Exercise 1

Consider a learning world where each object (example) is described by a list of of $n$ attributes, each of which can take $k$ possible discrete values.

(a) What is the size of the instance space, i.e., how many distinct instances can there be in this world?

(b) How many different concepts are potentially possible in this world, i.e., what is size of the concept space?

(c) What is the size of the hypothesis space in the following concept representation languages:

(i) Purely conjunctive expressions of conditions ‘attribute=value’ where only those conditions appear that are required, i.e., attributes irrelevant to the concept are omitted. Examples are:

\[ C \leftrightarrow (A2 = \text{small}) \land (A5 = \text{high}) \]
\[ C \leftrightarrow (A1 = \text{low}) \land (A2 = \text{big}) \land (A7 = \text{short}) \]

(ii) Purely conjunctive expressions of conditions ‘attribute in set’. Examples are:

\[ C \leftrightarrow (A2 \in \{\text{small, medium}\}) \land (A6 \in \{\text{red, blue, yellow}\}) \]

(iii) Unrestricted disjunctive normal form (DNF), i.e., a disjunction of conjunctive expressions.

Exercise 2

Exercise 2.2 in Mitchell’s book.

Exercise 3

Exercise 2.4 in Mitchell’s book.