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Learning Linear Classifiers

Once familiar with linear classifiers and logistic regression, you can now dive in and write your first learning algorithm for classification. In particular, you

⌄ More

Maximum likelihood estimation

Start Lesson

(/learn/ml-classification/lecture/uxALW/goal-learning-parameters-of-logistic-regression)

● Slides presented in this module

(/learn/ml-classification/supplement/OyDce/slides-presented-in-this-module)

▶ Goal: Learning parameters of logistic regression   2 min

(/learn/ml-classification/lecture/uxALW/goal-learning-parameters-of-logistic-regression)

▶ Intuition behind maximum likelihood estimation   4 min

(/learn/ml-classification/lecture/BXKp8/intuition-behind-maximum-likelihood-estimation)

Help Center

(▶) Data likelihood   8 min

(/learn/ml-classification/lecture/Qjvns/data-likelihood)

(▶) Finding best linear classifier with
gradient ascent   3 min

(/learn/ml-classification/lecture/G5kSo/finding-best-linear-
classifier-with-gradient-ascent)

Gradient ascent algorithm for learning logistic regression classifier

(▶) Review of gradient ascent   6 min

(/learn/ml-classification/lecture/uwmnm/review-of-gradient-
ascent)

(▶) Learning algorithm for logistic
regression   3 min

(/learn/ml-classification/lecture/dYFZx/learning-algorithm-for-
logistic-regression)

(▶) Example of computing derivative for
logistic regression   6 min

(/learn/ml-classification/lecture/UEmJg/example-of-computing-
derivative-for-logistic-regression)

(▶) Interpreting derivative for logistic
regression   6 min

(/learn/ml-classification/lecture/V9Ox8/interpreting-derivative-
for-logistic-regression)

(▶) Summary of gradient ascent for logistic
regression   2 min

(/learn/ml-classification/lecture/mMJ2j/summary-of-gradient-
ascent-for-logistic-regression)

Choosing step size for gradient ascent/descent

(▶) Choosing step size   6 min

(/learn/ml-classification/lecture/vFhWy/choosing-step-size)

(▶) Careful with step sizes that are too
large   4 min

(/learn/ml-classification/lecture/MVzEy/careful-with-step-sizes-
that-are-too-large)

(▶) Rule of thumb for choosing step

size   4 min

(/learn/ml-classification/lecture/hzxFS/rule-of-thumb-for-
choosing-step-size)

(VERY OPTIONAL LESSON) Deriving gradient of logistic regression

▶ (VERY OPTIONAL) Deriving gradient of logistic regression: Log trick   5 min

(/learn/ml-classification/lecture/QcofN/very-optional-deriving-
gradient-of-logistic-regression-log-trick)

▶ (VERY OPTIONAL) Expressing the log-likelihood   3 min

(/learn/ml-classification/lecture/1ZeTC/very-optional-
expressing-the-log-likelihood)

▶ (VERY OPTIONAL) Deriving probability y=-1 given x   2 min

(/learn/ml-classification/lecture/hKVpr/very-optional-deriving-
probability-y-1-given-x)

▶ (VERY OPTIONAL) Rewriting the log likelihood into a simpler form   8 min

(/learn/ml-classification/lecture/Ageum/very-optional-rewriting-
the-log-likelihood-into-a-simpler-form)

▶ (VERY OPTIONAL) Deriving gradient of log likelihood   8 min

(/learn/ml-classification/lecture/W3VBS/very-optional-deriving-
gradient-of-log-likelihood)

Summarizing learning linear classifiers

▶ Recap of learning logistic regression classifiers   2 min

(/learn/ml-classification/lecture/A0OjE/recap-of-learning-
logistic-regression-classifiers)

⭐ **Quiz:** Learning Linear Classifiers   6 questions

(/learn/ml-classification/exam/5MWIa/learning-linear-classifiers)

Programming Assignment

Implementing logistic regression from

⬤   scratch

(/learn/ml-classification/supplement/zU6HO/implementing-
logistic-regression-from-scratch)

⭐   **Quiz:** Implementing logistic regression
from scratch   9 questions

(/learn/ml-classification/exam/eHHDd/implementing-logistic-
regression-from-scratch)

Overfitting & Regularization in Logistic Regression

As we saw in the regression course, overfitting is
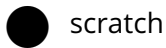perhaps the most significant challenge you will face as
you apply machine learning approaches in practice.

⌄ More

Overfitting
in
classification

| Start Lesson | (/learn/ml-
classification/lecture/RzxaQ/evaluating-
a-classifier)

⬤   Slides presented in this module

(/learn/ml-classification/supplement/5x4i6/slides-presented-in-
this-module)

▶   Evaluating a classifier   3 min

(/learn/ml-classification/lecture/RzxaQ/evaluating-a-classifier)

▶   Review of overfitting in regression   3 min

(/learn/ml-classification/lecture/WZJC0/review-of-overfitting-in-
regression)

▶   Overfitting in classification   6 min

(/learn/ml-classification/lecture/V1hPz/overfitting-in-
classification)

▶   Visualizing overfitting with high-degree
polynomial features   4 min

(/learn/ml-classification/lecture/BSNGu/visualizing-overfitting-
with-high-degree-polynomial-features)

Overconfident predictions due to overfitting

▶ Overfitting in classifiers leads to overconfident predictions   5 min

(/learn/ml-classification/lecture/FIYUC/overfitting-in-classifiers-leads-to-overconfident-predictions)

▶ Visualizing overconfident predictions   4 min

(/learn/ml-classification/lecture/jIJw5/visualizing-overconfident-predictions)

▶ (OPTIONAL) Another perspecting on overfitting in logistic regression   9 min

(/learn/ml-classification/lecture/lzGuI/optional-another-perspecting-on-overfitting-in-logistic-regression)

L2 regularized logistic regression

▶ Penalizing large coefficients to mitigate overfitting   5 min

(/learn/ml-classification/lecture/7Do2G/penalizing-large-coefficients-to-mitigate-overfitting)

▶ L2 regularized logistic regression   5 min

(/learn/ml-classification/lecture/DBTNt/l2-regularized-logistic-regression)

▶ Visualizing effect of L2 regularization in logistic regression   6 min

(/learn/ml-classification/lecture/1VXLD/visualizing-effect-of-l2-regularization-in-logistic-regression)

▶ Learning L2 regularized logistic regression with gradient ascent   8 min

(/learn/ml-classification/lecture/4JxyQ/learning-l2-regularized-logistic-regression-with-gradient-ascent)

Sparse logistic regression

▶ Sparse logistic regression with L1 regularization   8 min

(/learn/ml-classification/lecture/ypt7u/sparse-logistic-regression-with-l1-regularization)

Summarizing overfitting & regularization in logistic regression

▶ **Recap of overfitting & regularization in logistic regression**   1 min

(/learn/ml-classification/lecture/YYGdW/recap-of-overfitting-regularization-in-logistic-regression)

⭐ **Quiz:** Overfitting & Regularization in Logistic Regression   8 questions

(/learn/ml-classification/exam/jp0Yp/overfitting-regularization-in-logistic-regression)

Programming Assignment

● Logistic Regression with L2 regularization

(/learn/ml-classification/supplement/diZFx/logistic-regression-with-l2-regularization)

⭐ **Quiz:** Logistic Regression with L2 regularization   9 questions

(/learn/ml-classification/exam/bpHt8/logistic-regression-with-l2-regularization)