Machine Learning Assignment 61

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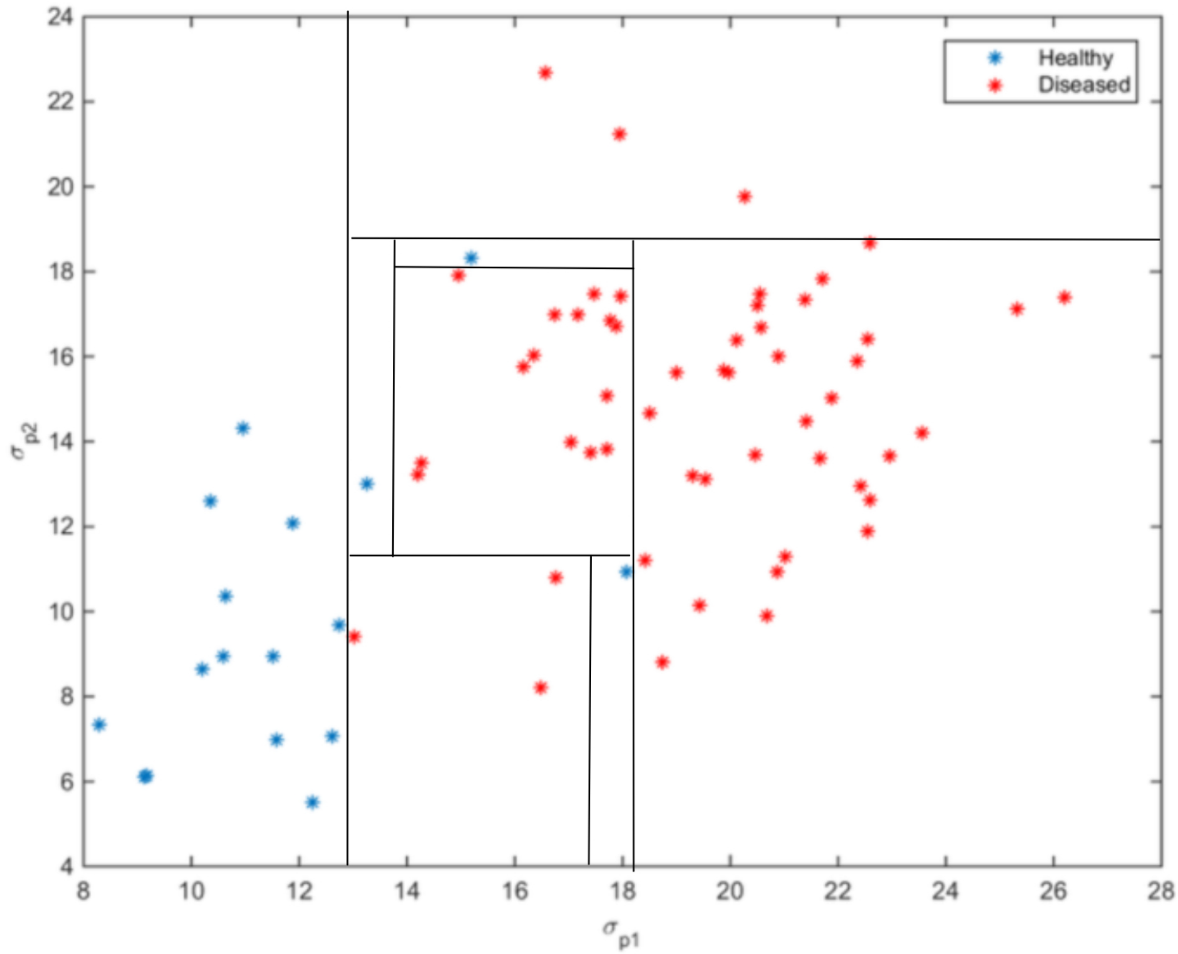
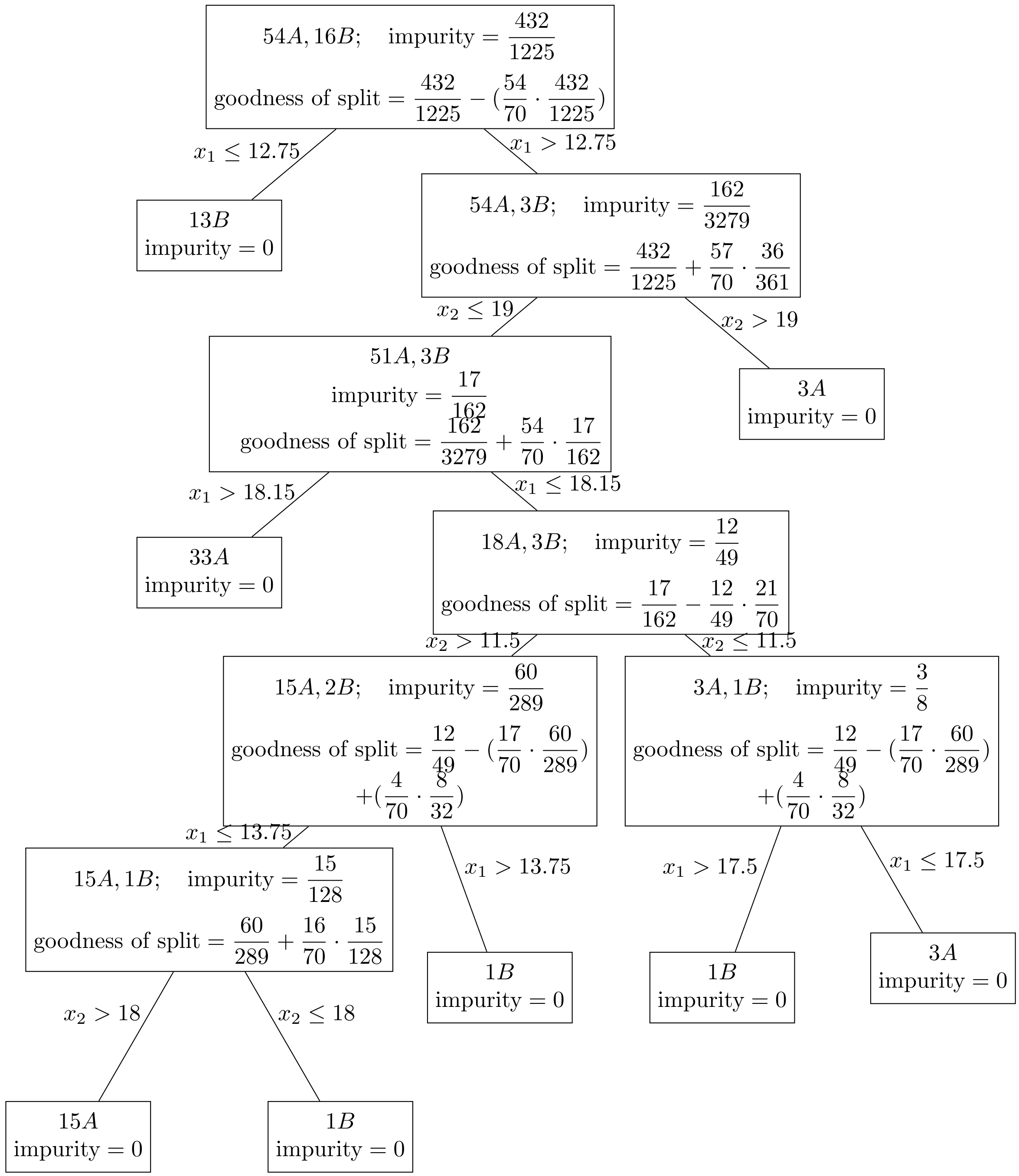
Problem 1




$54A, 16B$; impurity $= \frac{432}{1225}$
goodness of split $= \frac{432}{1225} - (\frac{54}{70} \cdot \frac{432}{1225})$
$x_1 \leq 12.75$
$x_1 > 12.75$
$13B$
impurity $= 0$
$54A, 3B$; impurity $= \frac{162}{3279}$
goodness of split $= \frac{432}{1225} + \frac{57}{70} \cdot \frac{36}{361}$
$x_2 \leq 19$
$x_2 > 19$
$51A, 3B$
impurity $= \frac{17}{162}$
goodness of split $= \frac{162}{3279} + \frac{54}{70} \cdot \frac{17}{162}$
$3A$
impurity $= 0$
$x_1 > 18.15$
$x_1 \leq 18.15$
$33A$
impurity $= 0$
$18A, 3B$; impurity $= \frac{12}{49}$
goodness of split $= \frac{17}{162} - \frac{12}{49} \cdot \frac{21}{70}$
$x_2 > 11.5$
$x_2 \leq 11.5$
$15A, 2B$; impurity $= \frac{60}{289}$
goodness of split $= \frac{12}{49} - (\frac{17}{70} \cdot \frac{60}{289})$
$+(\frac{4}{70} \cdot \frac{8}{32})$
$3A, 1B$; impurity $= \frac{3}{8}$
goodness of split $= \frac{12}{49} - (\frac{17}{70} \cdot \frac{60}{289})$
$+(\frac{4}{70} \cdot \frac{8}{32})$
$x_1 \leq 13.75$
$x_1 > 13.75$
$x_1 > 17.5$
$x_1 \leq 17.5$
$15A, 1B$; impurity $= \frac{15}{128}$
goodness of split $= \frac{60}{289} + \frac{16}{70} \cdot \frac{15}{128}$
$1B$
impurity $= 0$
$1B$
impurity $= 0$
$3A$
impurity $= 0$
$x_2 > 18$
$x_2 \leq 18$
$15A$
impurity $= 0$
$1B$
impurity $= 0$

Problem 4

(A.a)

$$P(A \cap B) = P(A) + P(B) - P(A \cup B)$$

$$P(A \cap B) = 0.4 + 0.7 - 0.9 = 1.1 = 4 - 0.9 = 0.2$$

(A.b)

$$P(A^c \cap B) = P(B) - P(A \cap B) = 0.7 - 0.2 = 0.5$$

(A.c)

$$P(A - B) = P(A) - P(A \cap B) = 0.4 - 0.2 = 0.2$$

(A.d)

$$P(A^c - B) = P(A^c) - P(A^c \cap B) = 0.6 - 0.5 = 0.1$$

(A.e)

Wouldn't this just be P(B). Hear me out, it's everything in A complement and B. Everything in A complement is just B without the intersection so when we combine it with B, we get the only thing we didn't have prior, the intersection. So the probability would just be 0.7, right?

(A.f)

0.2, It's the exact same as part a but with extra steps. (Reference part e for why I believe (B union A complement) is just B)

(B.a)

$\frac{1}{6}$, it's just the amount of 4's on the dice over the amount of outcomes on the dice.

(B.b)

1 + 6, 6 + 1, 2 + 5, 5 + 2, 3 + 4, 4 + 3.

All rolls that equal seven(above), over every roll possible for both, which would be $\dfrac{6}{36}$ because there are 36 outcomes for the dice rolls.

(B.c)

Both events are independent, so it would be $\dfrac{5}{6} \cdot \dfrac{3}{6} . \dfrac{15}{36} = \dfrac{5}{12}$.