# Lecture 06: *"Regression"*

## Book Chapter

Please read the *Chapter 04* **"Training Models"** till p. **134**, from Chapter 06 "Decision Trees" the section "Regression" and from Chapter 07 "Ensemble Learning" the section "Gradient Boosting". Answer the following Questions.

**Keep in mind: If you answer these questions and write a detailed summary, you won't need to read these chapters again while preparing for the exam**

## Video Nugget

For a deeper understanding of Gradient Descent you can watch this video.

## Questions

Classic regression - Linear Regression and Polynomial Regression (p. 111-117, 128-131)

1. What different ways are there to train a Linear Regression model? Which method provides the best results?
2. What is the common performance measure for regression?
3. Which is more computationally intensive for the closed form calculation, doubling the number of instances or doubling the number of features?
4. How does Polynomial Regression work?

Regression with Machine Learning Algorithms - Decision Tree and Random Forest (p. 183-184, 203-207)

1. Describe the difference between a decision tree for classification and for regression.
2. What types of functions can a decision tree regressor approximate well?
3. What is the plot of the function of a decision tree regressor for one input variable?
4. Is there a random forest regressor or can you just use the gradient tree boosting regressor for the regression?
5. How does the gradient tree boosting regressor work?

Gradient Descent Algorithms (p. 118-128, 130-134) and Early stopping (p. 141-142)

1. Please summarize the steps done using *Gradient Descent*.
2. What can be a problem with setting the learning rate to high or to low?
3. What is a problem with *Batch Gradient Descent* (or better "*Full Gradient Descent*")?
4. What is a problem with *Stochastic Gradient Descent*?
5. What is the intuition behind a *learning schedule*?
6. What is the intuition behind *Mini-batch Gradient Descent*?
7. How can you tell from the learning curves if a model underfits or overfits?
8. How does early stopping work?

# Homework Assignment

Code the task given in Regression Task.