# Messsystemanalyse Gruppe 6

16 November 2020 18:02

```
%Messwerte des Verfahren 1
data_jan = readtable("MSA_Verfahren1_200ml_Jan.csv")
```

data_jan = *25×1 table*

| | Gewicht_in_g |
|---|---|
| 1 | 199 |
| 2 | 213 |
| 3 | 185 |
| 4 | 198 |
| 5 | 205 |
| 6 | 191 |
| 7 | 184 |
| 8 | 193 |
| 9 | 199 |
| 10 | 206 |
| 11 | 207 |
| 12 | 210 |
| 13 | 213 |
| 14 | 197 |
| 15 | 205 |
| 16 | 203 |
| 17 | 196 |
| 18 | 206 |
| 19 | 197 |
| 20 | 204 |
| 21 | 210 |
| 22 | 193 |
| 23 | 195 |
| 24 | 196 |
| 25 | 196 |

```
data_benni = readtable("MSA_Verfahren1_200ml_Benjamin.csv")
```

data_benni = *25×1 table*

| | Gewicht_in_g |
|---|---|
| 1 | 195 |
| 2 | 199 |
| 3 | 201 |
| 4 | 209 |
| 5 | 192 |
| 6 | 193 |
| 7 | 199 |
| 8 | 192 |
| 9 | 201 |
| 10 | 202 |
| 11 | 205 |
| 12 | 210 |
| 13 | 196 |
| 14 | 197 |
| 15 | 195 |
| 16 | 192 |

| | |
|---|---|
| 17 | 202 |
| 18 | 205 |
| 19 | 200 |
| 20 | 202 |
| 21 | 198 |
| 22 | 193 |
| 23 | 195 |
| 24 | 196 |
| 25 | 199 |

```
data_anna = readtable("MSA_Verfahren1_200ml_Anna.csv")
```

data_anna = *25×1 table*

| | Gewicht_in_g |
|---|---|
| 1 | 201 |
| 2 | 194 |
| 3 | 192 |
| 4 | 195 |
| 5 | 195 |
| 6 | 204 |
| 7 | 201 |
| 8 | 202 |
| 9 | 195 |
| 10 | 201 |
| 11 | 203 |
| 12 | 201 |
| 13 | 198 |
| 14 | 202 |
| 15 | 200 |
| 16 | 204 |
| 17 | 205 |
| 18 | 201 |
| 19 | 201 |
| 20 | 195 |
| 21 | 203 |
| 22 | 204 |
| 23 | 197 |
| 24 | 198 |
| 25 | 202 |

```
data_michael = readtable("MSA_Verfahren1_200ml_Michael.csv")
```

data_michael = *25×1 table*

| | Gewicht_in_g |
|---|---|
| 1 | 205 |
| 2 | 209 |
| 3 | 210 |
| 4 | 204 |
| 5 | 208 |
| 6 | 209 |
| 7 | 208 |
| 8 | 206 |
| 9 | 208 |
| 10 | 205 |

| | |
|---|---|
| 11 | 202 |
| 12 | 209 |
| 13 | 204 |
| 14 | 207 |
| 15 | 208 |
| 16 | 204 |
| 17 | 210 |
| 18 | 206 |
| 19 | 209 |
| 20 | 206 |
| 21 | 204 |
| 22 | 209 |
| 23 | 206 |
| 24 | 208 |
| 25 | 208 |

```
%Statistische Kenngrößen
Mean_Jan = mean(data_jan.Gewicht_in_g)
```

```
Mean_Jan = 200.0400
```

```
Std_Jan = std(data_jan.Gewicht_in_g)
```

```
Std_Jan = 7.8818
```

```
Mean_Benni = mean(data_benni.Gewicht_in_g)
```

```
Mean_Benni = 198.7200
```

```
Std_Benni = std(data_benni.Gewicht_in_g)
```

```
Std_Benni = 5.0705
```

```
Mean_Anna = mean(data_anna.Gewicht_in_g)
```

```
Mean_Anna = 199.7600
```

```
Std_Anna = std(data_anna.Gewicht_in_g)
```

```
Std_Anna = 3.6774
```

```
Mean_Michael = mean(data_michael.Gewicht_in_g)
```

```
Mean_Michael = 206.8800
```

```
Std_Michael = std(data_michael.Gewicht_in_g)
```

```
Std_Michael = 2.2045
```

## Messmittel der verschiedenen Kandidaten

```
cg_Jan = 0.2 * 500 / (6*Std_Jan)
```

```
cg_Jan = 2.1146
```

```
cg_k_Jan = ((0.2/2)*500-abs(Mean_Jan-200))/(3*Std_Jan)
```

```
cg_k_Jan = 2.1129
```

```
cg_Benni = 0.2 * 500 / (6*Std_Benni)
```

```
cg_Benni = 3.2870
```

```
cg_k_Benni = ((0.2/2)*500-abs(Mean_Benni-200))/(3*Std_Benni)
```

```
cg_k_Benni = 3.2028
```

```
cg_Anna = 0.2 * 500 / (6*Std_Anna)
```

```
cg_Anna = 4.5322
```

```
cg_anna_matlab = capability(data_anna.Gewicht_in_g,[0,200])
```

```
cg_anna_matlab = struct with fields:
       mu: 199.7600
    sigma: 3.6774
        P: 0.5260
       Pl: 0
       Pu: 0.4740
       Cp: 9.0644
      Cpl: 18.1070
      Cpu: 0.0218
      Cpk: 0.0218
```

```
cg_k_Anna = ((0.2/2)*500-abs(Mean_Anna-200))/(3*Std_Anna)
```

```
cg_k_Anna = 4.5104
```

```
cg_Michael = 0.2 * 500 / (6*Std_Michael)
```

```
cg_Michael = 7.5602
```

```
cg_k_Michael = ((0.2/2)*500-abs(Mean_Michael-200))/(3*Std_Michael)
```

```
cg_k_Michael = 6.5199
```

```
x = (1:1:25)
```

```
x =
     1     2     3     4     5     6     7     8     9    10    11    12    13    14    15    16    17    1
```

```
% Frau Neff passen diese Werte ? T = 500 oder T=200? Versuch haben wir mit 200 ml gemacht,
% aber Versuch 2 mit 100-500 ml in 100ml-Schritten
```

## Lineare Anpassung

```
linreg_jan = fitlm(x,data_jan.Gewicht_in_g,"linear")
```

```
linreg_jan =
Linear regression model:
    y ~ 1 + x1

Estimated Coefficients:
                   Estimate      SE        tStat       pValue
                   ________    _______    _______    __________

    (Intercept)      199.36     3.3157     60.126    8.4599e-27
    x1             0.052308    0.22304    0.23452       0.81665


Number of observations: 25, Error degrees of freedom: 23
Root Mean Squared Error: 8.04
R-squared: 0.00239,  Adjusted R-Squared -0.041
F-statistic vs. constant model: 0.055, p-value = 0.817
```

```
linreg_anna = fitlm(x,data_anna.Gewicht_in_g,"linear")
```

```
linreg_anna =
```

```
Linear regression model:
    y ~ 1 + x1

Estimated Coefficients:
                   Estimate       SE       tStat       pValue
                   ________    ________    ______    __________

    (Intercept)     197.49       1.4512    136.09    6.1999e-35
    x1             0.17462     0.097617    1.7888      0.086832


Number of observations: 25, Error degrees of freedom: 23
Root Mean Squared Error: 3.52
R-squared: 0.122,  Adjusted R-Squared 0.084
F-statistic vs. constant model: 3.2, p-value = 0.0868
```

```
linreg_benni = fitlm(x,data_benni.Gewicht_in_g,"linear")
```

```
linreg_benni =
Linear regression model:
    y ~ 1 + x1

Estimated Coefficients:
                   Estimate       SE        tStat       pValue
                   ________    ________    ________    __________

    (Intercept)       199.38     2.1298      93.615    3.3318e-31
    x1             -0.050769    0.14326    -0.35437       0.72629


Number of observations: 25, Error degrees of freedom: 23
Root Mean Squared Error: 5.17
R-squared: 0.00543,  Adjusted R-Squared -0.0378
F-statistic vs. constant model: 0.126, p-value = 0.726
```

```
linreg_michael = fitlm(x,data_michael.Gewicht_in_g,"linear")
```

```
linreg_michael =
Linear regression model:
    y ~ 1 + x1

Estimated Coefficients:
                   Estimate        SE         tStat       pValue
                   _________    ________    _________    __________

    (Intercept)        206.9     0.92849       222.83    7.4203e-40
    x1             -0.0015385    0.062457    -0.024632       0.98056


Number of observations: 25, Error degrees of freedom: 23
Root Mean Squared Error: 2.25
R-squared: 2.64e-05,  Adjusted R-Squared -0.0435
F-statistic vs. constant model: 0.000607, p-value = 0.981
```

```
slope_jan = linreg_jan.Coefficients.Estimate(2)
```

```
slope_jan = 0.0523
```

```
intercept_jan = linreg_jan.Coefficients.Estimate(1)
```

```
intercept_jan = 199.3600
```

```
y_jan = slope_jan * x + intercept_jan
```

```
y_jan =
  199.4123  199.4646  199.5169  199.5692  199.6215  199.6738  199.7262  199.7785  199.8308  199.8831  199.
```

```
slope_anna = linreg_anna.Coefficients.Estimate(2)
```

```
slope_anna = 0.1746
```

```
intercept_anna = linreg_anna.Coefficients.Estimate(1)
```

```
intercept_anna = 197.4900
```

```
y_anna = slope_anna * x + intercept_anna
```

```
y_anna =
  197.6646  197.8392  198.0138  198.1885  198.3631  198.5377  198.7123  198.8869  199.0615  199.2362  199.
```

```
slope_benni = linreg_benni.Coefficients.Estimate(2)
```

```
slope_benni = -0.0508
```

```
intercept_benni = linreg_benni.Coefficients.Estimate(1)
```

```
intercept_benni = 199.3800
```

```
y_benni = slope_benni * x + intercept_benni
```

```
y_benni =
  199.3292  199.2785  199.2277  199.1769  199.1262  199.0754  199.0246  198.9738  198.9231  198.8723  198.
```

```
slope_michael = linreg_michael.Coefficients.Estimate(2)
```

```
slope_michael = -0.0015
```

```
intercept_michael = linreg_michael.Coefficients.Estimate(1)
```

```
intercept_michael = 206.9000
```

```
y_michael = slope_michael * x + intercept_michael
```

```
y_michael =
  206.8985  206.8969  206.8954  206.8938  206.8923  206.8908  206.8892  206.8877  206.8862  206.8846  206.
```

```
%%% Plot MSA

hold on
ms1_jan = plot(x,data_jan.Gewicht_in_g,"rx")
```

```
ms1_jan =
  Line with properties:

            Color: [1 0 0]
        LineStyle: 'none'
        LineWidth: 0.5000
           Marker: 'x'
       MarkerSize: 6
    MarkerFaceColor: 'none'
            XData: [1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25]
            YData: [199 213 185 198 205 191 184 193 199 206 207 210 213 197 205 203 196 206 197 204 210
            ZData: [1×0 double]
```

```
  Show all properties
```

```
plt_linreg_jan = plot(x, y_jan)
```

```
plt_linreg_jan =
  Line with properties:

            Color: [0 0.4470 0.7410]
        LineStyle: '-'
        LineWidth: 0.5000
           Marker: 'none'
       MarkerSize: 6
    MarkerFaceColor: 'none'
            XData: [1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25]
            YData: [199.4123 199.4646 199.5169 199.5692 199.6215 199.6738 199.7262 199.7785 199.8308 199
            ZData: [1×0 double]

  Show all properties
```

```


ms1_anna = plot(x,data_anna.Gewicht_in_g, "go")
```

```
ms1_anna =
  Line with properties:

            Color: [0 1 0]
        LineStyle: 'none'
        LineWidth: 0.5000
           Marker: 'o'
       MarkerSize: 6
    MarkerFaceColor: 'none'
            XData: [1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25]
            YData: [201 194 192 195 195 204 201 202 195 201 203 201 198 202 200 204 205 201 201 195 203 2
            ZData: [1×0 double]

  Show all properties
```

```
plt_linreg_anna = plot(x, y_anna)
```

```
plt_linreg_anna =
  Line with properties:

            Color: [0.8500 0.3250 0.0980]
        LineStyle: '-'
        LineWidth: 0.5000
           Marker: 'none'
       MarkerSize: 6
    MarkerFaceColor: 'none'
            XData: [1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25]
            YData: [197.6646 197.8392 198.0138 198.1885 198.3631 198.5377 198.7123 198.8869 199.0615 199
            ZData: [1×0 double]

  Show all properties
```

```


ms1_benni = plot(x, data_benni.Gewicht_in_g, "b+")
```

```
ms1_benni =
  Line with properties:

            Color: [0 0 1]
        LineStyle: 'none'
        LineWidth: 0.5000
           Marker: '+'
       MarkerSize: 6
```

```
    MarkerFaceColor: 'none'
              XData: [1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25]
              YData: [195 199 201 209 192 193 199 192 201 202 205 210 196 197 195 192 202 205 200 202 198 :
              ZData: [1×0 double]

  Show all properties
```

```
plt_linreg_benni = plot(x, y_benni)
```

```
plt_linreg_benni =
  Line with properties:

              Color: [0.9290 0.6940 0.1250]
          LineStyle: '-'
          LineWidth: 0.5000
             Marker: 'none'
         MarkerSize: 6
    MarkerFaceColor: 'none'
              XData: [1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25]
              YData: [199.3292 199.2785 199.2277 199.1769 199.1262 199.0754 199.0246 198.9738 198.9231 198
              ZData: [1×0 double]

  Show all properties
```

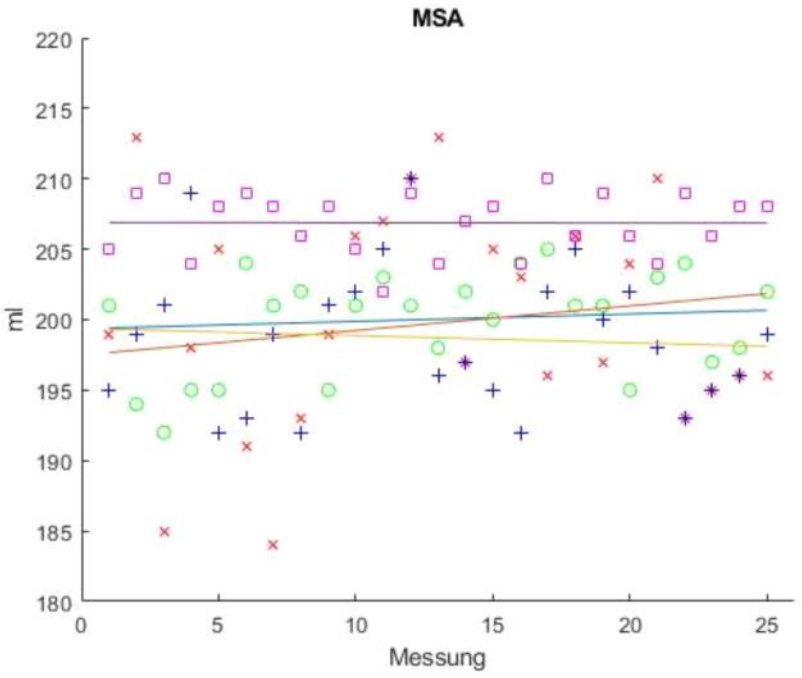
```
ms1_michael = plot(x, data_michael.Gewicht_in_g, "ms")
```

```
ms1_michael =
  Line with properties:

              Color: [1 0 1]
          LineStyle: 'none'
          LineWidth: 0.5000
             Marker: 'square'
         MarkerSize: 6
    MarkerFaceColor: 'none'
              XData: [1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25]
              YData: [205 209 210 204 208 209 208 206 208 205 202 209 204 207 208 204 210 206 209 206 204 :
              ZData: [1×0 double]

  Show all properties
```

```
plt_linreg_michael = plot(x, y_michael)
```

```
plt_linreg_michael =
  Line with properties:

              Color: [0.4940 0.1840 0.5560]
          LineStyle: '-'
          LineWidth: 0.5000
             Marker: 'none'
         MarkerSize: 6
    MarkerFaceColor: 'none'
              XData: [1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25]
              YData: [206.8985 206.8969 206.8954 206.8938 206.8923 206.8908 206.8892 206.8877 206.8862 206
              ZData: [1×0 double]

  Show all properties
```

```
hold off
title("MSA");
xlabel("Messung");
ylabel("ml");
xlim([0.0000 26]);
ylim([180 220]);
```




## MSA2

```
data_ms2_michael = readtable('Messwerte_MSA2_Micha.xlsx')
```

data_ms2_michael = *30×4 table*

| | Operator | Part | Repetition | Measurement |
|---|---|---|---|---|
| 1 | 'Michael' | 1 | 1 | 106 |
| 2 | 'Michael' | 2 | 1 | 205 |
| 3 | 'Michael' | 3 | 1 | 302 |
| 4 | 'Michael' | 4 | 1 | 407 |
| 5 | 'Michael' | 5 | 1 | 507 |
| 6 | 'Michael' | 1 | 2 | 105 |
| 7 | 'Michael' | 2 | 2 | 205 |
| 8 | 'Michael' | 3 | 2 | 303 |
| 9 | 'Michael' | 4 | 2 | 407 |
| 10 | 'Michael' | 5 | 2 | 507 |
| 11 | 'Michael' | 1 | 3 | 105 |
| 12 | 'Michael' | 2 | 3 | 205 |
| 13 | 'Michael' | 3 | 3 | 302 |
| 14 | 'Michael' | 4 | 3 | 408 |
| 15 | 'Michael' | 5 | 3 | 507 |
| 16 | 'Michele' | 1 | 1 | 105 |
| 17 | 'Michele' | 2 | 1 | 205 |
| 18 | 'Michele' | 3 | 1 | 302 |
| 19 | 'Michele' | 4 | 1 | 407 |
| 20 | 'Michele' | 5 | 1 | 507 |
| 21 | 'Michele' | 1 | 2 | 106 |
| 22 | 'Michele' | 2 | 2 | 205 |
| 23 | 'Michele' | 3 | 2 | 302 |
| 24 | 'Michele' | 4 | 2 | 407 |
| 25 | 'Michele' | 5 | 2 | 507 |

| | | | | |
|---|---|---|---|---|
| 26 | 'Michele' | 1 | 3 | 105 |
| 27 | 'Michele' | 2 | 3 | 204 |
| 28 | 'Michele' | 3 | 3 | 302 |
| 29 | 'Michele' | 4 | 3 | 406 |
| 30 | 'Michele' | 5 | 3 | 506 |

```
data_ms2_anna = readtable('Messwerte_MSA2_Anna.xlsx')
```

data_ms2_anna = *30×4 table*

| | Operator | Part | Repetition | Measurement |
|---|---|---|---|---|
| 1 | 'Anna' | 1 | 1 | 100 |
| 2 | 'Anna' | 2 | 1 | 204 |
| 3 | 'Anna' | 3 | 1 | 303 |
| 4 | 'Anna' | 4 | 1 | 409 |
| 5 | 'Anna' | 5 | 1 | 506 |
| 6 | 'Anna' | 1 | 2 | 99 |
| 7 | 'Anna' | 2 | 2 | 201 |
| 8 | 'Anna' | 3 | 2 | 300 |
| 9 | 'Anna' | 4 | 2 | 406 |
| 10 | 'Anna' | 5 | 2 | 503 |
| 11 | 'Anna' | 1 | 3 | NaN |
| 12 | 'Anna' | 2 | 3 | NaN |
| 13 | 'Anna' | 3 | 3 | NaN |
| 14 | 'Anna' | 4 | 3 | NaN |
| 15 | 'Anna' | 5 | 3 | NaN |
| 16 | 'JL' | 1 | 1 | 103 |
| 17 | 'JL' | 2 | 1 | 200 |
| 18 | 'JL' | 3 | 1 | 305 |
| 19 | 'JL' | 4 | 1 | 400 |
| 20 | 'JL' | 5 | 1 | 502 |
| 21 | 'JL' | 1 | 2 | 102 |
| 22 | 'JL' | 2 | 2 | 198 |
| 23 | 'JL' | 3 | 2 | 302 |
| 24 | 'JL' | 4 | 2 | 399 |
| 25 | 'JL' | 5 | 2 | 502 |
| 26 | 'JL' | 1 | 3 | NaN |
| 27 | 'JL' | 2 | 3 | NaN |
| 28 | 'JL' | 3 | 3 | NaN |
| 29 | 'JL' | 4 | 3 | NaN |
| 30 | 'JL' | 5 | 3 | NaN |

```
data_ms2_jan = readtable('Messwerte_MSA2_Jan.xlsx')
```

data_ms2_jan = *30×4 table*

| | Operator | Part | Repetition | Measurement |
|---|---|---|---|---|
| 1 | 'Jan' | 1 | 1 | 102 |
| 2 | 'Jan' | 2 | 1 | 200 |
| 3 | 'Jan' | 3 | 1 | 301 |
| 4 | 'Jan' | 4 | 1 | 399 |
| 5 | 'Jan' | 5 | 1 | 502 |
| 6 | 'Jan' | 1 | 2 | 98 |
| 7 | 'Jan' | 2 | 2 | 200 |
| 8 | 'Jan' | 3 | 2 | 299 |
| 9 | 'Jan' | 4 | 2 | 400 |

| | | | | |
|---|---|---|---|---|
| 10 | 'Jan' | 5 | 2 | 501 |
| 11 | 'Jan' | 1 | 3 | NaN |
| 12 | 'Jan' | 2 | 3 | NaN |
| 13 | 'Jan' | 3 | 3 | NaN |
| 14 | 'Jan' | 4 | 3 | NaN |
| 15 | 'Jan' | 5 | 3 | NaN |
| 16 | 'MJ' | 1 | 1 | 98 |
| 17 | 'MJ' | 2 | 1 | 202 |
| 18 | 'MJ' | 3 | 1 | 302 |
| 19 | 'MJ' | 4 | 1 | 401 |
| 20 | 'MJ' | 5 | 1 | 500 |
| 21 | 'MJ' | 1 | 2 | 100 |
| 22 | 'MJ' | 2 | 2 | 200 |
| 23 | 'MJ' | 3 | 2 | 302 |
| 24 | 'MJ' | 4 | 2 | 399 |
| 25 | 'MJ' | 5 | 2 | 500 |
| 26 | 'MJ' | 1 | 3 | NaN |
| 27 | 'MJ' | 2 | 3 | NaN |
| 28 | 'MJ' | 3 | 3 | NaN |
| 29 | 'MJ' | 4 | 3 | NaN |
| 30 | 'MJ' | 5 | 3 | NaN |

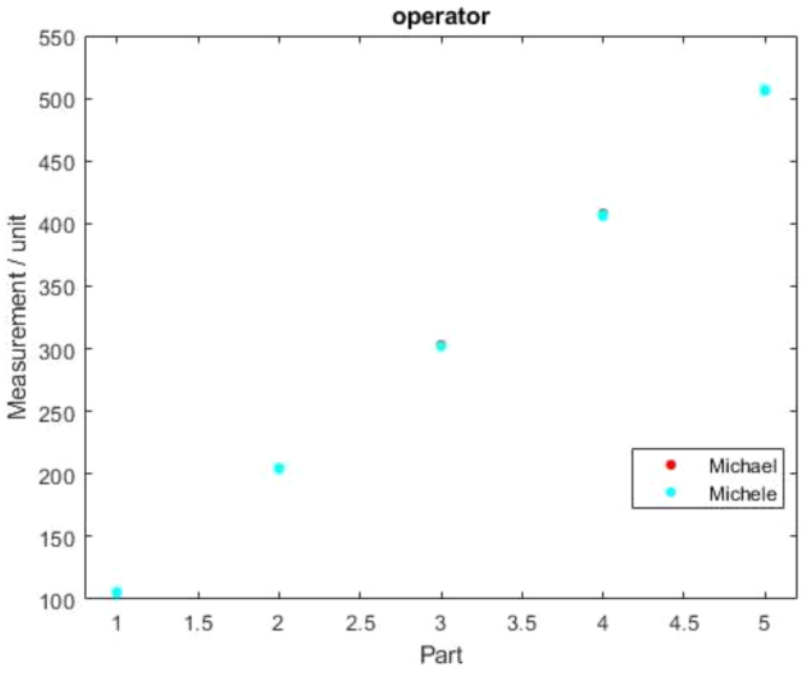
```
data_ms2_benni = readtable('Messwerte_MSA2_Benjamin.xlsx')
```

data_ms2_benni = *30×4 table*

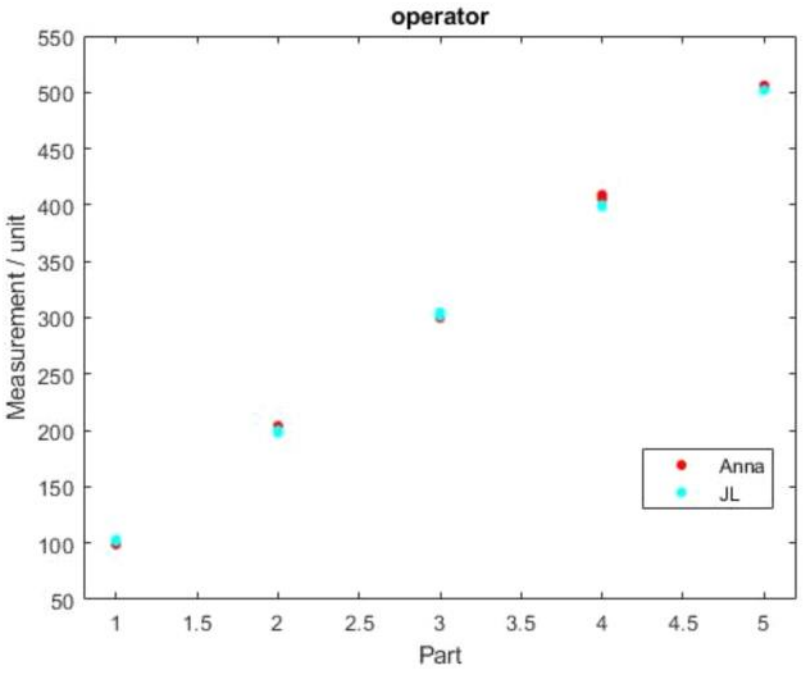
| | Operator | Part | Repetition | Measurement |
|---|---|---|---|---|
| 1 | 'Benjamin' | 1 | 1 | 101 |
| 2 | 'Benjamin' | 2 | 1 | 198 |
| 3 | 'Benjamin' | 3 | 1 | 299 |
| 4 | 'Benjamin' | 4 | 1 | 402 |
| 5 | 'Benjamin' | 5 | 1 | 500 |
| 6 | 'Benjamin' | 1 | 2 | 99 |
| 7 | 'Benjamin' | 2 | 2 | 202 |
| 8 | 'Benjamin' | 3 | 2 | 298 |
| 9 | 'Benjamin' | 4 | 2 | 397 |
| 10 | 'Benjamin' | 5 | 2 | 503 |
| 11 | 'Benjamin' | 1 | 3 | NaN |
| 12 | 'Benjamin' | 2 | 3 | NaN |
| 13 | 'Benjamin' | 3 | 3 | NaN |
| 14 | 'Benjamin' | 4 | 3 | NaN |
| 15 | 'Benjamin' | 5 | 3 | NaN |
| 16 | 'Marie' | 1 | 1 | 98 |
| 17 | 'Marie' | 2 | 1 | 200 |
| 18 | 'Marie' | 3 | 1 | 301 |
| 19 | 'Marie' | 4 | 1 | 398 |
| 20 | 'Marie' | 5 | 1 | 498 |
| 21 | 'Marie' | 1 | 2 | 100 |
| 22 | 'Marie' | 2 | 2 | 198 |
| 23 | 'Marie' | 3 | 2 | 201 |
| 24 | 'Marie' | 4 | 2 | 302 |
| 25 | 'Marie' | 5 | 2 | 499 |
| 26 | 'Marie' | 1 | 3 | NaN |

| | | | | |
|---|---|---|---|---|
| 27 | 'Marie' | 2 | 3 | NaN |
| 28 | 'Marie' | 3 | 3 | NaN |
| 29 | 'Marie' | 4 | 3 | NaN |
| 30 | 'Marie' | 5 | 3 | NaN |

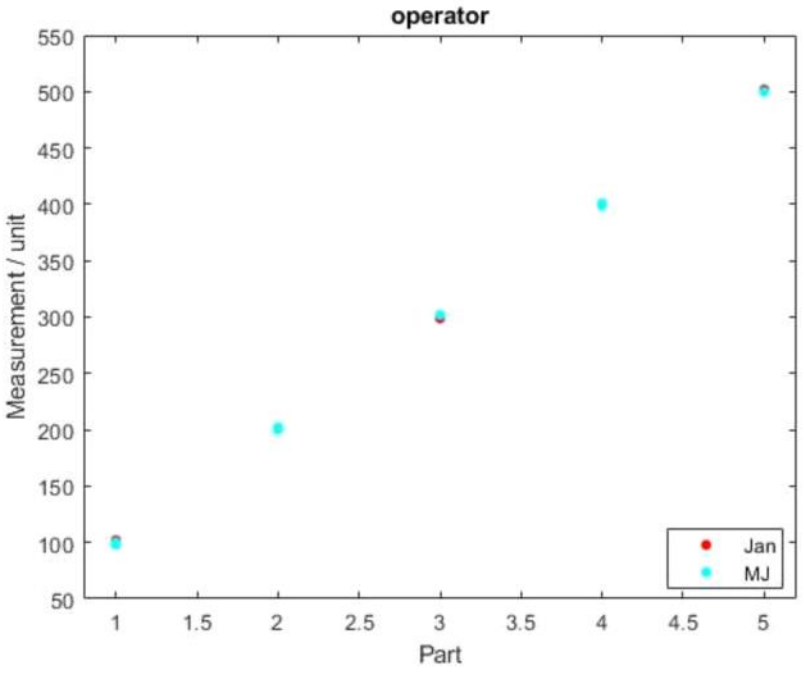
```
gscatter(data_ms2_michael.Part,data_ms2_michael.Measurement,data_ms2_michael.Operator)
xlabel("Part")
ylabel("Measurement / unit")
title("operator")
```



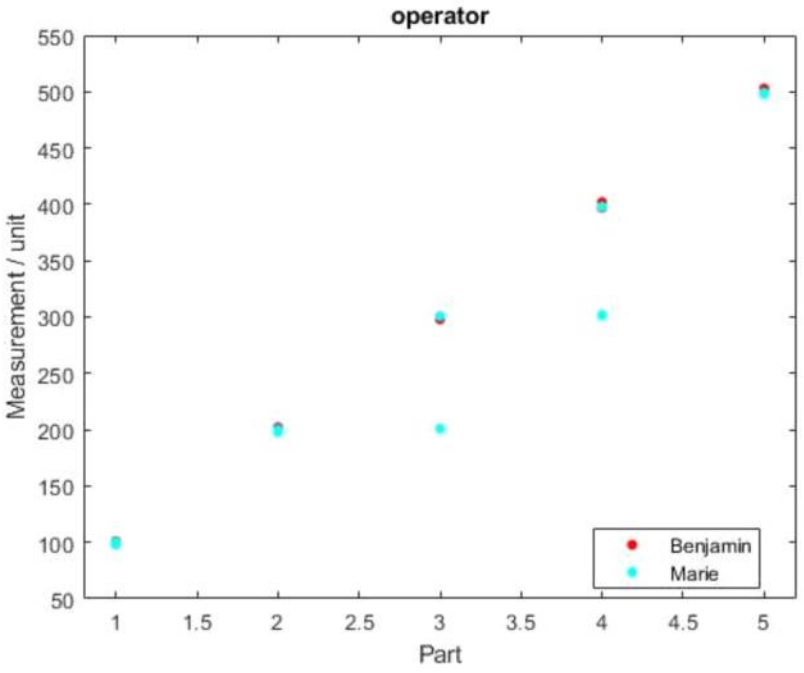

```
gscatter(data_ms2_anna.Part,data_ms2_anna.Measurement,data_ms2_anna.Operator)
xlabel("Part")
ylabel("Measurement / unit")
title("operator")
```




```
gscatter(data_ms2_jan.Part,data_ms2_jan.Measurement,data_ms2_jan.Operator)
xlabel("Part")
ylabel("Measurement / unit")
title("operator")
```



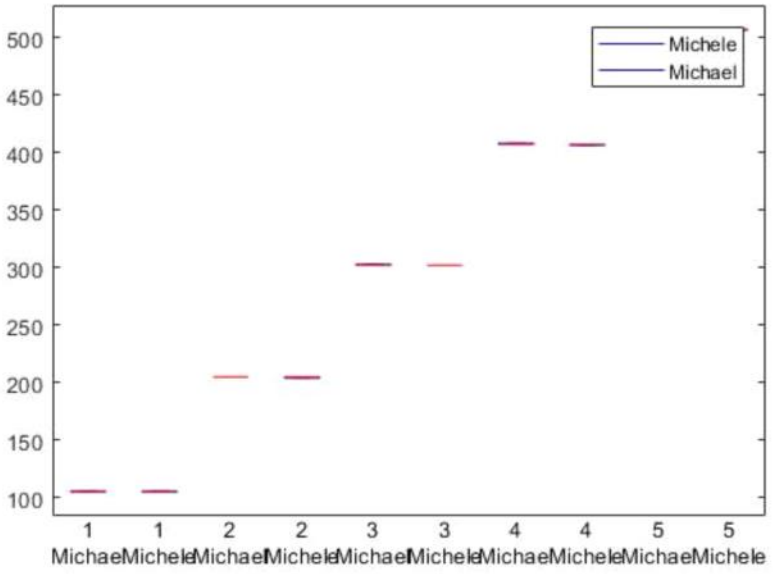

```
gscatter(data_ms2_benni.Part,data_ms2_benni.Measurement,data_ms2_benni.Operator)
xlabel("Part")
ylabel("Measurement / unit")
title("operator")

%Boxplot
hold off
```

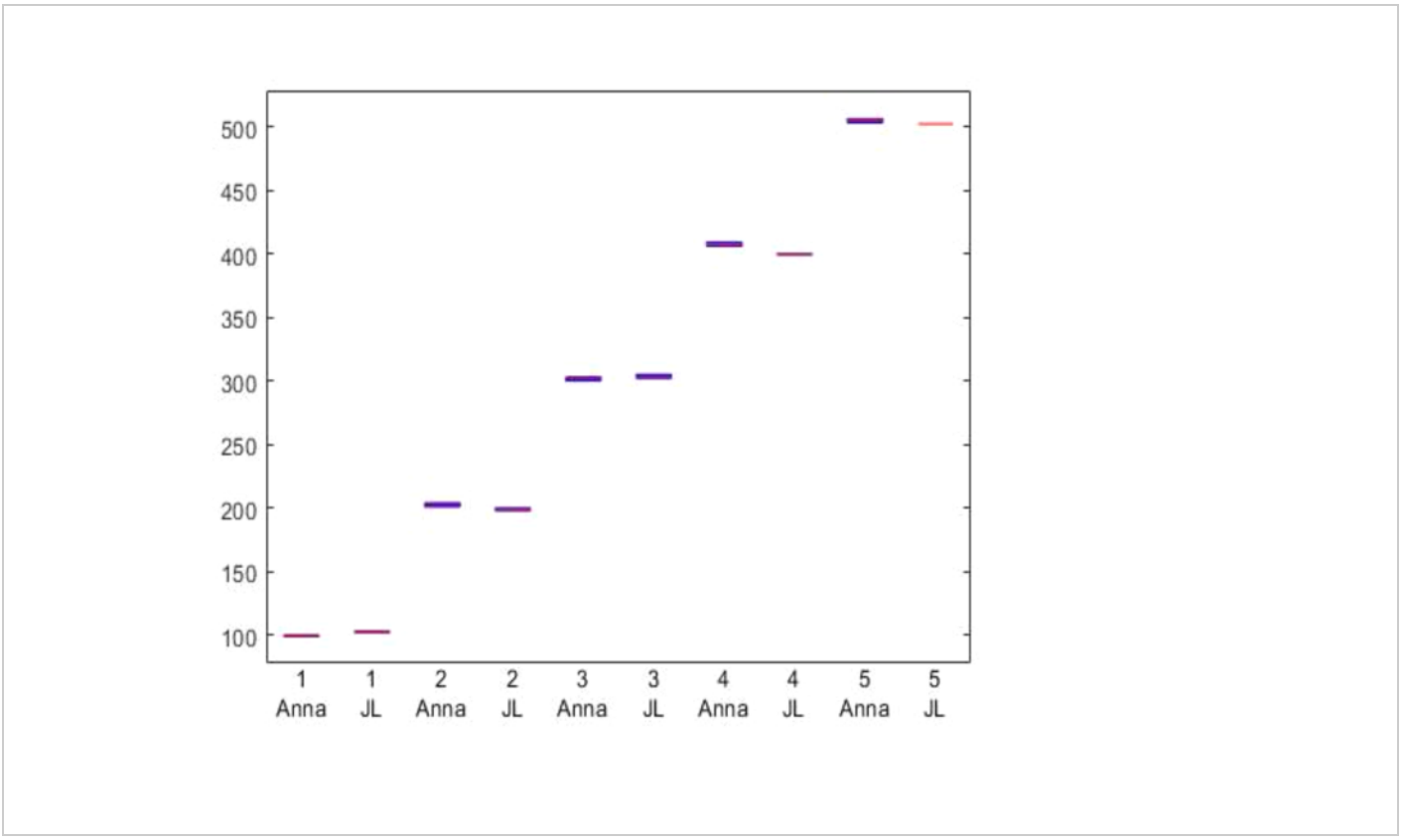



```
% @michael kannst du die Farben einfügen, bei meinem Matlab funzt es nicht
boxplot(data_ms2_michael.Measurement,{data_ms2_michael.Part,data_ms2_michael.Operator})
legend(findobj(gca,'Tag','Box'),'Michele','Michael')
```

```
Warning: Ignoring extra legend entries.
```

```
boxplot(data_ms2_anna.Measurement,{data_ms2_anna.Part,data_ms2_anna.Operator})
```




500
450
400
350
300
250
200
150
100
1 Anna
1 JL
2 Anna
2 JL
3 Anna
3 JL
4 Anna
4 JL
5 Anna
5 JL

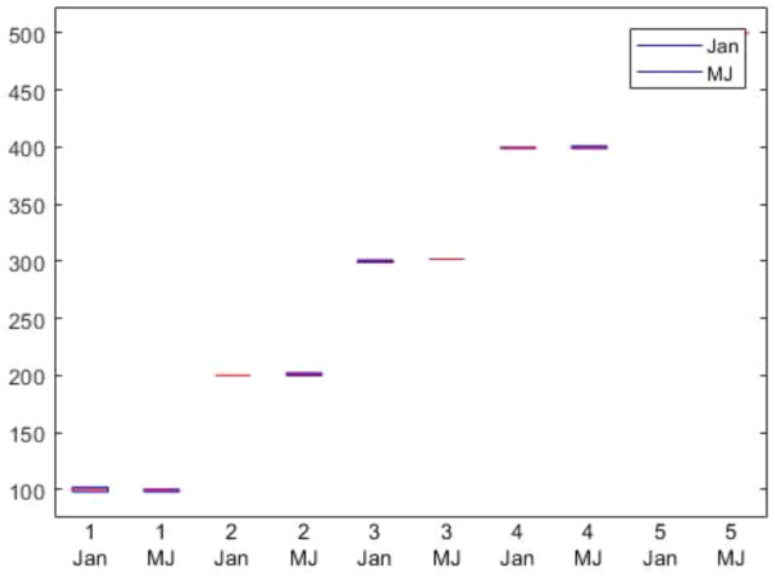
```
legend(findobj(gca,'Tag','Box'),'Anna','JL')
```

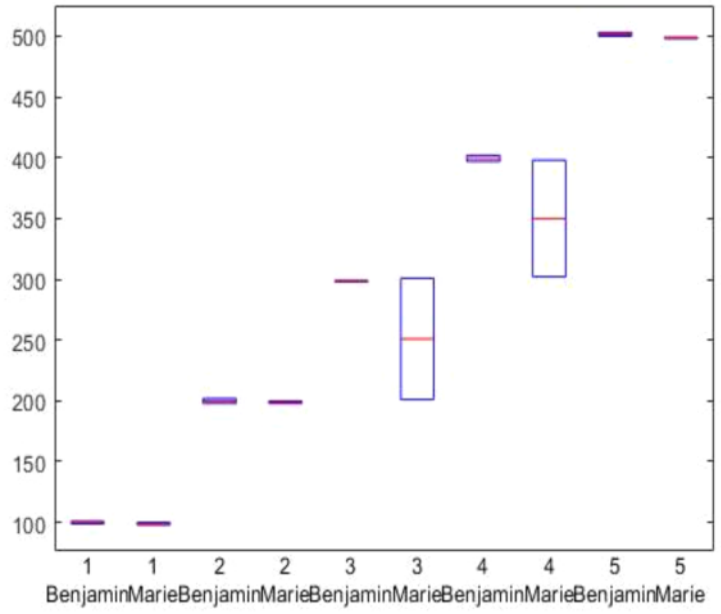
```
Warning: Ignoring extra legend entries.
```

```
boxplot(data_ms2_jan.Measurement,{data_ms2_jan.Part,data_ms2_jan.Operator})
legend(findobj(gca,'Tag','Box'),'Jan','MJ')
```

```
Warning: Ignoring extra legend entries.
```

```
boxplot(data_ms2_benni.Measurement,{data_ms2_benni.Part,data_ms2_benni.Operator})
```




500
450
400
350
300
250
200
150
100
1 1 2 2 3 3 4 4 5 5
BenjaminMarieBenjaminMarieBenjaminMarieBenjaminMarieBenjaminMarie

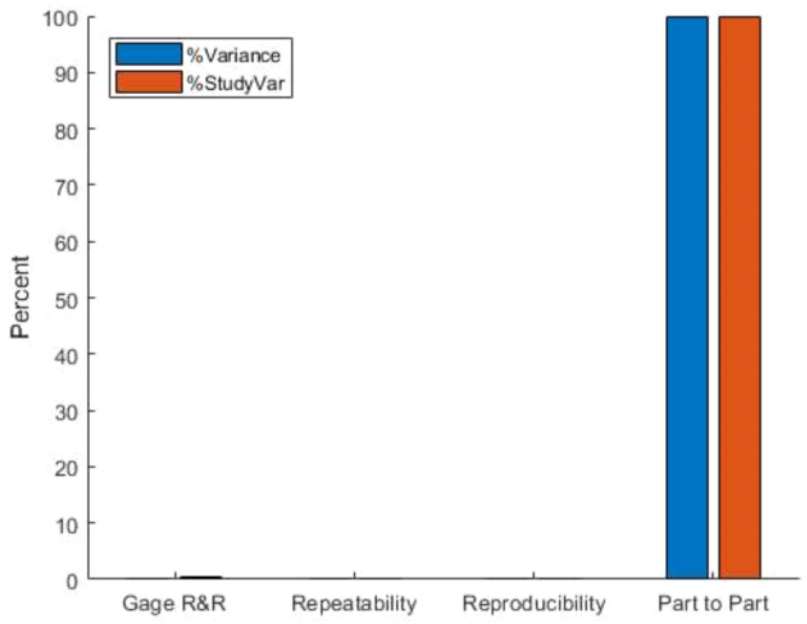
```
legend(findobj(gca,'Tag','Box'),'Benjamin','Marie')
```

```
Warning: Ignoring extra legend entries.
```

```
hold on

% GageErr
%GageR&R durchführen
hold on
gagerr(data_ms2_michael.Measurement,{data_ms2_michael.Part,data_ms2_michael.Operator})
```

```
    'Source'              'Variance'      '% Variance'    'sigma'       '5.15*sigma'    '% 5.15*sigma'
    'Gage R&R'            [    0.2500]    [9.8961e-04]    [  0.5000]    [    2.5750]    [       0.3146]
    '  Repeatability'     [    0.2083]    [8.2468e-04]    [  0.4564]    [    2.3506]    [       0.2872]
    '  Reproducibility'   [    0.0417]    [1.6494e-04]    [  0.2041]    [    1.0512]    [       0.1284]
    '    Operator'        [    0.0417]    [1.6494e-04]    [  0.2041]    [    1.0512]    [       0.1284]
    'Part'                [2.5262e+04]    [   99.9990]    [158.9406]    [  818.5441]    [      99.9995]
    'Total'               [2.5262e+04]    [       100]    [158.9414]    [  818.5481]    ''

Number of distinct categories (NDC):450
% of Gage R&R of total variations (PRR):  0.31
Note: The last column of the above table does not have to sum to 100%
```

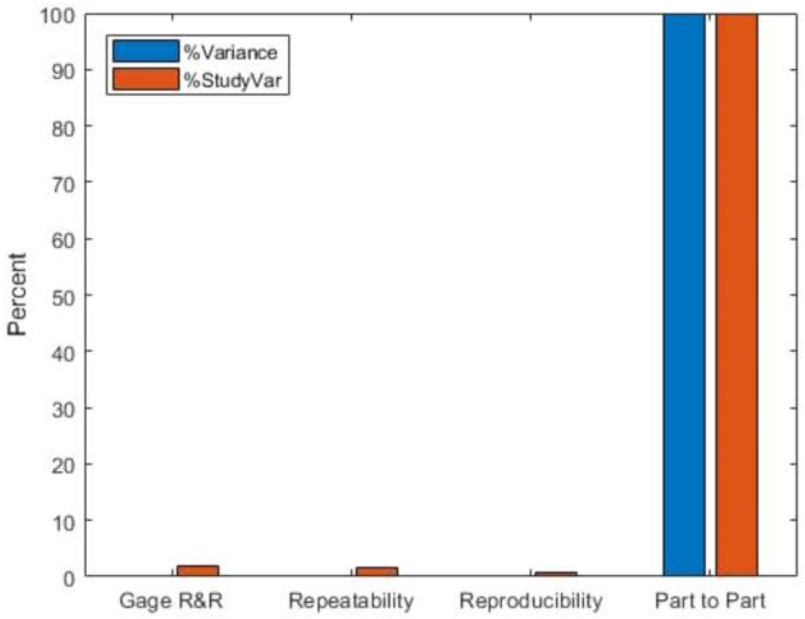
```
legend('Location',"northwest")
hold off
```




```
gagerr(data_ms2_anna.Measurement,{data_ms2_anna.Part,data_ms2_anna.Operator})
```

```
    'Source'              'Variance'      '% Variance'    'sigma'       '5.15*sigma'    '% 5.15*sigma'
    'Gage R&R'            [    8.3893]    [    0.0331]    [  2.8964]    [   14.9166]    [       1.8184]
    '  Repeatability'     [    7.5214]    [    0.0296]    [  2.7425]    [   14.1240]    [       1.7218]
    '  Reproducibility'   [    0.8679]    [    0.0034]    [  0.9316]    [    4.7977]    [       0.5849]
    '    Operator'        [    0.8679]    [    0.0034]    [  0.9316]    [    4.7977]    [       0.5849]
    'Part'                [2.5362e+04]    [   99.9669]    [159.2552]    [  820.1644]    [      99.9835]
    'Total'               [2.5371e+04]    [       100]    [159.2816]    [  820.3000]    ''

Number of distinct categories (NDC):78
% of Gage R&R of total variations (PRR):  1.82
Note: The last column of the above table does not have to sum to 100%
```

```
legend('Location',"northwest")
```

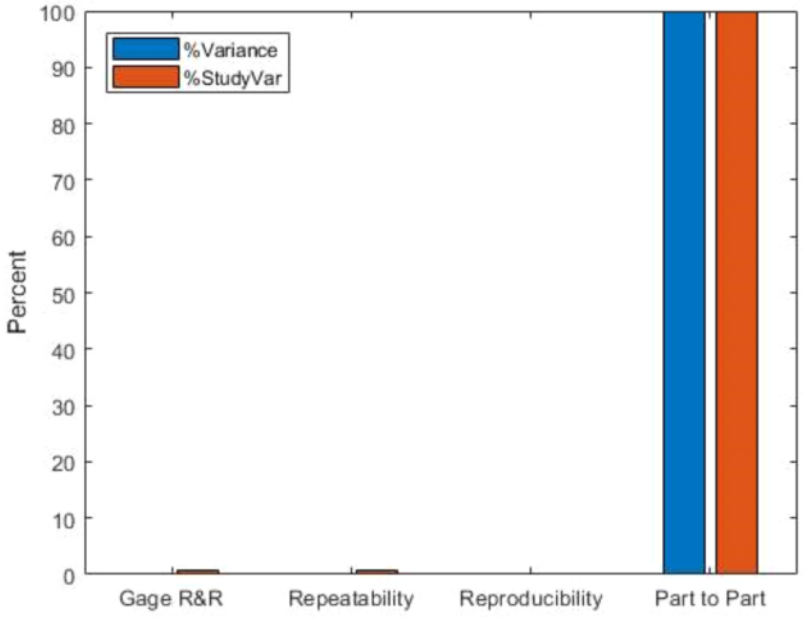



```
gagerr(data_ms2_jan.Measurement,{data_ms2_jan.Part,data_ms2_jan.Operator})
```

| 'Source' | 'Variance' | '% Variance' | 'sigma' | '5.15*sigma' | '% 5.15*sigma' |
|---|---|---|---|---|---|
| 'Gage R&R' | [ 1.8071] | [ 0.0072] | [ 1.3443] | [ 6.9231] | [ 0.8487] |
| ' Repeatability' | [ 1.8071] | [ 0.0072] | [ 1.3443] | [ 6.9231] | [ 0.8487] |
| ' Reproducibility' | [ 0] | [ 0] | [ 0] | [ 0] | [ 0] |
| ' Operator' | [ 0] | [ 0] | [ 0] | [ 0] | [ 0] |
| 'Part' | [2.5087e+04] | [ 99.9928] | [158.3902] | [ 815.7097] | [ 99.9964] |
| 'Total' | [2.5089e+04] | [ 100] | [158.3959] | [ 815.7391] | '' |

```
Number of distinct categories (NDC):167
% of Gage R&R of total variations (PRR):  0.85
Note: The last column of the above table does not have to sum to 100%
```

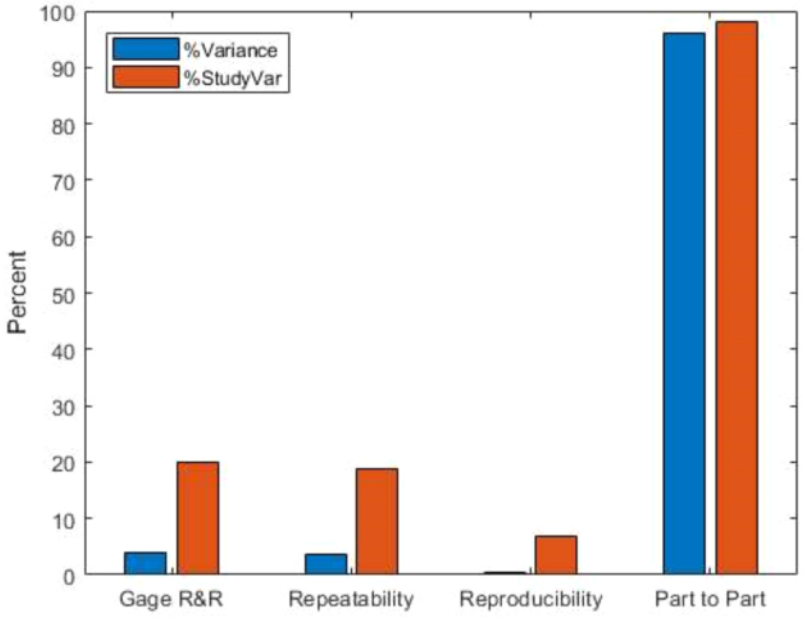
```
legend('Location',"northwest")
```




```
gagerr(data_ms2_benni.Measurement,{data_ms2_benni.Part,data_ms2_benni.Operator})
```

```
    'Source'              'Variance'      '% Variance'    'sigma'       '5.15*sigma'    '% 5.15*sigma'
    'Gage R&R'            [  997.2964]    [    4.0251]    [ 31.5800]    [  162.6370]    [     20.0627]
    '  Repeatability'     [  876.9071]    [    3.5392]    [ 29.6126]    [  152.5050]    [     18.8128]
    '  Reproducibility'   [  120.3893]    [    0.4859]    [ 10.9722]    [   56.5069]    [      6.9706]
    '   Operator'         [  120.3893]    [    0.4859]    [ 10.9722]    [   56.5069]    [      6.9706]
    'Part'                [2.3780e+04]    [   95.9749]    [154.2062]    [  794.1622]    [     97.9668]
    'Total'               [2.4777e+04]    [       100]    [157.4067]    [  810.6444]    ''

Number of distinct categories (NDC):7
% of Gage R&R of total variations (PRR): 20.06
Note: The last column of the above table does not have to sum to 100%
```

```
legend('Location',"northwest")
```


%Variance
%StudyVar
Percent
100
90
80
70
60
50
40
30
20
10
0
Gage R&R
Repeatability
Reproducibility
Part to Part