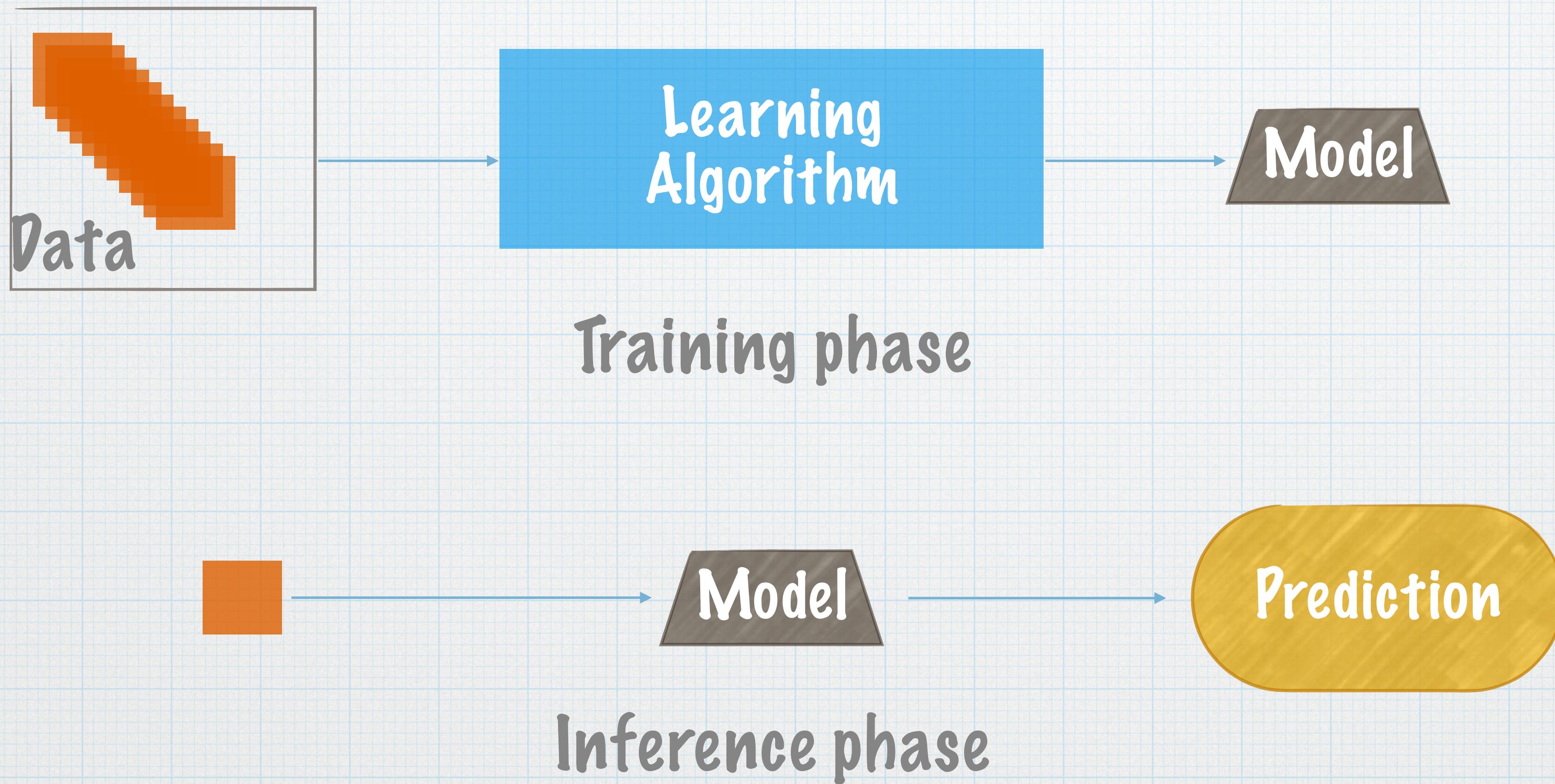


Intro2ML

Lec 1
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Machine Learning



Machine Learning

- * Machines
- * Compute/Processing capabilities
- * Storage — store training data or store trained model?
- * Sensors — offline training, online inference?
- * Actuators — do something based on prediction

Learning

- * Given X , learn \hat{X} , such that X and \hat{X} are close? — no
that is memorisation with errors
- * Given X , an unknown function $f(X)$, learn $\hat{f}(X)$ such that
 $f(X)$ and $\hat{f}(X)$ are close
- * Such that on another input Y $\hat{f}(Y)$ is close to $f(Y)$ —
generalisation

Components of learning

Formalization:

- Input: \mathbf{x} (*customer application*)
- Output: y (*good/bad customer?*)
- Target function: $f : \mathcal{X} \rightarrow \mathcal{Y}$ (*ideal credit approval formula*)
- Data: $(\mathbf{x}_1, y_1), (\mathbf{x}_2, y_2), \dots, (\mathbf{x}_N, y_N)$ (*historical records*)



- Hypothesis: $g : \mathcal{X} \rightarrow \mathcal{Y}$ (*formula to be used*)

UNKNOWN TARGET FUNCTION

$$f: \mathcal{X} \rightarrow \mathcal{Y}$$

(ideal credit approval function)

TRAINING EXAMPLES

$$(\mathbf{x}_1, y_1), \dots, (\mathbf{x}_N, y_N)$$

(historical records of credit customers)

LEARNING ALGORITHM

FINAL HYPOTHESIS

$$g \approx f$$

(final credit approval formula)

HYPOTHESIS SET

$$\mathcal{H}$$

(set of candidate formulas)

The 2 solution components of the learning problem:

- The Hypothesis Set

$$\mathcal{H} = \{h\} \quad g \in \mathcal{H}$$

- The Learning Algorithm

Together, they are referred to as the *learning model*.

