Tutorial 1: Linear Regression

1. Software

- Following the instructions in the section "Installation" (just after "Preface") of the book "Dive Into Deep Learning" (**https://d2l.ai/**), install Miniconda and the d2l package with PyTorch, or
- Use Google Colab **https://colab.research.google.com/**
- You can use the codes in Chapter 3 of the book.

2. Implement the ridge regression algorithm from scratch and test the performance of the algorithm with synthetic data.

- Loss function

$$L(\mathbf{w}, b) = \frac{1}{n}\sum_{i=1}^{n} \frac{1}{2}\left(\mathbf{w}^\top \mathbf{x}^{(i)} + b - y^{(i)}\right)^2 + \lambda \mathbf{w}^\top \mathbf{w}.$$

- λ: regularisation number, a hyperparameter specified by users. Try different values such as $0.01, 0.02, 0.05, 0.1, 0.2, 0, 5, 1, 2, 5, \cdots$ and check how regularisation numbers affect the performance of ridge regression.
- Similar to the generation of the synthethic data in Section 3.2.1 of the book, generate a set of n ($n = 100, 200, 1000$) examples of 100 dimensional data for training and test the accuracy of the estimation on the weights and bias.
- For reproductity, use "torch.manual_seed(0)" before generating the true weights and bias.

3. What are the hyperparameters in the softmax regression algorithms of Chapter 3? Try to adjust the hyperparameters and check how performance changes with each hyperparameter.

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