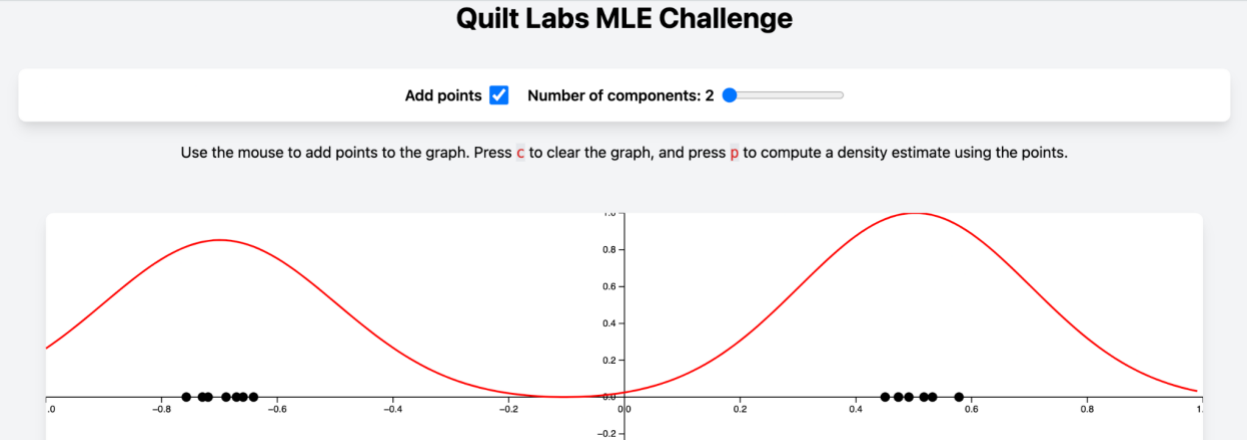
QUILTLABS

Challenge: Interactive ML model training July 2023

Goal

In this challenge, you will create an interactive human-in-the-loop training system using a simple machine learning model.



1. You are given parts of a web application and must implement the backend for this system
2. The frontend (shown above)
    a. Allows users to interactively add data points to a graph
    b. Sends data points to the backend
    c. Receives model parameters from the backend and plots a density over the points
3. The backend must
    a. Accept these data points and train the model in an online manner
    b. Return the parameters of the model to the front-end

Detailed requirements

1. Read through the provided code
2. Implement a backend API service that hosts the model, trains it, and returns model parameters
3. Implement an endpoint/multiple endpoints for online training of the model:
    a. When data points are added, they should automatically update the parameters of the model
    b. You ideally don't want to train from scratch when you get new data points, just using the incremental data points
4. Also implement an endpoint for training the model using all the data from scratch so you can compare your online solution to this one
5. When `p` is pressed, you need to retrieve the parameters of the model and pass them to the frontend for plotting
6. Submit a README.txt containing details about the methods you implemented, problems you ran into, and how to improve your submission if you had more time

Provided code

1. Web application:
    a. **solution_skeleton.py**: web application. Root endpoint takes the user to the app shown above. You'll need to implement any other endpoints in this file

   b. **index.html**: static HTML page with layouts for visual elements of the app
   c. **static/script.js**: Contains plotting code for the web app
2. Model training code:
   a. **gmm.py**: contains Pytorch model class, function to train the model, function to extract parameters from the model and return them as lists of floats

Judgment criteria

1. Does your web app work? For your submission to be considered complete, it must run on our Ubuntu 20.04 VM. If you choose to include additional requirements, please be sure to mention them in your README.txt
2. What are your endpoint response times?
3. How close is your online training solution to the solution? Do the density plots look similar?
4. How clean is your code? Do you use comments? Type annotations?
5. Do you discuss testing in README.txt? How would you think to test an application like this?