UNIVERSITÀ DI TRENTO

Bilancia a due piatti: rapporto di calibrazione

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2024-11-28

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1 Preparazione dei dati

```
Ord_dati <- expand.grid(Forza_sx = seq(100, 500, 50),
    Delta_forza = seq(-50, 50, 5), Risultato = NA) %>%
    mutate(StdOrd = 1:n(), RunOrd = sample(n()), .before = Forza_sx) %>%
    arrange(RunOrd)

write.csv(Ord_dati, "Test_suite.csv")
```

```
kable(Ord_dati[1:5, ], booktabs = T, caption = "Ordine di test", comment = "* La tabella completa sarà disponib
    kable_styling(latex_options = c("striped", "HOLD_position"), position = "center")
```

Table 1.1. Ordine di test

StdOrd	RunOrd	Forza_sx	Delta_forza	Risultato
112	1	250	10	NA
171	2	500	40	NA
160	3	400	35	NA
138	4	200	25	NA
154	5	100	35	NA

1.1 Lettura dei dati

```
Misurazioni_random <- read.csv("Misurazioni_random_1.csv", comment = "#")
Misurazioni_ordinate <- read.csv("Misurazioni_ordinate.csv", comment = "#")
Misurazioni_ordinate
```

```
##       time  F1  DF  angle
## 1     9660 100 -50 -14.05
## 2     9720 100 -45 -12.76
## 3     9780 100 -40 -11.02
## 4     9840 100 -35  -9.55
## 5     9900 100 -30  -7.75
## 6     9960 100 -25  -6.89
## 7    10020 100 -20  -5.19
## 8    10080 100 -15  -3.50
## 9    10140 100 -10  -2.64
## 10   10200 100  -5  -1.42
## 11   10260 100   0   0.09
## 12   10320 100   5   0.96
## 13   10380 100  10   2.00
## 14   10440 100  15   2.91
## 15   10500 100  20   4.34
## 16   10560 100  25   4.97
## 17   10620 100  30   5.74
## 18   10680 100  35   7.11
## 19   10740 100  40   7.35
## 20   10800 100  45   8.79
## 21   10860 100  50   9.63
## 22   10920 150 -50  -9.56
```

```
## 23  10980 150 -45  -8.57
## 24  11040 150 -40  -7.68
## 25  11100 150 -35  -6.78
## 26  11160 150 -30  -5.03
## 27  11220 150 -25  -4.13
## 28  11280 150 -20  -3.41
## 29  11340 150 -15  -2.20
## 30  11400 150 -10  -1.26
## 31  11460 150  -5  -0.80
## 32  11520 150   0   0.43
## 33  11580 150   5   0.93
## 34  11640 150  10   2.21
## 35  11700 150  15   2.59
## 36  11760 150  20   3.25
## 37  11820 150  25   4.55
## 38  11880 150  30   4.82
## 39  11940 150  35   5.01
## 40  12000 150  40   6.13
## 41  12060 150  45   6.66
## 42  12120 150  50   7.20
## 43  12180 200 -50  -6.76
## 44  12240 200 -45  -5.89
## 45  12300 200 -40  -5.44
## 46  12360 200 -35  -4.28
## 47  12420 200 -30  -3.86
## 48  12480 200 -25  -3.17
## 49  12540 200 -20  -2.36
## 50  12600 200 -15  -1.70
## 51  12660 200 -10  -1.02
## 52  12720 200  -5  -0.46
## 53  12780 200   0   0.45
## 54  12840 200   5   0.61
## 55  12900 200  10   1.43
## 56  12960 200  15   1.83
## 57  13020 200  20   2.49
## 58  13080 200  25   3.44
## 59  13140 200  30   3.65
## 60  13200 200  35   3.92
## 61  13260 200  40   4.46
## 62  13320 200  45   4.87
## 63  13380 200  50   5.92
## 64  13440 250 -50  -5.72
## 65  13500 250 -45  -4.76
## 66  13560 250 -40  -4.50
## 67  13620 250 -35  -3.96
## 68  13680 250 -30  -3.42
## 69  13740 250 -25  -3.03
## 70  13800 250 -20  -2.14
## 71  13860 250 -15  -1.57
## 72  13920 250 -10  -1.36
## 73  13980 250  -5  -0.59
## 74  14040 250   0  -0.28
## 75  14100 250   5   0.65
## 76  14160 250  10   0.83
```

```
## 77  14220 250  15   1.15
## 78  14280 250  20   1.48
## 79  14340 250  25   2.04
## 80  14400 250  30   2.87
## 81  14460 250  35   3.33
## 82  14520 250  40   3.89
## 83  14580 250  45   4.31
## 84  14640 250  50   4.55
## 85  14700 300 -50  -4.82
## 86  14760 300 -45  -4.08
## 87  14820 300 -40  -3.94
## 88  14880 300 -35  -3.33
## 89  14940 300 -30  -3.02
## 90  15000 300 -25  -2.36
## 91  15060 300 -20  -2.06
## 92  15120 300 -15  -1.77
## 93  15180 300 -10  -0.52
## 94  15240 300  -5  -0.68
## 95  15300 300   0   0.02
## 96  15360 300   5   0.18
## 97  15420 300  10   0.61
## 98  15480 300  15   0.70
## 99  15540 300  20   1.43
## 100 15600 300  25   2.46
## 101 15660 300  30   2.53
## 102 15720 300  35   2.52
## 103 15780 300  40   3.41
## 104 15840 300  45   4.08
## 105 15900 300  50   3.86
## 106 15960 350 -50  -4.22
## 107 16020 350 -45  -4.01
## 108 16080 350 -40  -3.06
## 109 16140 350 -35  -2.66
## 110 16200 350 -30  -2.45
## 111 16260 350 -25  -1.92
## 112 16320 350 -20  -1.32
## 113 16380 350 -15  -0.90
## 114 16440 350 -10  -1.28
## 115 16500 350  -5  -0.33
## 116 16560 350   0   0.20
## 117 16620 350   5   0.57
## 118 16680 350  10   1.26
## 119 16740 350  15   1.31
## 120 16800 350  15   0.98
## 121 16860 350  20   1.54
## 122 16920 350  25   1.91
## 123 16980 350  30   2.39
## 124 17040 350  35   2.75
## 125 17100 350  40   3.33
## 126 17160 350  45   3.32
## 127 17220 350  50   3.88
## 128 17280 400 -50  -3.28
## 129 17340 400 -45  -3.17
## 130 17400 400 -40  -2.93
```

```
## 131 17460 400 -35  -2.27
## 132 17520 400 -30  -2.04
## 133 17580 400 -25  -1.51
## 134 17640 400 -20  -1.16
## 135 17700 400 -15  -0.94
## 136 17760 400 -10  -0.47
## 137 17820 400  -5  -0.21
## 138 17880 400   0   0.14
## 139 17940 400   5   0.49
## 140 18000 400  10   0.96
## 141 18060 400  15   0.94
## 142 18120 400  20   1.28
## 143 18180 400  25   2.23
## 144 18240 400  30   2.06
## 145 18300 400  35   2.44
## 146 18360 400  40   2.28
## 147 18420 400  45   3.02
## 148 18480 400  50   3.33
## 149 18540 450 -50  -3.18
## 150 18600 450 -45  -3.10
## 151 18660 450 -40  -2.19
## 152 18720 450 -35  -1.77
## 153 18780 450 -30  -2.08
## 154 18840 450 -25  -1.57
## 155 18900 450 -20  -1.18
## 156 18960 450 -15  -1.15
## 157 19020 450 -10  -0.60
## 158 19080 450  -5  -0.52
## 159 19140 450   0   0.06
## 160 19200 450   5   0.55
## 161 19260 450  10   0.38
## 162 19320 450  15   0.56
## 163 19380 450  20   1.20
## 164 19440 450  25   1.28
## 165 19500 450  30   1.85
## 166 19560 450  35   1.94
## 167 19620 450  40   2.17
## 168 19680 450  45   2.17
## 169 19740 450  50   2.49
## 170 19800 500 -50  -3.50
## 171 19860 500 -45  -2.90
## 172 19920 500 -40  -2.24
## 173 19980 500 -35  -2.40
## 174 20040 500 -30  -1.79
## 175 20100 500 -25  -1.73
## 176 20160 500 -20  -1.26
## 177 20220 500 -15  -0.79
## 178 20280 500 -10  -0.54
## 179 20340 500  -5  -0.49
## 180 20400 500   0  -0.04
## 181 20460 500   5  -0.27
## 182 20520 500  10   0.20
## 183 20580 500  15   0.58
## 184 20640 500  20   1.18
```

```
## 185 20700 500  25   1.13
## 186 20760 500  30   1.50
## 187 20820 500  35   1.92
## 188 20880 500  35   1.64
## 189 20940 500  40   2.04
## 190 21000 500  45   2.44
## 191 21060 500  50   2.28
```