Dugga 2, 2013

3 questions, with 3 points each. 7 points needed to pass

1 Model formulation

Consider the following model:

d/dt(A) = u – k1*A – k2

d/dt(B) = k1*A

A(0) = 0.5, B(0) = 1. k1 = 2, k2 = 3.

yhat(t,p) = k*B

a) Which are the reactions?
b) What are the new equations if the k1-reaction is changed into a Michaelis-Menten expression?
c) How could you describe the yhat-equation in words; what does it mean?

2. Optimization and statistical tests

a) What is the input and output of an optimization algorithm?

b) What is the null-hypothesis of a chi-square test? What do you conclude if it is rejected?

c) What do you conclude if you do not reject a likelihood ratio test?

3. Closing the loop

a) What is the problem with predictions in systems biology? Why does this problem typically not appear in physics?

b) You have a well-determined prediction in a model, concerning the concentration of a state B, at a certain time point, t=15. How could that be a reason to measure B experimentally at that time point?

c) You have another prediction, of C, at time point t=20. This prediction, however, is very uncertain, more than that of many other states. How could that uncertainty be a reason to measure C at this time point?

Good luck! ☺