Summary statistics - use-wear archaeology

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# Goal of the script

This script computes standard descriptive statistics for each group.  
The groups are based on:

* Tool type
* Raw material
* Spots (replicas)
* Use-wear type

It computes the following statistics:

* n (sample size = length): number of measurements
* smallest value (min)
* largest value (max)
* mean
* median
* standard deviation (sd)

dir\_in <- "analysis/derived\_data/"  
dir\_out <- "analysis/summary\_stats/"

Raw data must be located in ~/analysis/derived\_data/.  
Formatted data will be saved in ~/analysis/summary\_stats/. The knit directory for this script is the project directory. —

# Load packages

library(openxlsx)

Warning: package 'openxlsx' was built under R version 4.0.3

library(R.utils)  
library(tools)  
library(doBy)

Warning: package 'doBy' was built under R version 4.0.3

# Get names, path and information of all files

data\_file <- list.files(dir\_in, pattern = "\\.Rbin$", full.names = TRUE)  
md5\_in <- md5sum(data\_file)  
info\_in <- data.frame(file = basename(names(md5\_in)), checksum = md5\_in,   
 row.names = NULL)

The checksum (MD5 hashes) of the imported files are:

file checksum  
1 Use-wear.Rbin 558d5b8d978e0d27f0cf6d308b0734de

# Load data into R object

imp\_data <- loadObject(data\_file)  
str(imp\_data)

'data.frame': 150 obs. of 57 variables:  
 $ Sample : chr "MU-232" "MU-232" "MU-232" "MU-003" ...  
 $ Site : Factor w/ 3 levels "Balve","Buhlen",..: 1 1 1 1 1 1 1 1 1 1 ...  
 $ Tool.type : Factor w/ 4 levels "Keilmesser","Pradnik scraper",..: 1 1 1 1 1 1 1 1 1 4 ...  
 $ Raw.material : Factor w/ 2 levels "flint","lydite": 2 2 2 2 2 2 2 2 2 2 ...  
 $ Location : chr "B" "B" "B" "D" ...  
 $ Sublocation : chr "2" "2" "2" "1" ...  
 $ Area : chr "01" "01" "01" "01" ...  
 $ Spot : chr "a" "b" "c" "a" ...  
 $ Usewear.type : Factor w/ 11 levels "A","B","B2","C",..: 9 9 9 2 2 2 4 4 4 3 ...  
 $ Objective : Factor w/ 3 levels "20x07","50x075",..: 1 1 1 3 3 3 2 2 2 3 ...  
 $ Analysis.date : Date, format: "2020-09-07" "2020-09-07" ...  
 $ Analysis.time : 'times' num 0.631 0.631 0.631 0.631 0.632 ...  
 ..- attr(\*, "format")= chr "h:m:s"  
 $ Acquisition.date.time : chr "07.07.2020 16:58" "07.08.2020 10:35" "07.08.2020 12:10" "07.03.2020 10:44" ...  
 $ Axis.length.X : num 255 255 255 255 255 ...  
 $ Axis.size.X : num 1198 1198 1198 1198 1198 ...  
 $ Axis.spacing.X : num 0.213 0.213 0.213 0.213 0.213 ...  
 $ Axis.length.Y : num 255 255 255 255 255 ...  
 $ Axis.size.Y : num 1198 1198 1198 1198 1198 ...  
 $ Axis.spacing.Y : num 0.213 0.213 0.213 0.213 0.213 ...  
 $ Axis.length.Z : num 249564 99661 162726 38576 39610 ...  
 $ Axis.size.Z : num 65505 35461 32419 65340 66654 ...  
 $ Axis.spacing.Z : num 3.81 2.81 5.019 0.59 0.594 ...  
 $ NM.points.ratio.Z : num 0 0 0 0 0 0 0 0 0 0 ...  
 $ Sq : num 3243 2493 4332 1912 1936 ...  
 $ Ssk : num 0.0634 -0.9445 0.1816 -0.058 -0.2928 ...  
 $ Sku : num 3.46 7.36 3.08 3.75 3.47 ...  
 $ Sp : num 10477 7460 12748 6231 5796 ...  
 $ Sv : num 10005 12962 16115 6843 6575 ...  
 $ Sz : num 20482 20422 28864 13075 12371 ...  
 $ Sa : num 2506 1813 3409 1464 1495 ...  
 $ Smr : num 0.551 0.697 0.388 0.784 0.586 ...  
 $ Smc : num 3754 2956 5778 2454 2429 ...  
 $ Sxp : num 6582 4878 7854 3949 4400 ...  
 $ Sal : num 25.9 20.5 23.4 24.4 24.9 ...  
 $ Str : num 0.321 0.215 0.241 0.784 0.767 ...  
 $ Std : num 42.5 93 51 103.7 106.7 ...  
 $ Sdq : num 0.603 0.376 0.557 0.301 0.298 ...  
 $ Sdr : num 9.99 5.11 10.54 4.13 4.09 ...  
 $ Vm : num 0.2094 0.1157 0.2311 0.0944 0.0828 ...  
 $ Vv : num 3.96 3.07 6.01 2.55 2.51 ...  
 $ Vmp : num 0.2094 0.1157 0.2311 0.0944 0.0828 ...  
 $ Vmc : num 2.78 1.82 3.63 1.59 1.6 ...  
 $ Vvc : num 3.56 2.73 5.53 2.31 2.24 ...  
 $ Vvv : num 0.403 0.342 0.48 0.238 0.275 ...  
 $ Maximum.depth.of.furrows: num 12698 14381 16377 7155 7130 ...  
 $ Mean.depth.of.furrows : num 2586 2471 3670 2350 2229 ...  
 $ Mean.density.of.furrows : num 2987 1790 1901 2032 2098 ...  
 $ First.direction : num 44.9809 90.00638 89.98321 0.01527 0.00574 ...  
 $ Second.direction : num 26.5 135 63.5 116.5 135 ...  
 $ Third.direction : num 63.5 116.4 45 135 90 ...  
 $ Isotropy : num 13.5 64.5 14.9 87 86.3 ...  
 $ epLsar : num 0.00368 0.0024 0.00301 0.00161 0.00236 ...  
 $ NewEplsar : num 0.0181 0.0177 0.0179 0.0171 0.0171 ...  
 $ Asfc : num 12.8 6.85 12.12 5.51 5.36 ...  
 $ Smfc : num 2.51 67.38 48.16 94.68 55.32 ...  
 $ HAsfc9 : num 0.629 0.444 0.496 0.666 0.75 ...  
 $ HAsfc81 : num 0.81 2.106 1.515 0.845 0.704 ...  
 - attr(\*, "comment")= Named chr [1:44] "µm" "points" "µm" "µm" ...  
 ..- attr(\*, "names")= chr [1:44] "Axis length - X" "Axis size - X" "Axis spacing - X" "Axis length - Y" ...

The imported file is: “~/analysis/derived\_data/Use-wear.Rbin”

# Define numeric variables

num.var <- 24:length(imp\_data)

The following variables will be used:

[24] Sq  
[25] Ssk  
[26] Sku  
[27] Sp  
[28] Sv  
[29] Sz  
[30] Sa  
[31] Smr  
[32] Smc  
[33] Sxp  
[34] Sal  
[35] Str  
[36] Std  
[37] Sdq  
[38] Sdr  
[39] Vm  
[40] Vv  
[41] Vmp  
[42] Vmc  
[43] Vvc  
[44] Vvv  
[45] Maximum.depth.of.furrows  
[46] Mean.depth.of.furrows  
[47] Mean.density.of.furrows  
[48] First.direction  
[49] Second.direction  
[50] Third.direction  
[51] Isotropy  
[52] epLsar  
[53] NewEplsar  
[54] Asfc  
[55] Smfc  
[56] HAsfc9  
[57] HAsfc81

# Compute summary statistics

## Create function to compute the statistics at once

nminmaxmeanmedsd <- function(x){  
 y <- x[!is.na(x)]  
 n\_test <- length(y)  
 min\_test <- min(y)  
 max\_test <- max(y)  
 mean\_test <- mean(y)  
 med\_test <- median(y)  
 sd\_test <- sd(y)  
 out <- c(n\_test, min\_test, max\_test, mean\_test, med\_test, sd\_test)  
 names(out) <- c("n", "min", "max", "mean", "median", "sd")  
 return(out)  
}

## Compute the summary statistics in groups

### Spots

spot <- summaryBy(.~Sample+Location+Sublocation+Area,   
 data = imp\_data[c("Sample","Location", "Sublocation", "Area" ,  
 names(imp\_data)[num.var])],   
 FUN = nminmaxmeanmedsd)  
str(spot)

'data.frame': 50 obs. of 208 variables:  
 $ Sample : chr "BU-003" "BU-032" "BU-077" "BU-115" ...  
 $ Location : chr "C" "B" "B" "A" ...  
 $ Sublocation : chr "1" "3" "3" "2" ...  
 $ Area : chr "01" "01" "01" "01" ...  
 $ Sq.n : num 3 3 3 3 3 3 3 3 3 3 ...  
 $ Sq.min : num 948 534 797 973 1231 ...  
 $ Sq.max : num 1049 832 999 1008 2171 ...  
 $ Sq.mean : num 999 704 901 988 1663 ...  
 $ Sq.median : num 1001 746 908 983 1586 ...  
 $ Sq.sd : num 50.3 153.3 101.1 18 474.6 ...  
 $ Ssk.n : num 3 3 3 3 3 3 3 3 3 3 ...  
 $ Ssk.min : num -0.574 -0.392 -0.855 0.121 -0.281 ...  
 $ Ssk.max : num 0.13256 -0.12753 -0.2485 0.40616 0.00382 ...  
 $ Ssk.mean : num -0.291 -0.298 -0.55 0.258 -0.108 ...  
 $ Ssk.median : num -0.4305 -0.376 -0.5461 0.2465 -0.0476 ...  
 $ Ssk.sd : num 0.373 0.148 0.303 0.143 0.152 ...  
 $ Sku.n : num 3 3 3 3 3 3 3 3 3 3 ...  
 $ Sku.min : num 3.1 3.3 3.8 2.93 2.98 ...  
 $ Sku.max : num 3.72 5.18 5.18 3.42 3.31 ...  
 $ Sku.mean : num 3.44 4.26 4.7 3.09 3.12 ...  
 $ Sku.median : num 3.52 4.3 5.13 2.93 3.07 ...  
 $ Sku.sd : num 0.316 0.94 0.782 0.287 0.17 ...  
 $ Sp.n : num 3 3 3 3 3 3 3 3 3 3 ...  
 $ Sp.min : num 2312 2085 1814 2917 3791 ...  
 $ Sp.max : num 5140 2859 3330 3517 5795 ...  
 $ Sp.mean : num 3366 2344 2531 3130 4634 ...  
 $ Sp.median : num 2645 2087 2450 2955 4315 ...  
 $ Sp.sd : num 1546 446 761 336 1040 ...  
 $ Sv.n : num 3 3 3 3 3 3 3 3 3 3 ...  
 $ Sv.min : num 3199 2780 3406 2558 3846 ...  
 $ Sv.max : num 3908 3390 4275 2775 7204 ...  
 $ Sv.mean : num 3549 2989 3911 2671 5365 ...  
 $ Sv.median : num 3542 2797 4051 2680 5043 ...  
 $ Sv.sd : num 354 347 451 109 1702 ...  
 $ Sz.n : num 3 3 3 3 3 3 3 3 3 3 ...  
 $ Sz.min : num 5511 4865 5856 5597 7637 ...  
 $ Sz.max : num 8683 6249 7605 6074 13000 ...  
 $ Sz.mean : num 6915 5332 6442 5800 9998 ...  
 $ Sz.median : num 6553 4884 5865 5730 9358 ...  
 $ Sz.sd : num 1617 794 1007 246 2738 ...  
 $ Sa.n : num 3 3 3 3 3 3 3 3 3 3 ...  
 $ Sa.min : num 749 392 620 774 953 ...  
 $ Sa.max : num 814 623 717 790 1757 ...  
 $ Sa.mean : num 780 537 672 783 1319 ...  
 $ Sa.median : num 777 596 678 783 1246 ...  
 $ Sa.sd : num 32.69 126.46 48.95 8.02 406.83 ...  
 $ Smr.n : num 3 3 3 3 3 3 3 3 3 3 ...  
 $ Smr.min : num 0.0851 1.2278 1.337 1.6065 0.8016 ...  
 $ Smr.max : num 6.82 4.48 13.77 3.49 2.12 ...  
 $ Smr.mean : num 3.31 2.81 7.22 2.74 1.64 ...  
 $ Smr.median : num 3.01 2.72 6.54 3.13 1.99 ...  
 $ Smr.sd : num 3.38 1.626 6.243 0.999 0.725 ...  
 $ Smc.n : num 3 3 3 3 3 3 3 3 3 3 ...  
 $ Smc.min : num 1148 665 929 1249 1483 ...  
 $ Smc.max : num 1348 961 1182 1297 2692 ...  
 $ Smc.mean : num 1215 839 1092 1272 2068 ...  
 $ Smc.median : num 1149 892 1165 1272 2029 ...  
 $ Smc.sd : num 115 155 142 24 605 ...  
 $ Sxp.n : num 3 3 3 3 3 3 3 3 3 3 ...  
 $ Sxp.min : num 1988 1081 1751 1757 2554 ...  
 $ Sxp.max : num 2409 1925 2450 1845 4662 ...  
 $ Sxp.mean : num 2184 1554 2089 1806 3492 ...  
 $ Sxp.median : num 2155 1656 2066 1815 3261 ...  
 $ Sxp.sd : num 211.8 431.3 350 44.7 1072.8 ...  
 $ Sal.n : num 3 3 3 3 3 3 3 3 3 3 ...  
 $ Sal.min : num 23.3 19.9 24.5 21.5 18.8 ...  
 $ Sal.max : num 28.4 25.1 31.5 24.6 29.1 ...  
 $ Sal.mean : num 25.1 22 27.9 22.7 23.8 ...  
 $ Sal.median : num 23.7 20.9 27.7 22.1 23.6 ...  
 $ Sal.sd : num 2.83 2.74 3.51 1.66 5.17 ...  
 $ Str.n : num 3 3 3 3 3 3 3 3 3 3 ...  
 $ Str.min : num 0.361 0.682 0.504 0.851 0.446 ...  
 $ Str.max : num 0.797 0.853 0.869 0.88 0.539 ...  
 $ Str.mean : num 0.631 0.785 0.694 0.863 0.507 ...  
 $ Str.median : num 0.735 0.819 0.711 0.856 0.536 ...  
 $ Str.sd : num 0.2359 0.0909 0.1833 0.0156 0.0529 ...  
 $ Std.n : num 3 3 3 3 3 3 3 3 3 3 ...  
 $ Std.min : num 132.5 2.27 93.5 120.25 16.49 ...  
 $ Std.max : num 141 177 141 138 39 ...  
 $ Std.mean : num 136.9 102.7 118.5 128.9 26.8 ...  
 $ Std.median : num 137 129 122 129 25 ...  
 $ Std.sd : num 4.15 90.11 23.64 8.63 11.37 ...  
 $ Sdq.n : num 3 3 3 3 3 3 3 3 3 3 ...  
 $ Sdq.min : num 0.22 0.123 0.15 0.177 0.217 ...  
 $ Sdq.max : num 0.227 0.179 0.171 0.178 0.244 ...  
 $ Sdq.mean : num 0.223 0.147 0.164 0.178 0.232 ...  
 $ Sdq.median : num 0.222 0.138 0.17 0.178 0.236 ...  
 $ Sdq.sd : num 0.003198 0.028963 0.012165 0.000543 0.013865 ...  
 $ Sdr.n : num 3 3 3 3 3 3 3 3 3 3 ...  
 $ Sdr.min : num 2.287 0.733 1.094 1.538 2.283 ...  
 $ Sdr.max : num 2.49 1.52 1.43 1.56 2.8 ...  
 $ Sdr.mean : num 2.37 1.06 1.31 1.55 2.58 ...  
 $ Sdr.median : num 2.35 0.934 1.402 1.555 2.661 ...  
 $ Sdr.sd : num 0.1012 0.4097 0.1856 0.0109 0.2661 ...  
 $ Vm.n : num 3 3 3 3 3 3 3 3 3 3 ...  
 $ Vm.min : num 0.0359 0.0283 0.0273 0.0525 0.0718 ...  
 $ Vm.max : num 0.0575 0.0442 0.0543 0.0666 0.0865 ...  
 $ Vm.mean : num 0.0448 0.035 0.0423 0.0585 0.079 ...  
 $ Vm.median : num 0.0409 0.0326 0.0452 0.0564 0.0787 ...  
 [list output truncated]

### Tool type

tool <- summaryBy(.~Tool.type+Location+Sublocation,   
 data = imp\_data[c("Tool.type", "Location", "Sublocation",  
 names(imp\_data)[num.var])],   
 FUN = nminmaxmeanmedsd)  
str(tool)

'data.frame': 23 obs. of 207 variables:  
 $ Tool.type : Factor w/ 4 levels "Keilmesser","Pradnik scraper",..: 1 1 1 1 1 1 1 1 1 1 ...  
 $ Location : chr "A" "A" "B" "B" ...  
 $ Sublocation : chr "1" "2" "1" "2" ...  
 $ Sq.n : num 9 6 9 12 9 9 15 12 18 9 ...  
 $ Sq.min : num 966 1243 956 906 534 ...  
 $ Sq.max : num 1641 1947 1703 5272 1994 ...  
 $ Sq.mean : num 1271 1423 1336 2261 1071 ...  
 $ Sq.median : num 1340 1309 1375 1831 908 ...  
 $ Sq.sd : num 266 272 214 1371 455 ...  
 $ Ssk.n : num 9 6 9 12 9 9 15 12 18 9 ...  
 $ Ssk.min : num -0.798 -0.882 -0.734 -0.945 -1.37 ...  
 $ Ssk.max : num 0.518 0.899 0.27 0.762 -0.128 ...  
 $ Ssk.mean : num -0.0551 -0.1608 -0.3334 0.1352 -0.5698 ...  
 $ Ssk.median : num 0.0596 -0.1428 -0.2483 0.2147 -0.5461 ...  
 $ Ssk.sd : num 0.452 0.69 0.318 0.491 0.371 ...  
 $ Sku.n : num 9 6 9 12 9 9 15 12 18 9 ...  
 $ Sku.min : num 2.99 2.92 2.82 2.76 3.18 ...  
 $ Sku.max : num 4.76 7.61 5.74 7.36 6.71 ...  
 $ Sku.mean : num 3.64 4.66 4.04 4.43 4.54 ...  
 $ Sku.median : num 3.31 3.64 4.16 3.93 4.3 ...  
 $ Sku.sd : num 0.621 2.03 0.926 1.613 1.121 ...  
 $ Sp.n : num 9 6 9 12 9 9 15 12 18 9 ...  
 $ Sp.min : num 2620 3361 2912 3210 1814 ...  
 $ Sp.max : num 5611 5622 5319 18307 4624 ...  
 $ Sp.mean : num 4119 4442 4079 7950 3060 ...  
 $ Sp.median : num 4565 4548 4053 5974 2859 ...  
 $ Sp.sd : num 1013 816 783 4262 1061 ...  
 $ Sv.n : num 9 6 9 12 9 9 15 12 18 9 ...  
 $ Sv.min : num 3548 4048 2908 2762 2780 ...  
 $ Sv.max : num 5328 10177 8150 17699 7908 ...  
 $ Sv.mean : num 4449 6714 5387 8022 4551 ...  
 $ Sv.median : num 4408 6213 5474 5841 4051 ...  
 $ Sv.sd : num 671 2597 1397 5162 1815 ...  
 $ Sz.n : num 9 6 9 12 9 9 15 12 18 9 ...  
 $ Sz.min : num 6772 8576 5820 7042 4865 ...  
 $ Sz.max : num 10199 13538 12220 36006 11688 ...  
 $ Sz.mean : num 8568 11156 9466 15972 7611 ...  
 $ Sz.median : num 8969 10939 9490 12836 6249 ...  
 $ Sz.sd : num 1423 1930 1821 8982 2737 ...  
 $ Sa.n : num 9 6 9 12 9 9 15 12 18 9 ...  
 $ Sa.min : num 717 919 766 677 392 ...  
 $ Sa.max : num 1285 1580 1375 3806 1563 ...  
 $ Sa.mean : num 989 1103 1034 1728 811 ...  
 $ Sa.median : num 1006 1011 1040 1424 678 ...  
 $ Sa.sd : num 217 248 178 1015 354 ...  
 $ Smr.n : num 9 6 9 12 9 9 15 12 18 9 ...  
 $ Smr.min : num 0.26 0.583 0.5 0.196 0.408 ...  
 $ Smr.max : num 4.05 2.98 2.71 2.95 13.77 ...  
 $ Smr.mean : num 1.552 1.312 1.217 0.714 3.616 ...  
 $ Smr.median : num 0.872 0.837 0.928 0.357 1.337 ...  
 $ Smr.sd : num 1.413 0.973 0.769 0.849 4.297 ...  
 $ Smc.n : num 9 6 9 12 9 9 15 12 18 9 ...  
 $ Smc.min : num 1227 1505 1169 1039 665 ...  
 $ Smc.max : num 2236 2368 2329 6299 2442 ...  
 $ Smc.mean : num 1593 1777 1635 2838 1253 ...  
 $ Smc.median : num 1488 1597 1597 2434 1165 ...  
 $ Smc.sd : num 363 352 330 1685 529 ...  
 $ Sxp.n : num 9 6 9 12 9 9 15 12 18 9 ...  
 $ Sxp.min : num 1714 1920 2057 1639 1081 ...  
 $ Sxp.max : num 3413 4425 3189 11231 4878 ...  
 $ Sxp.mean : num 2566 2740 2883 4352 2550 ...  
 $ Sxp.median : num 2638 2500 3001 3304 2066 ...  
 $ Sxp.sd : num 643 870 350 2890 1226 ...  
 $ Sal.n : num 9 6 9 12 9 9 15 12 18 9 ...  
 $ Sal.min : num 20.8 21.4 18.5 15.7 19.9 ...  
 $ Sal.max : num 27.7 36.6 27.7 29.5 33 ...  
 $ Sal.mean : num 24.9 26.2 23.8 23.2 25.7 ...  
 $ Sal.median : num 24.9 24.6 23.9 23.8 25.1 ...  
 $ Sal.sd : num 2.36 5.52 2.89 3.94 4.47 ...  
 $ Str.n : num 8 6 8 12 9 8 14 12 17 8 ...  
 $ Str.min : num 0.192 0.498 0.467 0.215 0.504 ...  
 $ Str.max : num 0.858 0.88 0.91 0.858 0.869 ...  
 $ Str.mean : num 0.533 0.744 0.675 0.548 0.756 ...  
 $ Str.median : num 0.519 0.773 0.674 0.588 0.778 ...  
 $ Str.sd : num 0.268 0.131 0.155 0.233 0.115 ...  
 $ Std.n : num 9 6 9 12 9 9 15 12 18 9 ...  
 $ Std.min : num 47.76 50.99 79.26 3.51 2.27 ...  
 $ Std.max : num 98.5 151.7 137.5 166.5 176.5 ...  
 $ Std.mean : num 88.3 91.2 96.7 66 94.1 ...  
 $ Std.median : num 93.5 86.1 86.2 64.3 115 ...  
 $ Std.sd : num 15.5 40.5 22.1 43.8 60 ...  
 $ Sdq.n : num 9 6 9 12 9 9 15 12 18 9 ...  
 $ Sdq.min : num 0.166 0.254 0.158 0.256 0.123 ...  
 $ Sdq.max : num 0.271 0.419 0.271 0.649 0.37 ...  
 $ Sdq.mean : num 0.227 0.327 0.207 0.363 0.212 ...  
 $ Sdq.median : num 0.244 0.322 0.181 0.281 0.171 ...  
 $ Sdq.sd : num 0.0424 0.0613 0.0502 0.1494 0.0891 ...  
 $ Sdr.n : num 9 6 9 12 9 9 15 12 18 9 ...  
 $ Sdr.min : num 1.345 2.811 1.195 3.061 0.733 ...  
 $ Sdr.max : num 3.43 6.67 3.42 12.99 6.02 ...  
 $ Sdr.mean : num 2.49 4.4 2.14 5.47 2.38 ...  
 $ Sdr.median : num 2.77 4.28 1.6 3.54 1.43 ...  
 $ Sdr.sd : num 0.833 1.426 0.999 3.548 1.887 ...  
 $ Vm.n : num 9 6 9 12 9 9 15 12 18 9 ...  
 $ Vm.min : num 0.0401 0.0513 0.041 0.0622 0.0273 ...  
 $ Vm.max : num 0.0988 0.113 0.0878 0.4079 0.06 ...  
 $ Vm.mean : num 0.065 0.0735 0.063 0.1326 0.0439 ...  
 $ Vm.median : num 0.0606 0.0706 0.0597 0.0898 0.0452 ...  
 $ Vm.sd : num 0.019 0.0212 0.0158 0.103 0.0119 ...  
 [list output truncated]

### Raw material

raw\_material <- summaryBy(.~Raw.material+Location+Sublocation,   
 data = imp\_data[c("Raw.material", "Location", "Sublocation",  
 names(imp\_data)[num.var])],  
 FUN = nminmaxmeanmedsd)  
str(raw\_material)

'data.frame': 19 obs. of 207 variables:  
 $ Raw.material : Factor w/ 2 levels "flint","lydite": 1 1 1 1 1 1 1 1 2 2 ...  
 $ Location : chr "A" "B" "B" "C" ...  
 $ Sublocation : chr "1" "1" "2" "1" ...  
 $ Sq.n : num 3 3 6 12 3 6 3 3 6 12 ...  
 $ Sq.min : num 966 1375 663 426 382 ...  
 $ Sq.max : num 1120 1703 1057 2273 912 ...  
 $ Sq.mean : num 1028 1490 865 1200 678 ...  
 $ Sq.median : num 999 1392 864 949 741 ...  
 $ Sq.sd : num 81.2 184.7 136 603.8 270.7 ...  
 $ Ssk.n : num 3 3 6 12 3 6 3 3 6 12 ...  
 $ Ssk.min : num -0.552 -0.734 -0.386 -4.568 -1.719 ...  
 $ Ssk.max : num 0.224 0.27 1.087 0.303 -0.348 ...  
 $ Ssk.mean : num -0.0794 -0.2012 0.3329 -1.0663 -1.2266 ...  
 $ Ssk.median : num 0.0897 -0.1396 0.4308 -0.3499 -1.6128 ...  
 $ Ssk.sd : num 0.414 0.505 0.618 1.45 0.763 ...  
 $ Sku.n : num 3 3 6 12 3 6 3 3 6 12 ...  
 $ Sku.min : num 2.99 2.82 3.2 3.11 3.43 ...  
 $ Sku.max : num 4.2 5.74 8.34 34.69 9.72 ...  
 $ Sku.mean : num 3.5 4.41 5.55 9.32 7.13 ...  
 $ Sku.median : num 3.31 4.66 5.9 5.56 8.24 ...  
 $ Sku.sd : num 0.628 1.477 1.968 9.183 3.289 ...  
 $ Sp.n : num 3 3 6 12 3 6 3 3 6 12 ...  
 $ Sp.min : num 2620 4070 1982 1894 795 ...  
 $ Sp.max : num 3224 5319 5768 12492 1957 ...  
 $ Sp.mean : num 2942 4827 4095 3862 1524 ...  
 $ Sp.median : num 2983 5093 4130 2721 1819 ...  
 $ Sp.sd : num 304 666 1452 3011 635 ...  
 $ Sv.n : num 3 3 6 12 3 6 3 3 6 12 ...  
 $ Sv.min : num 3548 4762 2362 1627 2158 ...  
 $ Sv.max : num 4339 8150 4335 15753 6129 ...  
 $ Sv.mean : num 3894 6169 3147 6907 3739 ...  
 $ Sv.median : num 3795 5597 2923 4311 2929 ...  
 $ Sv.sd : num 404 1765 782 4996 2106 ...  
 $ Sz.n : num 3 3 6 12 3 6 3 3 6 12 ...  
 $ Sz.min : num 6772 9855 4345 3613 2953 ...  
 $ Sz.max : num 6959 12220 8852 23963 8086 ...  
 $ Sz.mean : num 6836 10997 7243 10769 5262 ...  
 $ Sz.median : num 6777 10916 7551 6977 4748 ...  
 $ Sz.sd : num 106 1185 1555 6966 2605 ...  
 $ Sa.n : num 3 3 6 12 3 6 3 3 6 12 ...  
 $ Sa.min : num 753 1035 518 326 270 ...  
 $ Sa.max : num 897 1375 831 1601 643 ...  
 $ Sa.mean : num 808 1150 653 840 502 ...  
 $ Sa.median : num 773 1040 643 704 591 ...  
 $ Sa.sd : num 77.6 194.9 110.4 386 202.2 ...  
 $ Smr.n : num 3 3 6 12 3 6 3 3 6 12 ...  
 $ Smr.min : num 2.624 0.525 0.281 0.168 10.264 ...  
 $ Smr.max : num 4.05 1.27 5.33 10.13 79.01 ...  
 $ Smr.mean : num 3.347 0.874 1.637 3.056 34.529 ...  
 $ Smr.median : num 3.369 0.823 0.485 1.935 14.309 ...  
 $ Smr.sd : num 0.712 0.377 2.08 3.238 38.579 ...  
 $ Smc.n : num 3 3 6 12 3 6 3 3 6 12 ...  
 $ Smc.min : num 1227 1592 765 511 393 ...  
 $ Smc.max : num 1488 2329 1364 2479 968 ...  
 $ Smc.mean : num 1334 1840 1017 1262 767 ...  
 $ Smc.median : num 1286 1597 975 1099 941 ...  
 $ Smc.sd : num 137 424 212 570 324 ...  
 $ Sxp.n : num 3 3 6 12 3 6 3 3 6 12 ...  
 $ Sxp.min : num 1714 2991 1415 916 1062 ...  
 $ Sxp.max : num 2334 3025 1960 5191 2101 ...  
 $ Sxp.mean : num 2040 3006 1661 2674 1563 ...  
 $ Sxp.median : num 2072 3001 1652 2191 1525 ...  
 $ Sxp.sd : num 311.3 17.4 181.9 1458.3 520.4 ...  
 $ Sal.n : num 3 3 6 12 3 6 3 3 6 12 ...  
 $ Sal.min : num 20.8 23.4 15.7 19.2 17.4 ...  
 $ Sal.max : num 23.1 24.6 22 29.1 29.7 ...  
 $ Sal.mean : num 22.3 24 18.8 24 25 ...  
 $ Sal.median : num 22.9 23.9 18.1 24.1 27.9 ...  
 $ Sal.sd : num 1.274 0.573 2.681 3.022 6.607 ...  
 $ Str.n : num 2 2 6 12 3 4 2 3 6 12 ...  
 $ Str.min : num 0.287 0.59 0.639 0.295 0.361 ...  
 $ Str.max : num 0.603 0.786 0.858 0.896 0.938 ...  
 $ Str.mean : num 0.445 0.688 0.732 0.757 0.677 ...  
 $ Str.median : num 0.445 0.688 0.724 0.787 0.732 ...  
 $ Str.sd : num 0.2233 0.1389 0.0924 0.1586 0.2923 ...  
 $ Std.n : num 3 3 6 12 3 6 3 3 6 12 ...  
 $ Std.min : num 47.76 82.49 16.74 8.76 36 ...  
 $ Std.max : num 98.5 132.5 81.2 101.5 93.5 ...  
 $ Std.mean : num 79.9 102.8 57 66.6 59.9 ...  
 $ Std.median : num 93.5 93.5 63.9 69.1 50.3 ...  
 $ Std.sd : num 28 26.3 26.1 28.9 29.9 ...  
 $ Sdq.n : num 3 3 6 12 3 6 3 3 6 12 ...  
 $ Sdq.min : num 0.166 0.267 0.15 0.104 0.112 ...  
 $ Sdq.max : num 0.18 0.271 0.277 0.292 0.149 ...  
 $ Sdq.mean : num 0.173 0.269 0.223 0.196 0.127 ...  
 $ Sdq.median : num 0.174 0.269 0.239 0.185 0.121 ...  
 $ Sdq.sd : num 0.00731 0.00192 0.05326 0.05879 0.01962 ...  
 $ Sdr.n : num 3 3 6 12 3 6 3 3 6 12 ...  
 $ Sdr.min : num 1.345 3.361 1.097 0.53 0.617 ...  
 $ Sdr.max : num 1.55 3.42 3.58 3.75 1.08 ...  
 $ Sdr.mean : num 1.457 3.396 2.458 1.741 0.805 ...  
 $ Sdr.median : num 1.482 3.411 2.722 1.622 0.721 ...  
 $ Sdr.sd : num 0.1025 0.0302 1.0302 0.8737 0.2404 ...  
 $ Vm.n : num 3 3 6 12 3 6 3 3 6 12 ...  
 $ Vm.min : num 0.0401 0.063 0.0314 0.0221 0.0102 ...  
 $ Vm.max : num 0.0565 0.0878 0.0682 0.1566 0.0371 ...  
 $ Vm.mean : num 0.0497 0.0793 0.0563 0.0571 0.0245 ...  
 $ Vm.median : num 0.0525 0.0869 0.0602 0.0458 0.0263 ...  
 $ Vm.sd : num 0.00855 0.01407 0.01376 0.03675 0.01356 ...  
 [list output truncated]

### Use-wear type with sample

wear <- summaryBy(.~Sample+Location+Sublocation+Area+Usewear.type,   
 data = imp\_data[c("Sample", "Location", "Sublocation",  
 "Area","Usewear.type",  
 names(imp\_data)[num.var])],  
 FUN = nminmaxmeanmedsd)  
str(wear)

'data.frame': 50 obs. of 209 variables:  
 $ Sample : chr "BU-003" "BU-032" "BU-077" "BU-115" ...  
 $ Location : chr "C" "B" "B" "A" ...  
 $ Sublocation : chr "1" "3" "3" "2" ...  
 $ Area : chr "01" "01" "01" "01" ...  
 $ Usewear.type : Factor w/ 11 levels "A","B","B2","C",..: 4 8 5 4 4 4 2 4 3 7 ...  
 $ Sq.n : num 3 3 3 3 3 3 3 3 3 3 ...  
 $ Sq.min : num 948 534 797 973 1231 ...  
 $ Sq.max : num 1049 832 999 1008 2171 ...  
 $ Sq.mean : num 999 704 901 988 1663 ...  
 $ Sq.median : num 1001 746 908 983 1586 ...  
 $ Sq.sd : num 50.3 153.3 101.1 18 474.6 ...  
 $ Ssk.n : num 3 3 3 3 3 3 3 3 3 3 ...  
 $ Ssk.min : num -0.574 -0.392 -0.855 0.121 -0.281 ...  
 $ Ssk.max : num 0.13256 -0.12753 -0.2485 0.40616 0.00382 ...  
 $ Ssk.mean : num -0.291 -0.298 -0.55 0.258 -0.108 ...  
 $ Ssk.median : num -0.4305 -0.376 -0.5461 0.2465 -0.0476 ...  
 $ Ssk.sd : num 0.373 0.148 0.303 0.143 0.152 ...  
 $ Sku.n : num 3 3 3 3 3 3 3 3 3 3 ...  
 $ Sku.min : num 3.1 3.3 3.8 2.93 2.98 ...  
 $ Sku.max : num 3.72 5.18 5.18 3.42 3.31 ...  
 $ Sku.mean : num 3.44 4.26 4.7 3.09 3.12 ...  
 $ Sku.median : num 3.52 4.3 5.13 2.93 3.07 ...  
 $ Sku.sd : num 0.316 0.94 0.782 0.287 0.17 ...  
 $ Sp.n : num 3 3 3 3 3 3 3 3 3 3 ...  
 $ Sp.min : num 2312 2085 1814 2917 3791 ...  
 $ Sp.max : num 5140 2859 3330 3517 5795 ...  
 $ Sp.mean : num 3366 2344 2531 3130 4634 ...  
 $ Sp.median : num 2645 2087 2450 2955 4315 ...  
 $ Sp.sd : num 1546 446 761 336 1040 ...  
 $ Sv.n : num 3 3 3 3 3 3 3 3 3 3 ...  
 $ Sv.min : num 3199 2780 3406 2558 3846 ...  
 $ Sv.max : num 3908 3390 4275 2775 7204 ...  
 $ Sv.mean : num 3549 2989 3911 2671 5365 ...  
 $ Sv.median : num 3542 2797 4051 2680 5043 ...  
 $ Sv.sd : num 354 347 451 109 1702 ...  
 $ Sz.n : num 3 3 3 3 3 3 3 3 3 3 ...  
 $ Sz.min : num 5511 4865 5856 5597 7637 ...  
 $ Sz.max : num 8683 6249 7605 6074 13000 ...  
 $ Sz.mean : num 6915 5332 6442 5800 9998 ...  
 $ Sz.median : num 6553 4884 5865 5730 9358 ...  
 $ Sz.sd : num 1617 794 1007 246 2738 ...  
 $ Sa.n : num 3 3 3 3 3 3 3 3 3 3 ...  
 $ Sa.min : num 749 392 620 774 953 ...  
 $ Sa.max : num 814 623 717 790 1757 ...  
 $ Sa.mean : num 780 537 672 783 1319 ...  
 $ Sa.median : num 777 596 678 783 1246 ...  
 $ Sa.sd : num 32.69 126.46 48.95 8.02 406.83 ...  
 $ Smr.n : num 3 3 3 3 3 3 3 3 3 3 ...  
 $ Smr.min : num 0.0851 1.2278 1.337 1.6065 0.8016 ...  
 $ Smr.max : num 6.82 4.48 13.77 3.49 2.12 ...  
 $ Smr.mean : num 3.31 2.81 7.22 2.74 1.64 ...  
 $ Smr.median : num 3.01 2.72 6.54 3.13 1.99 ...  
 $ Smr.sd : num 3.38 1.626 6.243 0.999 0.725 ...  
 $ Smc.n : num 3 3 3 3 3 3 3 3 3 3 ...  
 $ Smc.min : num 1148 665 929 1249 1483 ...  
 $ Smc.max : num 1348 961 1182 1297 2692 ...  
 $ Smc.mean : num 1215 839 1092 1272 2068 ...  
 $ Smc.median : num 1149 892 1165 1272 2029 ...  
 $ Smc.sd : num 115 155 142 24 605 ...  
 $ Sxp.n : num 3 3 3 3 3 3 3 3 3 3 ...  
 $ Sxp.min : num 1988 1081 1751 1757 2554 ...  
 $ Sxp.max : num 2409 1925 2450 1845 4662 ...  
 $ Sxp.mean : num 2184 1554 2089 1806 3492 ...  
 $ Sxp.median : num 2155 1656 2066 1815 3261 ...  
 $ Sxp.sd : num 211.8 431.3 350 44.7 1072.8 ...  
 $ Sal.n : num 3 3 3 3 3 3 3 3 3 3 ...  
 $ Sal.min : num 23.3 19.9 24.5 21.5 18.8 ...  
 $ Sal.max : num 28.4 25.1 31.5 24.6 29.1 ...  
 $ Sal.mean : num 25.1 22 27.9 22.7 23.8 ...  
 $ Sal.median : num 23.7 20.9 27.7 22.1 23.6 ...  
 $ Sal.sd : num 2.83 2.74 3.51 1.66 5.17 ...  
 $ Str.n : num 3 3 3 3 3 3 3 3 3 3 ...  
 $ Str.min : num 0.361 0.682 0.504 0.851 0.446 ...  
 $ Str.max : num 0.797 0.853 0.869 0.88 0.539 ...  
 $ Str.mean : num 0.631 0.785 0.694 0.863 0.507 ...  
 $ Str.median : num 0.735 0.819 0.711 0.856 0.536 ...  
 $ Str.sd : num 0.2359 0.0909 0.1833 0.0156 0.0529 ...  
 $ Std.n : num 3 3 3 3 3 3 3 3 3 3 ...  
 $ Std.min : num 132.5 2.27 93.5 120.25 16.49 ...  
 $ Std.max : num 141 177 141 138 39 ...  
 $ Std.mean : num 136.9 102.7 118.5 128.9 26.8 ...  
 $ Std.median : num 137 129 122 129 25 ...  
 $ Std.sd : num 4.15 90.11 23.64 8.63 11.37 ...  
 $ Sdq.n : num 3 3 3 3 3 3 3 3 3 3 ...  
 $ Sdq.min : num 0.22 0.123 0.15 0.177 0.217 ...  
 $ Sdq.max : num 0.227 0.179 0.171 0.178 0.244 ...  
 $ Sdq.mean : num 0.223 0.147 0.164 0.178 0.232 ...  
 $ Sdq.median : num 0.222 0.138 0.17 0.178 0.236 ...  
 $ Sdq.sd : num 0.003198 0.028963 0.012165 0.000543 0.013865 ...  
 $ Sdr.n : num 3 3 3 3 3 3 3 3 3 3 ...  
 $ Sdr.min : num 2.287 0.733 1.094 1.538 2.283 ...  
 $ Sdr.max : num 2.49 1.52 1.43 1.56 2.8 ...  
 $ Sdr.mean : num 2.37 1.06 1.31 1.55 2.58 ...  
 $ Sdr.median : num 2.35 0.934 1.402 1.555 2.661 ...  
 $ Sdr.sd : num 0.1012 0.4097 0.1856 0.0109 0.2661 ...  
 $ Vm.n : num 3 3 3 3 3 3 3 3 3 3 ...  
 $ Vm.min : num 0.0359 0.0283 0.0273 0.0525 0.0718 ...  
 $ Vm.max : num 0.0575 0.0442 0.0543 0.0666 0.0865 ...  
 $ Vm.mean : num 0.0448 0.035 0.0423 0.0585 0.079 ...  
 [list output truncated]

### Use-wear type

use\_type <- summaryBy(.~Tool.type+Usewear.type,   
 data = imp\_data[c("Tool.type","Usewear.type",  
 names(imp\_data)[num.var])],   
 FUN = nminmaxmeanmedsd)  
str(use\_type)

'data.frame': 21 obs. of 206 variables:  
 $ Tool.type : Factor w/ 4 levels "Keilmesser","Pradnik scraper",..: 1 1 1 1 1 1 1 1 1 1 ...  
 $ Usewear.type : Factor w/ 11 levels "A","B","B2","C",..: 1 2 3 4 5 6 7 8 9 10 ...  
 $ Sq.n : num 9 6 3 24 9 3 12 9 21 9 ...  
 $ Sq.min : num 1419 1100 902 948 797 ...  
 $ Sq.max : num 5272 2062 1889 8384 1994 ...  
 $ Sq.mean : num 2891 1709 1331 2592 1336 ...  
 $ Sq.median : num 2299 1872 1200 1677 1347 ...  
 $ Sq.sd : num 1413 372 506 2193 399 ...  
 $ Ssk.n : num 9 6 3 24 9 3 12 9 21 9 ...  
 $ Ssk.min : num -0.734 -0.925 -0.454 -2.751 -1.37 ...  
 $ Ssk.max : num 0.457 -0.058 0.548 0.398 -0.249 ...  
 $ Ssk.mean : num -0.1289 -0.2818 -0.0562 -0.4405 -0.579 ...  
 $ Ssk.median : num -0.21 -0.173 -0.263 -0.248 -0.546 ...  
 $ Ssk.sd : num 0.393 0.328 0.532 0.695 0.356 ...  
 $ Sku.n : num 9 6 3 24 9 3 12 9 21 9 ...  
 $ Sku.min : num 2.76 3.04 3.24 2.82 2.93 ...  
 $ Sku.max : num 5.85 5.76 4.52 14.57 6.71 ...  
 $ Sku.mean : num 3.68 4.02 3.81 4.87 4.12 ...  
 $ Sku.median : num 3.12 3.8 3.67 3.71 3.8 ...  
 $ Sku.sd : num 1.081 0.945 0.653 3.046 1.301 ...  
 $ Sp.n : num 9 6 3 24 9 3 12 9 21 9 ...  
 $ Sp.min : num 3491 3817 3112 2312 1814 ...  
 $ Sp.max : num 18307 6231 4896 28502 4636 ...  
 $ Sp.mean : num 9144 5172 4209 7800 3594 ...  
 $ Sp.median : num 8267 5212 4620 5194 3780 ...  
 $ Sp.sd : num 4522 870 960 6775 1072 ...  
 $ Sv.n : num 9 6 3 24 9 3 12 9 21 9 ...  
 $ Sv.min : num 4793 4940 2997 3199 3406 ...  
 $ Sv.max : num 19926 9752 6471 36672 7908 ...  
 $ Sv.mean : num 10126 6780 4534 10928 5204 ...  
 $ Sv.median : num 8110 6643 4135 6294 4971 ...  
 $ Sv.sd : num 5697 1620 1771 9953 1441 ...  
 $ Sz.n : num 9 6 3 24 9 3 12 9 21 9 ...  
 $ Sz.min : num 8825 8756 6108 5511 5856 ...  
 $ Sz.max : num 36006 14514 11367 58945 11688 ...  
 $ Sz.mean : num 19270 11951 8744 18729 8797 ...  
 $ Sz.median : num 15403 12330 8755 11168 9472 ...  
 $ Sz.sd : num 9629 1994 2629 16052 2290 ...  
 $ Sa.n : num 9 6 3 24 9 3 12 9 21 9 ...  
 $ Sa.min : num 1127 839 685 749 620 ...  
 $ Sa.max : num 3806 1640 1482 6501 1563 ...  
 $ Sa.mean : num 2222 1308 1018 1926 1028 ...  
 $ Sa.median : num 1848 1402 888 1317 1035 ...  
 $ Sa.sd : num 1017 299 414 1595 326 ...  
 $ Smr.n : num 9 6 3 24 9 3 12 9 21 9 ...  
 $ Smr.min : num 0.1834 0.586 0.6543 0.0851 0.4082 ...  
 $ Smr.max : num 2.16 1.18 1.29 6.82 13.77 ...  
 $ Smr.mean : num 0.562 0.767 1.017 1.252 3.805 ...  
 $ Smr.median : num 0.357 0.732 1.11 0.717 1.038 ...  
 $ Smr.sd : num 0.621 0.22 0.326 1.505 4.775 ...  
 $ Smc.n : num 9 6 3 24 9 3 12 9 21 9 ...  
 $ Smc.min : num 1660 1421 1021 1148 929 ...  
 $ Smc.max : num 6299 2666 2333 10517 2442 ...  
 $ Smc.mean : num 3581 2135 1582 3055 1593 ...  
 $ Smc.median : num 2839 2270 1392 2170 1527 ...  
 $ Smc.sd : num 1651 478 677 2537 490 ...  
 $ Sxp.n : num 9 6 3 24 9 3 12 9 21 9 ...  
 $ Sxp.min : num 2738 2103 2105 1988 1751 ...  
 $ Sxp.max : num 11231 4476 4459 20698 4878 ...  
 $ Sxp.mean : num 6120 3707 2905 5766 3129 ...  
 $ Sxp.median : num 4860 4174 2150 3153 3191 ...  
 $ Sxp.sd : num 3234 1000 1346 5382 1017 ...  
 $ Sal.n : num 9 6 3 24 9 3 12 9 21 9 ...  
 $ Sal.min : num 19.3 21.6 18.3 18.9 22.5 ...  
 $ Sal.max : num 31.5 29.8 30.7 31.3 33 ...  
 $ Sal.mean : num 25.4 24.5 25.4 25 27.3 ...  
 $ Sal.median : num 25.9 24.3 27.4 24.8 26.2 ...  
 $ Sal.sd : num 4.04 2.93 6.41 3.08 4.05 ...  
 $ Str.n : num 8 6 2 22 9 3 11 9 20 9 ...  
 $ Str.min : num 0.284 0.404 0.733 0.23 0.418 ...  
 $ Str.max : num 0.794 0.784 0.781 0.919 0.869 ...  
 $ Str.mean : num 0.676 0.681 0.757 0.616 0.655 ...  
 $ Str.median : num 0.74 0.73 0.757 0.619 0.711 ...  
 $ Str.sd : num 0.173 0.143 0.0345 0.1807 0.1694 ...  
 $ Std.n : num 9 6 3 24 9 3 12 9 21 9 ...  
 $ Std.min : num 3.51 13.5 39.01 16.75 3.74 ...  
 $ Std.max : num 177 176 176 166 141 ...  
 $ Std.mean : num 100.9 84.6 88.8 101.5 61.7 ...  
 $ Std.median : num 129 98.6 51 93.9 65 ...  
 $ Std.sd : num 65.7 62.4 76.2 36.7 57.6 ...  
 $ Sdq.n : num 9 6 3 24 9 3 12 9 21 9 ...  
 $ Sdq.min : num 0.256 0.195 0.22 0.161 0.142 ...  
 $ Sdq.max : num 0.649 0.301 0.269 1.032 0.37 ...  
 $ Sdq.mean : num 0.414 0.25 0.238 0.379 0.22 ...  
 $ Sdq.median : num 0.434 0.251 0.226 0.29 0.171 ...  
 $ Sdq.sd : num 0.1208 0.0452 0.0266 0.2311 0.0832 ...  
 $ Sdr.n : num 9 6 3 24 9 3 12 9 21 9 ...  
 $ Sdr.min : num 3.061 1.811 2.282 1.265 0.993 ...  
 $ Sdr.max : num 12.99 4.13 3.37 27.81 6.02 ...  
 $ Sdr.mean : num 7.12 2.97 2.69 6.37 2.5 ...  
 $ Sdr.median : num 7.4 2.9 2.41 3.73 1.43 ...  
 $ Sdr.sd : num 3.146 0.998 0.598 6.481 1.802 ...  
 $ Vm.n : num 9 6 3 24 9 3 12 9 21 9 ...  
 $ Vm.min : num 0.0499 0.0563 0.0523 0.0359 0.0273 ...  
 $ Vm.max : num 0.4079 0.0944 0.1039 0.543 0.0722 ...  
 $ Vm.mean : num 0.1477 0.0793 0.0746 0.1372 0.0523 ...  
 $ Vm.median : num 0.0989 0.0819 0.0678 0.0861 0.0534 ...  
 $ Vm.sd : num 0.1102 0.0126 0.0265 0.1404 0.0129 ...  
 $ Vv.n : num 9 6 3 24 9 3 12 9 21 9 ...  
 [list output truncated]

### Tool type and use-wear type

tool\_use <- summaryBy(.~Tool.type+Location+Sublocation+Usewear.type,   
 data = imp\_data[c("Tool.type", "Location",  
 "Sublocation","Usewear.type",  
 names(imp\_data)[num.var])],   
 FUN = nminmaxmeanmedsd)  
str(tool\_use)

'data.frame': 43 obs. of 208 variables:  
 $ Tool.type : Factor w/ 4 levels "Keilmesser","Pradnik scraper",..: 1 1 1 1 1 1 1 1 1 1 ...  
 $ Location : chr "A" "A" "A" "B" ...  
 $ Sublocation : chr "1" "2" "2" "1" ...  
 $ Usewear.type : Factor w/ 11 levels "A","B","B2","C",..: 7 8 9 4 9 1 4 9 10 5 ...  
 $ Sq.n : num 9 3 3 6 3 3 3 3 3 6 ...  
 $ Sq.min : num 966 1243 1247 1273 956 ...  
 $ Sq.max : num 1641 1482 1947 1703 1331 ...  
 $ Sq.mean : num 1271 1354 1492 1438 1132 ...  
 $ Sq.median : num 1340 1337 1282 1397 1108 ...  
 $ Sq.sd : num 266 121 395 146 188 ...  
 $ Ssk.n : num 9 3 3 6 3 3 3 3 3 6 ...  
 $ Ssk.min : num -0.798 0.0907 -0.8824 -0.7343 -0.5862 ...  
 $ Ssk.max : num 0.518 0.899 -0.376 0.27 -0.185 ...  
 $ Ssk.mean : num -0.0551 0.3903 -0.7119 -0.3372 -0.3257 ...  
 $ Ssk.median : num 0.0596 0.1809 -0.8769 -0.3864 -0.2055 ...  
 $ Ssk.sd : num 0.452 0.443 0.291 0.375 0.226 ...  
 $ Sku.n : num 9 3 3 6 3 3 3 3 3 6 ...  
 $ Sku.min : num 2.99 3.3 2.92 2.82 2.92 ...  
 $ Sku.max : num 4.76 3.86 7.61 5.74 4.43 ...  
 $ Sku.mean : num 3.64 3.53 5.8 4.24 3.63 ...  
 $ Sku.median : num 3.31 3.42 6.87 4.33 3.54 ...  
 $ Sku.sd : num 0.621 0.298 2.519 0.995 0.758 ...  
 $ Sp.n : num 9 3 3 6 3 3 3 3 3 6 ...  
 $ Sp.min : num 2620 4528 3361 3261 2912 ...  
 $ Sp.max : num 5611 5622 4567 5319 4053 ...  
 $ Sp.mean : num 4119 5009 3875 4355 3528 ...  
 $ Sp.median : num 4565 4877 3696 4221 3621 ...  
 $ Sp.sd : num 1013 559 623 757 576 ...  
 $ Sv.n : num 9 3 3 6 3 3 3 3 3 6 ...  
 $ Sv.min : num 3548 4048 7296 4762 2908 ...  
 $ Sv.max : num 5328 5130 10177 8150 5148 ...  
 $ Sv.mean : num 4449 4523 8905 5958 4243 ...  
 $ Sv.median : num 4408 4392 9241 5538 4674 ...  
 $ Sv.sd : num 671 553 1470 1178 1180 ...  
 $ Sz.n : num 9 3 3 6 3 3 3 3 3 6 ...  
 $ Sz.min : num 6772 8576 11864 8739 5820 ...  
 $ Sz.max : num 10199 10014 13538 12220 9201 ...  
 $ Sz.mean : num 8568 9532 12779 10313 7772 ...  
 $ Sz.median : num 8969 10007 12937 10257 8295 ...  
 $ Sz.sd : num 1423 828 848 1223 1750 ...  
 $ Sa.n : num 9 3 3 6 3 3 3 3 3 6 ...  
 $ Sa.min : num 717 963 919 953 766 ...  
 $ Sa.max : num 1285 1141 1580 1375 1049 ...  
 $ Sa.mean : num 989 1055 1151 1109 884 ...  
 $ Sa.median : num 1006 1059 954 1068 837 ...  
 $ Sa.sd : num 217 89 372 147 147 ...  
 $ Smr.n : num 9 3 3 6 3 3 3 3 3 6 ...  
 $ Smr.min : num 0.26 0.583 1.001 0.525 0.5 ...  
 $ Smr.max : num 4.048 0.673 2.982 2.71 1.443 ...  
 $ Smr.mean : num 1.552 0.632 1.991 1.347 0.957 ...  
 $ Smr.median : num 0.872 0.642 1.991 1.048 0.928 ...  
 $ Smr.sd : num 1.4132 0.0458 0.9902 0.8926 0.4719 ...  
 $ Smc.n : num 9 3 3 6 3 3 3 3 3 6 ...  
 $ Smc.min : num 1227 1572 1505 1554 1169 ...  
 $ Smc.max : num 2236 2053 2368 2329 1685 ...  
 $ Smc.mean : num 1593 1749 1805 1761 1383 ...  
 $ Smc.median : num 1488 1622 1544 1620 1295 ...  
 $ Smc.sd : num 363 264 488 298 269 ...  
 $ Sxp.n : num 9 3 3 6 3 3 3 3 3 6 ...  
 $ Sxp.min : num 1714 1920 2530 2991 2057 ...  
 $ Sxp.max : num 3413 2469 4425 3189 2749 ...  
 $ Sxp.mean : num 2566 2244 3236 3072 2503 ...  
 $ Sxp.median : num 2638 2343 2755 3068 2703 ...  
 $ Sxp.sd : num 642.9 287.6 1035.1 78.8 386.8 ...  
 $ Sal.n : num 9 3 3 6 3 3 3 3 3 6 ...  
 $ Sal.min : num 20.8 21.4 22.6 20.4 18.5 ...  
 $ Sal.max : num 27.7 36.6 25.4 27.7 26.8 ...  
 $ Sal.mean : num 24.9 28.5 23.9 24 23.5 ...  
 $ Sal.median : num 24.9 27.5 23.8 23.9 25.2 ...  
 $ Sal.sd : num 2.36 7.63 1.43 2.33 4.43 ...  
 $ Str.n : num 8 3 3 5 3 3 3 3 3 6 ...  
 $ Str.min : num 0.192 0.498 0.73 0.59 0.467 ...  
 $ Str.max : num 0.858 0.808 0.88 0.91 0.574 ...  
 $ Str.mean : num 0.533 0.685 0.802 0.766 0.523 ...  
 $ Str.median : num 0.519 0.749 0.797 0.786 0.529 ...  
 $ Str.sd : num 0.2683 0.1644 0.075 0.1146 0.0537 ...  
 $ Std.n : num 9 3 3 6 3 3 3 3 3 6 ...  
 $ Std.min : num 47.8 73.5 51 82.5 79.3 ...  
 $ Std.max : num 98.5 151.7 98.7 137.5 86.8 ...  
 $ Std.mean : num 88.3 115.6 66.9 103 84 ...  
 $ Std.median : num 93.5 121.5 51 89.9 86 ...  
 $ Std.sd : num 15.48 39.46 27.57 25.06 4.13 ...  
 $ Sdq.n : num 9 3 3 6 3 3 3 3 3 6 ...  
 $ Sdq.min : num 0.166 0.354 0.254 0.161 0.158 ...  
 $ Sdq.max : num 0.271 0.419 0.29 0.271 0.178 ...  
 $ Sdq.mean : num 0.227 0.378 0.276 0.229 0.165 ...  
 $ Sdq.median : num 0.244 0.36 0.284 0.245 0.158 ...  
 $ Sdq.sd : num 0.0424 0.036 0.0195 0.0486 0.0112 ...  
 $ Sdr.n : num 9 3 3 6 3 3 3 3 3 6 ...  
 $ Sdr.min : num 1.34 4.81 2.81 1.27 1.19 ...  
 $ Sdr.max : num 3.43 6.67 3.74 3.42 1.5 ...  
 $ Sdr.mean : num 2.49 5.54 3.26 2.56 1.3 ...  
 $ Sdr.median : num 2.77 5.13 3.24 2.83 1.2 ...  
 $ Sdr.sd : num 0.833 0.994 0.466 0.975 0.177 ...  
 $ Vm.n : num 9 3 3 6 3 3 3 3 3 6 ...  
 $ Vm.min : num 0.0401 0.0723 0.0513 0.0521 0.041 ...  
 $ Vm.max : num 0.0988 0.113 0.069 0.0878 0.0597 ...  
 $ Vm.mean : num 0.065 0.0869 0.0602 0.0692 0.0507 ...  
 $ Vm.median : num 0.0606 0.0755 0.0603 0.0655 0.0514 ...  
 [list output truncated]

# Save data

## Format name of output file

file\_out <- "Use-wear\_stats"

The file will be saved as “~/analysis/summary\_stats/.[ext]”.

## Write to XLSX

write.xlsx(list(spot = spot, tool = tool, raw\_material = raw\_material,   
 wear = wear, use\_type = use\_type, tool\_use = tool\_use),   
 file = paste0(dir\_out, file\_out, ".xlsx"))

## Save R object

saveObject(list(spot = spot, tool = tool, raw\_material = raw\_material, wear = wear, use\_type = use\_type, tool\_use = tool\_use),   
 file = paste0(dir\_out, file\_out, ".Rbin"))

# sessionInfo() and RStudio version

sessionInfo()

R version 4.0.2 (2020-06-22)  
Platform: x86\_64-w64-mingw32/x64 (64-bit)  
Running under: Windows 10 x64 (build 19041)  
  
Matrix products: default  
  
locale:  
[1] LC\_COLLATE=German\_Germany.1252 LC\_CTYPE=German\_Germany.1252   
[3] LC\_MONETARY=German\_Germany.1252 LC\_NUMERIC=C   
[5] LC\_TIME=German\_Germany.1252   
  
attached base packages:  
[1] tools stats graphics grDevices utils datasets methods   
[8] base   
  
other attached packages:  
[1] doBy\_4.6.8 R.utils\_2.10.1 R.oo\_1.24.0 R.methodsS3\_1.8.1  
[5] openxlsx\_4.2.3   
  
loaded via a namespace (and not attached):  
 [1] zip\_2.1.1 Rcpp\_1.0.6 compiler\_4.0.2 pillar\_1.4.7   
 [5] digest\_0.6.27 lattice\_0.20-41 evaluate\_0.14 lifecycle\_0.2.0   
 [9] tibble\_3.0.6 gtable\_0.3.0 pkgconfig\_2.0.3 rlang\_0.4.10   
[13] Matrix\_1.2-18 DBI\_1.1.1 yaml\_2.2.1 xfun\_0.20   
[17] dplyr\_1.0.3 stringr\_1.4.0 knitr\_1.31 generics\_0.1.0   
[21] vctrs\_0.3.6 grid\_4.0.2 tidyselect\_1.1.0 glue\_1.4.2   
[25] R6\_2.5.0 rmarkdown\_2.6 tidyr\_1.1.2 purrr\_0.3.4   
[29] ggplot2\_3.3.3 magrittr\_2.0.1 backports\_1.2.1 scales\_1.1.1   
[33] ellipsis\_0.3.1 htmltools\_0.5.1.1 MASS\_7.3-51.6 assertthat\_0.2.1   
[37] colorspace\_2.0-0 Deriv\_4.1.2 stringi\_1.5.3 munsell\_0.5.0   
[41] broom\_0.7.4 crayon\_1.4.0

RStudio version 1.3.1073.

END OF SCRIPT