "graphics, tcltk, beeper, cli, crayon, pbmcapply,
progress,\npurrr, foreach, plyr, doFuture, future, future.apply,
furrr,\nRPushbullet, rstudioapi, shiny, commonmark, base64enc, tools"
## proxy       "cba"
## pryr        "testthat (>= 0.8.0)"
## purrr       "covr, dplyr (>= 0.7.8), httr, knitr, lubridate,
rmarkdown,\ntestthat (>= 3.0.0), tibble, tidyselect"
## R6          "testthat, pryr"
## randomForest "RColorBrewer, MASS"
## rappdirs    "roxygen2, testthat (>= 3.0.0), covr, withr"
## rapportools NA
## RColorBrewer NA
## Rcpp        "tinytest, inline, rbenchmark, pkgKitten (>= 0.1.2)"
## readr       "covr, curl, datasets, knitr, rmarkdown, spelling,
stringi,\ntestthat (>= 3.1.2), tzdb (>= 0.1.1), waldo, withr, xml2"
## recipes     "covr, dalpha, dials (>= 1.2.0), ggplot2, igrph,
kernlab,\nknitr, modeldata (>= 0.1.1), parsnip (>= 0.1.7), RANN,\nRcppRoll,
rmarkdown, rpart, rsample, RSpectra, splines2,\ntestthat (>= 3.0.0),

```



```

workflows, xml2"
## repr      "methods, highr, Cairo, stringr, testthat (>= 3.0.0),
leaflet"
## reshape2  "covr, lattice, testthat (>= 0.8.0)"
## rlang      "cli (>= 3.1.0), covr, crayon, fs, glue, knitr,
magrittr,\nmetho ds, pillar, rmarkdown, stats, testthat (>= 3.0.0),
tibble,\nusethis, vctrs (>= 0.2.3), withr"
## rmarkdown  "digest, dygraphs, fs, rsconnect, downlit (>= 0.4.0),
katex\n(>= 1.4.0), sass (>= 0.4.0), shiny (>= 1.6.0), testthat (>=\n3.0.3),
tibble, vctrs, cleanrmd, withr (>= 2.4.2)"
## rstudioapi "testthat, knitr, rmarkdown, clipr, covr"
## RWeka      "partykit (>= 0.8.0), mlbench, e1071"
## RWekajars  NA
## sass       "testthat, knitr, rmarkdown, withr, shiny, curl"
## scales     "bit64, covr, dichromat, ggplot2, hms (>= 0.5.0),
stringi,\ntestthat (>= 3.0.0), waldo (>= 0.4.0)"
## shape      NA
## SQUAREM     "setRNG"
## stringi     NA
## stringr     "covr, htmltools, htmlwidgets, knitr, rmarkdown, testthat
(>=\n3.0.0)"
## summarytools "forcats, formatR, kableExtra, knitr, magrittr,
rmarkdown,\nrstudioapi"
## svglite     "covr, fontquiver (>= 0.2.0), htmltools, knitr,
rmarkdown,\ntestthat (>= 3.0.0), xml2 (>= 1.0.0)"
## systemfonts "covr, knitr, rmarkdown, testthat (>= 2.1.0), tools"
## tibble      "bench, bit64, blob, brio, callr, cli, covr, crayon
(>=\n1.3.4), DiagrammeR, dplyr, evaluate, formattable, ggplot2,\nhere, hms,
htmltools, knitr, lubridate, mockr, nycflights13,\nnpkgbuild, pkgload, purrr,
rmarkdown, stringi, testthat (>=\n3.0.2), tidyr, withr"
## tidyr       "covr, data.table, knitr, readr, repurrrsive (>=
1.1.0),\nrmarkdown, testthat (>= 3.0.0)"
## tidyselect  "covr, crayon, dplyr, knitr, magrittr, rmarkdown,
stringr,\ntestthat (>= 3.1.1), tibble (>= 2.1.3)"
## timechange   "testthat (>= 0.7.1.99), knitr"
## timeDate    "RUnit"
## tinytex     "testit, rstudioapi"
## tzdb        "covr, testthat (>= 3.0.0)"
## utf8        "cli, covr, knitr, rlang, rmarkdown, testthat (>=
3.0.0),\nwit hr"
## vctrs       "bit64, covr, crayon, dplyr (>= 0.8.5), generics,
knitr,\npillar (>= 1.4.4), pkgdown (>= 2.0.1), rmarkdown, testthat
(>=\n3.0.0), tibble (>= 3.1.3), waldo (>= 0.2.0), withr, xml2,\nzeallot"
## viridisLite "hexbin (>= 1.27.0), ggplot2 (>= 1.0.1), testthat, covr"
## vroom       "archive, bench (>= 1.1.0), covr, curl, dplyr, forcats,
fs,\nggplot2, knitr, patchwork, prettyunits, purrr, rmarkdown,\nrstudioapi,
scales, spelling, testthat (>= 2.1.0), tidyr,\nutils, waldo, xml2"
## withr       "callr, covr, DBI, knitr, lattice, methods, rlang,
rmarkdown\n(>= 2.12), RSQLite, testthat (>= 3.0.0)"
## xfun        "testit, parallel, codetools, rstudioapi, tinytex (>=

```

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0.30),\nmime, markdown (>= 1.5), knitr (>= 1.42), htmltools, remotes,\npak,
rhub, renv, curl, jsonlite, magick, yaml, rmarkdown"
## xml2      "covr, curl, httr, knitr, magrittr, mockery,
rmarkdown,\ntestthat (>= 3.0.0)"
## yaml      "RUnit"
## base      "methods"
## boot      "MASS, survival"
## class     NA
## cluster   "MASS, Matrix"
## codetools NA
## compiler  NA
## datasets  NA
## foreign   NA
## graphics  NA
## grDevices "KernSmooth"
## grid      NA
## KernSmooth "MASS, carData"
## lattice   "KernSmooth, MASS, latticeExtra, colorspace"
## MASS      "lattice, nlme, nnet, survival"
## Matrix    "expm, MASS"
## methods   "codetools"
## mgcv      "parallel, survival, MASS"
## nlme      "Hmisc, MASS, SASmixed"
## nnet      "MASS"
## parallel  "methods"
## rpart     "survival"
## spatial   "MASS"
## splines   "Matrix, methods"
## stats     "MASS, Matrix, SuppDists, methods, stats4"
## stats4    NA
## survival  NA
## tcltk     NA
## tools     "codetools, methods, xml2, curl, commonmark, knitr,
xfun,\nmathjaxr, V8"
## translations NA
## utils     "methods, xml2, commonmark, knitr"
##          Enhances
## backports NA
## base64enc "png"
## bit       NA
## bit64     NA
## bitops    NA
## bslib     NA
## cachem    NA
## caret     NA
## caTools   NA
## checkmate NA
## cli       NA
## clipr     NA
## clock     NA

```

```
## colorspace      NA
## commonmark      NA
## cowplot          NA
## cpp11            NA
## crayon           NA
## curl             NA
## data.table       NA
## DataExplorer     NA
## diagram          NA
## digest           NA
## dplyr            NA
## e1071             NA
## ellipsis         NA
## entropy          NA
## evaluate         NA
## fansi            NA
## farver           NA
## fastmap          NA
## fontawesome      NA
## forcats          NA
## foreach          NA
## formatR          NA
## fs               NA
## FSelector        NA
## future           NA
## future.apply     NA
## gdata            NA
## generics         NA
## ggplot2          "sp"
## globals          NA
## glue             NA
## gmodels          NA
## gower            NA
## gridExtra        NA
## gtable           NA
## gtools           NA
## hardhat          NA
## highr            NA
## hms              NA
## htmltools        "knitr"
## htmlwidgets     "shiny (>= 1.1)"
## igraph           NA
## ipred            NA
## isoband          NA
## iterators        NA
## jquerylib        NA
## jsonlite         NA
## kableExtra       NA
## knitr            NA
## labeling         NA
```

```
## lava                NA
## lifecycle           NA
## listenv             NA
## lobster            NA
## lubridate           "chron, data.table, timeDate, tis, zoo"
## magick              NA
## magrittr           NA
## markdown           NA
## matrixStats        NA
## memoise            NA
## mime               NA
## ModelMetrics       NA
## munsell            NA
## networkD3          "knitr, shiny"
## numDeriv           NA
## pander             NA
## parallelly        NA
## pastecs            NA
## pillar            NA
## pkgconfig          NA
## plyr              NA
## prettyunits       NA
## pROC              NA
## prodlim           NA
## progress          NA
## progressr         NA
## proxy            NA
## pryr             NA
## purrr            NA
## R6               NA
## randomForest     NA
## rappdirs         NA
## rapportools      NA
## RColorBrewer     NA
## Rcpp            NA
## readr           NA
## recipes         NA
## repr           "data.table, tibble, htmlwidgets, vegalite, plotly,
geojsonio"
## reshape2       NA
## rlang          "winch"
## rmarkdown      NA
## rstudioapi     NA
## RWeka          NA
## RWekajars      NA
## sass           NA
## scales         NA
## shape          NA
## SQUAREM        NA
## stringi        NA
```

```

## stringr      NA
## summarytools NA
## svglite      NA
## systemfonts  NA
## tibble       NA
## tidyr        NA
## tidyselect   NA
## timechange    NA
## timeDate     NA
## tinytex      NA
## tzdb         NA
## utf8         NA
## vctr         NA
## viridisLite  NA
## vroom        NA
## withr        NA
## xfun         NA
## xml2         NA
## yaml         NA
## base         NA
## boot         NA
## class        NA
## cluster      NA
## codetools    NA
## compiler     NA
## datasets     NA
## foreign      NA
## graphics     NA
## grDevices    NA
## grid         NA
## KernSmooth   NA
## lattice      "chron"
## MASS         NA
## Matrix       "MatrixModels, graph, SparseM, sfsmisc, igraph, maptools,
sp,\nspdep"
## methods      NA
## mgcv         NA
## nlme         NA
## nnet         NA
## parallel     "snow, Rmpi"
## rpart        NA
## spatial      NA
## splines      NA
## stats        NA
## stats4       NA
## survival     NA
## tcltk        NA
## tools        NA
## translations NA
## utils        NA

```

	License	License_is_FOSS
##		
## backports	"GPL-2 GPL-3"	NA
## base64enc	"GPL-2 GPL-3"	NA
## bit	"GPL-2 GPL-3"	NA
## bit64	"GPL-2 GPL-3"	NA
## bitops	"GPL (>= 2)"	NA
## bslib	"MIT + file LICENSE"	NA
## cachem	"MIT + file LICENSE"	NA
## caret	"GPL (>= 2)"	NA
## caTools	"GPL-3"	NA
## checkmate	"BSD_3_clause + file LICENSE"	NA
## cli	"MIT + file LICENSE"	NA
## clipr	"GPL-3"	NA
## clock	"MIT + file LICENSE"	NA
## colorspace	"BSD_3_clause + file LICENSE"	NA
## commonmark	"BSD_2_clause + file LICENSE"	NA
## cowplot	"GPL-2"	NA
## cpp11	"MIT + file LICENSE"	NA
## crayon	"MIT + file LICENSE"	NA
## curl	"MIT + file LICENSE"	NA
## data.table	"MPL-2.0 file LICENSE"	NA
## DataExplorer	"MIT + file LICENSE"	NA
## diagram	"GPL (>= 2)"	NA
## digest	"GPL (>= 2)"	NA
## dplyr	"MIT + file LICENSE"	NA
## e1071	"GPL-2 GPL-3"	NA
## ellipsis	"MIT + file LICENSE"	NA
## entropy	"GPL (>= 3)"	NA
## evaluate	"MIT + file LICENSE"	NA
## fansi	"GPL-2 GPL-3"	NA
## farver	"MIT + file LICENSE"	NA
## fastmap	"MIT + file LICENSE"	NA
## fontawesome	"MIT + file LICENSE"	NA
## forcats	"MIT + file LICENSE"	NA
## foreach	"Apache License (== 2.0)"	NA
## formatR	"GPL"	NA
## fs	"MIT + file LICENSE"	NA
## FSelector	"GPL-2"	NA
## future	"LGPL (>= 2.1)"	NA
## future.apply	"GPL (>= 2)"	NA
## gdata	"GPL-2"	NA
## generics	"MIT + file LICENSE"	NA
## ggplot2	"MIT + file LICENSE"	NA
## globals	"LGPL (>= 2.1)"	NA
## glue	"MIT + file LICENSE"	NA
## gmodels	"GPL-2"	NA
## gower	"GPL-3"	NA
## gridExtra	"GPL (>= 2)"	NA
## gtable	"MIT + file LICENSE"	NA
## gtools	"GPL-2"	NA

## hardhat	"MIT + file LICENSE"	NA
## highr	"GPL"	NA
## hms	"MIT + file LICENSE"	NA
## htmltools	"GPL (>= 2)"	NA
## htmlwidgets	"MIT + file LICENSE"	NA
## igraph	"GPL (>= 2)"	NA
## ipred	"GPL (>= 2)"	NA
## isoband	"MIT + file LICENSE"	NA
## iterators	"Apache License (== 2.0)"	NA
## jquerylib	"MIT + file LICENSE"	NA
## jsonlite	"MIT + file LICENSE"	NA
## kableExtra	"MIT + file LICENSE"	NA
## knitr	"GPL"	NA
## labeling	"MIT + file LICENSE Unlimited"	NA
## lava	"GPL-3"	NA
## lifecycle	"MIT + file LICENSE"	NA
## listenv	"LGPL (>= 2.1)"	NA
## lobstr	"MIT + file LICENSE"	NA
## lubridate	"GPL (>= 2)"	NA
## magick	"MIT + file LICENSE"	NA
## magrittr	"MIT + file LICENSE"	NA
## markdown	"MIT + file LICENSE"	NA
## matrixStats	"Artistic-2.0"	NA
## memoise	"MIT + file LICENSE"	NA
## mime	"GPL"	NA
## ModelMetrics	"GPL (>= 2)"	NA
## munsell	"MIT + file LICENSE"	NA
## networkD3	"GPL (>= 3)"	NA
## numDeriv	"GPL-2"	NA
## pander	"AGPL-3 file LICENSE"	NA
## parallelly	"LGPL (>= 2.1)"	NA
## pastecs	"GPL-2"	NA
## pillar	"MIT + file LICENSE"	NA
## pkgconfig	"MIT + file LICENSE"	NA
## plyr	"MIT + file LICENSE"	NA
## prettyunits	"MIT + file LICENSE"	NA
## pROC	"GPL (>= 3)"	NA
## prodlim	"GPL (>= 2)"	NA
## progress	"MIT + file LICENSE"	NA
## progressr	"GPL (>= 3)"	NA
## proxy	"GPL-2"	NA
## pryr	"GPL-2"	NA
## purrr	"MIT + file LICENSE"	NA
## R6	"MIT + file LICENSE"	NA
## randomForest	"GPL (>= 2)"	NA
## rappdirs	"MIT + file LICENSE"	NA
## rapportools	"AGPL-3"	NA
## RColorBrewer	"Apache License 2.0"	NA
## Rcpp	"GPL (>= 2)"	NA
## readr	"MIT + file LICENSE"	NA

## recipes	"MIT + file LICENSE"	NA
## repr	"GPL (>= 3)"	NA
## reshape2	"MIT + file LICENSE"	NA
## rlang	"MIT + file LICENSE"	NA
## rmarkdown	"GPL-3"	NA
## rstudioapi	"MIT + file LICENSE"	NA
## RWeka	"GPL-2"	NA
## RWekajars	"GPL-2"	NA
## sass	"MIT + file LICENSE"	NA
## scales	"MIT + file LICENSE"	NA
## shape	"GPL (>= 3)"	NA
## SQUAREM	"GPL (>= 2)"	NA
## stringi	"file LICENSE"	"yes"
## stringr	"MIT + file LICENSE"	NA
## summarytools	"GPL-2"	NA
## svglite	"GPL (>= 2)"	NA
## systemfonts	"MIT + file LICENSE"	NA
## tibble	"MIT + file LICENSE"	NA
## tidyr	"MIT + file LICENSE"	NA
## tidyselect	"MIT + file LICENSE"	NA
## timechange	"GPL (>= 3)"	NA
## timeDate	"GPL (>= 2)"	NA
## tinytex	"MIT + file LICENSE"	NA
## tzdb	"MIT + file LICENSE"	NA
## utf8	"Apache License (== 2.0) file LICENSE"	NA
## vctrs	"MIT + file LICENSE"	NA
## viridisLite	"MIT + file LICENSE"	NA
## vroom	"MIT + file LICENSE"	NA
## withr	"MIT + file LICENSE"	NA
## xfun	"MIT + file LICENSE"	NA
## xml2	"MIT + file LICENSE"	NA
## yaml	"BSD_3_clause + file LICENSE"	NA
## base	"Part of R 4.3.0"	NA
## boot	"Unlimited"	NA
## class	"GPL-2 GPL-3"	NA
## cluster	"GPL (>= 2)"	NA
## codetools	"GPL"	NA
## compiler	"Part of R 4.3.0"	NA
## datasets	"Part of R 4.3.0"	NA
## foreign	"GPL (>= 2)"	NA
## graphics	"Part of R 4.3.0"	NA
## grDevices	"Part of R 4.3.0"	NA
## grid	"Part of R 4.3.0"	NA
## KernSmooth	"Unlimited"	NA
## lattice	"GPL (>= 2)"	NA
## MASS	"GPL-2 GPL-3"	NA
## Matrix	"GPL (>= 2) file LICENCE"	NA
## methods	"Part of R 4.3.0"	NA
## mgcv	"GPL (>= 2)"	NA
## nlme	"GPL (>= 2)"	NA

## nnet	"GPL-2 GPL-3"				NA
## parallel	"Part of R 4.3.0"				NA
## rpart	"GPL-2 GPL-3"				NA
## spatial	"GPL-2 GPL-3"				NA
## splines	"Part of R 4.3.0"				NA
## stats	"Part of R 4.3.0"				NA
## stats4	"Part of R 4.3.0"				NA
## survival	"LGPL (>= 2)"				NA
## tcltk	"Part of R 4.3.0"				NA
## tools	"Part of R 4.3.0"				NA
## translations	"Part of R 4.3.0"				NA
## utils	"Part of R 4.3.0"				NA
##	License_restricts_use	OS_type	MD5sum	NeedsCompilation	Built
## backports	NA	NA	NA	"yes"	"4.3.1"
## base64enc	NA	NA	NA	"yes"	"4.3.1"
## bit	NA	NA	NA	"yes"	"4.3.1"
## bit64	NA	NA	NA	"yes"	"4.3.1"
## bitops	NA	NA	NA	"yes"	"4.3.1"
## bslib	NA	NA	NA	"no"	"4.3.2"
## cachem	NA	NA	NA	"yes"	"4.3.2"
## caret	NA	NA	NA	"yes"	"4.3.2"
## caTools	NA	NA	NA	"yes"	"4.3.2"
## checkmate	NA	NA	NA	"yes"	"4.3.2"
## cli	NA	NA	NA	"yes"	"4.3.1"
## clipr	NA	NA	NA	"no"	"4.3.1"
## clock	NA	NA	NA	"yes"	"4.3.2"
## colorspace	NA	NA	NA	"yes"	"4.3.1"
## commonmark	NA	NA	NA	"yes"	"4.3.2"
## cowplot	NA	NA	NA	"no"	"4.3.2"
## cpp11	NA	NA	NA	"no"	"4.3.2"
## crayon	NA	NA	NA	"no"	"4.3.1"
## curl	NA	NA	NA	"yes"	"4.3.2"
## data.table	NA	NA	NA	"yes"	"4.3.2"
## DataExplorer	NA	NA	NA	"no"	"4.3.2"
## diagram	NA	NA	NA	"no"	"4.3.1"
## digest	NA	NA	NA	"yes"	"4.3.2"
## dplyr	NA	NA	NA	"yes"	"4.3.2"
## e1071	NA	NA	NA	"yes"	"4.3.2"
## ellipsis	NA	NA	NA	"yes"	"4.3.2"
## entropy	NA	NA	NA	"no"	"4.3.1"
## evaluate	NA	NA	NA	"no"	"4.3.2"
## fansi	NA	NA	NA	"yes"	"4.3.1"
## farver	NA	NA	NA	"yes"	"4.3.1"
## fastmap	NA	NA	NA	"yes"	"4.3.2"
## fontawesome	NA	NA	NA	"no"	"4.3.2"
## forcats	NA	NA	NA	"no"	"4.3.2"
## foreach	NA	NA	NA	"no"	"4.3.2"
## formatR	NA	NA	NA	"no"	"4.3.2"
## fs	NA	NA	NA	"yes"	"4.3.2"
## FSelector	NA	NA	NA	"no"	"4.3.2"

## future	NA	NA	NA	"no"	"4.3.2"
## future.apply	NA	NA	NA	"no"	"4.3.2"
## gdata	NA	NA	NA	"no"	"4.3.2"
## generics	NA	NA	NA	"no"	"4.3.2"
## ggplot2	NA	NA	NA	"no"	"4.3.2"
## globals	NA	NA	NA	"no"	"4.3.1"
## glue	NA	NA	NA	"yes"	"4.3.1"
## gmodels	NA	NA	NA	"no"	"4.3.2"
## gower	NA	NA	NA	"yes"	"4.3.1"
## gridExtra	NA	NA	NA	"no"	"4.3.2"
## gtable	NA	NA	NA	"no"	"4.3.1"
## gtools	NA	NA	NA	"yes"	"4.3.2"
## hardhat	NA	NA	NA	"no"	"4.3.2"
## highr	NA	NA	NA	"no"	"4.3.2"
## hms	NA	NA	NA	"no"	"4.3.1"
## htmltools	NA	NA	NA	"yes"	"4.3.2"
## htmlwidgets	NA	NA	NA	"no"	"4.3.2"
## igraph	NA	NA	NA	"yes"	"4.3.2"
## ipred	NA	NA	NA	"yes"	"4.3.2"
## isoband	NA	NA	NA	"yes"	"4.3.1"
## iterators	NA	NA	NA	"no"	"4.3.2"
## jquerylib	NA	NA	NA	"no"	"4.3.2"
## jsonlite	NA	NA	NA	"yes"	"4.3.2"
## kableExtra	NA	NA	NA	"no"	"4.3.2"
## knitr	NA	NA	NA	"no"	"4.3.2"
## labeling	NA	NA	NA	"no"	"4.3.0"
## lava	NA	NA	NA	"no"	"4.3.2"
## lifecycle	NA	NA	NA	"no"	"4.3.1"
## listenv	NA	NA	NA	"no"	"4.3.2"
## lobstr	NA	NA	NA	"yes"	"4.3.2"
## lubridate	NA	NA	NA	"yes"	"4.3.2"
## magick	NA	NA	NA	"yes"	"4.3.2"
## magrittr	NA	NA	NA	"yes"	"4.3.1"
## markdown	NA	NA	NA	"no"	"4.3.2"
## matrixStats	NA	NA	NA	"yes"	"4.3.2"
## memoise	NA	NA	NA	"no"	"4.3.2"
## mime	NA	NA	NA	"yes"	"4.3.1"
## ModelMetrics	NA	NA	NA	"yes"	"4.3.2"
## munsell	NA	NA	NA	"no"	"4.3.1"
## networkD3	NA	NA	NA	"no"	"4.3.2"
## numDeriv	NA	NA	NA	"no"	"4.3.1"
## pander	NA	NA	NA	"yes"	"4.3.2"
## parallelly	NA	NA	NA	"no"	"4.3.1"
## pastecs	NA	NA	NA	"no"	"4.3.2"
## pillar	NA	NA	NA	"no"	"4.3.1"
## pkgconfig	NA	NA	NA	"no"	"4.3.1"
## plyr	NA	NA	NA	"yes"	"4.3.1"
## prettyunits	NA	NA	NA	"no"	"4.3.1"
## pROC	NA	NA	NA	"yes"	"4.3.2"
## prodlim	NA	NA	NA	"yes"	"4.3.2"

## progress	NA	NA	NA	"no"	"4.3.1"
## progressr	NA	NA	NA	"no"	"4.3.2"
## proxy	NA	NA	NA	"yes"	"4.3.2"
## pryr	NA	NA	NA	"yes"	"4.3.2"
## purrr	NA	NA	NA	"yes"	"4.3.2"
## R6	NA	NA	NA	"no"	"4.3.1"
## randomForest	NA	NA	NA	"yes"	"4.3.2"
## rappdirs	NA	NA	NA	"yes"	"4.3.2"
## rapportools	NA	NA	NA	"no"	"4.3.2"
## RColorBrewer	NA	NA	NA	"no"	"4.3.0"
## Rcpp	NA	NA	NA	"yes"	"4.3.1"
## readr	NA	NA	NA	"yes"	"4.3.1"
## recipes	NA	NA	NA	"no"	"4.3.2"
## repr	NA	NA	NA	"no"	"4.3.2"
## reshape2	NA	NA	NA	"yes"	"4.3.1"
## rlang	NA	NA	NA	"yes"	"4.3.1"
## rmarkdown	NA	NA	NA	"no"	"4.3.0"
## rstudioapi	NA	NA	NA	"no"	"4.3.2"
## RWeka	NA	NA	NA	"no"	"4.3.2"
## RWekajars	NA	NA	NA	"no"	"4.3.2"
## sass	NA	NA	NA	"yes"	"4.3.2"
## scales	NA	NA	NA	"no"	"4.3.1"
## shape	NA	NA	NA	"no"	"4.3.1"
## SQUAREM	NA	NA	NA	"no"	"4.3.1"
## stringi	NA	NA	NA	"yes"	"4.3.0"
## stringr	NA	NA	NA	"no"	"4.3.1"
## summarytools	NA	NA	NA	"no"	"4.3.2"
## svglite	NA	NA	NA	"yes"	"4.3.2"
## systemfonts	NA	NA	NA	"yes"	"4.3.2"
## tibble	NA	NA	NA	"yes"	"4.3.1"
## tidyr	NA	NA	NA	"yes"	"4.3.2"
## tidyselect	NA	NA	NA	"no"	"4.3.1"
## timechange	NA	NA	NA	"yes"	"4.3.2"
## timeDate	NA	NA	NA	"no"	"4.3.2"
## tinytex	NA	NA	NA	"no"	"4.3.2"
## tzdb	NA	NA	NA	"yes"	"4.3.1"
## utf8	NA	NA	NA	"yes"	"4.3.1"
## vctrs	NA	NA	NA	"yes"	"4.3.2"
## viridisLite	NA	NA	NA	"no"	"4.3.1"
## vroom	NA	NA	NA	"yes"	"4.3.1"
## withr	NA	NA	NA	"no"	"4.3.1"
## xfun	NA	NA	NA	"yes"	"4.3.2"
## xml2	NA	NA	NA	"yes"	"4.3.2"
## yaml	NA	NA	NA	"yes"	"4.3.2"
## base	NA	NA	NA	NA	"4.3.0"
## boot	NA	NA	NA	"no"	"4.3.0"
## class	NA	NA	NA	"yes"	"4.3.0"
## cluster	NA	NA	NA	"yes"	"4.3.0"
## codetools	NA	NA	NA	"no"	"4.3.0"
## compiler	NA	NA	NA	NA	"4.3.0"

## datasets	NA	NA	NA	NA	"4.3.0"
## foreign	NA	NA	NA	"yes"	"4.3.0"
## graphics	NA	NA	NA	"yes"	"4.3.0"
## grDevices	NA	NA	NA	"yes"	"4.3.0"
## grid	NA	NA	NA	"yes"	"4.3.0"
## KernSmooth	NA	NA	NA	"yes"	"4.3.0"
## lattice	NA	NA	NA	"yes"	"4.3.0"
## MASS	NA	NA	NA	"yes"	"4.3.0"
## Matrix	NA	NA	NA	"yes"	"4.3.0"
## methods	NA	NA	NA	"yes"	"4.3.0"
## mgcv	NA	NA	NA	"yes"	"4.3.0"
## nlme	NA	NA	NA	"yes"	"4.3.0"
## nnet	NA	NA	NA	"yes"	"4.3.0"
## parallel	NA	NA	NA	"yes"	"4.3.0"
## rpart	NA	NA	NA	"yes"	"4.3.0"
## spatial	NA	NA	NA	"yes"	"4.3.0"
## splines	NA	NA	NA	"yes"	"4.3.0"
## stats	NA	NA	NA	"yes"	"4.3.0"
## stats4	NA	NA	NA	NA	"4.3.0"
## survival	NA	NA	NA	"yes"	"4.3.0"
## tcltk	NA	NA	NA	"yes"	"4.3.0"
## tools	NA	NA	NA	"yes"	"4.3.0"
## translations	NA	NA	NA	NA	"4.3.0"
## utils	NA	NA	NA	"yes"	"4.3.0"

Now we will look what are all the packages that are preloaded

```
search()
```

```
## [1] ".GlobalEnv"      "package:stats"    "package:graphics"
## [4] "package:grDevices" "package:utils"    "package:datasets"
## [7] "package:methods"  "Autoloads"        "package:base"
```

let's load the packages

```
library(pastecs)
```

```
## Warning: package 'pastecs' was built under R version 4.3.2
```

```
library(DataExplorer)
```

```
## Warning: package 'DataExplorer' was built under R version 4.3.2
```

I will load the data into a variable

```
data<-read.csv("WA_Fn-UseC_-HR-Employee-Attrition.csv")
```

first we find out what is the class of the data

```
class(data)
```

```
## [1] "data.frame"
```

we found that the variable data is a data frame hence it is easy for to operate on it or else we would have to convert it into a data frame first and then perform the operations

lets take a look at the structure of data

```
str(data)
```

```
## 'data.frame':    1470 obs. of  35 variables:
## $ Age                : int  41 49 37 33 27 32 59 30 38 36 ...
## $ Attrition           : chr  "Yes" "No" "Yes" "No" ...
## $ BusinessTravel      : chr  "Travel_Rarely" "Travel_Frequently"
"Travel_Rarely" "Travel_Frequently" ...
## $ DailyRate           : int  1102 279 1373 1392 591 1005 1324 1358
216 1299 ...
## $ Department          : chr  "Sales" "Research & Development"
"Research & Development" "Research & Development" ...
## $ DistanceFromHome    : int  1 8 2 3 2 2 3 24 23 27 ...
## $ Education           : int  2 1 2 4 1 2 3 1 3 3 ...
## $ EducationField       : chr  "Life Sciences" "Life Sciences" "Other"
"Life Sciences" ...
## $ EmployeeCount        : int  1 1 1 1 1 1 1 1 1 1 ...
## $ EmployeeNumber       : int  1 2 4 5 7 8 10 11 12 13 ...
## $ EnvironmentSatisfaction : int  2 3 4 4 1 4 3 4 4 3 ...
## $ Gender              : chr  "Female" "Male" "Male" "Female" ...
## $ HourlyRate           : int  94 61 92 56 40 79 81 67 44 94 ...
## $ JobInvolvement       : int  3 2 2 3 3 3 4 3 2 3 ...
## $ JobLevel             : int  2 2 1 1 1 1 1 1 3 2 ...
## $ JobRole              : chr  "Sales Executive" "Research Scientist"
"Laboratory Technician" "Research Scientist" ...
## $ JobSatisfaction      : int  4 2 3 3 2 4 1 3 3 3 ...
## $ MaritalStatus        : chr  "Single" "Married" "Single" "Married"
...
## $ MonthlyIncome        : int  5993 5130 2090 2909 3468 3068 2670 2693
9526 5237 ...
## $ MonthlyRate          : int  19479 24907 2396 23159 16632 11864 9964
13335 8787 16577 ...
## $ NumCompaniesWorked   : int  8 1 6 1 9 0 4 1 0 6 ...
## $ Over18               : chr  "Y" "Y" "Y" "Y" ...
## $ OverTime              : chr  "Yes" "No" "Yes" "Yes" ...
## $ PercentSalaryHike     : int  11 23 15 11 12 13 20 22 21 13 ...
## $ PerformanceRating     : int  3 4 3 3 3 3 4 4 4 3 ...
## $ RelationshipSatisfaction : int  1 4 2 3 4 3 1 2 2 2 ...
## $ StandardHours         : int  80 80 80 80 80 80 80 80 80 80 ...
## $ StockOptionLevel      : int  0 1 0 0 1 0 3 1 0 2 ...
## $ TotalWorkingYears     : int  8 10 7 8 6 8 12 1 10 17 ...
## $ TrainingTimesLastYear : int  0 3 3 3 3 2 3 2 2 3 ...
## $ WorkLifeBalance       : int  1 3 3 3 3 2 2 3 3 2 ...
## $ YearsAtCompany        : int  6 10 0 8 2 7 1 1 9 7 ...
## $ YearsInCurrentRole    : int  4 7 0 7 2 7 0 0 7 7 ...
## $ YearsSinceLastPromotion : int  0 1 0 3 2 3 0 0 1 7 ...
## $ YearsWithCurrManager  : int  5 7 0 0 2 6 0 0 8 7 ...
```

now further moving lets get the summary of the current data before processing the data

```
summary(data)
```

```

##      Age      Attrition      BusinessTravel      DailyRate
## Min.   :18.00   Length:1470      Length:1470      Min.    : 102.0
## 1st Qu.:30.00   Class :character      Class :character  1st Qu.: 465.0
## Median :36.00   Mode  :character      Mode  :character  Median : 802.0
## Mean   :36.92                                     Mean   : 802.5
## 3rd Qu.:43.00                                     3rd Qu.:1157.0
## Max.   :60.00                                     Max.   :1499.0
## Department      DistanceFromHome      Education      EducationField
## Length:1470      Min.    : 1.000      Min.    :1.000      Length:1470
## Class :character  1st Qu.: 2.000      1st Qu.:2.000      Class :character
## Mode  :character  Median : 7.000      Median :3.000      Mode  :character
##                                     Mean   : 9.193      Mean   :2.913
##                                     3rd Qu.:14.000     3rd Qu.:4.000
##                                     Max.    :29.000     Max.    :5.000
## EmployeeCount EmployeeNumber      EnvironmentSatisfaction      Gender
## Min.    :1      Min.    : 1.0      Min.    :1.000                                     Length:1470
## 1st Qu.:1      1st Qu.: 491.2      1st Qu.:2.000                                     Class :character
## Median :1      Median :1020.5      Median :3.000                                     Mode  :character
## Mean    :1      Mean    :1024.9      Mean    :2.722
## 3rd Qu.:1      3rd Qu.:1555.8      3rd Qu.:4.000
## Max.    :1      Max.    :2068.0      Max.    :4.000
## HourlyRate      JobInvolvement      JobLevel      JobRole
## Min.    : 30.00      Min.    :1.00      Min.    :1.000      Length:1470
## 1st Qu.: 48.00      1st Qu.:2.00      1st Qu.:1.000      Class :character
## Median : 66.00      Median :3.00      Median :2.000      Mode  :character
## Mean    : 65.89      Mean    :2.73      Mean    :2.064
## 3rd Qu.: 83.75      3rd Qu.:3.00      3rd Qu.:3.000
## Max.    :100.00      Max.    :4.00      Max.    :5.000
## JobSatisfaction MaritalStatus      MonthlyIncome      MonthlyRate
## Min.    :1.000      Length:1470      Min.    : 1009      Min.    : 2094
## 1st Qu.:2.000      Class :character  1st Qu.: 2911      1st Qu.: 8047
## Median :3.000      Mode  :character  Median : 4919      Median :14236
## Mean    :2.729                                     Mean    : 6503      Mean   :14313
## 3rd Qu.:4.000                                     3rd Qu.: 8379      3rd Qu.:20462
## Max.    :4.000                                     Max.    :19999      Max.    :26999
## NumCompaniesWorked      Over18      OverTime
PercentSalaryHike
## Min.    :0.000      Length:1470      Length:1470      Min.    :11.00
## 1st Qu.:1.000      Class :character  Class :character  1st Qu.:12.00
## Median :2.000      Mode  :character  Mode  :character  Median :14.00
## Mean    :2.693                                     Mean   :15.21
## 3rd Qu.:4.000                                     3rd Qu.:18.00
## Max.    :9.000                                     Max.    :25.00
## PerformanceRating RelationshipSatisfaction      StandardHours      StockOptionLevel
## Min.    :3.000      Min.    :1.000      Min.    :80      Min.    :0.0000
## 1st Qu.:3.000      1st Qu.:2.000      1st Qu.:80      1st Qu.:0.0000
## Median :3.000      Median :3.000      Median :80      Median :1.0000
## Mean    :3.154      Mean    :2.712      Mean    :80      Mean    :0.7939
## 3rd Qu.:3.000      3rd Qu.:4.000      3rd Qu.:80      3rd Qu.:1.0000
## Max.    :4.000      Max.    :4.000      Max.    :80      Max.    :3.0000

```

```
## TotalWorkingYears TrainingTimesLastYear WorkLifeBalance YearsAtCompany
## Min. : 0.00 Min. :0.000 Min. :1.000 Min. : 0.000
## 1st Qu.: 6.00 1st Qu.:2.000 1st Qu.:2.000 1st Qu.: 3.000
## Median :10.00 Median :3.000 Median :3.000 Median : 5.000
## Mean :11.28 Mean :2.799 Mean :2.761 Mean : 7.008
## 3rd Qu.:15.00 3rd Qu.:3.000 3rd Qu.:3.000 3rd Qu.: 9.000
## Max. :40.00 Max. :6.000 Max. :4.000 Max. :40.000
## YearsInCurrentRole YearsSinceLastPromotion YearsWithCurrManager
## Min. : 0.000 Min. : 0.000 Min. : 0.000
## 1st Qu.: 2.000 1st Qu.: 0.000 1st Qu.: 2.000
## Median : 3.000 Median : 1.000 Median : 3.000
## Mean : 4.229 Mean : 2.188 Mean : 4.123
## 3rd Qu.: 7.000 3rd Qu.: 3.000 3rd Qu.: 7.000
## Max. :18.000 Max. :15.000 Max. :17.000
```

before manipulating the data let's have a look at the contents of the data frame by looking the head of the data frame and stats of the data

```
head(data)
```

```
## Age Attrition BusinessTravel DailyRate Department
## 1 41 Yes Travel_Rarely 1102 Sales
## 2 49 No Travel_Frequently 279 Research & Development
## 3 37 Yes Travel_Rarely 1373 Research & Development
## 4 33 No Travel_Frequently 1392 Research & Development
## 5 27 No Travel_Rarely 591 Research & Development
## 6 32 No Travel_Frequently 1005 Research & Development
## DistanceFromHome Education EducationField EmployeeCount EmployeeNumber
## 1 1 2 Life Sciences 1 1
## 2 8 1 Life Sciences 1 2
## 3 2 2 Other 1 4
## 4 3 4 Life Sciences 1 5
## 5 2 1 Medical 1 7
## 6 2 2 Life Sciences 1 8
## EnvironmentSatisfaction Gender HourlyRate JobInvolvement JobLevel
## 1 2 Female 94 3 2
## 2 3 Male 61 2 2
## 3 4 Male 92 2 1
## 4 4 Female 56 3 1
## 5 1 Male 40 3 1
## 6 4 Male 79 3 1
## JobRole JobSatisfaction MaritalStatus MonthlyIncome
MonthlyRate
## 1 Sales Executive 4 Single 5993
19479
## 2 Research Scientist 2 Married 5130
24907
## 3 Laboratory Technician 3 Single 2090
2396
## 4 Research Scientist 3 Married 2909
23159
```

```
## 5 Laboratory Technician      2      Married      3468
16632
```

```
## 6 Laboratory Technician      4      Single      3068
11864
```

```
##   NumCompaniesWorked Over18 OverTime PercentSalaryHike PerformanceRating
## 1           8         Y      Yes           11              3
## 2           1         Y      No            23              4
## 3           6         Y      Yes           15              3
## 4           1         Y      Yes           11              3
## 5           9         Y      No            12              3
## 6           0         Y      No            13              3
```

```
##   RelationshipSatisfaction StandardHours StockOptionLevel
TotalWorkingYears
```

```
## 1           1           80           0
8
## 2           4           80           1
10
## 3           2           80           0
7
## 4           3           80           0
8
## 5           4           80           1
6
## 6           3           80           0
8
```

```
##   TrainingTimesLastYear WorkLifeBalance YearsAtCompany YearsInCurrentRole
## 1           0           1           6           4
## 2           3           3          10           7
## 3           3           3           0           0
## 4           3           3           8           7
## 5           3           3           2           2
## 6           2           2           7           7
```

```
##   YearsSinceLastPromotion YearsWithCurrManager
## 1           0           5
## 2           1           7
## 3           0           0
## 4           3           0
## 5           2           2
## 6           3           6
```

```
stat.desc(data)
```

```
##           Age Attrition BusinessTravel   DailyRate Department
## nbr.val    1.470000e+03      NA      NA 1.470000e+03      NA
## nbr.null    0.000000e+00      NA      NA 0.000000e+00      NA
## nbr.na      0.000000e+00      NA      NA 0.000000e+00      NA
## min        1.800000e+01      NA      NA 1.020000e+02      NA
## max        6.000000e+01      NA      NA 1.499000e+03      NA
## range      4.200000e+01      NA      NA 1.397000e+03      NA
## sum        5.427800e+04      NA      NA 1.179654e+06      NA
```



```

## median      3.600000e+01      NA      NA 8.020000e+02      NA
## mean        3.692381e+01      NA      NA 8.024857e+02      NA
## SE.mean     2.382691e-01      NA      NA 1.052434e+01      NA
## CI.mean.0.95 4.673839e-01      NA      NA 2.064433e+01      NA
## var         8.345505e+01      NA      NA 1.628196e+05      NA
## std.dev     9.135373e+00      NA      NA 4.035091e+02      NA
## coef.var    2.474115e-01      NA      NA 5.028240e-01      NA
##
## DistanceFromHome Education EducationField EmployeeCount
## nbr.val      1.470000e+03 1.470000e+03      NA      1470
## nbr.null     0.000000e+00 0.000000e+00      NA      0
## nbr.na       0.000000e+00 0.000000e+00      NA      0
## min         1.000000e+00 1.000000e+00      NA      1
## max         2.900000e+01 5.000000e+00      NA      1
## range       2.800000e+01 4.000000e+00      NA      0
## sum         1.351300e+04 4.282000e+03      NA      1470
## median      7.000000e+00 3.000000e+00      NA      1
## mean        9.192517e+00 2.912925e+00      NA      1
## SE.mean     2.114435e-01 2.671230e-02      NA      0
## CI.mean.0.95 4.147633e-01 5.239831e-02      NA      0
## var         6.572125e+01 1.048914e+00      NA      0
## std.dev     8.106864e+00 1.024165e+00      NA      0
## coef.var    8.818982e-01 3.515933e-01      NA      0
##
## EmployeeNumber EnvironmentSatisfaction Gender HourlyRate
## nbr.val      1.470000e+03      1.470000e+03      NA 1.470000e+03
## nbr.null     0.000000e+00      0.000000e+00      NA 0.000000e+00
## nbr.na       0.000000e+00      0.000000e+00      NA 0.000000e+00
## min         1.000000e+00      1.000000e+00      NA 3.000000e+01
## max         2.068000e+03      4.000000e+00      NA 1.000000e+02
## range       2.067000e+03      3.000000e+00      NA 7.000000e+01
## sum         1.506552e+06      4.001000e+03      NA 9.686000e+04
## median      1.020500e+03      3.000000e+00      NA 6.600000e+01
## mean        1.024865e+03      2.721769e+00      NA 6.589116e+01
## SE.mean     1.570201e+01      2.850980e-02      NA 5.302327e-01
## CI.mean.0.95 3.080076e+01      5.592426e-02      NA 1.040094e+00
## var         3.624333e+05      1.194829e+00      NA 4.132856e+02
## std.dev     6.020243e+02      1.093082e+00      NA 2.032943e+01
## coef.var    5.874180e-01      4.016073e-01      NA 3.085304e-01
##
## JobInvolvement JobLevel JobRole JobSatisfaction
MaritalStatus
## nbr.val      1.470000e+03 1.470000e+03      NA 1.470000e+03
NA
## nbr.null     0.000000e+00 0.000000e+00      NA 0.000000e+00
NA
## nbr.na       0.000000e+00 0.000000e+00      NA 0.000000e+00
NA
## min         1.000000e+00 1.000000e+00      NA 1.000000e+00
NA
## max         4.000000e+00 5.000000e+00      NA 4.000000e+00
NA
## range       3.000000e+00 4.000000e+00      NA 3.000000e+00

```

NA					
## sum	4.013000e+03	3.034000e+03	NA	4.011000e+03	
NA					
## median	3.000000e+00	2.000000e+00	NA	3.000000e+00	
NA					
## mean	2.729932e+00	2.063946e+00	NA	2.728571e+00	
NA					
## SE.mean	1.855896e-02	2.887124e-02	NA	2.876446e-02	
NA					
## CI.mean.0.95	3.640488e-02	5.663324e-02	NA	5.642380e-02	
NA					
## var	5.063193e-01	1.225316e+00	NA	1.216270e+00	
NA					
## std.dev	7.115611e-01	1.106940e+00	NA	1.102846e+00	
NA					
## coef.var	2.606516e-01	5.363222e-01	NA	4.041844e-01	
NA					
##	MonthlyIncome	MonthlyRate	NumCompaniesWorked	Over18	OverTime
## nbr.val	1.470000e+03	1.470000e+03	1.470000e+03	NA	NA
## nbr.null	0.000000e+00	0.000000e+00	1.970000e+02	NA	NA
## nbr.na	0.000000e+00	0.000000e+00	0.000000e+00	NA	NA
## min	1.009000e+03	2.094000e+03	0.000000e+00	NA	NA
## max	1.999900e+04	2.699900e+04	9.000000e+00	NA	NA
## range	1.899000e+04	2.490500e+04	9.000000e+00	NA	NA
## sum	9.559309e+06	2.104026e+07	3.959000e+03	NA	NA
## median	4.919000e+03	1.423550e+04	2.000000e+00	NA	NA
## mean	6.502931e+03	1.431310e+04	2.693197e+00	NA	NA
## SE.mean	1.227931e+02	1.856463e+02	6.515314e-02	NA	NA
## CI.mean.0.95	2.408684e+02	3.641601e+02	1.278031e-01	NA	NA
## var	2.216486e+07	5.066288e+07	6.240049e+00	NA	NA
## std.dev	4.707957e+03	7.117786e+03	2.498009e+00	NA	NA
## coef.var	7.239746e-01	4.972916e-01	9.275254e-01	NA	NA
##	PercentSalaryHike	PerformanceRating	RelationshipSatisfaction		
## nbr.val	1.470000e+03	1.470000e+03	1.470000e+03		
## nbr.null	0.000000e+00	0.000000e+00	0.000000e+00		
## nbr.na	0.000000e+00	0.000000e+00	0.000000e+00		
## min	1.100000e+01	3.000000e+00	1.000000e+00		
## max	2.500000e+01	4.000000e+00	4.000000e+00		
## range	1.400000e+01	1.000000e+00	3.000000e+00		
## sum	2.235800e+04	4.636000e+03	3.987000e+03		
## median	1.400000e+01	3.000000e+00	3.000000e+00		
## mean	1.520952e+01	3.153741e+00	2.712245e+00		
## SE.mean	9.545859e-02	9.411009e-03	2.820012e-02		
## CI.mean.0.95	1.872497e-01	1.846045e-02	5.531679e-02		
## var	1.339514e+01	1.301936e-01	1.169013e+00		
## std.dev	3.659938e+00	3.608235e-01	1.081209e+00		
## coef.var	2.406346e-01	1.144113e-01	3.986398e-01		
##	StandardHours	StockOptionLevel	TotalWorkingYears		
## nbr.val	1470	1.470000e+03	1.470000e+03		
## nbr.null	0	6.310000e+02	1.100000e+01		

```

## nbr.na          0      0.000000e+00      0.000000e+00
## min            80      0.000000e+00      0.000000e+00
## max            80      3.000000e+00      4.000000e+01
## range          0      3.000000e+00      4.000000e+01
## sum          117600      1.167000e+03      1.658100e+04
## median         80      1.000000e+00      1.000000e+01
## mean          80      7.938776e-01      1.127959e+01
## SE.mean        0      2.222389e-02      2.029386e-01
## CI.mean.0.95   0      4.359393e-02      3.980802e-01
## var            0      7.260346e-01      6.054056e+01
## std.dev        0      8.520767e-01      7.780782e+00
## coef.var       0      1.073310e+00      6.898106e-01
##
##           TrainingTimesLastYear WorkLifeBalance YearsAtCompany
## nbr.val          1.470000e+03      1.470000e+03      1.470000e+03
## nbr.null          5.400000e+01      0.000000e+00      4.400000e+01
## nbr.na            0.000000e+00      0.000000e+00      0.000000e+00
## min              0.000000e+00      1.000000e+00      0.000000e+00
## max              6.000000e+00      4.000000e+00      4.000000e+01
## range            6.000000e+00      3.000000e+00      4.000000e+01
## sum              4.115000e+03      4.059000e+03      1.030200e+04
## median           3.000000e+00      3.000000e+00      5.000000e+00
## mean             2.799320e+00      2.761224e+00      7.008163e+00
## SE.mean          3.362679e-02      1.842632e-02      1.597922e-01
## CI.mean.0.95     6.596165e-02      3.614471e-02      3.134452e-01
## var              1.662219e+00      4.991081e-01      3.753431e+01
## std.dev          1.289271e+00      7.064758e-01      6.126525e+00
## coef.var          4.605657e-01      2.558560e-01      8.741984e-01
##
##           YearsInCurrentRole YearsSinceLastPromotion
YearsWithCurrManager
## nbr.val          1.470000e+03      1.470000e+03
1.470000e+03
## nbr.null          2.440000e+02      5.810000e+02
2.630000e+02
## nbr.na            0.000000e+00      0.000000e+00
0.000000e+00
## min              0.000000e+00      0.000000e+00
0.000000e+00
## max              1.800000e+01      1.500000e+01
1.700000e+01
## range            1.800000e+01      1.500000e+01
1.700000e+01
## sum              6.217000e+03      3.216000e+03
6.061000e+03
## median           3.000000e+00      1.000000e+00
3.000000e+00
## mean             4.229252e+00      2.187755e+00
4.123129e+00
## SE.mean          9.449876e-02      8.404751e-02      9.306422e-
02
## CI.mean.0.95     1.853669e-01      1.648659e-01      1.825529e-

```

```
01
## var          1.312712e+01      1.038406e+01
1.273160e+01
## std.dev      3.623137e+00      3.222430e+00
3.568136e+00
## coef.var     8.566851e-01      1.472939e+00      8.653952e-
01

dim(data)

## [1] 1470  35
```

Data Pre-Processing

creating a Function Check if a value is blank

```
is.blank <- function(x) {
  ifelse(is.na(x), TRUE, ifelse(is.character(x), trimws(x) == "", FALSE))
}
```

Replace blank values with NA in the entire data frame

```
data[data == ""] <- NA
data[sapply(data, is.blank)] <- NA
```

now let's again look into the structure of data

```
str(data)

## 'data.frame':  1470 obs. of  35 variables:
## $ Age          : int  41 49 37 33 27 32 59 30 38 36 ...
## $ Attrition    : chr  "Yes" "No" "Yes" "No" ...
## $ BusinessTravel : chr  "Travel_Rarely" "Travel_Frequently"
"Travel_Rarely" "Travel_Frequently" ...
## $ DailyRate    : int  1102 279 1373 1392 591 1005 1324 1358
216 1299 ...
## $ Department   : chr  "Sales" "Research & Development"
"Research & Development" "Research & Development" ...
## $ DistanceFromHome : int  1 8 2 3 2 2 3 24 23 27 ...
## $ Education    : int  2 1 2 4 1 2 3 1 3 3 ...
## $ EducationField : chr  "Life Sciences" "Life Sciences" "Other"
"Life Sciences" ...
## $ EmployeeCount : int  1 1 1 1 1 1 1 1 1 1 ...
## $ EmployeeNumber : int  1 2 4 5 7 8 10 11 12 13 ...
## $ EnvironmentSatisfaction : int  2 3 4 4 1 4 3 4 4 3 ...
## $ Gender        : chr  "Female" "Male" "Male" "Female" ...
## $ HourlyRate    : int  94 61 92 56 40 79 81 67 44 94 ...
## $ JobInvolvement : int  3 2 2 3 3 3 4 3 2 3 ...
## $ JobLevel      : int  2 2 1 1 1 1 1 1 3 2 ...
## $ JobRole       : chr  "Sales Executive" "Research Scientist"
"Laboratory Technician" "Research Scientist" ...
## $ JobSatisfaction : int  4 2 3 3 2 4 1 3 3 3 ...
## $ MaritalStatus : chr  "Single" "Married" "Single" "Married"
```

```

...
## $ MonthlyIncome      : int  5993 5130 2090 2909 3468 3068 2670 2693
9526 5237 ...
## $ MonthlyRate        : int  19479 24907 2396 23159 16632 11864 9964
13335 8787 16577 ...
## $ NumCompaniesWorked : int   8 1 6 1 9 0 4 1 0 6 ...
## $ Over18             : chr   "Y" "Y" "Y" "Y" ...
## $ OverTime           : chr   "Yes" "No" "Yes" "Yes" ...
## $ PercentSalaryHike   : int  11 23 15 11 12 13 20 22 21 13 ...
## $ PerformanceRating   : int   3 4 3 3 3 3 4 4 4 3 ...
## $ RelationshipSatisfaction: int  1 4 2 3 4 3 1 2 2 2 ...
## $ StandardHours       : int  80 80 80 80 80 80 80 80 80 80 ...
## $ StockOptionLevel    : int   0 1 0 0 1 0 3 1 0 2 ...
## $ TotalWorkingYears   : int   8 10 7 8 6 8 12 1 10 17 ...
## $ TrainingTimesLastYear : int   0 3 3 3 3 2 3 2 2 3 ...
## $ WorkLifeBalance     : int   1 3 3 3 3 2 2 3 3 2 ...
## $ YearsAtCompany      : int   6 10 0 8 2 7 1 1 9 7 ...
## $ YearsInCurrentRole   : int   4 7 0 7 2 7 0 0 7 7 ...
## $ YearsSinceLastPromotion : int  0 1 0 3 2 3 0 0 1 7 ...
## $ YearsWithCurrManager : int   5 7 0 0 2 6 0 0 8 7 ...

```

Check duplicates based on id

```

duplicates <- data[duplicated(data), ]
print(duplicates)

## [1] Age Attrition BusinessTravel
## [4] DailyRate Department DistanceFromHome
## [7] Education EducationField EmployeeCount
## [10] EmployeeNumber EnvironmentSatisfaction Gender
## [13] HourlyRate JobInvolvement JobLevel
## [16] JobRole JobSatisfaction MaritalStatus
## [19] MonthlyIncome MonthlyRate NumCompaniesWorked
## [22] Over18 OverTime PercentSalaryHike
## [25] PerformanceRating RelationshipSatisfaction StandardHours
## [28] StockOptionLevel TotalWorkingYears
TrainingTimesLastYear
## [31] WorkLifeBalance YearsAtCompany YearsInCurrentRole
## [34] YearsSinceLastPromotion YearsWithCurrManager
## <0 rows> (or 0-length row.names)

print(nrow(duplicates))

## [1] 0

```

we find that there are no duplicate id's

Drop irrelevant feature

```

data <- subset(data, select = -c(EmployeeCount, EmployeeNumber,
StandardHours, Over18))
dim(data)

```

```
## [1] 1470 31
```

Lets's look at the Unique data

```
data <- unique(data)
dim(data)
```

```
## [1] 1470 31
```

as there is no duplicate data and the number of unique rows is also the same after applying the unique function

IN gender Replace "Male" with 1 and "Female" with 2

```
data$Gender[data$Gender == "Male"] <- 1
data$Gender[data$Gender == "Female"] <- 2
```

Convert the 'Gender' column back to a factor with correct levels

```
data$Gender <- factor(data$Gender, levels = c("1", "2"))
```

Lets get to know the Count of single and Married employees

```
marital_single <- sum(data$MaritalStatus == "Single", na.rm = TRUE)
marital_married <- sum(data$MaritalStatus == "Married", na.rm = TRUE)
cat("Single:", marital_single, "\nMarried:", marital_married)
```

```
## Single: 470
## Married: 673
```

factorizing the values of attrition column

```
data$Attrition <- factor(data$Attrition)
```

####loading the summarytools library

```
library(summarytools)
```

```
## Warning: package 'summarytools' was built under R version 4.3.2
```

Check data types

```
print(class(data$MaritalStatus))
```

```
## [1] "character"
```

```
print(class(data$Attrition))
```

```
## [1] "factor"
```

Check for missing values

```
print(anyNA(data$MaritalStatus))
```

```
## [1] FALSE
```

```
print(anyNA(data$Attrition))
```

```
## [1] FALSE
```

Update summarytools package

```
install.packages("summarytools", dependencies = TRUE)
```

```
## Warning: package 'summarytools' is in use and will not be installed
```

creating a contingency table

```
contingency_table <- ctable(data$MaritalStatus, data$Attrition, digits = 2)
```

looking into the contingency table

```
head(contingency_table)
```

```
## $cross_table
##           Attrition
## MaritalStatus  No  Yes Total
##      Divorced  294   33   327
##      Married   589   84   673
##      Single    350  120   470
##      Total    1233  237  1470
##
## $proportions
##           No           Yes Total
## Divorced 0.8990826 0.1009174    1
## Married  0.8751857 0.1248143    1
## Single   0.7446809 0.2553191    1
## Total    0.8387755 0.1612245    1
```

loading the dplyr library

```
library(dplyr)
```

```
## Warning: package 'dplyr' was built under R version 4.3.2
```

```
##
```

```
## Attaching package: 'dplyr'
```

```
## The following objects are masked from 'package:pastecs':
```

```
##
```

```
##      first, last
```

```
## The following objects are masked from 'package:stats':
```

```
##
```

```
##      filter, lag
```

```
## The following objects are masked from 'package:base':
```

```
##
```

```
##      intersect, setdiff, setequal, union
```

looking into the structure and dimensions of the data after the changes are made

```
str(data)
```

```
## 'data.frame':   1470 obs. of  31 variables:
##  $ Age           : int  41 49 37 33 27 32 59 30 38 36 ...
##  $ Attrition      : Factor w/ 2 levels "No","Yes": 2 1 2 1 1 1 1
```

```

1 1 1 ...
## $ BusinessTravel      : chr  "Travel_Rarely" "Travel_Frequently"
"Travel_Rarely" "Travel_Frequently" ...
## $ DailyRate           : int   1102 279 1373 1392 591 1005 1324 1358
216 1299 ...
## $ Department          : chr   "Sales" "Research & Development"
"Research & Development" "Research & Development" ...
## $ DistanceFromHome    : int    1 8 2 3 2 2 3 24 23 27 ...
## $ Education            : int    2 1 2 4 1 2 3 1 3 3 ...
## $ EducationField       : chr    "Life Sciences" "Life Sciences" "Other"
"Life Sciences" ...
## $ EnvironmentSatisfaction : int   2 3 4 4 1 4 3 4 4 3 ...
## $ Gender               : Factor w/ 2 levels "1","2": 2 1 1 2 1 1 2 1 1
1 ...
## $ HourlyRate           : int   94 61 92 56 40 79 81 67 44 94 ...
## $ JobInvolvement       : int    3 2 2 3 3 3 4 3 2 3 ...
## $ JobLevel             : int    2 2 1 1 1 1 1 1 3 2 ...
## $ JobRole              : chr    "Sales Executive" "Research Scientist"
"Laboratory Technician" "Research Scientist" ...
## $ JobSatisfaction      : int    4 2 3 3 2 4 1 3 3 3 ...
## $ MaritalStatus        : chr    "Single" "Married" "Single" "Married"
...
## $ MonthlyIncome        : int   5993 5130 2090 2909 3468 3068 2670 2693
9526 5237 ...
## $ MonthlyRate          : int   19479 24907 2396 23159 16632 11864 9964
13335 8787 16577 ...
## $ NumCompaniesWorked   : int    8 1 6 1 9 0 4 1 0 6 ...
## $ OverTime             : chr    "Yes" "No" "Yes" "Yes" ...
## $ PercentSalaryHike    : int   11 23 15 11 12 13 20 22 21 13 ...
## $ PerformanceRating     : int    3 4 3 3 3 3 4 4 4 3 ...
## $ RelationshipSatisfaction: int   1 4 2 3 4 3 1 2 2 2 ...
## $ StockOptionLevel      : int    0 1 0 0 1 0 3 1 0 2 ...
## $ TotalWorkingYears     : int    8 10 7 8 6 8 12 1 10 17 ...
## $ TrainingTimesLastYear : int    0 3 3 3 3 2 3 2 2 3 ...
## $ WorkLifeBalance       : int    1 3 3 3 3 2 2 3 3 2 ...
## $ YearsAtCompany        : int    6 10 0 8 2 7 1 1 9 7 ...
## $ YearsInCurrentRole    : int    4 7 0 7 2 7 0 0 7 7 ...
## $ YearsSinceLastPromotion : int   0 1 0 3 2 3 0 0 1 7 ...
## $ YearsWithCurrManager  : int    5 7 0 0 2 6 0 0 8 7 ...

dim(data)

## [1] 1470  31

```

from the observation we see that the data is almost clean

To further clarify let's plot and see if there is any missing data

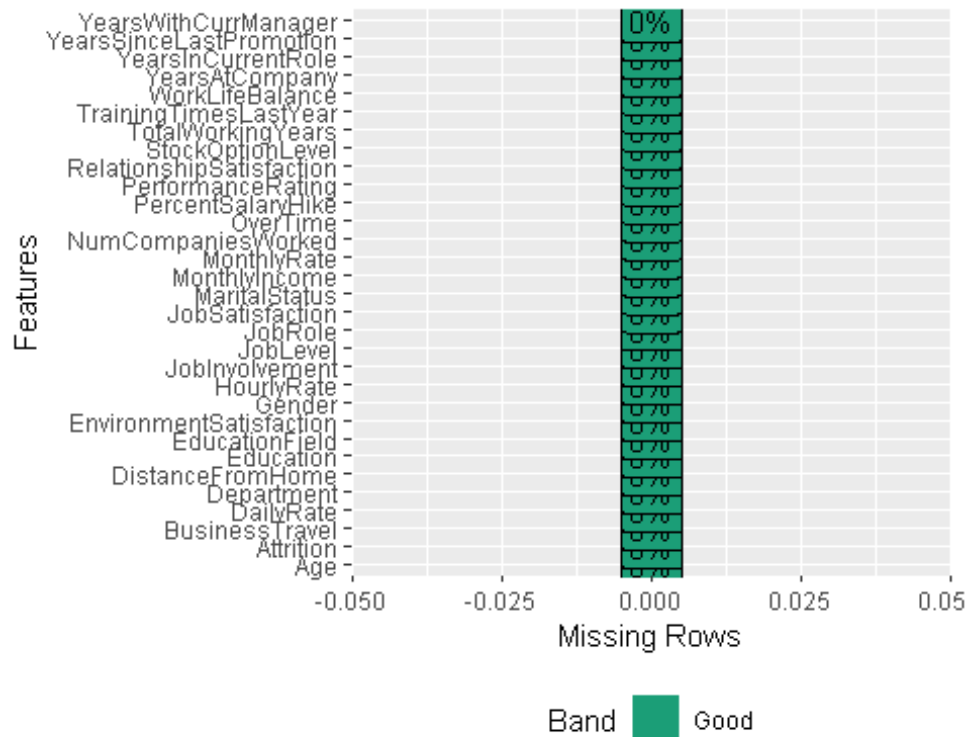
```
colSums(is.na(data))
```

```
##           Age           Attrition           BusinessTravel
##           0              0              0
```



```
##           DailyRate           Department           DistanceFromHome
##           0           0           0
##           Education           EducationField           EnvironmentSatisfaction
##           0           0           0
##           Gender           HourlyRate           JobInvolvement
##           0           0           0
##           JobLevel           JobRole           JobSatisfaction
##           0           0           0
##           MaritalStatus           MonthlyIncome           MonthlyRate
##           0           0           0
##           NumCompaniesWorked           OverTime           PercentSalaryHike
##           0           0           0
##           PerformanceRating           RelationshipSatisfaction           StockOptionLevel
##           0           0           0
##           TotalWorkingYears           TrainingTimesLastYear           WorkLifeBalance
##           0           0           0
##           YearsAtCompany           YearsInCurrentRole           YearsSinceLastPromotion
##           0           0           0
##           YearsWithCurrManager
##           0
```

```
plot_missing(data)
```



Replace missing values in numeric columns with mean using the ave function if it exists

```
numeric_columns <- c("Age", "DailyRate", "HourlyRate", "MonthlyIncome",  
"MonthlyRate",  
"NumCompaniesWorked", "PercentSalaryHike",  
"YearsAtCompany",  
"YearsInCurrentRole", "YearsSinceLastPromotion",  
"YearsWithCurrManager",  
"TrainingTimesLastYear")  
for (col in numeric_columns) {  
  data[[col]] <- ifelse(is.na(data[[col]]),  
    ave(data[[col]], FUN = function(x) mean(x, na.rm =  
TRUE)),  
    data[[col]])  
}
```

Again let's have a look at the structure of data after making the changes

```
str(data)  
  
## 'data.frame': 1470 obs. of 31 variables:  
## $ Age : int 41 49 37 33 27 32 59 30 38 36 ...  
## $ Attrition : Factor w/ 2 levels "No","Yes": 2 1 2 1 1 1 1 1 1 1 ...  
## $ BusinessTravel : chr "Travel_Rarely" "Travel_Frequently"  
"Travel_Rarely" "Travel_Frequently" ...  
## $ DailyRate : int 1102 279 1373 1392 591 1005 1324 1358  
216 1299 ...  
## $ Department : chr "Sales" "Research & Development"  
"Research & Development" "Research & Development" ...  
## $ DistanceFromHome : int 1 8 2 3 2 2 3 24 23 27 ...  
## $ Education : int 2 1 2 4 1 2 3 1 3 3 ...  
## $ EducationField : chr "Life Sciences" "Life Sciences" "Other"  
"Life Sciences" ...  
## $ EnvironmentSatisfaction : int 2 3 4 4 1 4 3 4 4 3 ...  
## $ Gender : Factor w/ 2 levels "1","2": 2 1 1 2 1 1 2 1 1 1 ...  
## $ HourlyRate : int 94 61 92 56 40 79 81 67 44 94 ...  
## $ JobInvolvement : int 3 2 2 3 3 3 4 3 2 3 ...  
## $ JobLevel : int 2 2 1 1 1 1 1 1 3 2 ...  
## $ JobRole : chr "Sales Executive" "Research Scientist"  
"Laboratory Technician" "Research Scientist" ...  
## $ JobSatisfaction : int 4 2 3 3 2 4 1 3 3 3 ...  
## $ MaritalStatus : chr "Single" "Married" "Single" "Married"  
...  
## $ MonthlyIncome : int 5993 5130 2090 2909 3468 3068 2670 2693  
9526 5237 ...  
## $ MonthlyRate : int 19479 24907 2396 23159 16632 11864 9964  
13335 8787 16577 ...  
## $ NumCompaniesWorked : int 8 1 6 1 9 0 4 1 0 6 ...
```

```
## $ OverTime : chr "Yes" "No" "Yes" "Yes" ...
## $ PercentSalaryHike : int 11 23 15 11 12 13 20 22 21 13 ...
## $ PerformanceRating : int 3 4 3 3 3 3 4 4 4 3 ...
## $ RelationshipSatisfaction: int 1 4 2 3 4 3 1 2 2 2 ...
## $ StockOptionLevel : int 0 1 0 0 1 0 3 1 0 2 ...
## $ TotalWorkingYears : int 8 10 7 8 6 8 12 1 10 17 ...
## $ TrainingTimesLastYear : int 0 3 3 3 3 2 3 2 2 3 ...
## $ WorkLifeBalance : int 1 3 3 3 3 2 2 3 3 2 ...
## $ YearsAtCompany : int 6 10 0 8 2 7 1 1 9 7 ...
## $ YearsInCurrentRole : int 4 7 0 7 2 7 0 0 7 7 ...
## $ YearsSinceLastPromotion : int 0 1 0 3 2 3 0 0 1 7 ...
## $ YearsWithCurrManager : int 5 7 0 0 2 6 0 0 8 7 ...
```

```
df<-data
```

Let's perform a bivariate analysis for each and every column with respect to Attrition

```
library(ggplot2)
```

```
## Warning: package 'ggplot2' was built under R version 4.3.2
```

```
library(gridExtra)
```

```
## Warning: package 'gridExtra' was built under R version 4.3.2
```

```
##
```

```
## Attaching package: 'gridExtra'
```

```
## The following object is masked from 'package:dplyr':
```

```
##
```

```
## combine
```

```
# Select numerical variables for bivariate analysis
```

```
numerical_vars_bivariate <- c("Age", "DailyRate", "DistanceFromHome",
"HourlyRate",
"MonthlyIncome", "MonthlyRate",
"NumCompaniesWorked",
"PercentSalaryHike", "TotalWorkingYears",
"TrainingTimesLastYear",
"YearsAtCompany", "YearsInCurrentRole",
"YearsSinceLastPromotion",
"YearsWithCurrManager")
```

```
# Calculate the number of rows and columns for the plot layout
```

```
num_rows_num <- ceiling(length(numerical_vars_bivariate) / 4)
```

```
num_cols_num <- min(length(numerical_vars_bivariate), 4)
```

```
# Set the figure size
```

```
options(repr.plot.width = 40, repr.plot.height = 20 * num_rows_num)
```

```
# Create a list to store individual ggplot objects
```

```
plot_list_num <- vector("list", length = length(numerical_vars_bivariate))
```

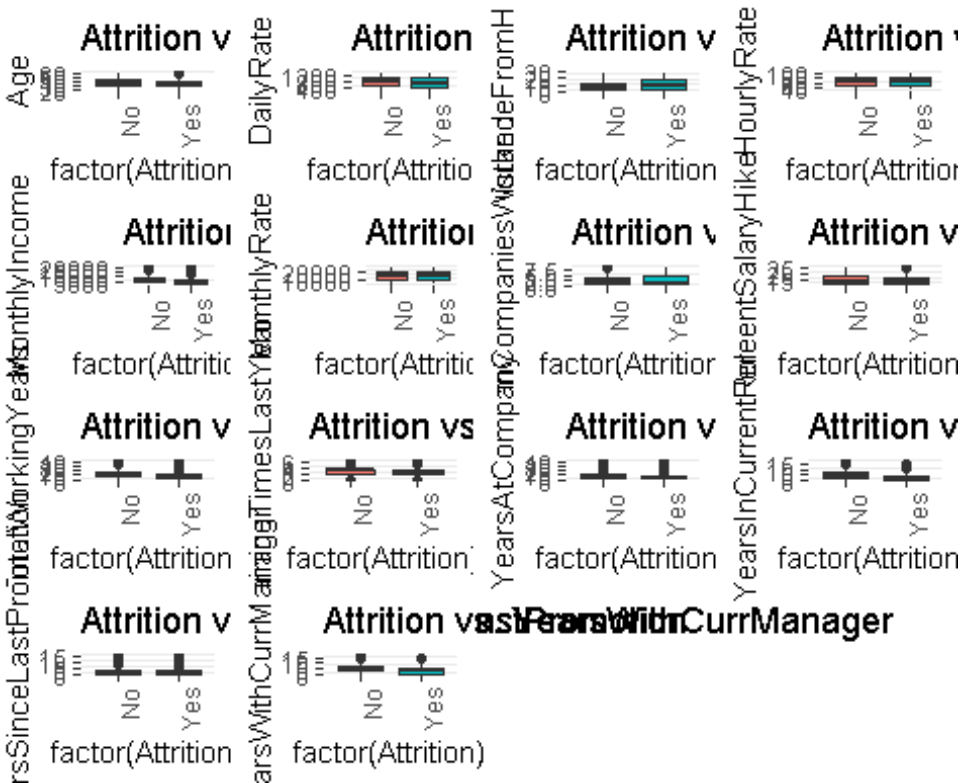
```

# Create box plots for each numerical variable
for (i in seq_along(numerical_vars_bivariate)) {
  var <- numerical_vars_bivariate[i]
  p <- ggplot(data = data, aes(x = factor(Attrition), y = .data[[var]], fill
= factor(Attrition))) +
    geom_boxplot() +
    labs(title = paste("Attrition vs.", var), y = var) +
    theme(axis.text.x = element_text(angle = 90, hjust = 1), legend.position
= "none")

  plot_list_num[[i]] <- p
}

# Display the plots using grid.arrange from the gridExtra package
library(gridExtra)
grid.arrange(grobs = plot_list_num, ncol = num_cols_num)

```



lets create create some histograms to look the effects of other variables on attrition

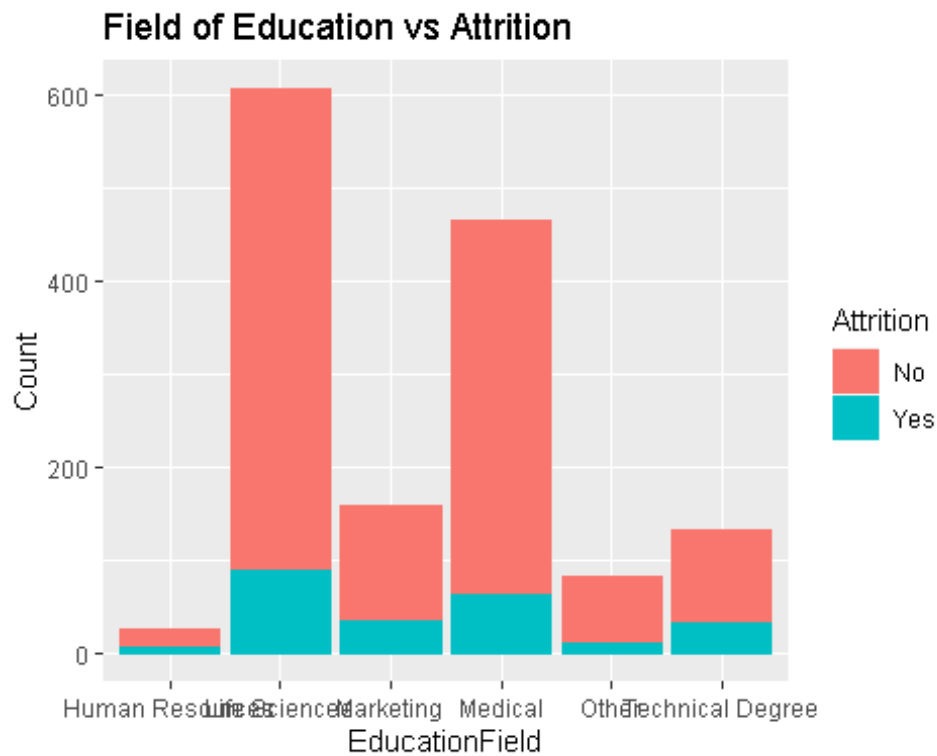
- Educational Field

```
library(repr)
```

```
## Warning: package 'repr' was built under R version 4.3.2
```

```
options(repr.plot.width=10, repr.plot.height = 10)
ggplot(data=data)+
```

```
geom_bar(aes(x=EducationField,color=Attrition,fill=Attrition))+
ggtitle("Field of Education vs Attrition ") +
labs(x = "EducationField", y = "Count")
```



```
library(dplyr)
data %>%
  select(Attrition,Gender,EducationField) %>%
  filter (Attrition=="Yes") %>%
  group_by(EducationField,Gender) %>%
  summarise(Count=n())

## `summarise()` has grouped output by 'EducationField'. You can override
## using
## the `groups` argument.

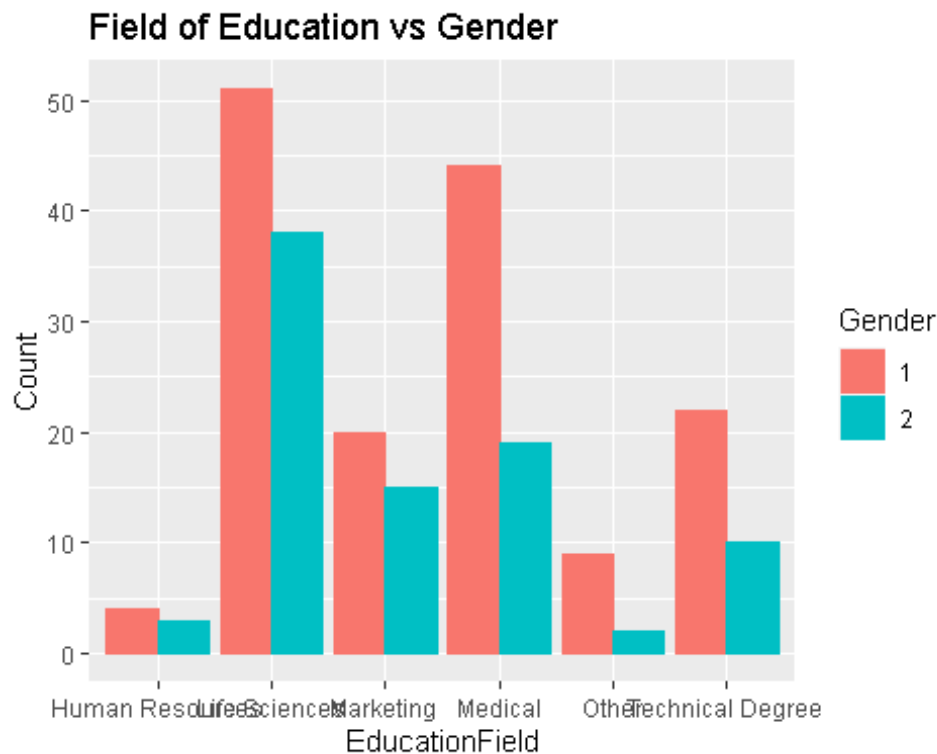
## # A tibble: 12 × 3
## # Groups:   EducationField [6]
##   EducationField Gender Count
##   <chr>          <fct> <int>
## 1 Human Resources 1         4
## 2 Human Resources 2         3
## 3 Life Sciences   1        51
## 4 Life Sciences   2        38
## 5 Marketing       1        20
## 6 Marketing       2        15
## 7 Medical         1       44
## 8 Medical         2        19
```

```
## 9 Other          1          9
## 10 Other         2          2
## 11 Technical Degree 1      22
## 12 Technical Degree 2      10

attr_new <- data %>%
  select(Attrition,Gender,EducationField) %>%
  filter (Attrition=="Yes") %>%
  group_by(EducationField,Gender) %>%
  summarise(Count=n())

## `summarise()` has grouped output by 'EducationField'. You can override
## using
## the `.groups` argument.

ggplot(data=attr_new,aes(x=EducationField,y =
Count,color=Gender,fill=Gender))+
  geom_bar(stat="identity", position=position_dodge())+
  ggtitle("Field of Education vs Gender")+
  labs(x = "EducationField", y = "Count")
```

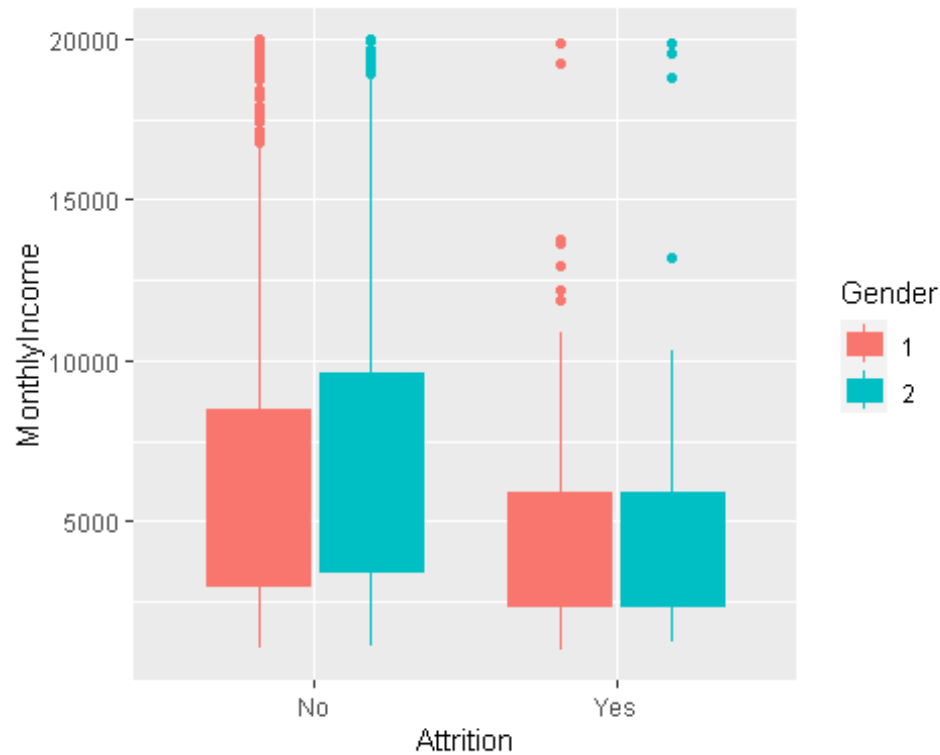


- Monthly Income

```
data %>%
  summarise(Median = median(MonthlyIncome),
            Mean = mean(MonthlyIncome),
            Max = max(MonthlyIncome),
            Min = min(MonthlyIncome))
```

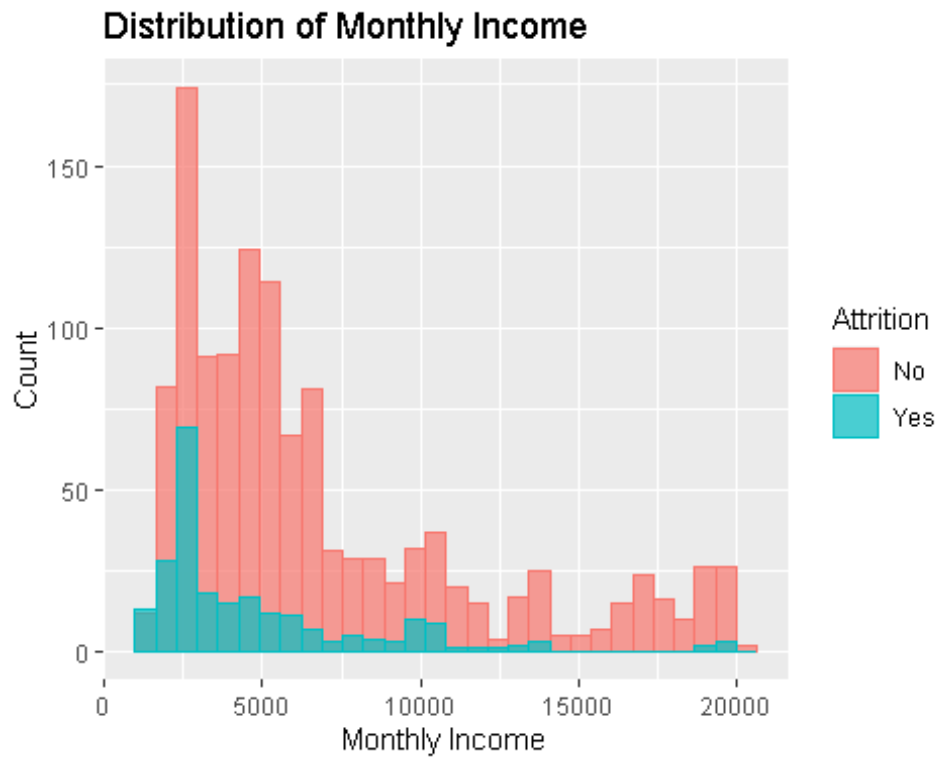
```
##   Median    Mean   Max   Min
## 1   4919 6502.931 19999 1009
```

```
ggplot(data, aes(x=Attrition, y=MonthlyIncome, color=Gender, fill=Gender)) +
  geom_boxplot()
```



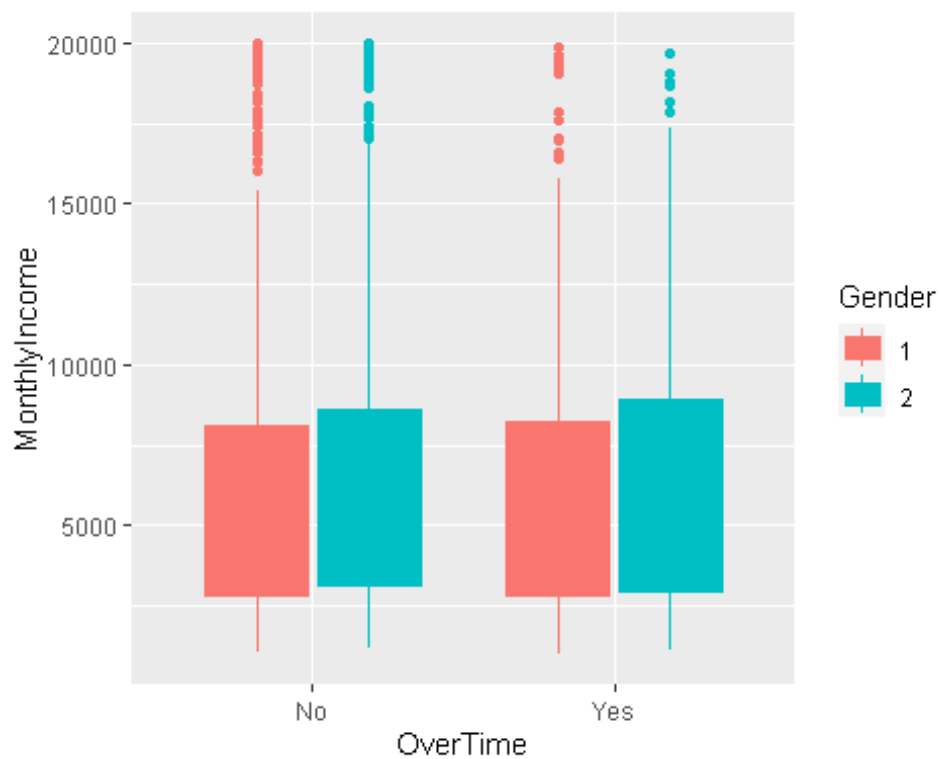
```
ggplot(data, aes(x=MonthlyIncome, color=Attrition, fill=Attrition)) +
  geom_histogram(position="identity", alpha=0.7)+
  ggtitle("Distribution of Monthly Income ")+
  labs(x = "Monthly Income", y = "Count")
```

```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```



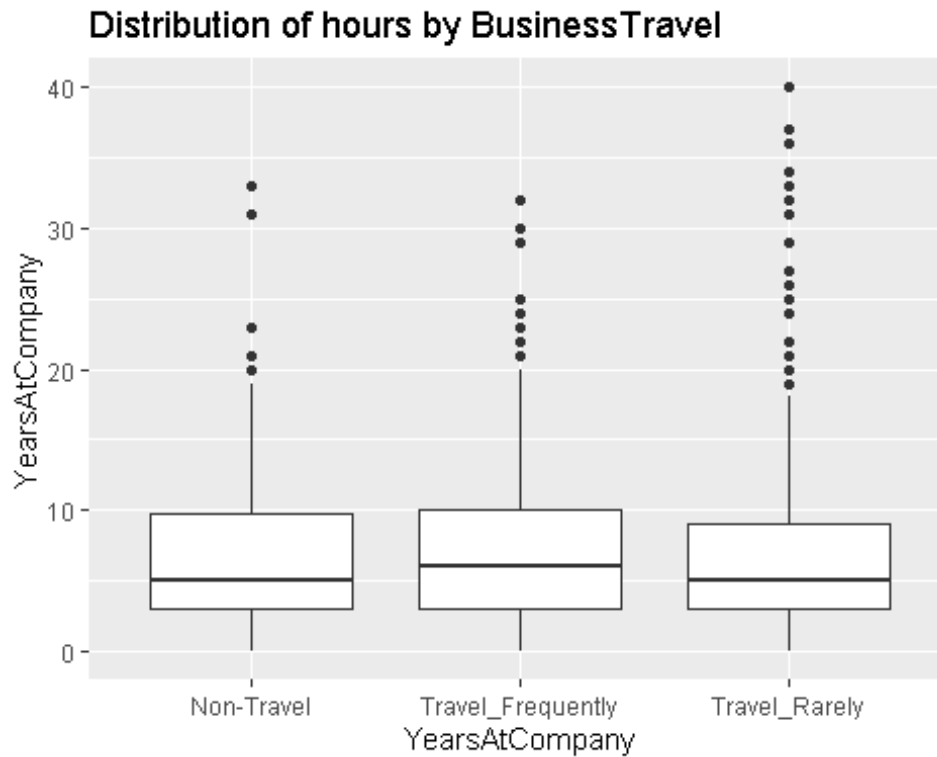
Relation between monthly income and overtime

```
ggplot(data, aes(x=OverTime, y=MonthlyIncome, color=Gender, fill=Gender)) +  
  geom_boxplot()
```



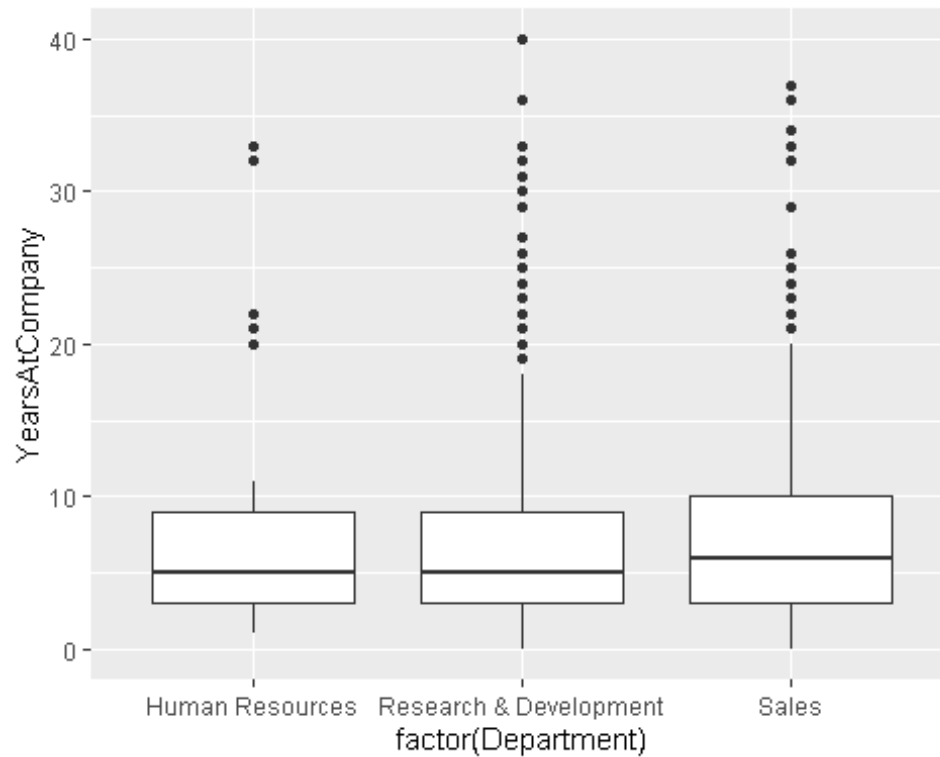
Relation between business travel and years at company

```
library(ggplot2)
ggplot(data = data) + geom_boxplot(aes(x = factor(BusinessTravel), y =
YearsAtCompany)) +
xlab('YearsAtCompany') + labs(title = 'Distribution of hours by
BusinessTravel')
```



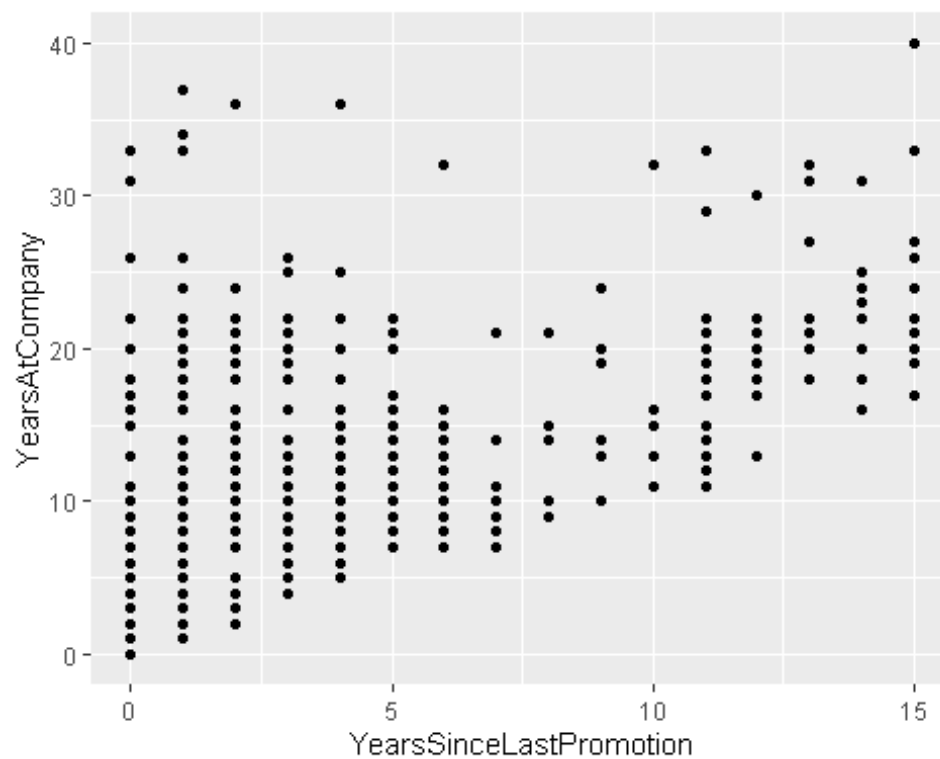
Department and years at company

```
ggplot(data = data) + geom_boxplot(aes(x = factor(Department), y =
YearsAtCompany))
```



Years since last promotion and years at company

```
ggplot(data = data) + geom_point(aes(x = YearsSinceLastPromotion, y = YearsAtCompany))
```



Normalizing the data to create a correlation matrix

```
library(caret)

## Warning: package 'caret' was built under R version 4.3.2

## Loading required package: lattice

library(dplyr)
ds1 <- data %>% select (Department, EducationField, MaritalStatus, JobRole)
ds2 <- data %>% select (-Department, -EducationField, -MaritalStatus, -
JobRole)

dmy <- dummyVars("~.", data=ds1)
onehot <- data.frame(predict(dmy, newdata=ds1))
head(onehot)

##   DepartmentHuman.Resources DepartmentResearch...Development
DepartmentSales
## 1              0              0
1
## 2              0              1
0
## 3              0              1
0
## 4              0              1
0
## 5              0              1
0
## 6              0              1
0
##   EducationFieldHuman.Resources EducationFieldLife.Sciences
## 1              0              1
## 2              0              1
## 3              0              0
## 4              0              1
## 5              0              0
## 6              0              1
##   EducationFieldMarketing EducationFieldMedical EducationFieldOther
## 1              0              0              0
## 2              0              0              0
## 3              0              0              1
## 4              0              0              0
## 5              0              1              0
## 6              0              0              0
##   EducationFieldTechnical.Degree MaritalStatusDivorced
MaritalStatusMarried
## 1              0              0
0
## 2              0              0
1
```

## 3	0	0
0		
## 4	0	0
1		
## 5	0	0
1		
## 6	0	0
0		
## MaritalStatusSingle JobRoleHealthcare.Representative		
JobRoleHuman.Resources		
## 1	1	0
0		
## 2	0	0
0		
## 3	1	0
0		
## 4	0	0
0		
## 5	0	0
0		
## 6	1	0
0		
## JobRoleLaboratory.Technician JobRoleManager		
JobRoleManufacturing.Director		
## 1	0	0
0		
## 2	0	0
0		
## 3	1	0
0		
## 4	0	0
0		
## 5	1	0
0		
## 6	1	0
0		
## JobRoleResearch.Director JobRoleResearch.Scientist		
JobRoleSales.Executive		
## 1	0	0
1		
## 2	0	1
0		
## 3	0	0
0		
## 4	0	1
0		
## 5	0	0
0		
## 6	0	0
0		

```
## JobRoleSales.Representative
## 1 0
## 2 0
## 3 0
## 4 0
## 5 0
## 6 0
```

```
final <- cbind(onehot,ds2)
```

[Have a look at structure of data](#)

```
str(final)
```

```
## 'data.frame': 1470 obs. of 48 variables:
## $ DepartmentHuman.Resources : num 0 0 0 0 0 0 0 0 0 0 ...
## $ DepartmentResearch...Development: num 0 1 1 1 1 1 1 1 1 1 ...
## $ DepartmentSales : num 1 0 0 0 0 0 0 0 0 0 ...
## $ EducationFieldHuman.Resources : num 0 0 0 0 0 0 0 0 0 0 ...
## $ EducationFieldLife.Sciences : num 1 1 0 1 0 1 0 1 1 0 ...
## $ EducationFieldMarketing : num 0 0 0 0 0 0 0 0 0 0 ...
## $ EducationFieldMedical : num 0 0 0 0 1 0 1 0 0 1 ...
## $ EducationFieldOther : num 0 0 1 0 0 0 0 0 0 0 ...
## $ EducationFieldTechnical.Degree : num 0 0 0 0 0 0 0 0 0 0 ...
## $ MaritalStatusDivorced : num 0 0 0 0 0 0 0 1 0 0 ...
## $ MaritalStatusMarried : num 0 1 0 1 1 0 1 0 0 1 ...
## $ MaritalStatusSingle : num 1 0 1 0 0 1 0 0 1 0 ...
## $ JobRoleHealthcare.Representative: num 0 0 0 0 0 0 0 0 0 1 ...
## $ JobRoleHuman.Resources : num 0 0 0 0 0 0 0 0 0 0 ...
## $ JobRoleLaboratory.Technician : num 0 0 1 0 1 1 1 1 0 0 ...
## $ JobRoleManager : num 0 0 0 0 0 0 0 0 0 0 ...
## $ JobRoleManufacturing.Director : num 0 0 0 0 0 0 0 0 1 0 ...
## $ JobRoleResearch.Director : num 0 0 0 0 0 0 0 0 0 0 ...
## $ JobRoleResearch.Scientist : num 0 1 0 1 0 0 0 0 0 0 ...
## $ JobRoleSales.Executive : num 1 0 0 0 0 0 0 0 0 0 ...
## $ JobRoleSales.Representative : num 0 0 0 0 0 0 0 0 0 0 ...
## $ Age : int 41 49 37 33 27 32 59 30 38 36
...
## $ Attrition : Factor w/ 2 levels "No","Yes": 2 1 2
1 1 1 1 1 1 1 ...
## $ BusinessTravel : chr "Travel_Rarely"
"Travel_Frequently" "Travel_Rarely" "Travel_Frequently" ...
## $ DailyRate : int 1102 279 1373 1392 591 1005 1324
1358 216 1299 ...
## $ DistanceFromHome : int 1 8 2 3 2 2 3 24 23 27 ...
## $ Education : int 2 1 2 4 1 2 3 1 3 3 ...
## $ EnvironmentSatisfaction : int 2 3 4 4 1 4 3 4 4 3 ...
## $ Gender : Factor w/ 2 levels "1","2": 2 1 1 2 1
1 2 1 1 1 ...
## $ HourlyRate : int 94 61 92 56 40 79 81 67 44 94
...
```

```
## $ JobInvolvement      : int  3 2 2 3 3 3 4 3 2 3 ...
## $ JobLevel            : int  2 2 1 1 1 1 1 1 3 2 ...
## $ JobSatisfaction     : int  4 2 3 3 2 4 1 3 3 3 ...
## $ MonthlyIncome      : int  5993 5130 2090 2909 3468 3068
2670 2693 9526 5237 ...
## $ MonthlyRate        : int  19479 24907 2396 23159 16632
11864 9964 13335 8787 16577 ...
## $ NumCompaniesWorked : int  8 1 6 1 9 0 4 1 0 6 ...
## $ OverTime           : chr  "Yes" "No" "Yes" "Yes" ...
## $ PercentSalaryHike  : int  11 23 15 11 12 13 20 22 21 13
...
## $ PerformanceRating  : int  3 4 3 3 3 3 4 4 4 3 ...
## $ RelationshipSatisfaction : int  1 4 2 3 4 3 1 2 2 2 ...
## $ StockOptionLevel   : int  0 1 0 0 1 0 3 1 0 2 ...
## $ TotalWorkingYears  : int  8 10 7 8 6 8 12 1 10 17 ...
## $ TrainingTimesLastYear : int  0 3 3 3 3 2 3 2 2 3 ...
## $ WorkLifeBalance     : int  1 3 3 3 3 2 2 3 3 2 ...
## $ YearsAtCompany     : int  6 10 0 8 2 7 1 1 9 7 ...
## $ YearsInCurrentRole  : int  4 7 0 7 2 7 0 0 7 7 ...
## $ YearsSinceLastPromotion : int  0 1 0 3 2 3 0 0 1 7 ...
## $ YearsWithCurrManager : int  5 7 0 0 2 6 0 0 8 7 ...
```

###Normalization

```
library(caret)

# Exclude non-numeric columns and the target variable
numeric_cols <- final[, sapply(final, is.numeric) & !colnames(final) %in%
"Attrition"]

# Function to apply Min-Max scaling on the dataset
min_max_scaling <- function(x) {
  return((x - min(x, na.rm = TRUE)) / (max(x, na.rm = TRUE) - min(x, na.rm =
TRUE)))
}

# Apply Min-Max scaling on the numerical variables
normalized_data <- as.data.frame(lapply(numeric_cols, min_max_scaling))

# Combine the normalized numerical variables with the target variable
(Attrition)
final_normalized <- cbind.data.frame(normalized_data, Attrition =
final$Attrition)

# Print the structure of the final normalized dataset
str(final_normalized)

## 'data.frame': 1470 obs. of 45 variables:
## $ DepartmentHuman.Resources : num 0 0 0 0 0 0 0 0 0 0 ...
## $ DepartmentResearch...Development: num 0 1 1 1 1 1 1 1 1 1 ...
```

```

## $ DepartmentSales : num 1 0 0 0 0 0 0 0 0 0 ...
## $ EducationFieldHuman.Resources : num 0 0 0 0 0 0 0 0 0 0 ...
## $ EducationFieldLife.Sciences : num 1 1 0 1 0 1 0 1 1 0 ...
## $ EducationFieldMarketing : num 0 0 0 0 0 0 0 0 0 0 ...
## $ EducationFieldMedical : num 0 0 0 0 1 0 1 0 0 1 ...
## $ EducationFieldOther : num 0 0 1 0 0 0 0 0 0 0 ...
## $ EducationFieldTechnical.Degree : num 0 0 0 0 0 0 0 0 0 0 ...
## $ MaritalStatusDivorced : num 0 0 0 0 0 0 0 1 0 0 ...
## $ MaritalStatusMarried : num 0 1 0 1 1 0 1 0 0 1 ...
## $ MaritalStatusSingle : num 1 0 1 0 0 1 0 0 1 0 ...
## $ JobRoleHealthcare.Representative : num 0 0 0 0 0 0 0 0 0 1 ...
## $ JobRoleHuman.Resources : num 0 0 0 0 0 0 0 0 0 0 ...
## $ JobRoleLaboratory.Technician : num 0 0 1 0 1 1 1 1 0 0 ...
## $ JobRoleManager : num 0 0 0 0 0 0 0 0 0 0 ...
## $ JobRoleManufacturing.Director : num 0 0 0 0 0 0 0 0 1 0 ...
## $ JobRoleResearch.Director : num 0 0 0 0 0 0 0 0 0 0 ...
## $ JobRoleResearch.Scientist : num 0 1 0 1 0 0 0 0 0 0 ...
## $ JobRoleSales.Executive : num 1 0 0 0 0 0 0 0 0 0 ...
## $ JobRoleSales.Representative : num 0 0 0 0 0 0 0 0 0 0 ...
## $ Age : num 0.548 0.738 0.452 0.357 0.214
...
## $ DailyRate : num 0.716 0.127 0.91 0.923 0.35 ...
## $ DistanceFromHome : num 0 0.25 0.0357 0.0714 0.0357 ...
## $ Education : num 0.25 0 0.25 0.75 0 0.25 0.5 0
0.5 0.5 ...
## $ EnvironmentSatisfaction : num 0.333 0.667 1 1 0 ...
## $ HourlyRate : num 0.914 0.443 0.886 0.371 0.143
...
## $ JobInvolvement : num 0.667 0.333 0.333 0.667 0.667
...
## $ JobLevel : num 0.25 0.25 0 0 0 0 0 0 0.5 0.25
...
## $ JobSatisfaction : num 1 0.333 0.667 0.667 0.333 ...
## $ MonthlyIncome : num 0.2625 0.217 0.0569 0.1001
0.1295 ...
## $ MonthlyRate : num 0.6981 0.916 0.0121 0.8458
0.5837 ...
## $ NumCompaniesWorked : num 0.889 0.111 0.667 0.111 1 ...
## $ PercentSalaryHike : num 0 0.8571 0.2857 0 0.0714 ...
## $ PerformanceRating : num 0 1 0 0 0 0 1 1 1 0 ...
## $ RelationshipSatisfaction : num 0 1 0.333 0.667 1 ...
## $ StockOptionLevel : num 0 0.333 0 0 0.333 ...
## $ TotalWorkingYears : num 0.2 0.25 0.175 0.2 0.15 0.2 0.3
0.025 0.25 0.425 ...
## $ TrainingTimesLastYear : num 0 0.5 0.5 0.5 0.5 ...
## $ WorkLifeBalance : num 0 0.667 0.667 0.667 0.667 ...
## $ YearsAtCompany : num 0.15 0.25 0 0.2 0.05 0.175 0.025
0.025 0.225 0.175 ...
## $ YearsInCurrentRole : num 0.222 0.389 0 0.389 0.111 ...
## $ YearsSinceLastPromotion : num 0 0.0667 0 0.2 0.1333 ...

```

```
## $ YearsWithCurrManager      : num  0.294 0.412 0 0 0.118 ...
## $ Attrition                 : Factor w/ 2 levels "No","Yes": 2 1 2
1 1 1 1 1 1 1 ...
```

Renaming

```
# Rename the 'final$Attrition' column to 'Attrition'
colnames(final_normalized)[colnames(final_normalized) == "final$Attrition"]
<- "Attrition"
final_normalized$Attrition <- as.numeric(final_normalized$Attrition)
```

Plotting of correlation matrix

```
library(reshape2)
```

```
## Warning: package 'reshape2' was built under R version 4.3.1
```

```
correlation_matrix <- cor(final_normalized)
correlation_matrix
```

```
##                                DepartmentHuman.Resources
## DepartmentHuman.Resources      1.000000000
## DepartmentResearch...Development -0.290754221
## DepartmentSales                -0.139649915
## EducationFieldHuman.Resources  0.646435935
## EducationFieldLife.Sciences    -0.068039985
## EducationFieldMarketing        -0.073692017
## EducationFieldMedical          -0.049761221
## EducationFieldOther            -0.007526669
## EducationFieldTechnical.Degree -0.019469058
## MaritalStatusDivorced          0.016036876
## MaritalStatusMarried           0.034767421
## MaritalStatusSingle            -0.051442616
## JobRoleHealthcare.Representative -0.066186373
## JobRoleHuman.Resources         0.904982811
## JobRoleLaboratory.Technician  -0.097859059
## JobRoleManager                 0.087614668
## JobRoleManufacturing.Director -0.070000201
## JobRoleResearch.Director       -0.050764583
## JobRoleResearch.Scientist      -0.105351811
## JobRoleSales.Executive         -0.112958525
## JobRoleSales.Representative    -0.051763549
## Age                            0.020522881
## DailyRate                      -0.026725634
## DistanceFromHome               -0.012901397
## Education                      0.011435425
## EnvironmentSatisfaction        -0.007596712
## HourlyRate                     -0.016551039
## JobInvolvement                 0.004789372
## JobLevel                       -0.006157391
## JobSatisfaction                -0.024068145
## MonthlyIncome                  0.006815078
## MonthlyRate                    -0.024389511
```


## NumCompaniesWorked	0.020617601
## PercentSalaryHike	-0.025888439
## PerformanceRating	-0.006385263
## RelationshipSatisfaction	0.034582808
## StockOptionLevel	-0.003999559
## TotalWorkingYears	0.007507576
## TrainingTimesLastYear	-0.040021815
## WorkLifeBalance	0.047762871
## YearsAtCompany	0.007944309
## YearsInCurrentRole	-0.040286920
## YearsSinceLastPromotion	-0.026930679
## YearsWithCurrManager	-0.027079134
## Attrition	0.016832010
##	DepartmentResearch...Development
## DepartmentHuman.Resources	-0.290754221
## DepartmentResearch...Development	1.000000000
## DepartmentSales	-0.906818254
## EducationFieldHuman.Resources	-0.187953977
## EducationFieldLife.Sciences	0.127321376
## EducationFieldMarketing	-0.478519917
## EducationFieldMedical	0.183548457
## EducationFieldOther	0.064750669
## EducationFieldTechnical.Degree	0.038540526
## MaritalStatusDivorced	0.035158317
## MaritalStatusMarried	-0.019997232
## MaritalStatusSingle	-0.009990012
## JobRoleHealthcare.Representative	0.227636844
## JobRoleHuman.Resources	-0.263127572
## JobRoleLaboratory.Technician	0.336569694
## JobRoleManager	-0.071355719
## JobRoleManufacturing.Director	0.240753860
## JobRoleResearch.Director	0.174596201
## JobRoleResearch.Scientist	0.362339748
## JobRoleSales.Executive	-0.733497420
## JobRoleSales.Representative	-0.336127169
## Age	0.017882960
## DailyRate	0.014870634
## DistanceFromHome	-0.008117375
## Education	-0.018603600
## EnvironmentSatisfaction	0.027976127
## HourlyRate	0.018686496
## JobInvolvement	0.023187111
## JobLevel	-0.107829685
## JobSatisfaction	-0.002797636
## MonthlyIncome	-0.064720452
## MonthlyRate	-0.005452981
## NumCompaniesWorked	0.022237374
## PercentSalaryHike	0.030735414
## PerformanceRating	0.032720430
## RelationshipSatisfaction	-0.004586854

## StockOptionLevel		0.016926505	
## TotalWorkingYears		0.011086883	
## TrainingTimesLastYear		-0.006818580	
## WorkLifeBalance		-0.069921567	
## YearsAtCompany		-0.032181306	
## YearsInCurrentRole		-0.028151286	
## YearsSinceLastPromotion		-0.021497201	
## YearsWithCurrManager		-0.014962746	
## Attrition		-0.085292928	
##	DepartmentSales		
EducationFieldHuman.Resources			
## DepartmentHuman.Resources	-0.139649915		
0.646435935			
## DepartmentResearch...Development	-0.906818254		-
0.187953977			
## DepartmentSales	1.000000000		-
0.090274724			
## EducationFieldHuman.Resources	-0.090274724		
1.000000000			
## EducationFieldLife.Sciences	-0.101791005		-
0.114558721			
## EducationFieldMarketing	0.527691095		-
0.047637168			
## EducationFieldMedical	-0.168033850		-
0.092898503			
## EducationFieldOther	-0.063695297		-
0.033247647			
## EducationFieldTechnical.Degree	-0.031308843		-
0.042964289			
## MaritalStatusDivorced	-0.043450866		
0.012107046			
## MaritalStatusMarried	0.005378411		
0.057339038			
## MaritalStatusSingle	0.033002068		-
0.072051104			
## JobRoleHealthcare.Representative	-0.206425246		-
0.042785250			
## JobRoleHuman.Resources	-0.126380773		
0.549751407			
## JobRoleLaboratory.Technician	-0.305207542		-
0.063259612			
## JobRoleManager	0.035247787		
0.082270516			
## JobRoleManufacturing.Director	-0.218319995		-
0.045250645			
## JobRoleResearch.Director	-0.158327022		-
0.032816050			
## JobRoleResearch.Scientist	-0.328576297		-
0.068103197			
## JobRoleSales.Executive	0.808869271		-

0.073020450		
## JobRoleSales.Representative	0.370666523	-
0.033461818		
## Age	-0.027548733	
0.001695986		
## DailyRate	-0.003615683	-
0.043144017		
## DistanceFromHome	0.014084536	-
0.002624327		
## Education	0.014215147	
0.026478868		
## EnvironmentSatisfaction	-0.025606045	-
0.006897812		
## HourlyRate	-0.012047229	-
0.033669623		
## JobInvolvement	-0.026106587	
0.002078550		
## JobLevel	0.114306839	
0.010408731		
## JobSatisfaction	0.013498641	-
0.021466810		
## MonthlyIncome	0.063977520	
0.021455961		
## MonthlyRate	0.016388268	
0.009566752		
## NumCompaniesWorked	-0.032096895	
0.031007480		
## PercentSalaryHike	-0.020403156	-
0.016141770		
## PerformanceRating	-0.031049688	-
0.016166682		
## RelationshipSatisfaction	-0.010488634	
0.041104786		
## StockOptionLevel	-0.015755408	
0.021205615		
## TotalWorkingYears	-0.014781440	
0.005504510		
## TrainingTimesLastYear	0.024688428	-
0.037664148		
## WorkLifeBalance	0.051320467	-
0.003967424		
## YearsAtCompany	0.029804897	-
0.005145616		
## YearsInCurrentRole	0.046882683	-
0.025443438		
## YearsSinceLastPromotion	0.034112138	-
0.023699806		
## YearsWithCurrManager	0.027414959	-
0.028867619		
## Attrition	0.080855202	

0.036466197

##	EducationFieldLife.Sciences	
## DepartmentHuman.Resources		-0.068039985
## DepartmentResearch...Development		0.127321376
## DepartmentSales		-0.101791005
## EducationFieldHuman.Resources		-0.114558721
## EducationFieldLife.Sciences		1.000000000
## EducationFieldMarketing		-0.291659856
## EducationFieldMedical		-0.568773614
## EducationFieldOther		-0.203559621
## EducationFieldTechnical.Degree		-0.263050026
## MaritalStatusDivorced		-0.002671944
## MaritalStatusMarried		-0.017866043
## MaritalStatusSingle		0.021468786
## JobRoleHealthcare.Representative		0.029083986
## JobRoleHuman.Resources		-0.063118803
## JobRoleLaboratory.Technician		0.044358609
## JobRoleManager		-0.011143424
## JobRoleManufacturing.Director		0.052023411
## JobRoleResearch.Director		0.018400829
## JobRoleResearch.Scientist		0.043729440
## JobRoleSales.Executive		-0.091122053
## JobRoleSales.Representative		-0.043207889
## Age		0.016823698
## DailyRate		0.004027930
## DistanceFromHome		-0.024499294
## Education		0.013184428
## EnvironmentSatisfaction		-0.024525660
## HourlyRate		0.038759056
## JobInvolvement		0.003227533
## JobLevel		-0.008431405
## JobSatisfaction		0.052004178
## MonthlyIncome		-0.007054333
## MonthlyRate		0.025544610
## NumCompaniesWorked		-0.006130619
## PercentSalaryHike		0.010209488
## PerformanceRating		0.010853083
## RelationshipSatisfaction		-0.019972727
## StockOptionLevel		-0.017992830
## TotalWorkingYears		-0.003630414
## TrainingTimesLastYear		-0.039018068
## WorkLifeBalance		-0.039728025
## YearsAtCompany		-0.002018900
## YearsInCurrentRole		0.018343208
## YearsSinceLastPromotion		-0.002479523
## YearsWithCurrManager		0.003635683
## Attrition		-0.032703148

##	EducationFieldMarketing	
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EducationFieldMedical

## DepartmentHuman.Resources		-0.0736920168
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-

0.049761221		
## DepartmentResearch...Development	-0.4785199173	
0.183548457		
## DepartmentSales	0.5276910949	-
0.168033850		
## EducationFieldHuman.Resources	-0.0476371678	-
0.092898503		
## EducationFieldLife.Sciences	-0.2916598561	-
0.568773614		
## EducationFieldMarketing	1.0000000000	-
0.236514198		
## EducationFieldMedical	-0.2365141978	
1.000000000		
## EducationFieldOther	-0.0846465787	-
0.165071536		
## EducationFieldTechnical.Degree	-0.1093845854	-
0.213313779		
## MaritalStatusDivorced	-0.0072118532	
0.013316068		
## MaritalStatusMarried	0.0184910957	-
0.007138661		
## MaritalStatusSingle	-0.0133225457	-
0.004248603		
## JobRoleHealthcare.Representative	-0.1089287640	
0.034164674		
## JobRoleHuman.Resources	-0.0666900085	-
0.042894950		
## JobRoleLaboratory.Technician	-0.1610553021	
0.066262307		
## JobRoleManager	0.0255765886	-
0.001128474		
## JobRoleManufacturing.Director	-0.1152055173	
0.035496321		
## JobRoleResearch.Director	-0.0835477598	
0.062897852		
## JobRoleResearch.Scientist	-0.1733867862	
0.039735215		
## JobRoleSales.Executive	0.4573081080	-
0.133531752		
## JobRoleSales.Representative	0.1330650552	-
0.051990485		
## Age	0.0381619649	-
0.006354488		
## DailyRate	-0.0644491244	
0.034201628		
## DistanceFromHome	0.0392942386	
0.013486377		
## Education	0.0724054345	-
0.072334760		
## EnvironmentSatisfaction	0.0004786134	-

0.021298679		
## HourlyRate	0.0044518153	-
0.020417967		
## JobInvolvement	-0.0186573412	
0.017102530		
## JobLevel	0.0926984732	-
0.014114342		
## JobSatisfaction	-0.0235282394	-
0.022645460		
## MonthlyIncome	0.0625756007	
0.001025323		
## MonthlyRate	-0.0115586312	-
0.001722569		
## NumCompaniesWorked	-0.0186108336	
0.024826499		
## PercentSalaryHike	-0.0277261225	
0.029116142		
## PerformanceRating	-0.0209184441	
0.014867706		
## RelationshipSatisfaction	-0.0065797949	
0.030494189		
## StockOptionLevel	0.0225600757	
0.033749757		
## TotalWorkingYears	0.0257785673	
0.024890058		
## TrainingTimesLastYear	-0.0290464132	
0.070541828		
## WorkLifeBalance	0.0185004924	
0.001641074		
## YearsAtCompany	0.0313648590	
0.010805171		
## YearsInCurrentRole	0.0251260063	-
0.026418128		
## YearsSinceLastPromotion	0.0062192799	
0.022664541		
## YearsWithCurrManager	0.0334183135	-
0.011543794		
## Attrition	0.0557806657	-
0.046998716		
##	EducationFieldOther	
## DepartmentHuman.Resources	-0.007526669	
## DepartmentResearch...Development	0.064750669	
## DepartmentSales	-0.063695297	
## EducationFieldHuman.Resources	-0.033247647	
## EducationFieldLife.Sciences	-0.203559621	
## EducationFieldMarketing	-0.084646579	
## EducationFieldMedical	-0.165071536	
## EducationFieldOther	1.000000000	
## EducationFieldTechnical.Degree	-0.076343330	
## MaritalStatusDivorced	0.005410851	

## MaritalStatusMarried	-0.009171103
## MaritalStatusSingle	0.004972185
## JobRoleHealthcare.Representative	0.017608517
## JobRoleHuman.Resources	0.001593718
## JobRoleLaboratory.Technician	0.058759435
## JobRoleManager	-0.008046243
## JobRoleManufacturing.Director	-0.010819978
## JobRoleResearch.Director	-0.006044423
## JobRoleResearch.Scientist	0.005286472
## JobRoleSales.Executive	-0.036995208
## JobRoleSales.Representative	-0.033774032
## Age	-0.041465681
## DailyRate	-0.003893392
## DistanceFromHome	-0.007968536
## Education	0.038043115
## EnvironmentSatisfaction	0.064601596
## HourlyRate	-0.042162974
## JobInvolvement	-0.011894660
## JobLevel	-0.016724486
## JobSatisfaction	0.003379993
## MonthlyIncome	-0.022278709
## MonthlyRate	-0.035605519
## NumCompaniesWorked	-0.012869705
## PercentSalaryHike	0.019297312
## PerformanceRating	0.011448903
## RelationshipSatisfaction	-0.020305220
## StockOptionLevel	-0.042099753
## TotalWorkingYears	-0.028934530
## TrainingTimesLastYear	-0.008151216
## WorkLifeBalance	0.031812267
## YearsAtCompany	-0.030331043
## YearsInCurrentRole	-0.017021439
## YearsSinceLastPromotion	-0.039931117
## YearsWithCurrManager	-0.011714373
## Attrition	-0.017897517
##	EducationFieldTechnical.Degree
## DepartmentHuman.Resources	-0.0194690580
## DepartmentResearch...Development	0.0385405256
## DepartmentSales	-0.0313088434
## EducationFieldHuman.Resources	-0.0429642886
## EducationFieldLife.Sciences	-0.2630500264
## EducationFieldMarketing	-0.1093845854
## EducationFieldMedical	-0.2133137786
## EducationFieldOther	-0.0763433305
## EducationFieldTechnical.Degree	1.0000000000
## MaritalStatusDivorced	-0.0192427195
## MaritalStatusMarried	0.0027096571
## MaritalStatusSingle	0.0142652002
## JobRoleHealthcare.Representative	0.0186806012
## JobRoleHuman.Resources	-0.0086226407

## JobRoleLaboratory.Technician	-0.0265887905	
## JobRoleManager	-0.0389463962	
## JobRoleManufacturing.Director	0.0078172775	
## JobRoleResearch.Director	-0.0229053861	
## JobRoleResearch.Scientist	0.0762175922	
## JobRoleSales.Executive	-0.0588433828	
## JobRoleSales.Representative	0.0571845105	
## Age	-0.0276043878	
## DailyRate	0.0308688652	
## DistanceFromHome	-0.0148018457	
## Education	-0.0267418736	
## EnvironmentSatisfaction	0.0277134086	
## HourlyRate	0.0112833354	
## JobInvolvement	-0.0045194172	
## JobLevel	-0.0547066030	
## JobSatisfaction	-0.0197949685	
## MonthlyIncome	-0.0496951180	
## MonthlyRate	-0.0045352404	
## NumCompaniesWorked	-0.0138187217	
## PercentSalaryHike	-0.0427012937	
## PerformanceRating	-0.0217292808	
## RelationshipSatisfaction	-0.0110435560	
## StockOptionLevel	-0.0245603012	
## TotalWorkingYears	-0.0415765587	
## TrainingTimesLastYear	0.0082892505	
## WorkLifeBalance	0.0219621205	
## YearsAtCompany	-0.0213989837	
## YearsInCurrentRole	0.0096829879	
## YearsSinceLastPromotion	0.0038531329	
## YearsWithCurrManager	-0.0008359179	
## Attrition	0.0693545948	
##	MaritalStatusDivorced	
MaritalStatusMarried		
## DepartmentHuman.Resources	0.0160368763	
0.034767421		
## DepartmentResearch...Development	0.0351583173	-
0.019997232		
## DepartmentSales	-0.0434508664	
0.005378411		
## EducationFieldHuman.Resources	0.0121070456	
0.057339038		
## EducationFieldLife.Sciences	-0.0026719437	-
0.017866043		
## EducationFieldMarketing	-0.0072118532	
0.018491096		
## EducationFieldMedical	0.0133160682	-
0.007138661		
## EducationFieldOther	0.0054108506	-
0.009171103		
## EducationFieldTechnical.Degree	-0.0192427195	

0.002709657		
## MaritalStatusDivorced	1.0000000000	-
0.491506349		
## MaritalStatusMarried	-0.4915063494	
1.0000000000		
## MaritalStatusSingle	-0.3666905265	-
0.629980781		
## JobRoleHealthcare.Representative	0.0278970141	
0.004913044		
## JobRoleHuman.Resources	0.0215407456	
0.030994608		
## JobRoleLaboratory.Technician	-0.0112240977	-
0.009232869		
## JobRoleManager	0.0019967547	
0.049982244		
## JobRoleManufacturing.Director	0.0205432141	
0.002819161		
## JobRoleResearch.Director	0.0375242525	
0.008271081		
## JobRoleResearch.Scientist	-0.0121151488	-
0.039987225		
## JobRoleSales.Executive	-0.0138528685	
0.005750591		
## JobRoleSales.Representative	-0.0528898027	-
0.023658624		
## Age	0.0331203513	
0.083919210		
## DailyRate	0.0370801775	
0.040034696		
## DistanceFromHome	-0.0054400885	
0.030232069		
## Education	-0.0024388573	-
0.001865293		
## EnvironmentSatisfaction	0.0164386013	-
0.022180173		
## HourlyRate	-0.0061498622	
0.036432322		
## JobInvolvement	0.0168147061	
0.028324424		
## JobLevel	0.0370871845	
0.050547075		
## JobSatisfaction	-0.0151969688	-
0.010314939		
## MonthlyIncome	0.0322031782	
0.056767393		
## MonthlyRate	-0.0002268508	-
0.034688787		
## NumCompaniesWorked	0.0408239957	-
0.016142078		
## PercentSalaryHike	-0.0234776458	

0.020895441		
## PerformanceRating	-0.0103096766	
0.009584628		
## RelationshipSatisfaction	0.0061985836	-
0.043382251		
## StockOptionLevel	0.4462847451	
0.225574233		
## TotalWorkingYears	0.0362912209	
0.053512130		
## TrainingTimesLastYear	0.0084047599	-
0.029602421		
## WorkLifeBalance	-0.0090799771	-
0.006387995		
## YearsAtCompany	0.0257276949	
0.044924691		
## YearsInCurrentRole	0.0185317834	
0.065487762		
## YearsSinceLastPromotion	-0.0052787380	
0.054102473		
## YearsWithCurrManager	0.0140950653	
0.032971928		
## Attrition	-0.0877163459	-
0.090983651		
##	MaritalStatusSingle	
## DepartmentHuman.Resources	-0.051442616	
## DepartmentResearch...Development	-0.009990012	
## DepartmentSales	0.033002068	
## EducationFieldHuman.Resources	-0.072051104	
## EducationFieldLife.Sciences	0.021468786	
## EducationFieldMarketing	-0.013322546	
## EducationFieldMedical	-0.004248603	
## EducationFieldOther	0.004972185	
## EducationFieldTechnical.Degree	0.014265200	
## MaritalStatusDivorced	-0.366690527	
## MaritalStatusMarried	-0.629980781	
## MaritalStatusSingle	1.000000000	
## JobRoleHealthcare.Representative	-0.030125984	
## JobRoleHuman.Resources	-0.052320302	
## JobRoleLaboratory.Technician	0.019872553	
## JobRoleManager	-0.055175985	
## JobRoleManufacturing.Director	-0.021331292	
## JobRoleResearch.Director	-0.042298518	
## JobRoleResearch.Scientist	0.053521622	
## JobRoleSales.Executive	0.006210157	
## JobRoleSales.Representative	0.072439209	
## Age	-0.119185174	
## DailyRate	-0.075835152	
## DistanceFromHome	-0.027445259	
## Education	0.004167543	
## EnvironmentSatisfaction	0.009035491	

## HourlyRate	-0.033435958
## JobInvolvement	-0.045253287
## JobLevel	-0.087071634
## JobSatisfaction	0.024571362
## MonthlyIncome	-0.089361354
## MonthlyRate	0.037259862
## NumCompaniesWorked	-0.019160847
## PercentSalaryHike	-0.001385890
## PerformanceRating	-0.001045371
## RelationshipSatisfaction	0.040817026
## StockOptionLevel	-0.638956874
## TotalWorkingYears	-0.089529354
## TrainingTimesLastYear	0.024128838
## WorkLifeBalance	0.014921371
## YearsAtCompany	-0.070935377
## YearsInCurrentRole	-0.086485602
## YearsSinceLastPromotion	-0.053089577
## YearsWithCurrManager	-0.047792885
## Attrition	0.175418554
##	JobRoleHealthcare.Representative
## DepartmentHuman.Resources	-0.0661863734
## DepartmentResearch...Development	0.2276368444
## DepartmentSales	-0.2064252458
## EducationFieldHuman.Resources	-0.0427852502
## EducationFieldLife.Sciences	0.0290839860
## EducationFieldMarketing	-0.1089287640
## EducationFieldMedical	0.0341646736
## EducationFieldOther	0.0176085170
## EducationFieldTechnical.Degree	0.0186806012
## MaritalStatusDivorced	0.0278970141
## MaritalStatusMarried	0.0049130437
## MaritalStatusSingle	-0.0301259841
## JobRoleHealthcare.Representative	1.0000000000
## JobRoleHuman.Resources	-0.0598975303
## JobRoleLaboratory.Technician	-0.1446515760
## JobRoleManager	-0.0854087560
## JobRoleManufacturing.Director	-0.1034716611
## JobRoleResearch.Director	-0.0750382942
## JobRoleResearch.Scientist	-0.1557270798
## JobRoleSales.Executive	-0.1669710380
## JobRoleSales.Representative	-0.0765149282
## Age	0.0988246854
## DailyRate	0.0401408008
## DistanceFromHome	0.0229159772
## Education	0.0242699705
## EnvironmentSatisfaction	0.0140901038
## HourlyRate	0.0145989897
## JobInvolvement	0.0012718839
## JobLevel	0.1157044190
## JobSatisfaction	0.0163668290

## MonthlyIncome	0.0681768500
## MonthlyRate	0.0038286158
## NumCompaniesWorked	0.0269550862
## PercentSalaryHike	0.0205911345
## PerformanceRating	-0.0009276345
## RelationshipSatisfaction	-0.0050899098
## StockOptionLevel	0.0140213681
## TotalWorkingYears	0.1121593833
## TrainingTimesLastYear	-0.0124324723
## WorkLifeBalance	-0.0261014591
## YearsAtCompany	0.0697577172
## YearsInCurrentRole	0.0546950264
## YearsSinceLastPromotion	0.0759024109
## YearsWithCurrManager	0.0394071436
## Attrition	-0.0786960496
##	JobRoleHuman.Resources
## DepartmentHuman.Resources	0.904982811
## DepartmentResearch...Development	-0.263127572
## DepartmentSales	-0.126380773
## EducationFieldHuman.Resources	0.549751407
## EducationFieldLife.Sciences	-0.063118803
## EducationFieldMarketing	-0.066690008
## EducationFieldMedical	-0.042894950
## EducationFieldOther	0.001593718
## EducationFieldTechnical.Degree	-0.008622641
## MaritalStatusDivorced	0.021540746
## MaritalStatusMarried	0.030994608
## MaritalStatusSingle	-0.052320302
## JobRoleHealthcare.Representative	-0.059897530
## JobRoleHuman.Resources	1.000000000
## JobRoleLaboratory.Technician	-0.088560767
## JobRoleManager	-0.052290235
## JobRoleManufacturing.Director	-0.063348979
## JobRoleResearch.Director	-0.045941075
## JobRoleResearch.Scientist	-0.095341578
## JobRoleSales.Executive	-0.102225524
## JobRoleSales.Representative	-0.046845122
## Age	-0.029856364
## DailyRate	-0.021155772
## DistanceFromHome	-0.024089075
## Education	-0.005295147
## EnvironmentSatisfaction	-0.022014028
## HourlyRate	-0.016189351
## JobInvolvement	-0.004951807
## JobLevel	-0.100922311
## JobSatisfaction	-0.029681470
## MonthlyIncome	-0.092249731
## MonthlyRate	-0.027470358
## NumCompaniesWorked	0.020578071
## PercentSalaryHike	-0.021032050

## PerformanceRating	-0.010154141	
## RelationshipSatisfaction	0.044168514	
## StockOptionLevel	-0.009864499	
## TotalWorkingYears	-0.076482406	
## TrainingTimesLastYear	-0.035901571	
## WorkLifeBalance	0.043886733	
## YearsAtCompany	-0.052568655	
## YearsInCurrentRole	-0.057875721	
## YearsSinceLastPromotion	-0.054603246	
## YearsWithCurrManager	-0.051005550	
## Attrition	0.036215082	
##		
JobRoleLaboratory.Technician		
JobRoleManager		
## DepartmentHuman.Resources	-0.097859059	
0.087614668		
## DepartmentResearch...Development	0.336569694	-
0.071355719		
## DepartmentSales	-0.305207542	
0.035247787		
## EducationFieldHuman.Resources	-0.063259612	
0.082270516		
## EducationFieldLife.Sciences	0.044358609	-
0.011143424		
## EducationFieldMarketing	-0.161055302	
0.025576589		
## EducationFieldMedical	0.066262307	-
0.001128474		
## EducationFieldOther	0.058759435	-
0.008046243		
## EducationFieldTechnical.Degree	-0.026588791	-
0.038946396		
## MaritalStatusDivorced	-0.011224098	
0.001996755		
## MaritalStatusMarried	-0.009232869	
0.049982244		
## MaritalStatusSingle	0.019872553	-
0.055175985		
## JobRoleHealthcare.Representative	-0.144651576	-
0.085408756		
## JobRoleHuman.Resources	-0.088560767	-
0.052290235		
## JobRoleLaboratory.Technician	1.000000000	-
0.126280080		
## JobRoleManager	-0.126280080	
1.000000000		
## JobRoleManufacturing.Director	-0.152986769	-
0.090330226		
## JobRoleResearch.Director	-0.110946959	-
0.065508044		
## JobRoleResearch.Scientist	-0.230248384	-

0.135948937		
## JobRoleSales.Executive	-0.246873002	-
0.145764855		
## JobRoleSales.Representative	-0.113130219	-
0.066797138		
## Age	-0.143175521	
0.294247754		
## DailyRate	-0.006727581	-
0.013223882		
## DistanceFromHome	0.012368886	-
0.039189607		
## Education	-0.063566028	
0.028453048		
## EnvironmentSatisfaction	-0.001532922	
0.010729647		
## HourlyRate	0.018028428	
0.012659370		
## JobInvolvement	-0.022723562	
0.017112423		
## JobLevel	-0.344608162	
0.552744116		
## JobSatisfaction	-0.015710233	-
0.005619617		
## MonthlyIncome	-0.320905799	
0.619573112		
## MonthlyRate	-0.016056496	
0.031716818		
## NumCompaniesWorked	-0.021120992	
0.042124574		
## PercentSalaryHike	-0.020627667	-
0.005393648		
## PerformanceRating	0.010796355	
0.032050099		
## RelationshipSatisfaction	-0.010690952	
0.025637649		
## StockOptionLevel	0.013386179	-
0.015637365		
## TotalWorkingYears	-0.215425543	
0.465836777		
## TrainingTimesLastYear	0.053998428	
0.003052087		
## WorkLifeBalance	-0.028208598	
0.005136642		
## YearsAtCompany	-0.150181068	
0.330965169		
## YearsInCurrentRole	-0.131321689	
0.167498557		
## YearsSinceLastPromotion	-0.110099160	
0.224254871		
## YearsWithCurrManager	-0.107071984	

0.164695082		
## Attrition	0.098290485	-
0.083316384		
##	JobRoleManufacturing.Director	
## DepartmentHuman.Resources	-0.070000201	
## DepartmentResearch...Development	0.240753860	
## DepartmentSales	-0.218319995	
## EducationFieldHuman.Resources	-0.045250645	
## EducationFieldLife.Sciences	0.052023411	
## EducationFieldMarketing	-0.115205517	
## EducationFieldMedical	0.035496321	
## EducationFieldOther	-0.010819978	
## EducationFieldTechnical.Degree	0.007817278	
## MaritalStatusDivorced	0.020543214	
## MaritalStatusMarried	0.002819161	
## MaritalStatusSingle	-0.021331292	
## JobRoleHealthcare.Representative	-0.103471661	
## JobRoleHuman.Resources	-0.063348979	
## JobRoleLaboratory.Technician	-0.152986769	
## JobRoleManager	-0.090330226	
## JobRoleManufacturing.Director	1.000000000	
## JobRoleResearch.Director	-0.079362192	
## JobRoleResearch.Scientist	-0.164700472	
## JobRoleSales.Executive	-0.176592335	
## JobRoleSales.Representative	-0.080923914	
## Age	0.049726342	
## DailyRate	-0.005302012	
## DistanceFromHome	0.011847606	
## Education	-0.005290467	
## EnvironmentSatisfaction	0.059177560	
## HourlyRate	-0.014393905	
## JobInvolvement	-0.021938571	
## JobLevel	0.114895864	
## JobSatisfaction	-0.013746617	
## MonthlyIncome	0.055683925	
## MonthlyRate	0.007711273	
## NumCompaniesWorked	0.009580497	
## PercentSalaryHike	0.034682124	
## PerformanceRating	0.029774861	
## RelationshipSatisfaction	0.003640046	
## StockOptionLevel	0.007734594	
## TotalWorkingYears	0.064077109	
## TrainingTimesLastYear	-0.013986647	
## WorkLifeBalance	0.002010769	
## YearsAtCompany	0.031967710	
## YearsInCurrentRole	0.067876997	
## YearsSinceLastPromotion	-0.007241257	
## YearsWithCurrManager	0.076206993	
## Attrition	-0.082993924	
##	JobRoleResearch.Director	

## DepartmentHuman.Resources	-5.076458e-02
## DepartmentResearch...Development	1.745962e-01
## DepartmentSales	-1.583270e-01
## EducationFieldHuman.Resources	-3.281605e-02
## EducationFieldLife.Sciences	1.840083e-02
## EducationFieldMarketing	-8.354776e-02
## EducationFieldMedical	6.289785e-02
## EducationFieldOther	-6.044423e-03
## EducationFieldTechnical.Degree	-2.290539e-02
## MaritalStatusDivorced	3.752425e-02
## MaritalStatusMarried	8.271081e-03
## MaritalStatusSingle	-4.229852e-02
## JobRoleHealthcare.Representative	-7.503829e-02
## JobRoleHuman.Resources	-4.594107e-02
## JobRoleLaboratory.Technician	-1.109470e-01
## JobRoleManager	-6.550804e-02
## JobRoleManufacturing.Director	-7.936219e-02
## JobRoleResearch.Director	1.000000e+00
## JobRoleResearch.Scientist	-1.194418e-01
## JobRoleSales.Executive	-1.280659e-01
## JobRoleSales.Representative	-5.868653e-02
## Age	1.858911e-01
## DailyRate	-2.124095e-05
## DistanceFromHome	-2.235060e-02
## Education	4.969407e-02
## EnvironmentSatisfaction	-4.868922e-02
## HourlyRate	-2.512846e-02
## JobInvolvement	1.519993e-02
## JobLevel	4.143185e-01
## JobSatisfaction	-6.217308e-03
## MonthlyIncome	4.858184e-01
## MonthlyRate	2.587549e-02
## NumCompaniesWorked	9.792522e-02
## PercentSalaryHike	-1.701723e-02
## PerformanceRating	-3.574376e-02
## RelationshipSatisfaction	-5.492391e-03
## StockOptionLevel	1.580678e-02
## TotalWorkingYears	3.121477e-01
## TrainingTimesLastYear	-4.526890e-03
## WorkLifeBalance	3.440270e-02
## YearsAtCompany	1.539183e-01
## YearsInCurrentRole	1.363322e-01
## YearsSinceLastPromotion	7.445451e-02
## YearsWithCurrManager	1.312789e-01
## Attrition	-8.886984e-02
##	JobRoleResearch.Scientist
## DepartmentHuman.Resources	-0.1053518112
## DepartmentResearch...Development	0.3623397479
## DepartmentSales	-0.3285762975
## EducationFieldHuman.Resources	-0.0681031966

## EducationFieldLife.Sciences	0.0437294400
## EducationFieldMarketing	-0.1733867862
## EducationFieldMedical	0.0397352151
## EducationFieldOther	0.0052864722
## EducationFieldTechnical.Degree	0.0762175922
## MaritalStatusDivorced	-0.0121151488
## MaritalStatusMarried	-0.0399872251
## MaritalStatusSingle	0.0535216221
## JobRoleHealthcare.Representative	-0.1557270798
## JobRoleHuman.Resources	-0.0953415783
## JobRoleLaboratory.Technician	-0.2302483841
## JobRoleManager	-0.1359489375
## JobRoleManufacturing.Director	-0.1647004715
## JobRoleResearch.Director	-0.1194418094
## JobRoleResearch.Scientist	1.0000000000
## JobRoleSales.Executive	-0.2657752702
## JobRoleSales.Representative	-0.1217922339
## Age	-0.1465176799
## DailyRate	-0.0026242310
## DistanceFromHome	-0.0109856507
## Education	0.0007092034
## EnvironmentSatisfaction	0.0019403931
## HourlyRate	0.0200336786
## JobInvolvement	0.0476044710
## JobLevel	-0.3877883387
## JobSatisfaction	0.0205030615
## MonthlyIncome	-0.3451800266
## MonthlyRate	-0.0270083536
## NumCompaniesWorked	-0.0439812236
## PercentSalaryHike	0.0325374807
## PerformanceRating	0.0194162175
## RelationshipSatisfaction	-0.0031164012
## StockOptionLevel	-0.0116345323
## TotalWorkingYears	-0.2281189296
## TrainingTimesLastYear	-0.0521255716
## WorkLifeBalance	-0.0586126377
## YearsAtCompany	-0.1540621022
## YearsInCurrentRole	-0.1313143127
## YearsSinceLastPromotion	-0.1052373844
## YearsWithCurrManager	-0.1276081160
## Attrition	-0.0003595713
##	JobRoleSales.Executive
## DepartmentHuman.Resources	-0.1129585253
## DepartmentResearch...Development	-0.7334974198
## DepartmentSales	0.8088692708
## EducationFieldHuman.Resources	-0.0730204499
## EducationFieldLife.Sciences	-0.0911220525
## EducationFieldMarketing	0.4573081080
## EducationFieldMedical	-0.1335317519
## EducationFieldOther	-0.0369952080

## EducationFieldTechnical.Degree	-0.0588433828	
## MaritalStatusDivorced	-0.0138528685	
## MaritalStatusMarried	0.0057505907	
## MaritalStatusSingle	0.0062101574	
## JobRoleHealthcare.Representative	-0.1669710380	
## JobRoleHuman.Resources	-0.1022255237	
## JobRoleLaboratory.Technician	-0.2468730021	
## JobRoleManager	-0.1457648550	
## JobRoleManufacturing.Director	-0.1765923353	
## JobRoleResearch.Director	-0.1280658632	
## JobRoleResearch.Scientist	-0.2657752702	
## JobRoleSales.Executive	1.0000000000	
## JobRoleSales.Representative	-0.1305859953	
## Age	-0.0020014187	
## DailyRate	-0.0005128889	
## DistanceFromHome	0.0307609872	
## Education	0.0533980715	
## EnvironmentSatisfaction	-0.0244213742	
## HourlyRate	-0.0118861963	
## JobInvolvement	-0.0114131300	
## JobLevel	0.1274899816	
## JobSatisfaction	0.0126037402	
## MonthlyIncome	0.0477916330	
## MonthlyRate	0.0118542759	
## NumCompaniesWorked	0.0059132619	
## PercentSalaryHike	-0.0466827464	
## PerformanceRating	-0.0414012061	
## RelationshipSatisfaction	-0.0048356740	
## StockOptionLevel	0.0157559614	
## TotalWorkingYears	-0.0122413576	
## TrainingTimesLastYear	0.0132410767	
## WorkLifeBalance	0.0320915249	
## YearsAtCompany	0.0426023162	
## YearsInCurrentRole	0.0923491523	
## YearsSinceLastPromotion	0.0492018190	
## YearsWithCurrManager	0.0830284142	
## Attrition	0.0197743685	
##	JobRoleSales.Representative	Age
## DepartmentHuman.Resources	-0.051763549	0.020522881
## DepartmentResearch...Development	-0.336127169	0.017882960
## DepartmentSales	0.370666523	-0.027548733
## EducationFieldHuman.Resources	-0.033461818	0.001695986
## EducationFieldLife.Sciences	-0.043207889	0.016823698
## EducationFieldMarketing	0.133065055	0.038161965
## EducationFieldMedical	-0.051990485	-0.006354488
## EducationFieldOther	-0.033774032	-0.041465681
## EducationFieldTechnical.Degree	0.057184511	-0.027604388
## MaritalStatusDivorced	-0.052889803	0.033120351
## MaritalStatusMarried	-0.023658624	0.083919210
## MaritalStatusSingle	0.072439209	-0.119185174

## JobRoleHealthcare.Representative	-0.076514928	0.098824685
## JobRoleHuman.Resources	-0.046845122	-0.029856364
## JobRoleLaboratory.Technician	-0.113130219	-0.143175521
## JobRoleManager	-0.066797138	0.294247754
## JobRoleManufacturing.Director	-0.080923914	0.049726342
## JobRoleResearch.Director	-0.058686527	0.185891088
## JobRoleResearch.Scientist	-0.121792234	-0.146517680
## JobRoleSales.Executive	-0.130585995	-0.002001419
## JobRoleSales.Representative	1.000000000	-0.175785309
## Age	-0.175785309	1.000000000
## DailyRate	0.005375384	0.010660943
## DistanceFromHome	-0.015994183	-0.001686120
## Education	-0.091465208	0.208033731
## EnvironmentSatisfaction	0.002948602	0.010146428
## HourlyRate	-0.018703398	0.024286543
## JobInvolvement	-0.027281700	0.029819959
## JobLevel	-0.216559364	0.509604228
## JobSatisfaction	0.001413056	-0.004891877
## MonthlyIncome	-0.201513535	0.497854567
## MonthlyRate	-0.001199807	0.028051167
## NumCompaniesWorked	-0.104494473	0.299634758
## PercentSalaryHike	0.031102210	0.003633585
## PerformanceRating	-0.006214413	0.001903896
## RelationshipSatisfaction	-0.024858834	0.053534720
## StockOptionLevel	-0.048067495	0.037509712
## TotalWorkingYears	-0.207726137	0.680380536
## TrainingTimesLastYear	0.040376633	-0.019620819
## WorkLifeBalance	0.045147625	-0.021490028
## YearsAtCompany	-0.163464375	0.311308770
## YearsInCurrentRole	-0.149750880	0.212901056
## YearsSinceLastPromotion	-0.085622332	0.216513368
## YearsWithCurrManager	-0.168743391	0.202088602
## Attrition	0.157234270	-0.159205007
##	DailyRate	DistanceFromHome
Education		
## DepartmentHuman.Resources	-2.672563e-02	-0.012901397
0.0114354254		
## DepartmentResearch...Development	1.487063e-02	-0.008117375
0.0186035998		
## DepartmentSales	-3.615683e-03	0.014084536
0.0142151465		
## EducationFieldHuman.Resources	-4.314402e-02	-0.002624327
0.0264788685		
## EducationFieldLife.Sciences	4.027930e-03	-0.024499294
0.0131844280		
## EducationFieldMarketing	-6.444912e-02	0.039294239
0.0724054345		
## EducationFieldMedical	3.420163e-02	0.013486377
0.0723347598		
## EducationFieldOther	-3.893392e-03	-0.007968536

0.0380431146		
## EducationFieldTechnical.Degree	3.086887e-02	-0.014801846 -
0.0267418736		
## MaritalStatusDivorced	3.708018e-02	-0.005440089 -
0.0024388573		
## MaritalStatusMarried	4.003470e-02	0.030232069 -
0.0018652925		
## MaritalStatusSingle	-7.583515e-02	-0.027445259
0.0041675427		
## JobRoleHealthcare.Representative	4.014080e-02	0.022915977
0.0242699705		
## JobRoleHuman.Resources	-2.115577e-02	-0.024089075 -
0.0052951467		
## JobRoleLaboratory.Technician	-6.727581e-03	0.012368886 -
0.0635660276		
## JobRoleManager	-1.322388e-02	-0.039189607
0.0284530475		
## JobRoleManufacturing.Director	-5.302012e-03	0.011847606 -
0.0052904671		
## JobRoleResearch.Director	-2.124095e-05	-0.022350600
0.0496940719		
## JobRoleResearch.Scientist	-2.624231e-03	-0.010985651
0.0007092034		
## JobRoleSales.Executive	-5.128889e-04	0.030760987
0.0533980715		
## JobRoleSales.Representative	5.375384e-03	-0.015994183 -
0.0914652080		
## Age	1.066094e-02	-0.001686120
0.2080337310		
## DailyRate	1.000000e+00	-0.004985337 -
0.0168064332		
## DistanceFromHome	-4.985337e-03	1.000000000
0.0210418256		
## Education	-1.680643e-02	0.021041826
1.0000000000		
## EnvironmentSatisfaction	1.835485e-02	-0.016075327 -
0.0271283133		
## HourlyRate	2.338142e-02	0.031130586
0.0167748289		
## JobInvolvement	4.613487e-02	0.008783280
0.0424376343		
## JobLevel	2.966335e-03	0.005302731
0.1015888862		
## JobSatisfaction	3.057101e-02	-0.003668839 -
0.0112961167		
## MonthlyIncome	7.707059e-03	-0.017014445
0.0949606770		
## MonthlyRate	-3.218160e-02	0.027472864 -
0.0260841972		
## NumCompaniesWorked	3.815343e-02	-0.029250804

0.1263165602		
## PercentSalaryHike	2.270368e-02	0.040235377 -
0.0111109409		
## PerformanceRating	4.732963e-04	0.027109618 -
0.0245387912		
## RelationshipSatisfaction	7.846031e-03	0.006557475 -
0.0091183767		
## StockOptionLevel	4.214280e-02	0.044871999
0.0184222202		
## TotalWorkingYears	1.451474e-02	0.004628426
0.1482796965		
## TrainingTimesLastYear	2.452543e-03	-0.036942234 -
0.0251002411		
## WorkLifeBalance	-3.784805e-02	-0.026556004
0.0098191893		
## YearsAtCompany	-3.405477e-02	0.009507720
0.0691136960		
## YearsInCurrentRole	9.932015e-03	0.018844999
0.0602355541		
## YearsSinceLastPromotion	-3.322898e-02	0.010028836
0.0542543336		
## YearsWithCurrManager	-2.636318e-02	0.014406048
0.0690653783		
## Attrition	-5.665199e-02	0.077923583 -
0.0313728196		
##	EnvironmentSatisfaction	HourlyRate
## DepartmentHuman.Resources	-0.0075967123	-0.016551039
## DepartmentResearch...Development	0.0279761266	0.018686496
## DepartmentSales	-0.0256060449	-0.012047229
## EducationFieldHuman.Resources	-0.0068978118	-0.033669623
## EducationFieldLife.Sciences	-0.0245256600	0.038759056
## EducationFieldMarketing	0.0004786134	0.004451815
## EducationFieldMedical	-0.0212986789	-0.020417967
## EducationFieldOther	0.0646015960	-0.042162974
## EducationFieldTechnical.Degree	0.0277134086	0.011283335
## MaritalStatusDivorced	0.0164386013	-0.006149862
## MaritalStatusMarried	-0.0221801729	0.036432322
## MaritalStatusSingle	0.0090354910	-0.033435958
## JobRoleHealthcare.Representative	0.0140901038	0.014598990
## JobRoleHuman.Resources	-0.0220140283	-0.016189351
## JobRoleLaboratory.Technician	-0.0015329215	0.018028428
## JobRoleManager	0.0107296473	0.012659370
## JobRoleManufacturing.Director	0.0591775598	-0.014393905
## JobRoleResearch.Director	-0.0486892181	-0.025128455
## JobRoleResearch.Scientist	0.0019403931	0.020033679
## JobRoleSales.Executive	-0.0244213742	-0.011886196
## JobRoleSales.Representative	0.0029486023	-0.018703398
## Age	0.0101464279	0.024286543
## DailyRate	0.0183548543	0.023381422
## DistanceFromHome	-0.0160753270	0.031130586

## Education	-0.0271283133	0.016774829	
## EnvironmentSatisfaction	1.0000000000	-0.049856956	
## HourlyRate	-0.0498569562	1.0000000000	
## JobInvolvement	-0.0082775982	0.042860641	
## JobLevel	0.0012116994	-0.027853486	
## JobSatisfaction	-0.0067843526	-0.071334624	
## MonthlyIncome	-0.0062590878	-0.015794304	
## MonthlyRate	0.0375996229	-0.015296750	
## NumCompaniesWorked	0.0125943232	0.022156883	
## PercentSalaryHike	-0.0317011952	-0.009061986	
## PerformanceRating	-0.0295479523	-0.002171697	
## RelationshipSatisfaction	0.0076653835	0.001330453	
## StockOptionLevel	0.0034321578	0.050263399	
## TotalWorkingYears	-0.0026930704	-0.002333682	
## TrainingTimesLastYear	-0.0193593083	-0.008547685	
## WorkLifeBalance	0.0276272955	-0.004607234	
## YearsAtCompany	0.0014575492	-0.019581616	
## YearsInCurrentRole	0.0180074601	-0.024106220	
## YearsSinceLastPromotion	0.0161936056	-0.026715586	
## YearsWithCurrManager	-0.0049987226	-0.020123200	
## Attrition	-0.1033689783	-0.006845550	
##	JobInvolvement	JobLevel	
JobSatisfaction			
## DepartmentHuman.Resources	0.004789372	-0.006157391	-
0.0240681448			
## DepartmentResearch...Development	0.023187111	-0.107829685	-
0.0027976358			
## DepartmentSales	-0.026106587	0.114306839	
0.0134986414			
## EducationFieldHuman.Resources	0.002078550	0.010408731	-
0.0214668101			
## EducationFieldLife.Sciences	0.003227533	-0.008431405	
0.0520041781			
## EducationFieldMarketing	-0.018657341	0.092698473	-
0.0235282394			
## EducationFieldMedical	0.017102530	-0.014114342	-
0.0226454604			
## EducationFieldOther	-0.011894660	-0.016724486	
0.0033799932			
## EducationFieldTechnical.Degree	-0.004519417	-0.054706603	-
0.0197949685			
## MaritalStatusDivorced	0.016814706	0.037087185	-
0.0151969688			
## MaritalStatusMarried	0.028324424	0.050547075	-
0.0103149392			
## MaritalStatusSingle	-0.045253287	-0.087071634	
0.0245713621			
## JobRoleHealthcare.Representative	0.001271884	0.115704419	
0.0163668290			
## JobRoleHuman.Resources	-0.004951807	-0.100922311	-

0.0296814700			
## JobRoleLaboratory.Technician	-0.022723562	-0.344608162	-
0.0157102331			
## JobRoleManager	0.017112423	0.552744116	-
0.0056196166			
## JobRoleManufacturing.Director	-0.021938571	0.114895864	-
0.0137466166			
## JobRoleResearch.Director	0.015199933	0.414318548	-
0.0062173082			
## JobRoleResearch.Scientist	0.047604471	-0.387788339	
0.0205030615			
## JobRoleSales.Executive	-0.011413130	0.127489982	
0.0126037402			
## JobRoleSales.Representative	-0.027281700	-0.216559364	
0.0014130556			
## Age	0.029819959	0.509604228	-
0.0048918771			
## DailyRate	0.046134874	0.002966335	
0.0305710078			
## DistanceFromHome	0.008783280	0.005302731	-
0.0036688392			
## Education	0.042437634	0.101588886	-
0.0112961167			
## EnvironmentSatisfaction	-0.008277598	0.001211699	-
0.0067843526			
## HourlyRate	0.042860641	-0.027853486	-
0.0713346244			
## JobInvolvement	1.000000000	-0.012629883	-
0.0214759103			
## JobLevel	-0.012629883	1.000000000	-
0.0019437080			
## JobSatisfaction	-0.021475910	-0.001943708	
1.0000000000			
## MonthlyIncome	-0.015271491	0.950299913	-
0.0071567424			
## MonthlyRate	-0.016322079	0.039562951	
0.0006439169			
## NumCompaniesWorked	0.015012413	0.142501124	-
0.0556994260			
## PercentSalaryHike	-0.017204572	-0.034730492	
0.0200020394			
## PerformanceRating	-0.029071333	-0.021222082	
0.0022971971			
## RelationshipSatisfaction	0.034296821	0.021641511	-
0.0124535932			
## StockOptionLevel	0.021522640	0.013983911	
0.0106902261			
## TotalWorkingYears	-0.005533182	0.782207805	-
0.0201850727			
## TrainingTimesLastYear	-0.015337826	-0.018190550	-

0.0057793350			
## WorkLifeBalance	-0.014616593	0.037817746	-
0.0194587102			
## YearsAtCompany	-0.021355427	0.534738687	-
0.0038026279			
## YearsInCurrentRole	0.008716963	0.389446733	-
0.0023047852			
## YearsSinceLastPromotion	-0.024184292	0.353885347	-
0.0182135678			
## YearsWithCurrManager	0.025975808	0.375280608	-
0.0276562139			
## Attrition	-0.130015957	-0.169104751	-
0.1034811261			
##	MonthlyIncome	MonthlyRate	
NumCompaniesWorked			
## DepartmentHuman.Resources	0.006815078	-0.0243895106	
0.020617601			
## DepartmentResearch...Development	-0.064720452	-0.0054529810	
0.022237374			
## DepartmentSales	0.063977520	0.0163882677	-
0.032096895			
## EducationFieldHuman.Resources	0.021455961	0.0095667520	
0.031007480			
## EducationFieldLife.Sciences	-0.007054333	0.0255446098	-
0.006130619			
## EducationFieldMarketing	0.062575601	-0.0115586312	-
0.018610834			
## EducationFieldMedical	0.001025323	-0.0017225692	
0.024826499			
## EducationFieldOther	-0.022278709	-0.0356055188	-
0.012869705			
## EducationFieldTechnical.Degree	-0.049695118	-0.0045352404	-
0.013818722			
## MaritalStatusDivorced	0.032203178	-0.0002268508	
0.040823996			
## MaritalStatusMarried	0.056767393	-0.0346887872	-
0.016142078			
## MaritalStatusSingle	-0.089361354	0.0372598616	-
0.019160847			
## JobRoleHealthcare.Representative	0.068176850	0.0038286158	
0.026955086			
## JobRoleHuman.Resources	-0.092249731	-0.0274703582	
0.020578071			
## JobRoleLaboratory.Technician	-0.320905799	-0.0160564964	-
0.021120992			
## JobRoleManager	0.619573112	0.0317168183	
0.042124574			
## JobRoleManufacturing.Director	0.055683925	0.0077112734	
0.009580497			
## JobRoleResearch.Director	0.485818435	0.0258754910	

0.097925218			
## JobRoleResearch.Scientist	-0.345180027	-0.0270083536	-
0.043981224			
## JobRoleSales.Executive	0.047791633	0.0118542759	
0.005913262			
## JobRoleSales.Representative	-0.201513535	-0.0011998071	-
0.104494473			
## Age	0.497854567	0.0280511671	
0.299634758			
## DailyRate	0.007707059	-0.0321816015	
0.038153434			
## DistanceFromHome	-0.017014445	0.0274728635	-
0.029250804			
## Education	0.094960677	-0.0260841972	
0.126316560			
## EnvironmentSatisfaction	-0.006259088	0.0375996229	
0.012594323			
## HourlyRate	-0.015794304	-0.0152967496	
0.022156883			
## JobInvolvement	-0.015271491	-0.0163220791	
0.015012413			
## JobLevel	0.950299913	0.0395629510	
0.142501124			
## JobSatisfaction	-0.007156742	0.0006439169	-
0.055699426			
## MonthlyIncome	1.000000000	0.0348136261	
0.149515216			
## MonthlyRate	0.034813626	1.0000000000	
0.017521353			
## NumCompaniesWorked	0.149515216	0.0175213534	
1.000000000			
## PercentSalaryHike	-0.027268586	-0.0064293459	-
0.010238309			
## PerformanceRating	-0.017120138	-0.0098114285	-
0.014094873			
## RelationshipSatisfaction	0.025873436	-0.0040853293	
0.052733049			
## StockOptionLevel	0.005407677	-0.0343228302	
0.030075475			
## TotalWorkingYears	0.772893246	0.0264424712	
0.237638590			
## TrainingTimesLastYear	-0.021736277	0.0014668806	-
0.066054072			
## WorkLifeBalance	0.030683082	0.0079631575	-
0.008365685			
## YearsAtCompany	0.514284826	-0.0236551067	-
0.118421340			
## YearsInCurrentRole	0.363817667	-0.0128148744	-
0.090753934			
## YearsSinceLastPromotion	0.344977638	0.0015667995	-

0.036813892		
## YearsWithCurrManager	0.344078883	-0.0367459053
0.110319155		
## Attrition	-0.159839582	0.0151702125
0.043493739		
##	PercentSalaryHike	PerformanceRating
## DepartmentHuman.Resources	-0.025888439	-0.0063852631
## DepartmentResearch...Development	0.030735414	0.0327204295
## DepartmentSales	-0.020403156	-0.0310496878
## EducationFieldHuman.Resources	-0.016141770	-0.0161666822
## EducationFieldLife.Sciences	0.010209488	0.0108530831
## EducationFieldMarketing	-0.027726122	-0.0209184441
## EducationFieldMedical	0.029116142	0.0148677058
## EducationFieldOther	0.019297312	0.0114489032
## EducationFieldTechnical.Degree	-0.042701294	-0.0217292808
## MaritalStatusDivorced	-0.023477646	-0.0103096766
## MaritalStatusMarried	0.020895441	0.0095846281
## MaritalStatusSingle	-0.001385890	-0.0010453705
## JobRoleHealthcare.Representative	0.020591134	-0.0009276345
## JobRoleHuman.Resources	-0.021032050	-0.0101541407
## JobRoleLaboratory.Technician	-0.020627667	0.0107963550
## JobRoleManager	-0.005393648	0.0320500989
## JobRoleManufacturing.Director	0.034682124	0.0297748611
## JobRoleResearch.Director	-0.017017230	-0.0357437633
## JobRoleResearch.Scientist	0.032537481	0.0194162175
## JobRoleSales.Executive	-0.046682746	-0.0414012061
## JobRoleSales.Representative	0.031102210	-0.0062144131
## Age	0.003633585	0.0019038955
## DailyRate	0.022703677	0.0004732963
## DistanceFromHome	0.040235377	0.0271096185
## Education	-0.011110941	-0.0245387912
## EnvironmentSatisfaction	-0.031701195	-0.0295479523
## HourlyRate	-0.009061986	-0.0021716974
## JobInvolvement	-0.017204572	-0.0290713334
## JobLevel	-0.034730492	-0.0212220821
## JobSatisfaction	0.020002039	0.0022971971
## MonthlyIncome	-0.027268586	-0.0171201382
## MonthlyRate	-0.006429346	-0.0098114285
## NumCompaniesWorked	-0.010238309	-0.0140948728
## PercentSalaryHike	1.000000000	0.7735499964
## PerformanceRating	0.773549996	1.0000000000
## RelationshipSatisfaction	-0.040490081	-0.0313514554
## StockOptionLevel	0.007527748	0.0035064716
## TotalWorkingYears	-0.020608488	0.0067436679
## TrainingTimesLastYear	-0.005221012	-0.0155788817
## WorkLifeBalance	-0.003279636	0.0025723613
## YearsAtCompany	-0.035991262	0.0034351261
## YearsInCurrentRole	-0.001520027	0.0349862604
## YearsSinceLastPromotion	-0.022154313	0.0178960661
## YearsWithCurrManager	-0.011985248	0.0228271689

## Attrition	-0.013478202	0.0028887517
## RelationshipSatisfaction		StockOptionLevel
## DepartmentHuman.Resources	0.0345828083	-0.003999559
## DepartmentResearch...Development	-0.0045868536	0.016926505
## DepartmentSales	-0.0104886343	-0.015755408
## EducationFieldHuman.Resources	0.0411047858	0.021205615
## EducationFieldLife.Sciences	-0.0199727266	-0.017992830
## EducationFieldMarketing	-0.0065797949	0.022560076
## EducationFieldMedical	0.0304941886	0.033749757
## EducationFieldOther	-0.0203052201	-0.042099753
## EducationFieldTechnical.Degree	-0.0110435560	-0.024560301
## MaritalStatusDivorced	0.0061985836	0.446284745
## MaritalStatusMarried	-0.0433822512	0.225574233
## MaritalStatusSingle	0.0408170260	-0.638956874
## JobRoleHealthcare.Representative	-0.0050899098	0.014021368
## JobRoleHuman.Resources	0.0441685137	-0.009864499
## JobRoleLaboratory.Technician	-0.0106909518	0.013386179
## JobRoleManager	0.0256376488	-0.015637365
## JobRoleManufacturing.Director	0.0036400458	0.007734594
## JobRoleResearch.Director	-0.0054923907	0.015806776
## JobRoleResearch.Scientist	-0.0031164012	-0.011634532
## JobRoleSales.Executive	-0.0048356740	0.015755961
## JobRoleSales.Representative	-0.0248588343	-0.048067495
## Age	0.0535347197	0.037509712
## DailyRate	0.0078460310	0.042142796
## DistanceFromHome	0.0065574746	0.044871999
## Education	-0.0091183767	0.018422220
## EnvironmentSatisfaction	0.0076653835	0.003432158
## HourlyRate	0.0013304528	0.050263399
## JobInvolvement	0.0342968206	0.021522640
## JobLevel	0.0216415105	0.013983911
## JobSatisfaction	-0.0124535932	0.010690226
## MonthlyIncome	0.0258734361	0.005407677
## MonthlyRate	-0.0040853293	-0.034322830
## NumCompaniesWorked	0.0527330486	0.030075475
## PercentSalaryHike	-0.0404900811	0.007527748
## PerformanceRating	-0.0313514554	0.003506472
## RelationshipSatisfaction	1.0000000000	-0.045952491
## StockOptionLevel	-0.0459524907	1.0000000000
## TotalWorkingYears	0.0240542918	0.010135969
## TrainingTimesLastYear	0.0024965264	0.011274070
## WorkLifeBalance	0.0196044057	0.004128730
## YearsAtCompany	0.0193667869	0.015058008
## YearsInCurrentRole	-0.0151229149	0.050817873
## YearsSinceLastPromotion	0.0334925021	0.014352185
## YearsWithCurrManager	-0.0008674968	0.024698227
## Attrition	-0.0458722789	-0.137144919
## TotalWorkingYears		TrainingTimesLastYear
## DepartmentHuman.Resources	0.007507576	-0.040021815
## DepartmentResearch...Development	0.011086883	-0.006818580

## DepartmentSales	-0.014781440	0.024688428
## EducationFieldHuman.Resources	0.005504510	-0.037664148
## EducationFieldLife.Sciences	-0.003630414	-0.039018068
## EducationFieldMarketing	0.025778567	-0.029046413
## EducationFieldMedical	0.024890058	0.070541828
## EducationFieldOther	-0.028934530	-0.008151216
## EducationFieldTechnical.Degree	-0.041576559	0.008289250
## MaritalStatusDivorced	0.036291221	0.008404760
## MaritalStatusMarried	0.053512130	-0.029602421
## MaritalStatusSingle	-0.089529354	0.024128838
## JobRoleHealthcare.Representative	0.112159383	-0.012432472
## JobRoleHuman.Resources	-0.076482406	-0.035901571
## JobRoleLaboratory.Technician	-0.215425543	0.053998428
## JobRoleManager	0.465836777	0.003052087
## JobRoleManufacturing.Director	0.064077109	-0.013986647
## JobRoleResearch.Director	0.312147716	-0.004526890
## JobRoleResearch.Scientist	-0.228118930	-0.052125572
## JobRoleSales.Executive	-0.012241358	0.013241077
## JobRoleSales.Representative	-0.207726137	0.040376633
## Age	0.680380536	-0.019620819
## DailyRate	0.014514739	0.002452543
## DistanceFromHome	0.004628426	-0.036942234
## Education	0.148279697	-0.025100241
## EnvironmentSatisfaction	-0.002693070	-0.019359308
## HourlyRate	-0.002333682	-0.008547685
## JobInvolvement	-0.005533182	-0.015337826
## JobLevel	0.782207805	-0.018190550
## JobSatisfaction	-0.020185073	-0.005779335
## MonthlyIncome	0.772893246	-0.021736277
## MonthlyRate	0.026442471	0.001466881
## NumCompaniesWorked	0.237638590	-0.066054072
## PercentSalaryHike	-0.020608488	-0.005221012
## PerformanceRating	0.006743668	-0.015578882
## RelationshipSatisfaction	0.024054292	0.002496526
## StockOptionLevel	0.010135969	0.011274070
## TotalWorkingYears	1.000000000	-0.035661571
## TrainingTimesLastYear	-0.035661571	1.000000000
## WorkLifeBalance	0.001007646	0.028072207
## YearsAtCompany	0.628133155	0.003568666
## YearsInCurrentRole	0.460364638	-0.005737504
## YearsSinceLastPromotion	0.404857759	-0.002066536
## YearsWithCurrManager	0.459188397	-0.004095526
## Attrition	-0.171063246	-0.059477799
##	WorkLifeBalance	YearsAtCompany
## DepartmentHuman.Resources	0.047762871	0.007944309
## DepartmentResearch...Development	-0.069921567	-0.032181306
## DepartmentSales	0.051320467	0.029804897
## EducationFieldHuman.Resources	-0.003967424	-0.005145616
## EducationFieldLife.Sciences	-0.039728025	-0.002018900
## EducationFieldMarketing	0.018500492	0.031364859

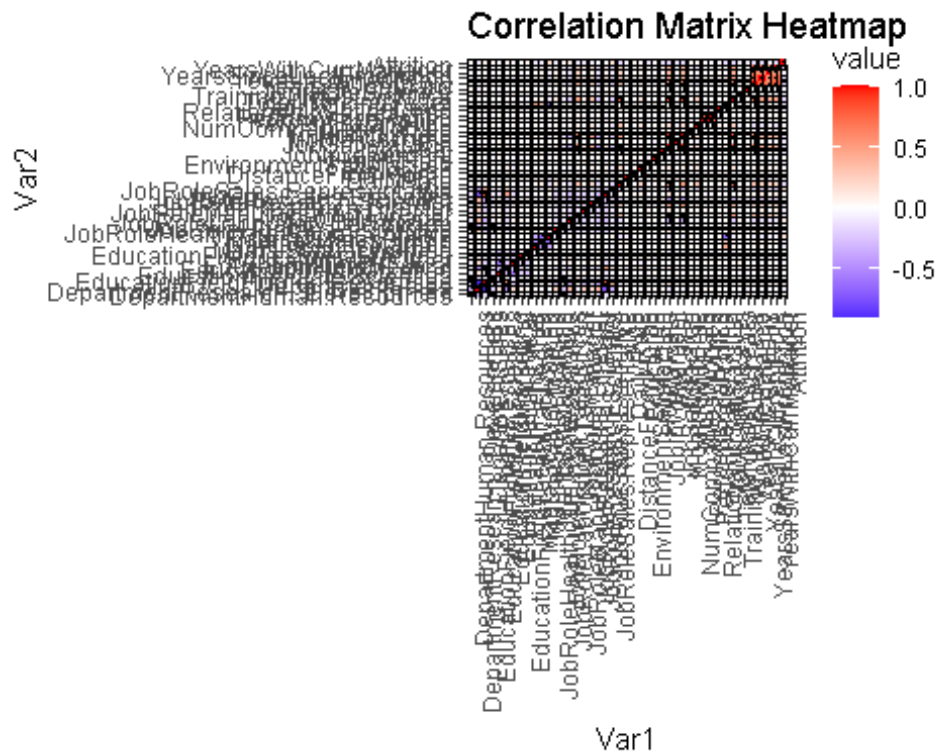
## EducationFieldMedical	0.001641074	0.010805171
## EducationFieldOther	0.031812267	-0.030331043
## EducationFieldTechnical.Degree	0.021962121	-0.021398984
## MaritalStatusDivorced	-0.009079977	0.025727695
## MaritalStatusMarried	-0.006387995	0.044924691
## MaritalStatusSingle	0.014921371	-0.070935377
## JobRoleHealthcare.Representative	-0.026101459	0.069757717
## JobRoleHuman.Resources	0.043886733	-0.052568655
## JobRoleLaboratory.Technician	-0.028208598	-0.150181068
## JobRoleManager	0.005136642	0.330965169
## JobRoleManufacturing.Director	0.002010769	0.031967710
## JobRoleResearch.Director	0.034402697	0.153918347
## JobRoleResearch.Scientist	-0.058612638	-0.154062102
## JobRoleSales.Executive	0.032091525	0.042602316
## JobRoleSales.Representative	0.045147625	-0.163464375
## Age	-0.021490028	0.311308770
## DailyRate	-0.037848051	-0.034054768
## DistanceFromHome	-0.026556004	0.009507720
## Education	0.009819189	0.069113696
## EnvironmentSatisfaction	0.027627295	0.001457549
## HourlyRate	-0.004607234	-0.019581616
## JobInvolvement	-0.014616593	-0.021355427
## JobLevel	0.037817746	0.534738687
## JobSatisfaction	-0.019458710	-0.003802628
## MonthlyIncome	0.030683082	0.514284826
## MonthlyRate	0.007963158	-0.023655107
## NumCompaniesWorked	-0.008365685	-0.118421340
## PercentSalaryHike	-0.003279636	-0.035991262
## PerformanceRating	0.002572361	0.003435126
## RelationshipSatisfaction	0.019604406	0.019366787
## StockOptionLevel	0.004128730	0.015058008
## TotalWorkingYears	0.001007646	0.628133155
## TrainingTimesLastYear	0.028072207	0.003568666
## WorkLifeBalance	1.000000000	0.012089185
## YearsAtCompany	0.012089185	1.000000000
## YearsInCurrentRole	0.049856498	0.758753737
## YearsSinceLastPromotion	0.008941249	0.618408865
## YearsWithCurrManager	0.002759440	0.769212425
## Attrition	-0.063939047	-0.134392214
##	YearsInCurrentRole	
YearsSinceLastPromotion		
## DepartmentHuman.Resources	-0.040286920	-
0.026930679		
## DepartmentResearch...Development	-0.028151286	-
0.021497201		
## DepartmentSales	0.046882683	
0.034112138		
## EducationFieldHuman.Resources	-0.025443438	-
0.023699806		
## EducationFieldLife.Sciences	0.018343208	-

0.002479523		
## EducationFieldMarketing	0.025126006	
0.006219280		
## EducationFieldMedical	-0.026418128	
0.022664541		
## EducationFieldOther	-0.017021439	-
0.039931117		
## EducationFieldTechnical.Degree	0.009682988	
0.003853133		
## MaritalStatusDivorced	0.018531783	-
0.005278738		
## MaritalStatusMarried	0.065487762	
0.054102473		
## MaritalStatusSingle	-0.086485602	-
0.053089577		
## JobRoleHealthcare.Representative	0.054695026	
0.075902411		
## JobRoleHuman.Resources	-0.057875721	-
0.054603246		
## JobRoleLaboratory.Technician	-0.131321689	-
0.110099160		
## JobRoleManager	0.167498557	
0.224254871		
## JobRoleManufacturing.Director	0.067876997	-
0.007241257		
## JobRoleResearch.Director	0.136332176	
0.074454513		
## JobRoleResearch.Scientist	-0.131314313	-
0.105237384		
## JobRoleSales.Executive	0.092349152	
0.049201819		
## JobRoleSales.Representative	-0.149750880	-
0.085622332		
## Age	0.212901056	
0.216513368		
## DailyRate	0.009932015	-
0.033228985		
## DistanceFromHome	0.018844999	
0.010028836		
## Education	0.060235554	
0.054254334		
## EnvironmentSatisfaction	0.018007460	
0.016193606		
## HourlyRate	-0.024106220	-
0.026715586		
## JobInvolvement	0.008716963	-
0.024184292		
## JobLevel	0.389446733	
0.353885347		
## JobSatisfaction	-0.002304785	-

0.018213568		
## MonthlyIncome	0.363817667	
0.344977638		
## MonthlyRate	-0.012814874	
0.001566800		
## NumCompaniesWorked	-0.090753934	-
0.036813892		
## PercentSalaryHike	-0.001520027	-
0.022154313		
## PerformanceRating	0.034986260	
0.017896066		
## RelationshipSatisfaction	-0.015122915	
0.033492502		
## StockOptionLevel	0.050817873	
0.014352185		
## TotalWorkingYears	0.460364638	
0.404857759		
## TrainingTimesLastYear	-0.005737504	-
0.002066536		
## WorkLifeBalance	0.049856498	
0.008941249		
## YearsAtCompany	0.758753737	
0.618408865		
## YearsInCurrentRole	1.000000000	
0.548056248		
## YearsSinceLastPromotion	0.548056248	
1.000000000		
## YearsWithCurrManager	0.714364762	
0.510223636		
## Attrition	-0.160545004	-
0.033018775		
##	YearsWithCurrManager	Attrition
## DepartmentHuman.Resources	-0.0270791337	0.0168320096
## DepartmentResearch...Development	-0.0149627463	-0.0852929276
## DepartmentSales	0.0274149587	0.0808552021
## EducationFieldHuman.Resources	-0.0288676187	0.0364661968
## EducationFieldLife.Sciences	0.0036356834	-0.0327031477
## EducationFieldMarketing	0.0334183135	0.0557806657
## EducationFieldMedical	-0.0115437939	-0.0469987159
## EducationFieldOther	-0.0117143725	-0.0178975168
## EducationFieldTechnical.Degree	-0.0008359179	0.0693545948
## MaritalStatusDivorced	0.0140950653	-0.0877163459
## MaritalStatusMarried	0.0329719283	-0.0909836512
## MaritalStatusSingle	-0.0477928854	0.1754185536
## JobRoleHealthcare.Representative	0.0394071436	-0.0786960496
## JobRoleHuman.Resources	-0.0510055504	0.0362150821
## JobRoleLaboratory.Technician	-0.1070719838	0.0982904855
## JobRoleManager	0.1646950822	-0.0833163842
## JobRoleManufacturing.Director	0.0762069928	-0.0829939241
## JobRoleResearch.Director	0.1312789228	-0.0888698417

## JobRoleResearch.Scientist	-0.1276081160	-0.0003595713
## JobRoleSales.Executive	0.0830284142	0.0197743685
## JobRoleSales.Representative	-0.1687433909	0.1572342701
## Age	0.2020886024	-0.1592050069
## DailyRate	-0.0263631782	-0.0566519919
## DistanceFromHome	0.0144060484	0.0779235830
## Education	0.0690653783	-0.0313728196
## EnvironmentSatisfaction	-0.0049987226	-0.1033689783
## HourlyRate	-0.0201232002	-0.0068455496
## JobInvolvement	0.0259758079	-0.1300159568
## JobLevel	0.3752806078	-0.1691047509
## JobSatisfaction	-0.0276562139	-0.1034811261
## MonthlyIncome	0.3440788833	-0.1598395824
## MonthlyRate	-0.0367459053	0.0151702125
## NumCompaniesWorked	-0.1103191554	0.0434937391
## PercentSalaryHike	-0.0119852485	-0.0134782021
## PerformanceRating	0.0228271689	0.0028887517
## RelationshipSatisfaction	-0.0008674968	-0.0458722789
## StockOptionLevel	0.0246982266	-0.1371449189
## TotalWorkingYears	0.4591883971	-0.1710632461
## TrainingTimesLastYear	-0.0040955260	-0.0594777986
## WorkLifeBalance	0.0027594402	-0.0639390472
## YearsAtCompany	0.7692124251	-0.1343922140
## YearsInCurrentRole	0.7143647616	-0.1605450043
## YearsSinceLastPromotion	0.5102236358	-0.0330187751
## YearsWithCurrManager	1.0000000000	-0.1561993159
## Attrition	-0.1561993159	1.0000000000

```
ggplot(data = melt(correlation_matrix), aes(x = Var1, y = Var2, fill = value,
label = round(value, ))) +
  geom_tile() +
  geom_text(color = "black", size = 2) +
  scale_fill_gradient2(low = "blue", mid = "white", high = "red", midpoint =
0) +
  theme(axis.text.x = element_text(angle = 90, hjust = 1)) +
  labs(title = "Correlation Matrix Heatmap")
```

Calculating the average age

```
avg.age <- data %>% select(Gender, Age) %>% group_by(Gender) %>%
  summarize(avg=mean(Age))
```

```
avg.age
```

```
## # A tibble: 2 × 2
##   Gender avg
##   <fct> <dbl>
## 1 1      36.7
## 2 2      37.3
```

Plotting the density distribution graph for age based on genders

```
library(cowplot)
```

```
## Warning: package 'cowplot' was built under R version 4.3.2
```

```
library(dplyr)
```

```
library(ggplot2)
```

```
options(repr.plot.width=8, repr.plot.height=6)
```

```
dat_text <- data.frame(
  label = c("Mean = 37.33 \n Years Old", "Mean = 36.65 \n Years Old"),
  Gender = c("Female", "Male")
)
```

```

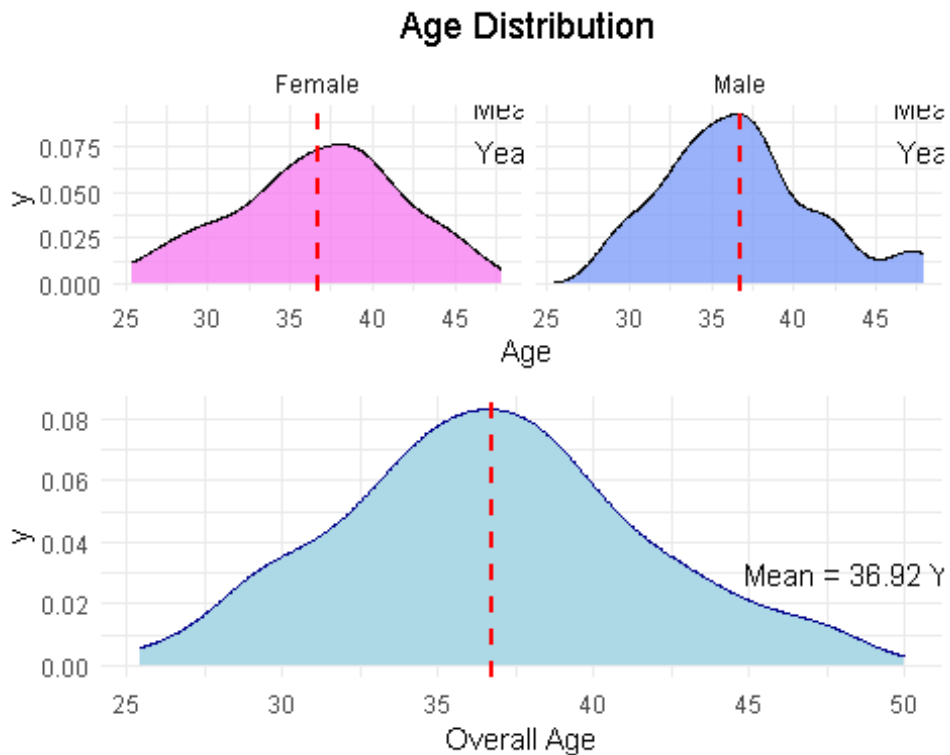
# Example data
set.seed(123)
data <- data.frame(
  Gender = sample(c("Male", "Female"), 100, replace = TRUE),
  Age = rnorm(100, mean = 37, sd = 5)
)

gender.dist <- data %>%
  select(Gender, Age) %>%
  filter(Gender == 'Male' | Gender == "Female") %>%
  filter(!is.na(Age)) %>%
  group_by(Gender) %>%
  ggplot(aes(x=Age)) +
  geom_density(aes(fill=Gender), alpha=0.8, show.legend=FALSE) +
  facet_wrap(~Gender) +
  theme_minimal() +
  geom_vline(aes(xintercept=mean(Age)),
             color="red", linetype="dashed", linewidth=1) +
  labs(title="Age Distribution") +
  theme(plot.title=element_text(hjust=0.5)) +
  scale_fill_manual(values=c("#F781F3", "#819FF7")) +
  geom_text(
    data = dat_text,
    mapping = aes(x = 45, y = 0.03, label = label),
    hjust = -0.1,
    vjust = -1
  )
)

overall.dist <- data %>%
  select(Gender, Age) %>%
  filter(!is.na(Age)) %>%
  ggplot(data=data, mapping=aes(x=Age)) +
  geom_density(color="darkblue", fill="lightblue") +
  geom_vline(aes(xintercept=mean(Age)),
             color="red", linetype="dashed", linewidth=1) +
  theme_minimal() +
  labs(x="Overall Age") +
  annotate("text", label = "Mean = 36.92 Years Old", x = 50, y = 0.03, color
= "black")

plot_grid(gender.dist, overall.dist, nrow=2)

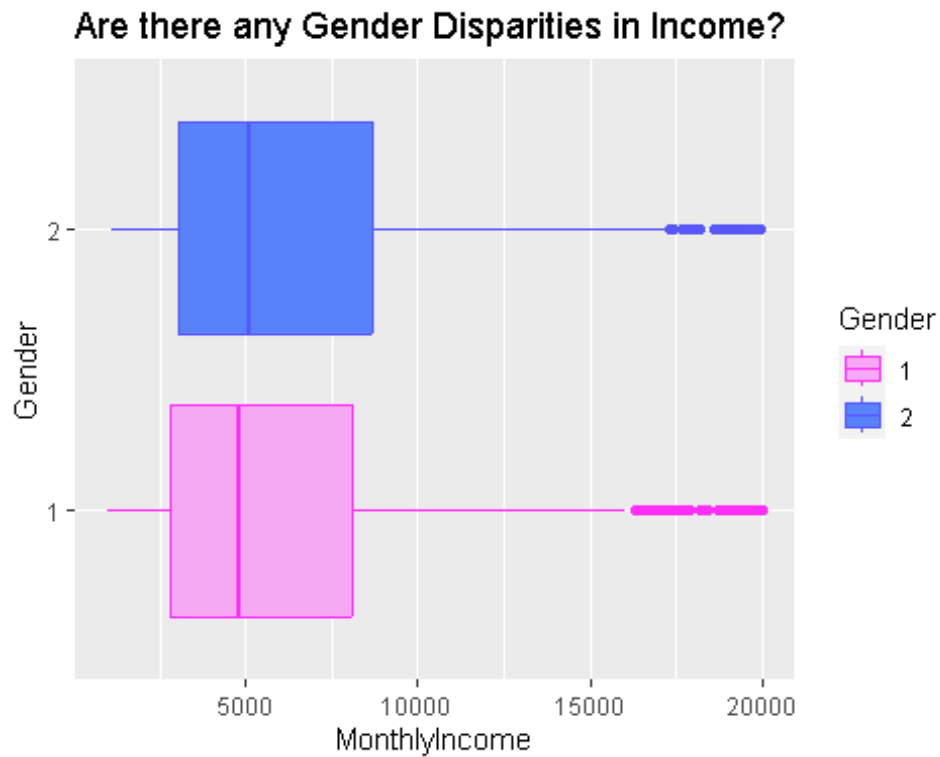
```



- The companies overall age groups almost follows the bell-curve stating that the company has well diversified employees in terms of age groups
- The age of women who's age is more than the average age of women are more in number
- The age of men who's age is lesser than the average age of men are more in number

Gender and income relation

```
library(ggplot2)
p <- ggplot(df, aes(x=Gender, y= MonthlyIncome, color=Gender, fill=Gender)) +
  geom_boxplot() +
  scale_fill_manual(values=c("#F5A9F2", "#5882FA")) +
  scale_color_manual(values=c("#FE2EF7", "#5858FA")) +
  coord_flip() + labs(title="Are there any Gender Disparities in Income?")
p
```



from the above

graph we can see that there is a slight disparity in the income

Attrition in research and development department

```
library(dplyr)
r.d <- df %>% select(Department, WorkLifeBalance, Attrition) %>%
  filter(Department == "Research & Development" & WorkLifeBalance == 1 |
  WorkLifeBalance == 2) %>%
  group_by(Attrition) %>% summarize(count=n())
r.d
```

```
## # A tibble: 2 × 2
##   Attrition count
##   <fct>      <int>
## 1 No         327
## 2 Yes         77
```