Untitled

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```
setwd("C:\\Users\\danus\\OneDrive\\Uni\\4.Semester\\Grundlagen der Versuchspalnung\\1.Experiment\\GdV-E
```

Versuchsablauf

Screening

```
library(SixSigma)


ExperimentDesign  = expand.grid(A = c(-1, 1), B = c(-1,1), C = c(-1, 1), D = c(-1,1), E = c(-1,1) )
"F" = ExperimentDesign$A * ExperimentDesign$C * ExperimentDesign$D
G = ExperimentDesign$A * ExperimentDesign$B * ExperimentDesign$C



ExperimentDesign$F = F
ExperimentDesign$G = G
```

```
Screening <- read.csv("Screening.CSV", sep = ";",dec = ",")
S <- Screening[order(Screening[,2]),]
S <-cbind(S, ExperimentDesign)
```

```
summary(lm(Zeit.ohne.Klammer ~A+B+C+D+E+F+G, data= S))
```

```
##
## Call:
## lm(formula = Zeit.ohne.Klammer ~ A + B + C + D + E + F + G, data = S)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -1.5694 -0.4650  0.1294  0.3719  2.1131
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  4.13562    0.13399  30.866   <2e-16 ***
## A            0.15250    0.13399   1.138   0.2663
## B            0.20875    0.13399   1.558   0.1323
## C           -0.08500    0.13399  -0.634   0.5318
## D            0.25000    0.13399   1.866   0.0743 .
## E            0.08375    0.13399   0.625   0.5378
## F            0.11375    0.13399   0.849   0.4043
```

```
## G           -0.06750    0.13399  -0.504   0.6190
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.7579 on 24 degrees of freedom
## Multiple R-squared:  0.2721, Adjusted R-squared:  0.0598
## F-statistic: 1.282 on 7 and 24 DF,  p-value: 0.3009
```

```
summary(lm(Zeit.mit.Klammer ~A+B+C+D+E+F+G, data= S))
```

```
##
## Call:
## lm(formula = Zeit.mit.Klammer ~ A + B + C + D + E + F + G, data = S)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -1.2962 -0.5911 -0.2037  0.4916  1.4875
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  3.70781    0.15986  23.194  < 2e-16 ***
## A            0.39906    0.15986   2.496  0.01982 *
## B            0.05281    0.15986   0.330  0.74399
## C           -0.08906    0.15986  -0.557  0.58260
## D           -0.04469    0.15986  -0.280  0.78223
## E           -0.06156    0.15986  -0.385  0.70356
## F           -0.07031    0.15986  -0.440  0.66399
## G           -0.58781    0.15986  -3.677  0.00119 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.9043 on 24 degrees of freedom
## Multiple R-squared:  0.4618, Adjusted R-squared:  0.3048
## F-statistic: 2.942 on 7 and 24 DF,  p-value: 0.02257
```

Optimierung

```
Optimierung <-read.csv("Optimierung.CSV", sep = ";",dec = ",")

#erster Durchlauf
set.seed(1735)
p1 <-expand.grid(A = c(-1,0, 1),  G = c(-1,0,1) )
p1 <- cbind(1:9,p1)
#zweiter Durchlauf
set.seed(1736)
s <-sample(1:9,9)
p2 <-p1[s,]


p <- rbind(p1,p2)
names(p)[1] <- "Nr."
o1 <-cbind(Optimierung,p[1:9,2:3])

o2 <- o1[,-3]
```

```r
o3 <- o1[,-2]

names(o2)[2] <- "Zeit"
names(o3)[2] <- "Zeit"

o <- rbind(o2,o3)
o$Asquare <- o$A^2
o$Gsquare <- o$G^2

lm(Zeit ~A + Asquare+G+Gsquare, data = o)
```

```
##
## Call:
## lm(formula = Zeit ~ A + Asquare + G + Gsquare, data = o)
##
## Coefficients:
## (Intercept)            A      Asquare            G      Gsquare
##     3.47111      0.43917      0.06333     -0.67125      0.29458
```

$\Rightarrow f(x_1, x_2) = 3.47 + 00.44 \cdot x_1 + 0.06 \cdot x_1^2 - 0.67 \cdot x_2 + 0.29 \cdot x_2^2 \Rightarrow \frac{\partial f}{\partial x} = \begin{pmatrix} 0.44 + 0.12 \cdot x_1 \\ -0.67 + 0.58 \cdot x_2 \end{pmatrix} \Rightarrow \frac{\partial f}{\partial x} = 0 \Rightarrow$
$0.44 = -0.12 \cdot x_1 \wedge 0.67 = 0.58 \cdot x_2 \Rightarrow x_1 = -3.67 \wedge x_2 = 1.16$

$\Rightarrow \frac{\partial^2 f}{\partial^2 x} = \begin{pmatrix} 0.12 & 0 \\ 0 & 0.58 \end{pmatrix}$

```r
det(matrix(c(0.12,0,0,0.58), ncol = 2))
```

```
## [1] 0.0696
```

$\Rightarrow\Rightarrow \frac{\partial^2 f}{\partial^2 x}$ ist positiv definit $\Rightarrow x = \begin{pmatrix} -3.67 \\ 1.16 \end{pmatrix}$ ist Maximum.