



Faculty of Engineering
Department of Biomedical Engineering

14

Binary Classification

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BME 312

Biomedical Instrumentation II

Hypothesis testing

- In hypotheses.

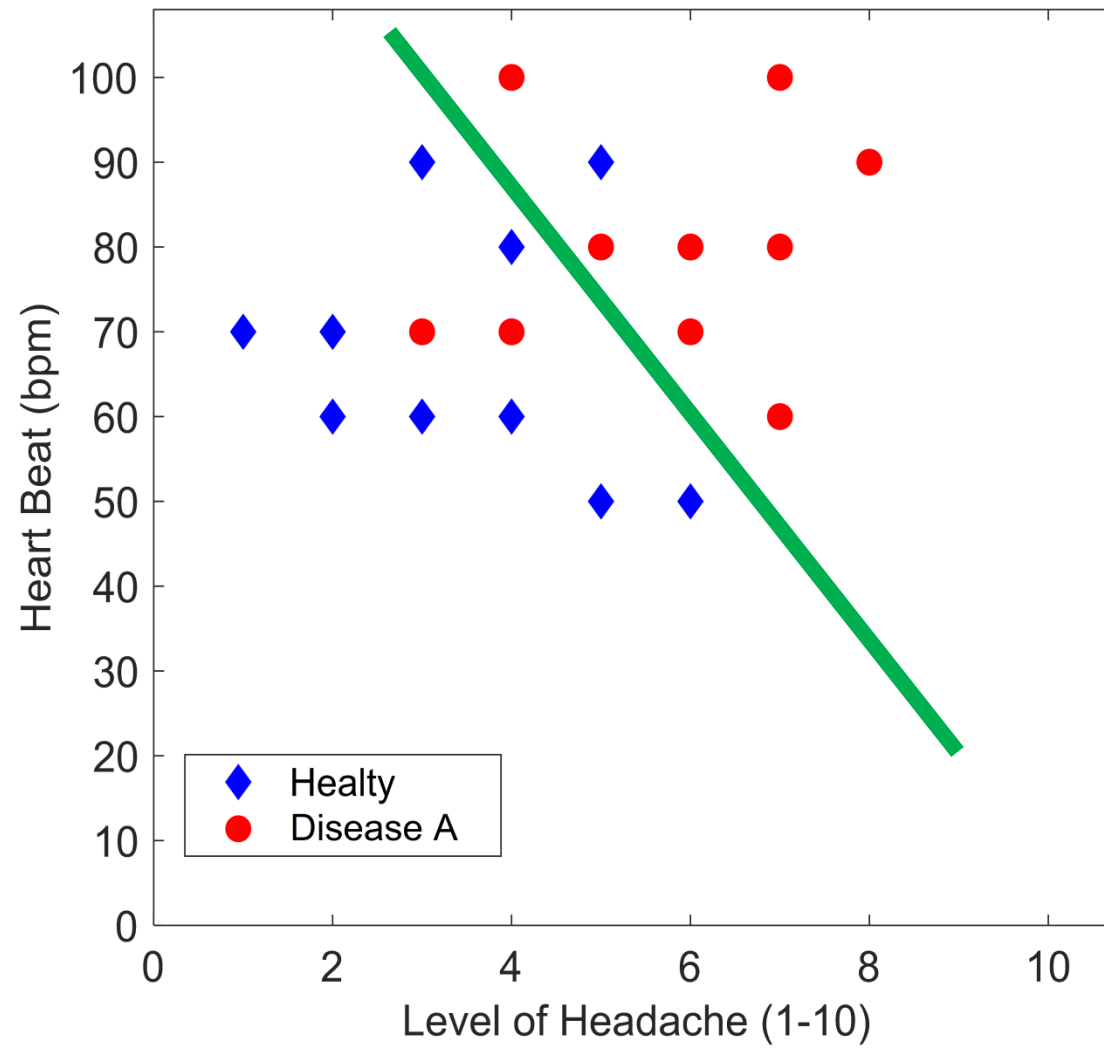
Hypothesis testing

- The four outcomes of hypothesis testing.

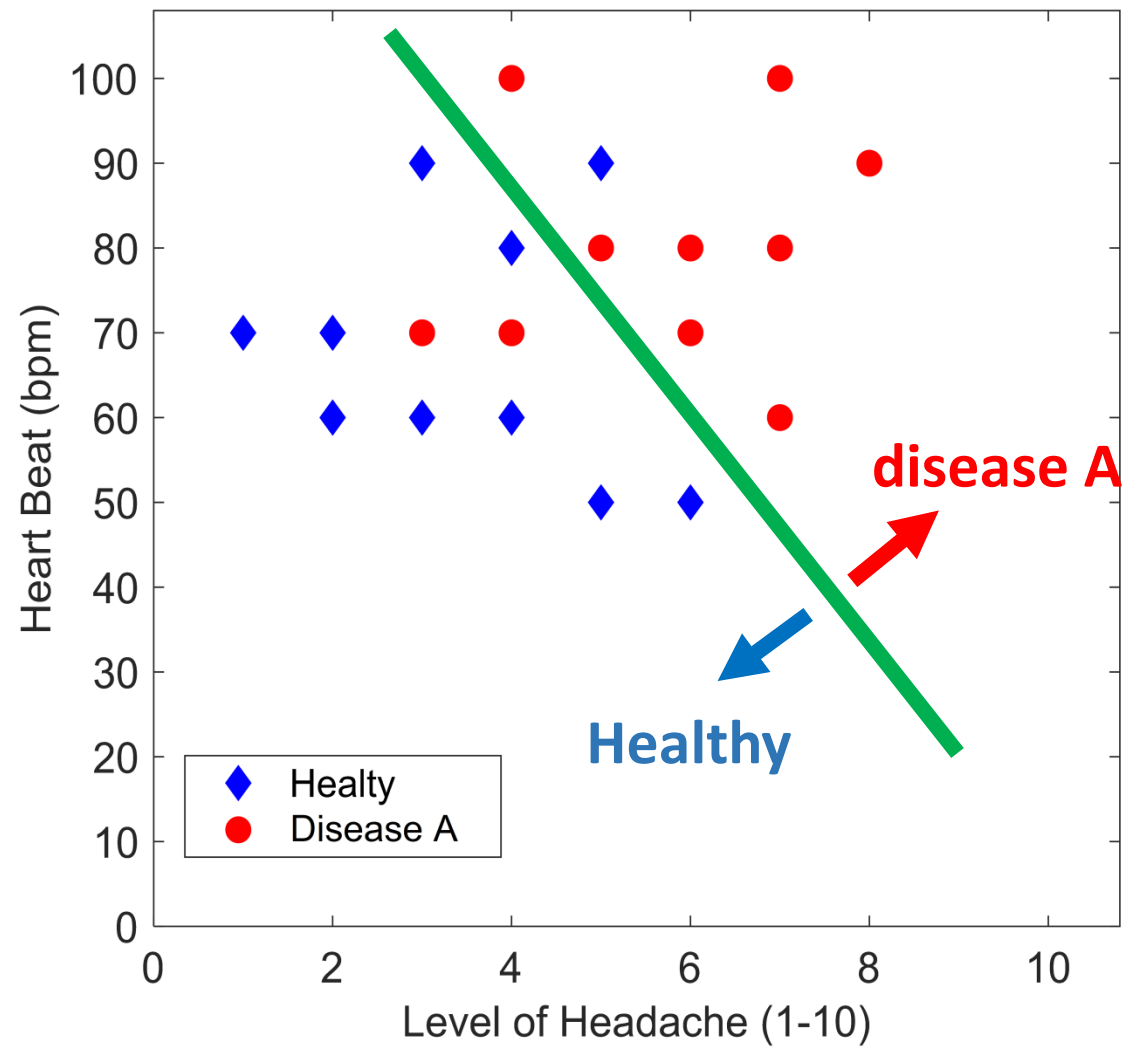
Hypothesis testing

- The test result threshold is set to minimize false positives and false negatives.

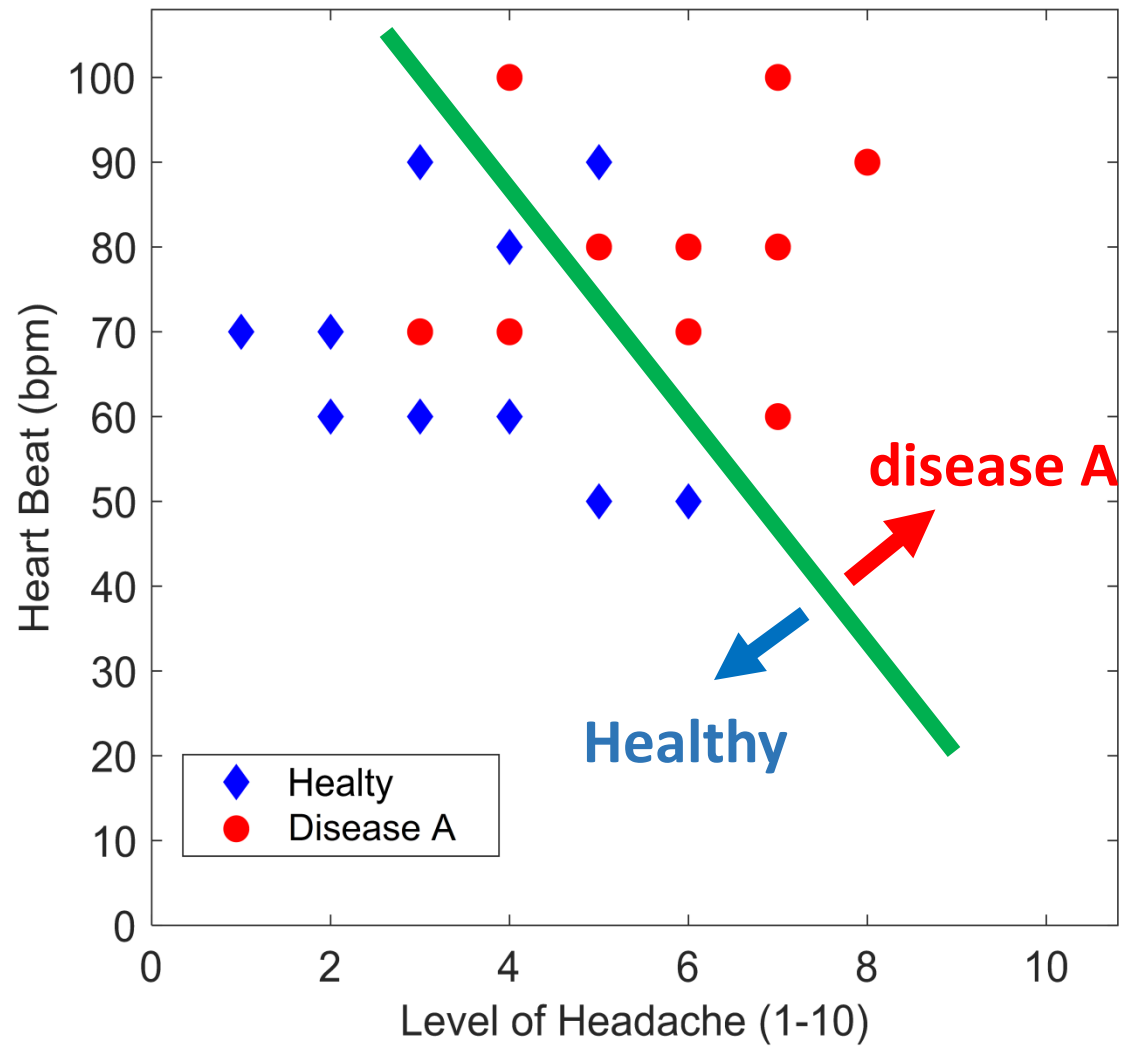
A Scientific Study Example (Hypothetical, not real)



A Scientific Study Example (Hypothetical, not real)



A Scientific Study Example (Hypothetical, not real)



True Positive: 8
Has disease and classified as infected
True Negative: 9
Healthy and classified as healthy
False Positive: 1
Healthy but classified as infected
False Negative: 2
Infected but classified as healthy

True Positive(TP): 8
Has disease and classified as infected

True Negative(TN): 9
Healthy and classified as healthy

Condition positive(CP) : $TP + FN = 10$

Condition negative(CN) : $TN + FP = 10$

Predicted Condition positive(PCP) : $TP + FP = 9$

Predicted Condition negative(PCN) : $TN + FN = 11$

Total population(TOT) : $CP + CN = 20$

Sensitivity: $TP/CP = 8/10 = 0.8$

Selectivity: $TN/CN = 9/10 = 0.9$

Miss rate: $FN/CP = 2/10 = 0.2$

Fall-out: $FP/CN = 1/10 = 0.1$

Prevalance: $CP/TOT = 10/20 = 0.5$

Accuracy: $(TP+TN)/TOT = 17/20 = 0.85$

Positive predictive value(PPV): $TP/PCP = 8/9$

Negative predictive value(NPV): $TN/PCN = 9/11$

False Positive(FP): 1
Healthy but classified as infected

False Negative(FN): 2
Infected but classified as healthy

False discovery rate(FDR): $FP/PCP = 1/9$

False omission rate(FOR): $FN/PCN = 2/11$

Positive likelihood ratio(LR+) :

Sensitivity/Fall-out = $0.8/0.1 = 8$

Negative likelihood ratio(LR-) :

Miss rate/Selectivity = $0.2/0.9 = 0.22$

Diagnostic odds ratio(DOR):

$LR+/LR- = 8/0.22$