Robust Regression and Outlier Detection

Chapter 2: Simple Regression

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Example 4: Brain and Weight Data

Table 7 presents the brain weight (in grams) and the body weight (in kilograms) of 28 animals. (This sample was taken from larger data sets in S. Weisberg [1] and H. J. Jerison [2].) It is to be investigated whether a larger brain is required to govern a heavier body.

A clear picture of the relationship between the logarithms (to the base 10) of these measurements is shown in Figure 7. This logarithmic transformation was necessary because plotting the original measurements would fail to represent either the smaller or the larger measurements. Indeed, both original variables range over several orders of magnitude. A linear fit to this transformed data would be equivalent to a relationship of the form

$$\hat{y} = \hat{\theta}_2' x^{\hat{\theta}_1}$$

Table 1: Table 7: Brain and body weights of 28 animals.

	body	brain
Mountain beaver	1.350	8.1
Cow	465.000	423.0
Grey wolf	36.330	119.5
Goat	27.660	115.0
Guinea pig	1.040	5.5
Dipliodocus	11700.000	50.0
Asian elephant	2547.000	4603.0
Donkey	187.100	419.0
Horse	521.000	655.0
Potar monkey	10.000	115.0
Cat	3.300	25.6
Giraffe	529.000	680.0
Gorilla	207.000	406.0
Human	62.000	1320.0
African elephant	6654.000	5712.0
Triceratops	9400.000	70.0
Rhesus monkey	6.800	179.0
Kangaroo	35.000	56.0
Golden hamster	0.120	1.0
Mouse	0.023	0.4
Rabbit	2.500	12.1
Sheep	55.500	175.0
Jaguar	100.000	157.0
Chimpanzee	52.160	440.0
Rat	0.280	1.9
Brachiosaurus	87000.000	154.5
Mole	0.122	3.0
Pig	192.000	180.0

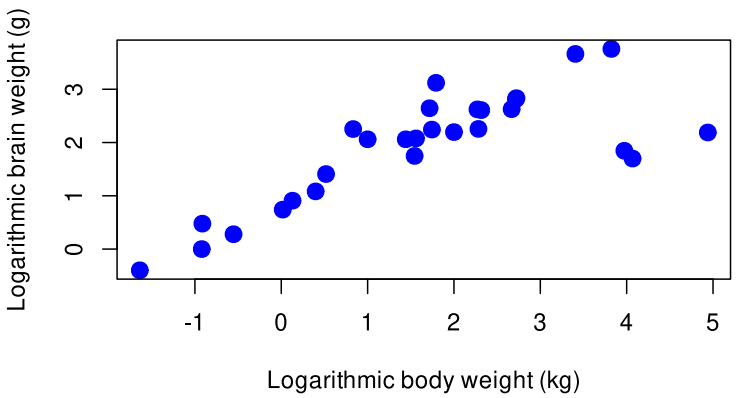

Figure 1: Logarithmic brain weight versus logarithmic body weight for 28 animals with LS (dashed line) and RLS fit (solid line).

Bibliography

[1] S. Weisberg, "Some large-sample tests for nonnormality in the linear regression model: Comment," *Journal of the American Statistical Association*, vol. 75, no. 369, pp. 28–31, 1980.

[2] H. J. Jerison, "Fossil evidence of the evolution of the human brain," *Annual Review of Anthropology*, vol. 4, pp. 27–58, 1973.