Politecnico di Milano
Scuola di Ingegneria Industriale e dell'Informazione
Applied Statistics
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Problem n.3

For the cost Y[€] of a tattoo, consider the following model:

$$Y = \alpha_g + \beta_g \cdot d + \gamma_g \cdot n_c + \varepsilon,$$

where d is the dimension of the tattoo, n_c is the number of colors used, $g = 1, 2$ describes the method of tattooing (1=traditional handmade, 2=electric tattoo machine) and $\varepsilon \sim N(0, \sigma^2)$. Based on the data contained in `tattoo.txt` answer the following questions.

a) Estimate the 7 parameters of the model (report the estimated of $\alpha_g, \beta_g, \gamma_g$ for $g = 1, 2$ and σ^2).

b) Having verified the needed assumptions, perform a test of level 5% to verify if the factor *method* has a significant impact on the cost of the tattoo.

c) Do the number of colors have a significant impact on the cost of a tattoo?

d) Reduce the model and update the estimates of its parameters.

e) Interpreting α_g as a fixed cost and the remaining terms as variable costs, provide confidence intervals of *global* level 95% for:

- the mean fixed cost for a tattoo;
- the mean total cost for an handmade, one color tattoo of 6.5 cm.

Upload your results here:
`https://forms.office.com/Pages/ResponsePage.aspx?id=K3EXCvNtXUKAjjCd8ope6-9AS0GWf2lHjvGX24HiqFVUMzJJNzMyQ1FITlBRVTNZQTlXQVY1MlBSMS4u`