ba

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10 11 2020

```
d <- read_excel("covid_study_v2.xlsx")
d$AGE[d$AGE < 18] <- NA
d$female = d$GENDER == "F"
d$male = d$GENDER == "M"
d <- select(d, -c("GENDER"))
d$Lymphocytes = as.numeric(d$Lymphocytes)</pre>
```

Warning: NAs durch Umwandlung erzeugt

summary(d)

```
##
                           WBC
         AGE
                                          Platelets
                                                          Neutrophils
##
            :18.00
                     Min.
                             : 1.100
                                                : 20.0
                                                               : 0.5
    Min.
                                        Min.
                                                         Min.
##
    1st Qu.:49.00
                     1st Qu.: 5.100
                                        1st Qu.:163.0
                                                         1st Qu.: 3.5
    Median :64.00
                     Median: 7.100
                                        Median :205.0
                                                         Median: 5.1
##
    Mean
            :61.78
                     Mean
                             : 8.553
                                        Mean
                                                :226.5
                                                         Mean
                                                                 : 6.2
##
    3rd Qu.:76.00
                     3rd Qu.:10.700
                                        3rd Qu.:271.0
                                                         3rd Qu.: 7.5
            :98.00
##
    Max.
                     Max.
                             :29.200
                                        Max.
                                                :620.0
                                                         Max.
                                                                 :26.4
            :2
                     NA's
                             :2
                                                :2
                                                         NA's
                                                                 :70
##
    NA's
                                        NA's
##
     Lymphocytes
                       Monocytes
                                         Eosinophils
                                                              Basophils
##
    Min.
            :0.200
                     Min.
                             :0.0000
                                        Min.
                                                :0.00000
                                                           Min.
                                                                   :0.00000
##
    1st Qu.:0.700
                      1st Qu.:0.4000
                                        1st Qu.:0.00000
                                                            1st Qu.:0.00000
##
    Median :1.000
                     Median :0.5000
                                        Median :0.00000
                                                            Median :0.00000
##
    Mean
            :1.187
                             :0.6057
                                                :0.05502
                     Mean
                                        Mean
                                                            Mean
                                                                   :0.01442
##
    3rd Qu.:1.400
                     3rd Qu.:0.7000
                                        3rd Qu.:0.10000
                                                            3rd Qu.:0.00000
            :7.200
                             :3.2000
                                                                    :0.30000
##
    Max.
                     Max.
                                        Max.
                                                :1.30000
                                                            Max.
##
    NA's
            :71
                     NA's
                             :70
                                        NA's
                                                :70
                                                            NA's
                                                                   :71
         CRP
##
                            AST
                                             ALT
                                                                ALP
##
           : 0.10
                      Min.
                              : 11.0
                                                  9.00
                                                                  : 34.00
    Min.
                                        Min.
                                                :
                                                          Min.
    1st Qu.: 21.40
                      1st Qu.: 27.0
                                        1st Qu.: 21.00
                                                           1st Qu.: 57.50
    Median: 54.20
                      Median: 36.0
                                        Median : 31.00
                                                          Median: 71.00
##
##
    Mean
           : 90.89
                      Mean
                              : 54.2
                                        Mean
                                                : 44.92
                                                          Mean
                                                                  : 89.89
    3rd Qu.:129.10
##
                      3rd Qu.: 60.0
                                        3rd Qu.: 46.00
                                                          3rd Qu.: 90.00
    Max.
            :478.00
                      Max.
                              :550.0
                                        Max.
                                                :335.00
                                                          Max.
                                                                  :838.00
##
    NA's
            :6
                              :2
                                        NA's
                                                          NA's
                                                                  :148
                      NA's
                                                :13
         GGT
                            LDH
                                              SWAB
##
                                                              female
##
            : 10.00
                                 98.0
                                                 :0.0000
                                                            Mode :logical
    Min.
                      Min.
                                         Min.
    1st Qu.: 23.75
                      1st Qu.: 243.2
                                         1st Qu.:0.0000
                                                            FALSE: 188
    Median : 41.00
##
                      Median: 328.0
                                         Median :1.0000
                                                            TRUE :91
##
    Mean
           : 82.48
                      Mean
                              : 380.4
                                         Mean
                                                 :0.6344
##
    3rd Qu.: 83.00
                      3rd Qu.: 454.5
                                         3rd Qu.:1.0000
##
    Max.
            :839.00
                      Max.
                              :1195.0
                                         Max.
                                                 :1.0000
    NA's
                      NA's
##
            :143
                              :85
```

```
##
    FALSE:91
    TRUE :188
##
##
##
##
##
   <- mice(d, m=5, maxit=20, seed=500)
##
##
    iter imp variable
##
     1
          1
             AGE
                   WBC
                        Platelets
                                     Neutrophils
                                                   Lymphocytes
                                                                  Monocytes
                                                                               Eosinophils
                                                                                             Basophils
                                                                                                         CRP
                                                                                                               AST
          2
                                                                                                         CRP
                                                                                                               AST
##
             AGE
                   WBC
                                     Neutrophils
                                                                               Eosinophils
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                        Platelets
                                                   Lymphocytes
                                                                  Monocytes
##
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                                     Neutrophils
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                                                                  Monocytes
                                                                               Eosinophils
                                                                                             Basophils
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##
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##
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##
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##
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##
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```

##

##

male

Mode :logical

```
##
     9
          3
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                          Platelets
                                      Neutrophils
                                                     Lymphocytes
                                                                    Monocytes
                                                                                Eosinophils
                                                                                               Basophils
                                                                                                           CRP
                                                                                                                 AST
##
     17
           1
              AGE
                    WBC
                          Platelets
                                      Neutrophils
                                                     Lymphocytes
                                                                    Monocytes
                                                                                Eosinophils
                                                                                               Basophils
                                                                                                           CRP
                                                                                                                 AST
##
           2
              AGE
                          Platelets
                                      Neutrophils
                                                     Lymphocytes
                                                                    Monocytes
                                                                                Eosinophils
                                                                                               Basophils
                                                                                                           CRP
                                                                                                                 AST
     17
                    WBC
##
                          Platelets
                                      Neutrophils
                                                     Lymphocytes
                                                                                Eosinophils
                                                                                               Basophils
                                                                                                           CRP
                                                                                                                 AST
     17
           3
              AGE
                    WBC
                                                                    Monocytes
##
     17
           4
              AGE
                    WBC
                          Platelets
                                      Neutrophils
                                                     Lymphocytes
                                                                    Monocytes
                                                                                Eosinophils
                                                                                               Basophils
                                                                                                           CRP
                                                                                                                 AST
                          Platelets
                                      Neutrophils
                                                     Lymphocytes
                                                                    Monocytes
                                                                                Eosinophils
                                                                                               Basophils
                                                                                                           CRP
                                                                                                                 AST
##
     17
           5
              AGE
                    WBC
##
                          Platelets
                                      Neutrophils
                                                     Lymphocytes
                                                                                Eosinophils
                                                                                               Basophils
                                                                                                           CRP
                                                                                                                 AST
     18
           1
              AGE
                    WBC
                                                                    Monocytes
##
           2
                          Platelets
                                      Neutrophils
                                                     Lymphocytes
                                                                                Eosinophils
                                                                                               Basophils
                                                                                                           CRP
                                                                                                                 AST
     18
              AGE
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                                                                    Monocytes
                                                     Lymphocytes
##
              AGE
                                      Neutrophils
                                                                                               Basophils
                                                                                                           CRP
                                                                                                                 AST
     18
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                    WBC
                          Platelets
                                                                    Monocytes
                                                                                Eosinophils
                                      Neutrophils
                                                     Lymphocytes
                                                                                               Basophils
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##
     18
           4
              AGE
                    WBC
                          Platelets
                                                                    Monocytes
                                                                                Eosinophils
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##
                          Platelets
                                      Neutrophils
                                                     Lymphocytes
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              AGE
                    WBC
##
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              AGE
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                          Platelets
                                      Neutrophils
                                                     Lymphocytes
                                                                    Monocytes
                                                                                Eosinophils
                                                                                               Basophils
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##
                                      Neutrophils
                                                                                               Basophils
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     19
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              AGE
                    WBC
                          Platelets
                                                     Lymphocytes
                                                                    Monocytes
                                                                                Eosinophils
##
     19
           3
              AGE
                    WBC
                          Platelets
                                      Neutrophils
                                                     Lymphocytes
                                                                    Monocytes
                                                                                Eosinophils
                                                                                               Basophils
                                                                                                           CRP
                                                                                                                 AST
                                                                                                           CRP
                                                                                                                 AST
##
     19
           4
              AGE
                    WBC
                          Platelets
                                      Neutrophils
                                                     Lymphocytes
                                                                    Monocytes
                                                                                Eosinophils
                                                                                               Basophils
##
     19
           5
              AGE
                    WBC
                          Platelets
                                      Neutrophils
                                                     Lymphocytes
                                                                    Monocytes
                                                                                Eosinophils
                                                                                               Basophils
                                                                                                           CRP
                                                                                                                 AST
                                                     Lymphocytes
##
     20
              AGE
                    WBC
                          Platelets
                                      Neutrophils
                                                                    Monocytes
                                                                                Eosinophils
                                                                                               Basophils
                                                                                                           CRP
                                                                                                                 AST
```

```
20
          2 AGE WBC Platelets Neutrophils Lymphocytes Monocytes
##
                                                                          Eosinophils
                                                                                       Basophils
##
     20
          3
             AGE
                 WBC
                       Platelets Neutrophils Lymphocytes Monocytes
                                                                          Eosinophils
                                                                                       Basophils
     20
                       Platelets Neutrophils
                                                Lymphocytes
                                                              Monocytes
                                                                          Eosinophils
                                                                                       Basophils
##
          4 AGE
                  WBC
##
     20
          5 AGE
                  WBC
                      Platelets Neutrophils Lymphocytes Monocytes Eosinophils
                                                                                       Basophils
## Warning: Number of logged events: 1
summary(dm)
## Class: mids
## Number of multiple imputations: 5
## Imputation methods:
##
           AGE
                       WBC
                              Platelets Neutrophils Lymphocytes
                                                                   Monocytes
##
         "mmq"
                      "pmm"
                                  "pmm"
                                               "pmm"
                                                           "pmm"
                                                                        "pmm"
## Eosinophils
                 Basophils
                                    CRP
                                                                          ALP
                                                 AST
                                                             ALT
##
         "pmm"
                      "pmm"
                                  "pmm"
                                               "mmm"
                                                           "pmm"
                                                                        "mmq"
           GGT
                                   SWAB
##
                       LDH
                                                            male
                                              female
         "mmq"
                                     11 11
##
                      "mmg"
## PredictorMatrix:
##
               AGE WBC Platelets Neutrophils Lymphocytes Monocytes Eosinophils
## AGE
                                1
                                            1
## WBC
                 1
                     0
                                1
                                            1
                                                         1
                                                                    1
                                                                                1
## Platelets
                                0
                                            1
                                                         1
                                                                    1
                 1
                     1
                                                                                1
## Neutrophils
                                1
                                            0
                                                         1
                                                                    1
                                                                                1
                     1
## Lymphocytes
                                             1
                                                         0
                                                                                1
## Monocytes
                                                                    0
                 1
                     1
                                1
                                             1
                                                         1
                                                                                1
##
               Basophils CRP AST ALT ALP GGT LDH SWAB female male
## AGE
                                1
                                    1
                                        1
                                            1
                                                 1
                                                      1
                        1
                            1
## WBC
                                    1
                                            1
                                                      1
                                                                  0
                            1
## Platelets
                        1
                            1
                                1
                                    1
                                        1
                                            1
                                                 1
                                                             1
                                                                  0
                                                      1
## Neutrophils
                        1
                            1
                                    1
                                            1
                                                      1
                                                                  0
                                                                  0
## Lymphocytes
                        1
                            1
                                1
                                    1
                                        1
                                            1
                                                1
                                                      1
                                                             1
## Monocytes
                                            1
                                                      1
                                                                  0
                        1
                            1
## Number of logged events: 1
     it im dep
                    meth out
## 1 0 0
               collinear male
densityplot(dm)
```

CRP

CRP

CRP

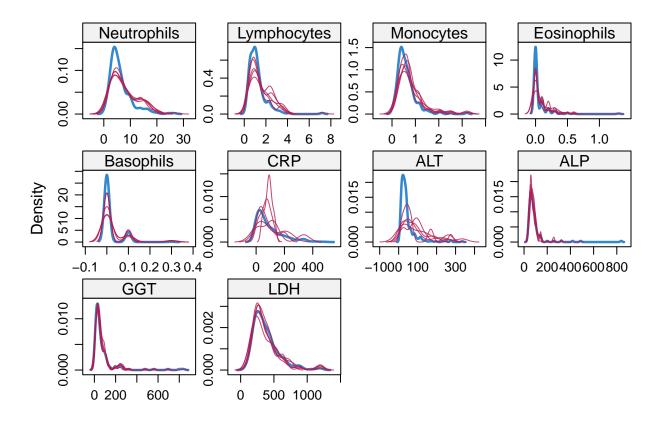
CRP

AST

AST

AST

AST



dc <- complete(dm, 1) summary(dc)</pre>

##	AGE	WBC	Platelets	Neutrophils
##	Min. :18.00			Min. : 0.500
##	1st Qu.:49.00			1st Qu.: 3.550
##	Median :64.00	Median: 7.10	·	Median : 5.300
##	Mean :61.86	Mean : 8.53	Mean :225.9	Mean : 6.571
##	3rd Qu.:76.00	3rd Qu.:10.70	3rd Qu.:271.0	3rd Qu.: 8.200
##	Max. :98.00	Max. :29.20	Max. :620.0	Max. :26.400
##	Lymphocytes	Monocytes	Eosinophils	Basophils
##	Min. :0.200	Min. :0.0000	Min. :0.00000	Min. :0.00000
##	1st Qu.:0.700	1st Qu.:0.4000	1st Qu.:0.00000	1st Qu.:0.00000
##	Median :1.000	Median :0.6000	Median :0.00000	Median :0.00000
##	Mean :1.234	Mean :0.6595	Mean :0.05663	Mean :0.01864
##	3rd Qu.:1.500	3rd Qu.:0.8000	3rd Qu.:0.10000	3rd Qu.:0.00000
##	Max. :7.200	Max. :3.2000	Max. :1.30000	Max. :0.30000
##	CRP	AST	ALT	ALP
##	Min. : 0.10	Min. : 11.00	Min. : 9.0	Min. : 34.00
##	1st Qu.: 21.55	1st Qu.: 27.00	1st Qu.: 22.0	1st Qu.: 59.00
##	Median : 53.80	Median : 36.00	Median: 33.0	Median : 72.00
##	Mean : 90.93	Mean : 54.01	Mean : 47.6	Mean : 85.48
##	3rd Qu.:129.35	3rd Qu.: 60.00	3rd Qu.: 47.0	3rd Qu.: 89.00
##	Max. :478.00	Max. :550.00	Max. :335.0	Max. :838.00
##	GGT	LDH	SWAB	female
##	Min. : 10.00	Min. : 98.0	Min. :0.0000	Mode :logical

```
## 1st Qu.: 25.00
                  1st Qu.: 235.0 1st Qu.:0.0000
                                                FALSE:188
## Median : 45.00
                  Median: 321.0 Median:1.0000
                                                TRUE :91
## Mean : 73.05
                  Mean : 382.8 Mean :0.6344
## 3rd Qu.: 82.00
                  3rd Qu.: 459.0 3rd Qu.:1.0000
## Max. :839.00
                  Max. :1195.0 Max. :1.0000
##
      male
## Mode :logical
## FALSE:91
## TRUE :188
##
##
##
```