Julian Ewaied and Namir Ballan

Introduction to machine learning

First Homework

**The University of Haifa – Spring Semester of 2023**

Contents

[Second Question 2](#_Toc130303064)

[Fifth question 2](#_Toc130303065)

# Second Question

Let be the event of the tested person being sick, and be the event of the test being positive. We're given a prior . We're also given the conditional probability , .

1. We want to calculate the conditional probability . We can use Bayes rule for that:
2. It is more probable I don't have the disease since .
3. Obviously yes, since the maximum likelihood would ignore the strong prior we have, which makes it almost sure that we have the disease (the likelihood ).

# Fifth question

Let's look at the output of the Bayesian classifier:

Where the last transition is simply substituting the loss function in.

We only added 1 which doesn't change the argument maximum, and reached a new probability argmax which is the MAP output.