

Final Project

1. Generate random $[x, y, \delta y]$ data points using the following code

```
data = [(x, random.gauss(1, 0.01)*exp(log(2)+log(id)*x/400), 20)
        for x in range(100, 201)]
```

where `id` is your student id.

2. Plot the data.
3. The data can be modeled with the following function

$$y = 2e^{bx}$$

You must determine the value of b in three different ways:

- Analytically, as function of your student id.
- Using the linear least square fitting function discussed in class. Notice the fitting function above is not linear in b therefore you need to perform a transformation of the data before you can apply linear least squares.
- From first principles, by minimizing χ^2 using an optimization algorithm (for example Newton).

For each of the above methods:

- Explain the method in detail
- Show your steps
- Show your result
- A plot of your fitting function superimposed to the data

Do you expect the three methods to agree? Why? If you do not expect them to agree exactly, to what precision should they agree?

Deliverables

You must deliver a 5 pages paper in PDF (Word documents will not be accepted) solving the problem described above. The paper should include an introduction explaining the problem in your own language. Imagine the reader of your paper your boss at work and not sombody like me who already understands the problem. The paper should include one section for each of

the three methods described above. The paper should include 4 plots as requested above. The paper should have a conclusion answering the above questions.

The paper should have an appendix listing all your code. The code must be properly formatted/indented.

Be aware that this is an individual project. The data should be different for every student and different papers will be checked for similarities. Excessive similarities will be reported for plagiarism.