

# Assignment7 – Learning

Given: June 13 Due: June 18

## Problem 7.1 (Loss)

Our goal is to find a linear approximation  $h(x) = ax$  for the series of square numbers 0, 1, 4, 9, 16.

1. Model this situation as an *inductive learning problem*.
2. Assuming all 5 possible examples are equality probable, compute the generalized loss using the *squared error loss* function. (This is a function of  $h$ .)
3. Find  $h^*$ .
4. What is the *error rate* of  $h^*$ ?

## Problem 7.2 (Overfitting)

Explain what *overfitting* means and why we want to avoid it.

## Problem 7.3 (Decision List)

We want to construct a decision list to classify the data below where result values  $V$  depend on 4 attributes  $A, B, C, D$ . The tests should be conjunctions of literals.

1. Assume your literals must be of the form *attribute = number*. Which values of  $k$  allow for giving the shortest possible decision list in  $k$ -DL (i.e., using at most  $k$  literals per test)? Give one such list.
2. Now assume your literals may also be of the form *attribute = attribute*. Answer the same question as above.

Example	$A$	$B$	$C$	$D$	$V$
#1	1	0	0	0	1
#2	1	0	1	1	1
#3	0	1	0	0	1
#4	1	1	0	1	1
#5	0	0	1	1	1
#6	0	1	1	0	0
#7	0	1	0	1	0
#8	0	0	1	0	0