BIOE: Biostatistics Course Fall 2017

Assignment 7

Due 7th December

Provide any code you used with the assignment.

1.[50] Consider the following data from an experiment on transfecting iPSCs (Induced Pluripotent Stem Cells) with the gene NANOG. NANOG is known to be involved in differentiation and a study was undertaken to investigate the time it took for morphological changes to occur in iPSCs as a function of the relative (to wildtype) gene dosage. The NANOG gene was transfected into cells using cationic lipid transfection which is a high efficiency system. A table of results is shown below:

Relative Gene Dosage	Time (mins) to see cell morphology changes
1.0 (Wildtype)	45
1.5	62
2.0	89
2.5	96
3.0	102
3.5	120

Answer the following questions (5 points each):

a) Compute the best slope and intercept for the data.

b) Plot the residuals. Make sure you plot against the fitted values.

c) Does the pattern of residuals suggest that a linear fit is a reasonable assumption? If so why?

d) Compute the variances and standard deviations for the slope and intercept.

e) Using your results from d) compute the 95% intervals for the slope an intercept.

f) Test the hypothesis that the slope is zero?

g) Predict the time to morphological changes for a gene dose of 2.25.

h) Estimate the 95% intervals for your prediction in g).

i) Compute the correlation coefficient for the model.

j) Use the correlation coefficient to do a hypothesis test that the correlation equals zero.

2. [15] A second set of experiments was done this time by transfecting the cell with SOX4, another gene involved in differentiation. This time the data generated was as follows:

Relative Gene Dosage	Time (mins) to see cell morphology changes
1.0 (Wildtype)	45
1.5	62
2.0	89
2.5	96
3.0	102
3.5	105

Answer the following questions (5 points each)

a) Compute the best slope and intercept for the data.

b) Plot the residuals.

c) Does the pattern of residuals suggest that a linear fit is a reasonable assumption? If not why?