

EXERCISE 1

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1. STOCHASTIC GRADIENT DESCENT

- (1) Implement in your favorite programming language the Stochastic Gradient Descent algorithm.
- (2) Generate 100 artificial data points (x_i, y_i) where each x_i is randomly generated from the interval $[0, 1]$ and $y_i = \sin(2\pi x_i) + \varepsilon$. Here, ε is a random noise value in the interval $[-0.3, 0.3]$.
- (3) Make your initial learning rate constant $\alpha = 0.1$, and train a polynomial model using your artificially created data. A polynomial model has the form $y = \theta_0 + \theta_1 x + \theta_2 x^2 + \dots + \theta_M x^M$.
- (4) All initial θ_i parameters are randomly generated in the interval $[-0.5, 0.5]$.
- (5) Try different α values to speed up the learning process.
- (6) Once you have found the best model, plot a graph containing the data points, the sine function, and the learned function.
- (7) Plot also the error curve.
- (8) Prepare a report containing your final model, your final α value, and your graph.

2. EXERCISE SUBMISSION

- You can hand me your printed report after the lectures or during the exercise sessions.
- Deadline: April 22-24, 2019.
- Note: Do not forget to include your name in the report!