

# Introduction to Machine Learning

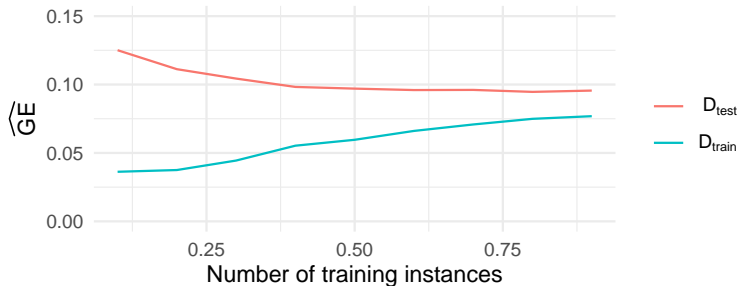
## Evaluation: Learning Curves

### Learning goals

- XXXXXXXXXXXXXXXX
- XXXXXXXXXX

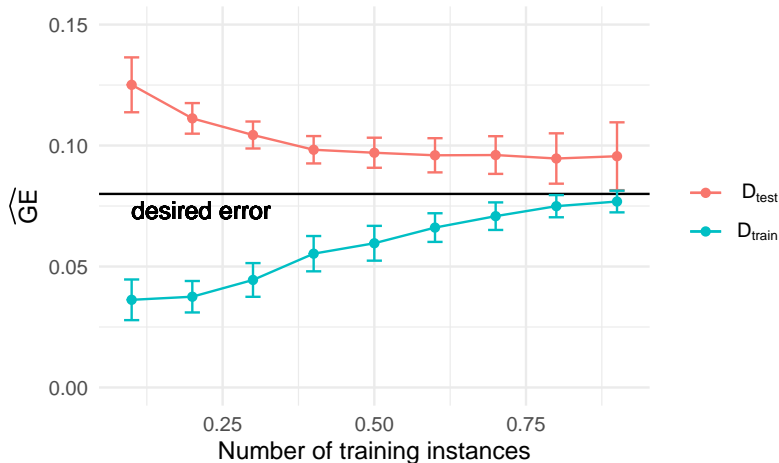
# LEARNING CURVES

- The *Learning Curve* compares the performance of a model on training and test data over a varying number of training instances.  
→ How fast can learner learn the given relationship in the data?
- Learning usually fast in the beginning
- Visualizes when a learner has learned as much as it can:
  - when performance on training and test set reach a plateau.
  - when gap between training and test error remains the same.



# LEARNING CURVES

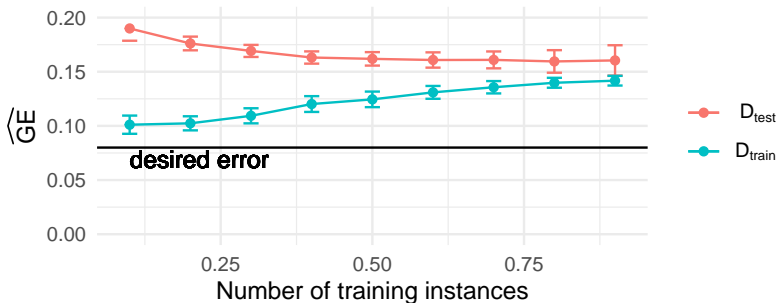
An ideal learning curve looks like:



# LEARNING CURVES

In general, there are two reasons for a bad looking learning curve:

- 1 High bias in model / underfitting
  - training and test errors converge at a high value.
  - model can't learn underlying relationship and has high systematic errors, no matter how big the training set.
  - poor fit, which also translates into high test error.



# LEARNING CURVES

## ② High variance in model / Overfitting

- large gap between training and test errors.
- model requires more training data to improve.
- model has a poor fit and does not generalize well.

