# Evaluation of Supervised Learning Problems

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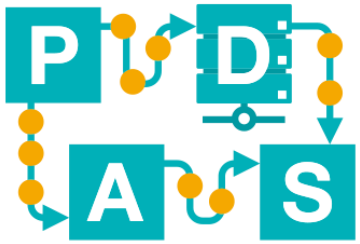


Chair of Process and Data Science

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# Confusion Matrix

## Exercise 1

| Target | Prediction |
|---|---|
| Pineapple | Citroen |
| Citroen | Citroen |
| Pineapple | Pineapple |
| Pineapple | Pineapple |
| Citroen | Pineapple |
| Citroen | Citroen |
| Citroen | Pineapple |

**Create the confusion matrix for the table to the left.**

# Confusion Matrix

## Exercise 2

| Target | Prediction |
|---|---|
| VW | BMW |
| Mercedes | BMW |
| VW | VW |
| BMW | BMW |
| BMW | BMW |
| BMW | VW |
| VW | VW |
| Mercedes | VW |
| Mercedes | Mercedes |
| VW | VW |
| VW | BMW |

**Create the confusion matrix for the table to the left.**



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# Profit Matrix

## Exercise 1

| Confusion | | predicted | | |
|---|---|---|---|---|
| | | Car | Train | |
| **target** | Car | 235 | 15 | 250 |
| | Train | 150 | 354 | 504 |
| | | 385 | 369 | 754 |

**Calculate the Profit for the given confusion and profit matrix.**

| Profit | | predicted | |
|---|---|---|---|
| | | Car | Train |
| **target** | Car | 50 | -10 |
| | Train | -35 | 60 |

# Basic metrics

## Exercise 1

**Calculate precision, recall, accuracy and F1-score based on the confusion matrix below?**

**(spam is “positive”, ham is “negative”)**

| | | predicted | |
|---|---|---|---|
| | | spam | ham |
| target | spam | 57 | 16 |
| | ham | 7 | 346 |

# Basic metrics

## Exercise 2

**Calculate precision and recall based on the confusion matrix below?**

| | | predicted | | | |
|---|---|---|---|---|---|
| | | Blond | Brown | Red | |
| Target | Blond | 52 | 60 | 2 | 114 |
| | Brown | 15 | 80 | 1 | 96 |
| | Red | 1 | 0 | 20 | 21 |
| | | 68 | 140 | 23 | 231 |

# Basic metrics

## Exercise 3

**Calculate the average class accuracy based on the confusion matrix below?**

| | | predicted | | | |
|---|---|---|---|---|---|
| | | Blond | Brown | Red | |
| Target | Blond | 52 | 60 | 2 | 114 |
| | Brown | 15 | 80 | 1 | 96 |
| | Red | 1 | 0 | 20 | 21 |
| | | 68 | 140 | 23 | 231 |

# Advanced metrics

## Exercise 1

| FPR | TPR |
|---|---|
| 0.0 | 0.0 |
| 0.1 | 0.2 |
| 0.2 | 0.49 |
| 0.3 | 0.58 |
| 0.4 | 0.7 |
| 0.5 | 0.8 |
| 0.6 | 0.87 |
| 0.7 | 0.83 |
| 0.8 | 0.9 |
| 0.9 | 0.95 |
| 1 | 1 |

**Create the ROC curve.**

# Advanced metrics

## Exercise 2

| ID | target | Model 1 - score |
|---|---|---|
| 1 | spam | 0.269716 |
| 2 | ham | 0.256025 |
| 3 | ham | 0.029838 |
| 4 | ham | 0.573647 |
| 5 | ham | 0.099473 |
| 6 | spam | 0.224657 |
| 7 | spam | 0.073765 |
| 8 | spam | 0.372195 |
| 9 | spam | 0.636284 |
| 10 | spam | 0.900927 |

| ID | target | Model 2 - score |
|---|---|---|
| 1 | spam | 0.386103 |
| 2 | ham | 0.489002 |
| 3 | ham | 0.366141 |
| 4 | ham | 0.305974 |
| 5 | ham | 0.231088 |
| 6 | spam | 0.746451 |
| 7 | spam | 0.949931 |
| 8 | spam | 0.786145 |
| 9 | spam | 0.847479 |
| 10 | spam | 0.738911 |

1. **Predict for the thresholds {0,0.25,0.75,1} for both models, whether it is spam or ham.**
2. **Calculate the TPR and FPR of both models and the given thresholds.**
3. **Create the ROC curve.**
4. **Which model would you prefer based on the ROC curve?**