

OM-S20: Gradient based Learning Problem Set

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Submission URL: <https://forms.gle/uZRSXMHSGWvSLj87>

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Nonlinear Model Fitting

We know how to fit lines or linear functions. What about when the function is nonlinear?

Consider the corona data of your choice (eg. countries/states/cities/world) and what (infected, tested, death, recovered). You can also take multiple such data.

Fit a function model that suits the data clearly explain why this is good model, including references.
Write the objective function and how to optimize with GD and Newton's.
Your output is a brief report (not more than one page in writing)

Demonstrate how to model using the data. Please show how the objective function converge and how good is your model at the end (quantitatively). Your output is a set of graphs and brief explanations. All together not more than one page.

Consider the phase of decline of cases in the case of corona.

How do we fit a model and calculate when $f(x) = 0$ i.e., when is it safe to start moving freely? (or should we solve $f(x) = \alpha$?

Use china data and the data from italy and see when will Italy be safe?

If your answer is not realistic, what could be the reasons?

(answer in not more than 1 page)

Comments:

For all the above questions, your original thoughts/efforts visible through the choice of data, effort in making the case will be appreciated.

As a starting point consider the following resources:

- Data API: <https://documenter.getpostman.com/view/8854915/SzS7R74n?version=latest>
- Blog on disease model: <https://www.lewuathe.com/covid-19-dynamics-with-sir-model.html>
- Video from 3Blue1Brown:
<https://www.youtube.com/watch?v=gxAa02rsdIs>