

Learning Expectations for Machine Learning Spring 2019

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- Understand what machine learning is and the kind of problems it is suited for.
- Be able to compare supervised, unsupervised and reinforcement learning.
- Understand the idea of least square regression, what problems it is suited for and how it may be applied to depth estimation.
- Be able to explain the design choices in developing a regression model and what those choices may be for a regression model.
- Be able to work through a simple regression example by hand like we did with the student GPA and mother's educational level.
- Understand the difference between batch, stochastic and mini-batch gradient descent.
- Understand solving least square regression in closed form; the normal equation.
- Understand the problem of model underfitting.
- Understand why and how basis functions are used and how it affects the modelling of least square regression.
- Understand the problem of overfitting including its relationship to model parameters and data size.
- Understand regularization and how it affects modelling of least square regression.
- Understand the regularization parameter and its effect on the model.
- Understand the problem of anomaly detection.
- Understand the gaussian distribution and the effects of its parameters; univariate and multivariate.
- Understand how the gaussian distribution is used for anomaly detection; univariate and multivariate.
- Understand the equations for estimating gaussian parameters; univariate and multivariate.
- Be able to derive the maximum likelihood estimate for the univariate gaussian mean.
- Understand evaluation metrics for models and what cross-validation, hold-out validation are about.
- Be able to compare simply extending a univariate gaussian for anomaly detection with high dimension input variables and using a multivariate gaussian.
- Understand IID and why it matters.
- Be able to interpret least square regression probabilistically.
- Understand MAP regression; MAP estimation.
- Be able to compare MAP regression to MLE regression; including MLE with regularization.
- Be able to explain the issue of model selection and its relationship to regularization.
- Be able to compare hold-out validation and cross-validation.
- Understand the importance of predicting with confidence levels and the sources of model uncertainty.