**INTRODUCTION MACHINE LEARNING**

**EXERCISE 5**

A red sign with white text

Description automatically generated

|  |
| --- |
| **TEACHER:** |
| Johannes Kiesel |

|  |
| --- |
| **GROUP:** |
| Group 16 |
|  |
| **SUBMITTED BY:** |
| Aaron Perez Herrera |
| Cesar Fernando Gamba Tiusaba |
| Chun Ting Lin |
| Olubunmi Emmanuel Ogunleye |

Exercise 1: Gradient Descent (1+1+1+1+1+1=6 Points)

1. Name these concepts:

(a1) xlA

(a2) T

(a3) t

(a4) X(t)

(a5) D(t)

(a6) Al

1. Name this expression: X = {x E X : x| E B} U {x E X : xl B}
2. What are the three requirements of an impurity function?
3. What is the hypothesis space of decision trees?
4. What is the search space of the ID3 algorithm?
5. What is the difference between the inductive bias of the candidate elimination algorithm and that of the ID3 algorithm? Hint: search bias and restriction bias.

Exercise 2: Decision Trees (1+1+1+0=3 Points)

Construct by hand decision trees corresponding to each of the following Boolean formulas. The examples (x, c) E D consist of a feature vector x where each component corresponds to one of the Boolean variables (A, B, ...) used in the formula, and each example corresponds to one interpretation (i.e. assignment of 0/1 to the Boolean variables). The target concept c is the truth value of the formula given that interpretation. Assume the set D contains examples with all possible combinations of attribute values.

Hint: It may be helpful to write out the set D for each formula as a truth table.

(a) AA-B

(b) A XOR B

(c) AV (BAC)

(d) (AA B) V (CAD)