Report

First task

The first task is to optimize the hyperparameters for our reservoir neural network. I could have used the scikit-learn technique called GridSearchCV, but I preferred to manually write a loop that trains the neural network at each step, providing us with the optimal values for beta, res\_scale, and input\_scale, using MSE as the evaluation metric.

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The best hyperparameters I obtained are as follows:

* Beta: 1e-05
* Radius: 0.1
* Sigma: 0.3
* MSE: 1.703144787398081

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I do not have a proper visualization of how the MSE changes over the iterations. The output I got from my code is uninteresting, though the final MSE is good.

Second task

The second task involves adding noise to our Kuramoto data. I added Gaussian noise using np.random.normal(mu, sigma, size). I varied the parameters for mu (mean) and sigma (standard deviation) twice:

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1. Mu = 0.1, Sigma = 0.1
2. Mu = 0.01, Sigma = 0.05

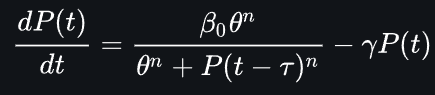
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You can see all the plots (with the differences) in my code.

Third task

Third task is about to change our main data(Kuramoto), I changed it to Mackey-Glass time series. This is how the equation looks like:

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Where P(t) represents the density of cells over time, b0, theta, n, tau, gamma are parameters of the equation.

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I changed res\_parameters because my new data is much smaller than Kuramoto.I trained it and did all the plots.