CEITEC

Central European Institute of Technology
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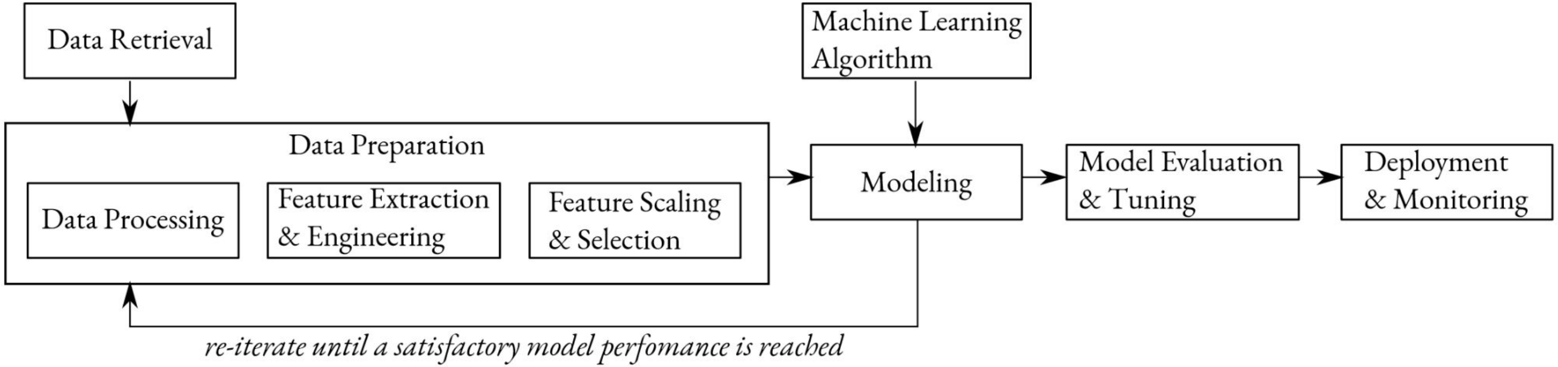
Data Science Practicum

(Lecture 10, 20.11.)

Denisa Šrámková

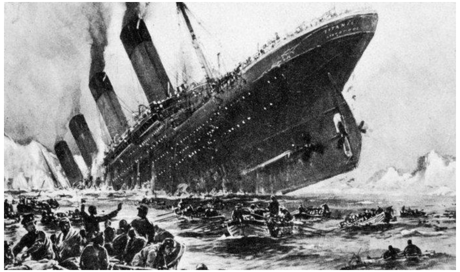
Data Preparation


Data Retrieval
Machine Learning Algorithm
Data Preparation
Data Processing
Feature Extraction & Engineering
Feature Scaling & Selection
Modeling
Model Evaluation & Tuning
Deployment & Monitoring
re-iterate until a satisfactory model perfomance is reached

Exercise:

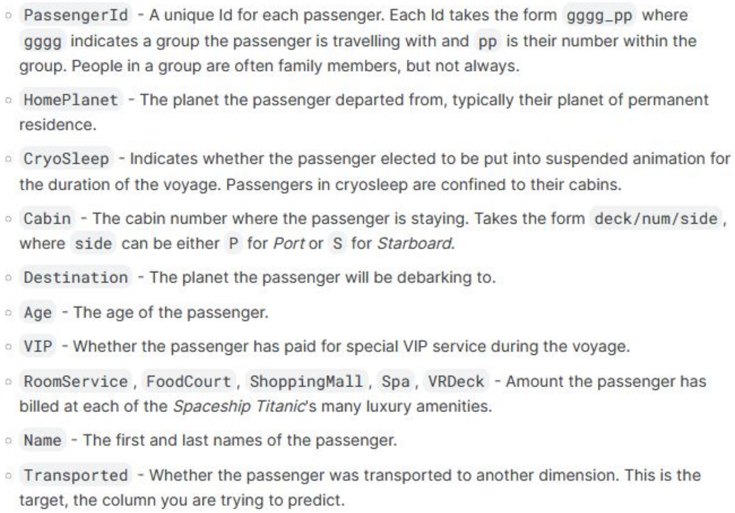
https://github.com/simecek/dspracticum2023/blob/main/lesson10/ds_practicum_ex_ml_pipeline_final.ipynb

Dataset

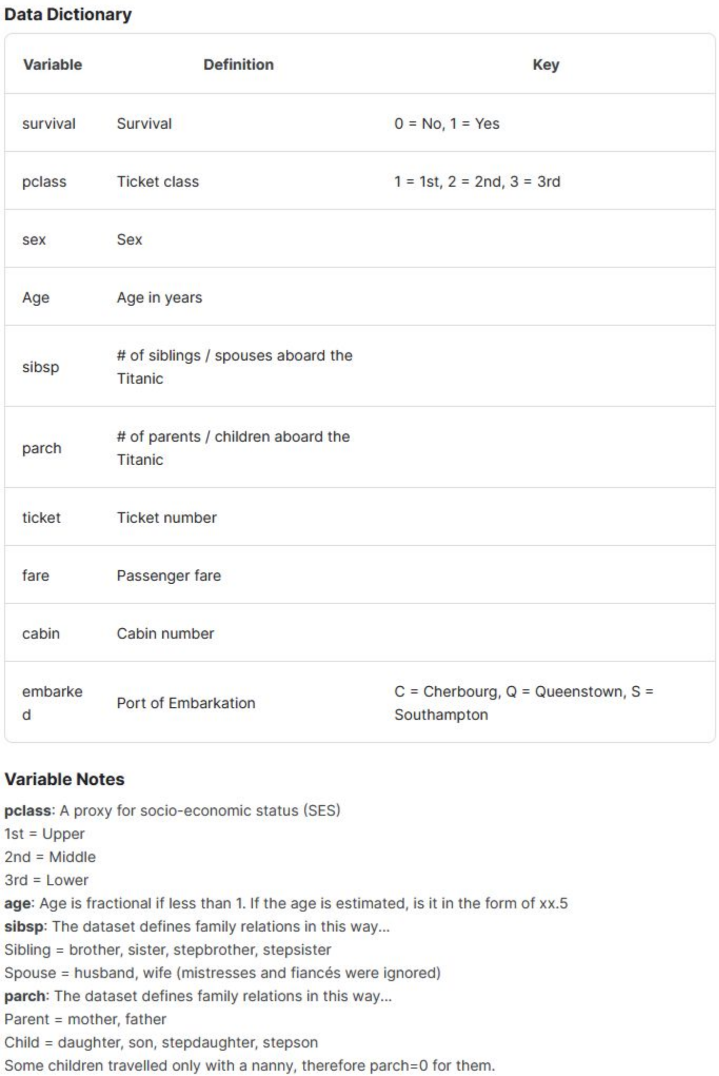


$(0.01, 0.48, \ldots 1.0) \rightarrow$ 🙂 😵

https://www.kaggle.com/competitions/titanic/data
https://www.kaggle.com/competitions/spaceship-titanic/data



- `PassengerId` - A unique Id for each passenger. Each Id takes the form `gggg_pp` where `gggg` indicates a group the passenger is travelling with and `pp` is their number within the group. People in a group are often family members, but not always.
- `HomePlanet` - The planet the passenger departed from, typically their planet of permanent residence.
- `CryoSleep` - Indicates whether the passenger elected to be put into suspended animation for the duration of the voyage. Passengers in cryosleep are confined to their cabins.
- `Cabin` - The cabin number where the passenger is staying. Takes the form `deck/num/side`, where `side` can be either `P` for *Port* or `S` for *Starboard*.
- `Destination` - The planet the passenger will be debarking to.
- `Age` - The age of the passenger.
- `VIP` - Whether the passenger has paid for special VIP service during the voyage.
- `RoomService`, `FoodCourt`, `ShoppingMall`, `Spa`, `VRDeck` - Amount the passenger has billed at each of the *Spaceship Titanic*'s many luxury amenities.
- `Name` - The first and last names of the passenger.
- `Transported` - Whether the passenger was transported to another dimension. This is the target, the column you are trying to predict.



Data Dictionary

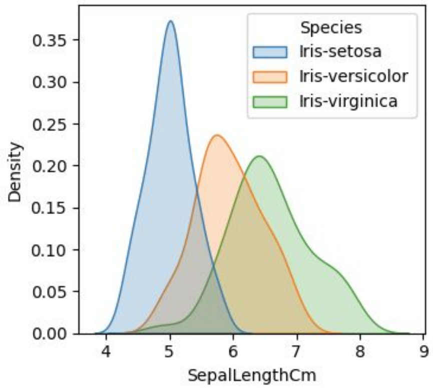
Variable	Definition	Key
survival	Survival	0 = No, 1 = Yes
pclass	Ticket class	1 = 1st, 2 = 2nd, 3 = 3rd
sex	Sex	
Age	Age in years	
sibsp	# of siblings / spouses aboard the Titanic	
parch	# of parents / children aboard the Titanic	
ticket	Ticket number	
fare	Passenger fare	
cabin	Cabin number	
embarked	Port of Embarkation	C = Cherbourg, Q = Queenstown, S = Southampton

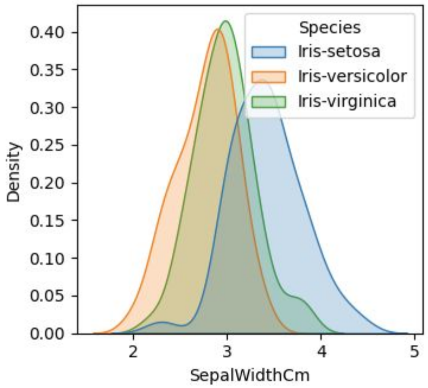
Variable Notes

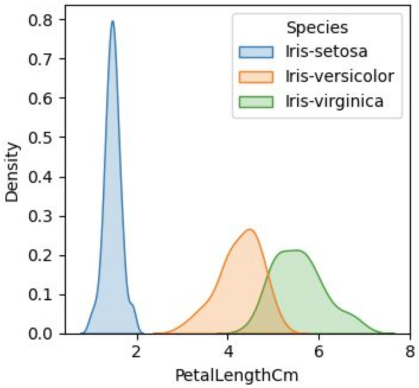
pclass: A proxy for socio-economic status (SES)
1st = Upper
2nd = Middle
3rd = Lower
age: Age is fractional if less than 1. If the age is estimated, is it in the form of xx.5
sibsp: The dataset defines family relations in this way...
Sibling = brother, sister, stepbrother, stepsister
Spouse = husband, wife (mistresses and fiancés were ignored)
parch: The dataset defines family relations in this way...
Parent = mother, father
Child = daughter, son, stepdaughter, stepson
Some children travelled only with a nanny, therefore parch=0 for them.

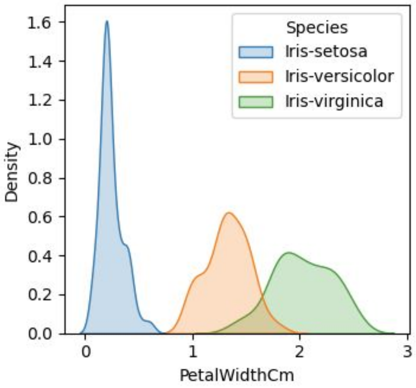
0. Data exploration

- get to know your data
- make visualization to get more insights









1. Data cleaning

Handle:

- **missing** values
  - skip
  - eliminate row/ column,
  - interpolate
- **inconsistent** values (age in *Birth* column, value of String type in otherwise Int column, …)
- **duplicate** values

2. Feature manipulation

- **encoding categorical features**
    - One-Hot encoding
    - Binning
- **scaling numerical features**
    - normalization
    - standardization

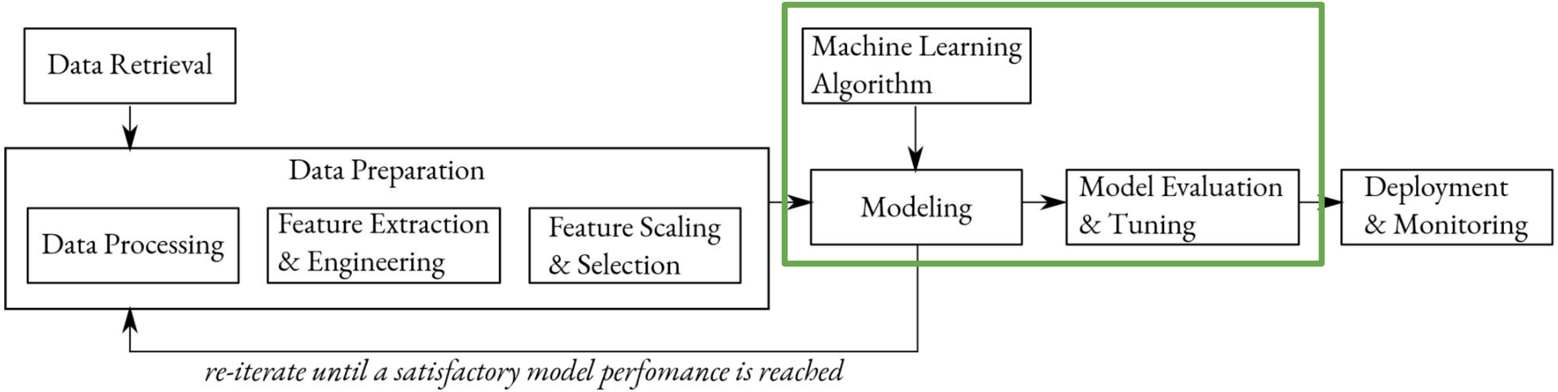
3. Dataset splitting

Train: used to build the model

Validation: to improve hyperparameters

Test: to test the hypothesis of the model (not used until the model is trained and its hyperparameters are decided)

4. Choosing the right solution + Training the model *(switch to exercise)*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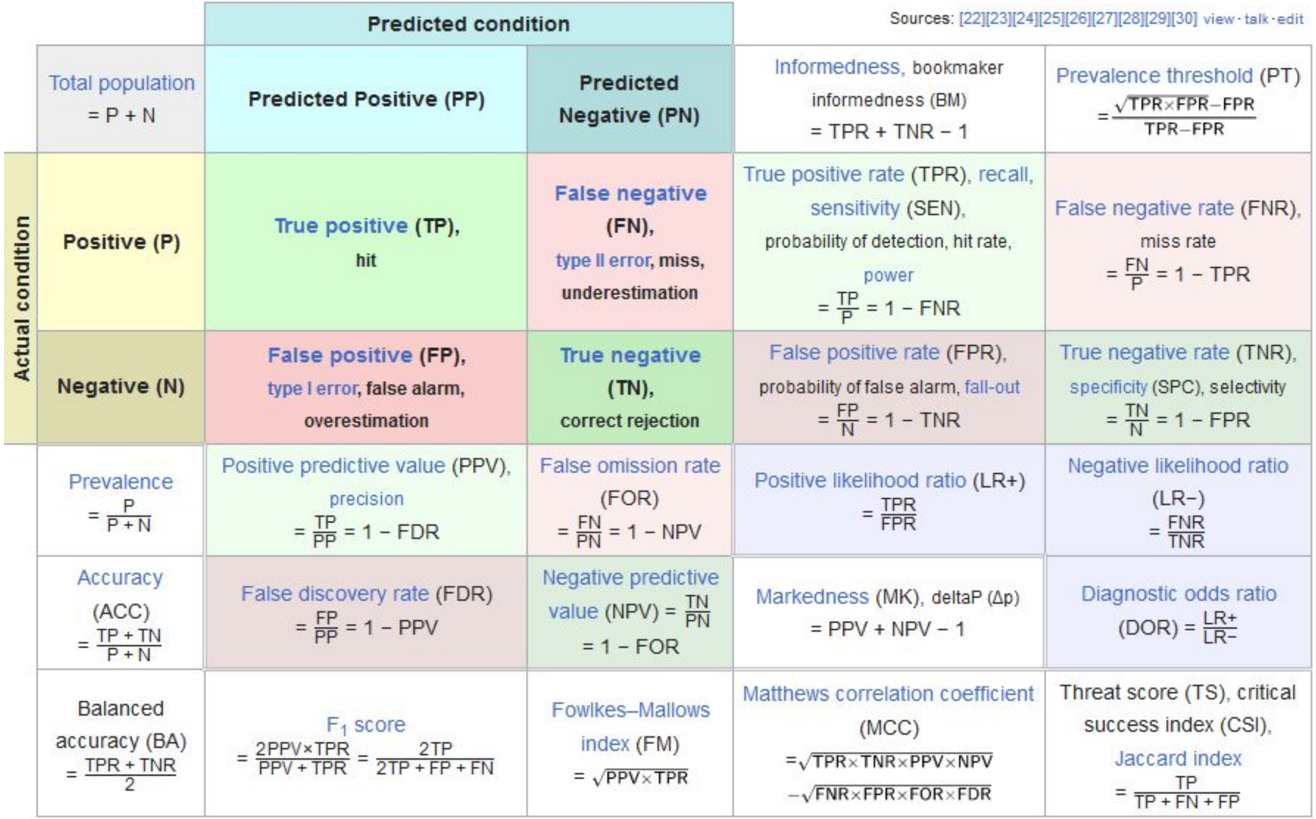
5. Evaluation

Classification metrics:



Sources: [22][23][24][25][26][27][28][29][30] view · talk · edit

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Actual condition	Positive (P)	True positive (TP), hit	False negative (FN), type II error, miss, underestimation	True positive rate (TPR), recall, sensitivity (SEN), probability of detection, hit rate, power $= \frac{TP}{P} = 1 - FNR$	False negative rate (FNR), miss rate $= \frac{FN}{P} = 1 - TPR$
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https://en.wikipedia.org/wiki/Confusion_matrix

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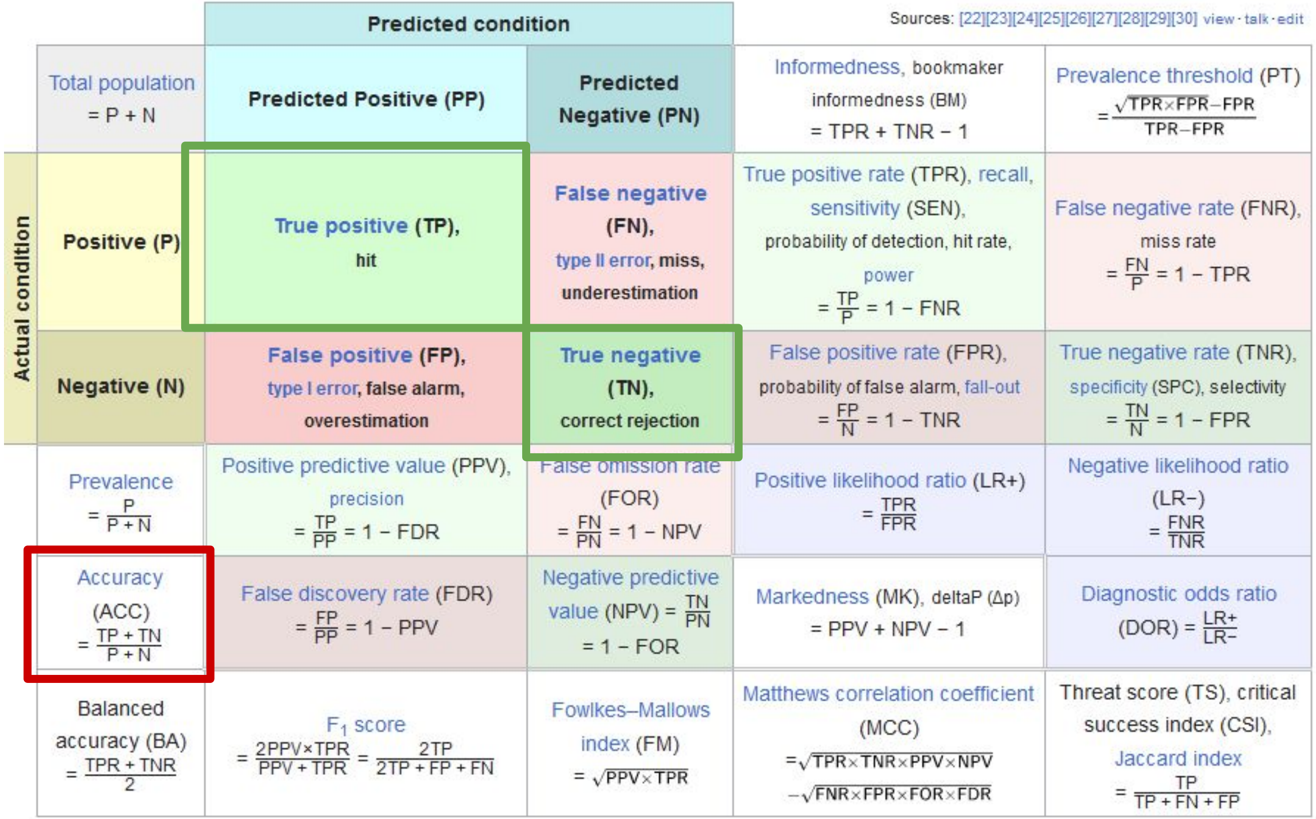

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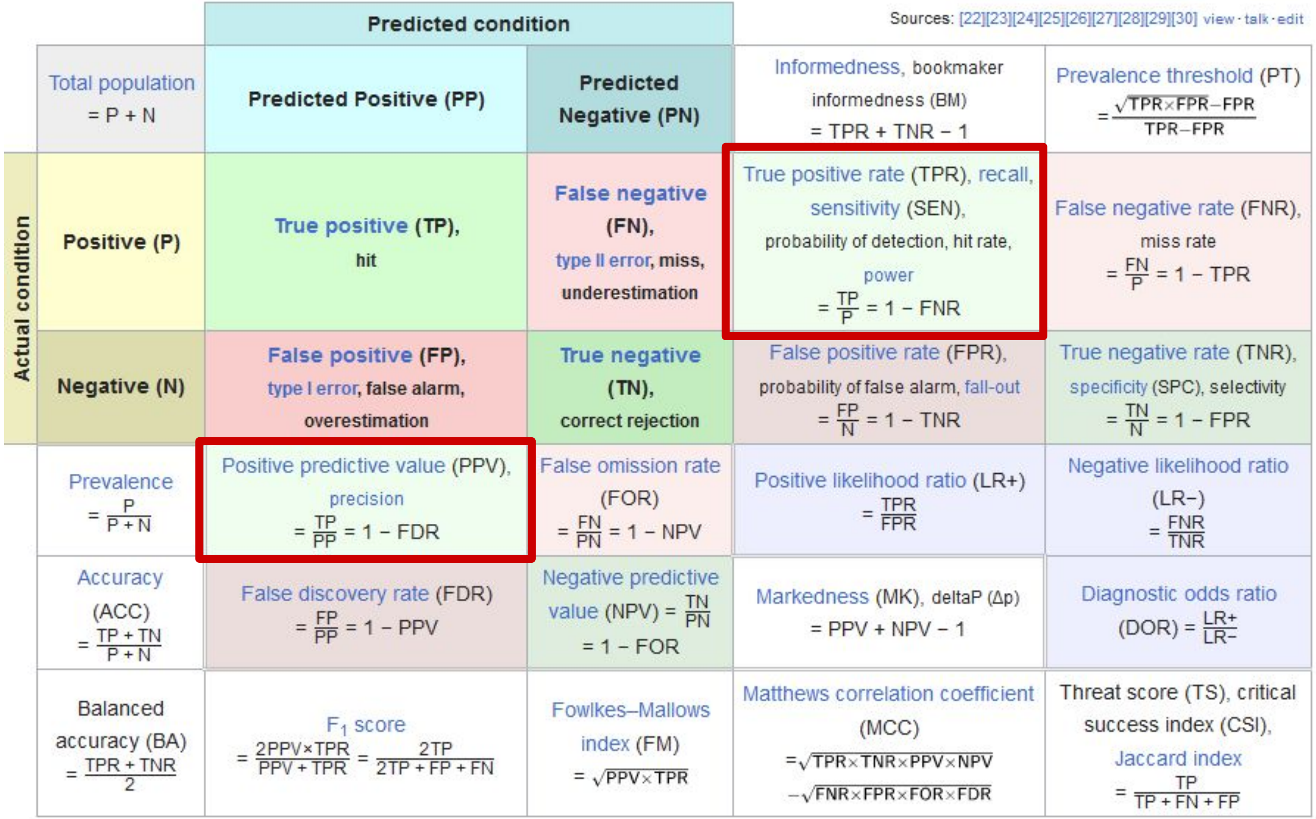

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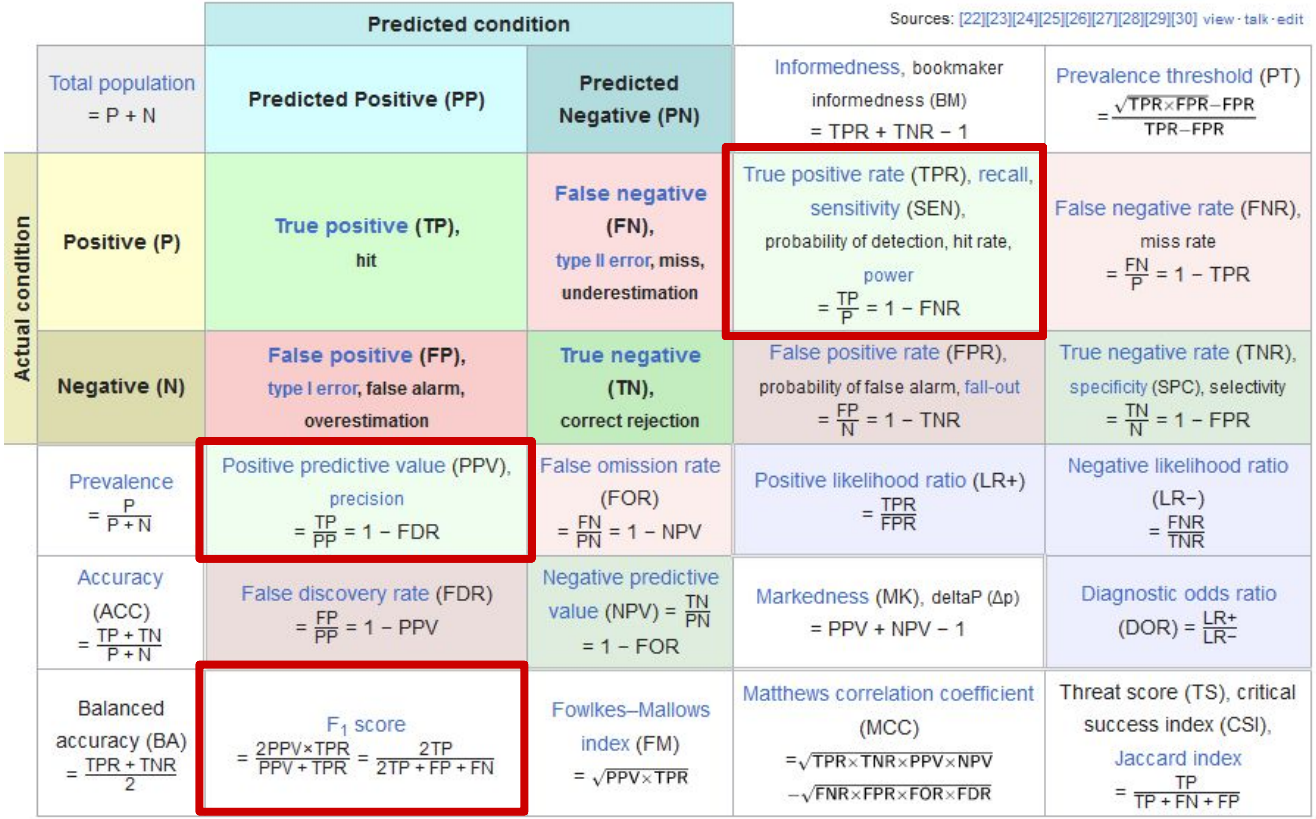

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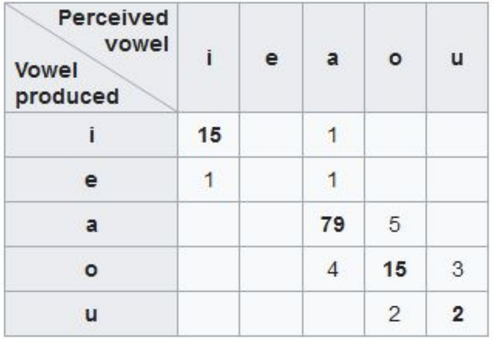
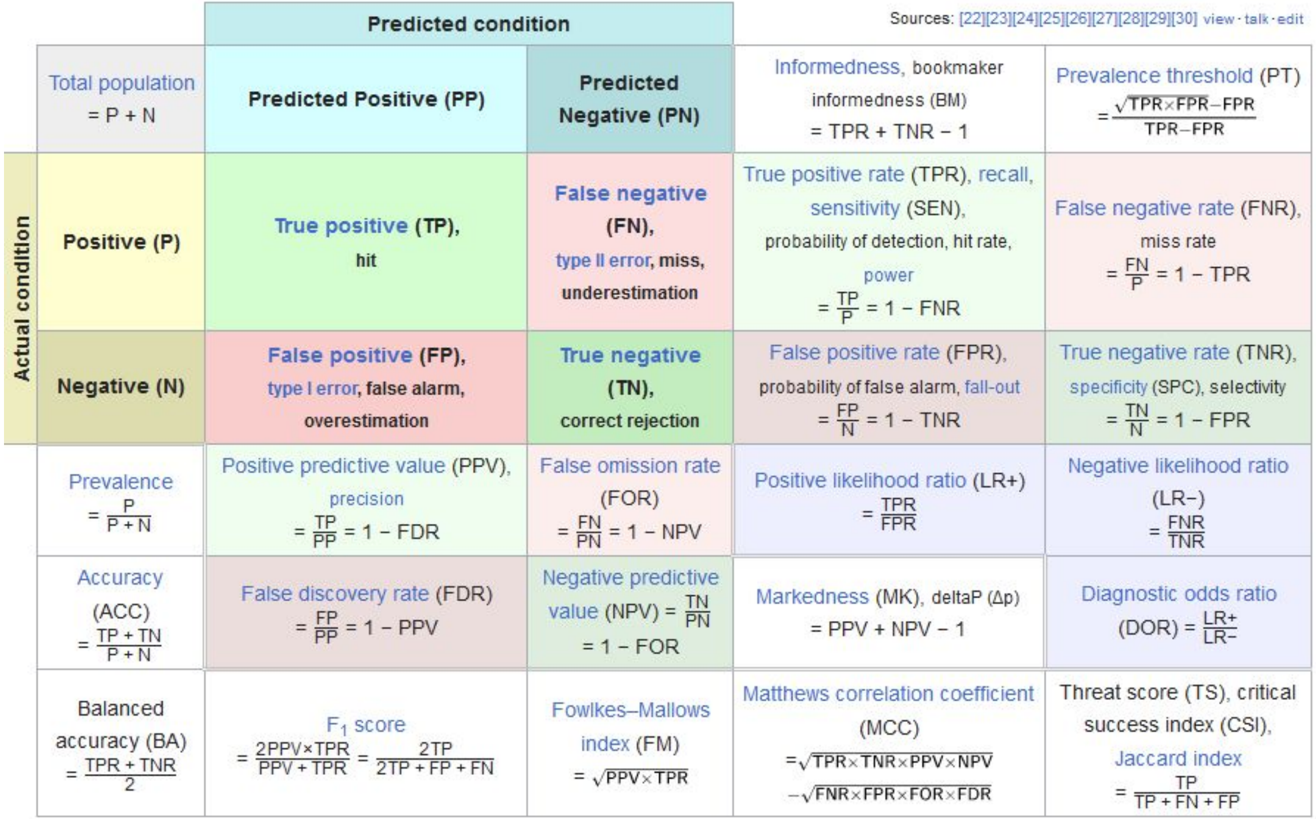


Vowel produced \ Perceived vowel	i	e	a	o	u
i	15		1		
e	1		1		
a			79	5	
o			4	15	3
u				2	2



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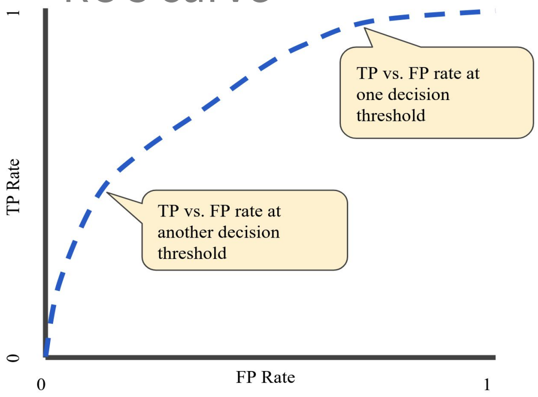
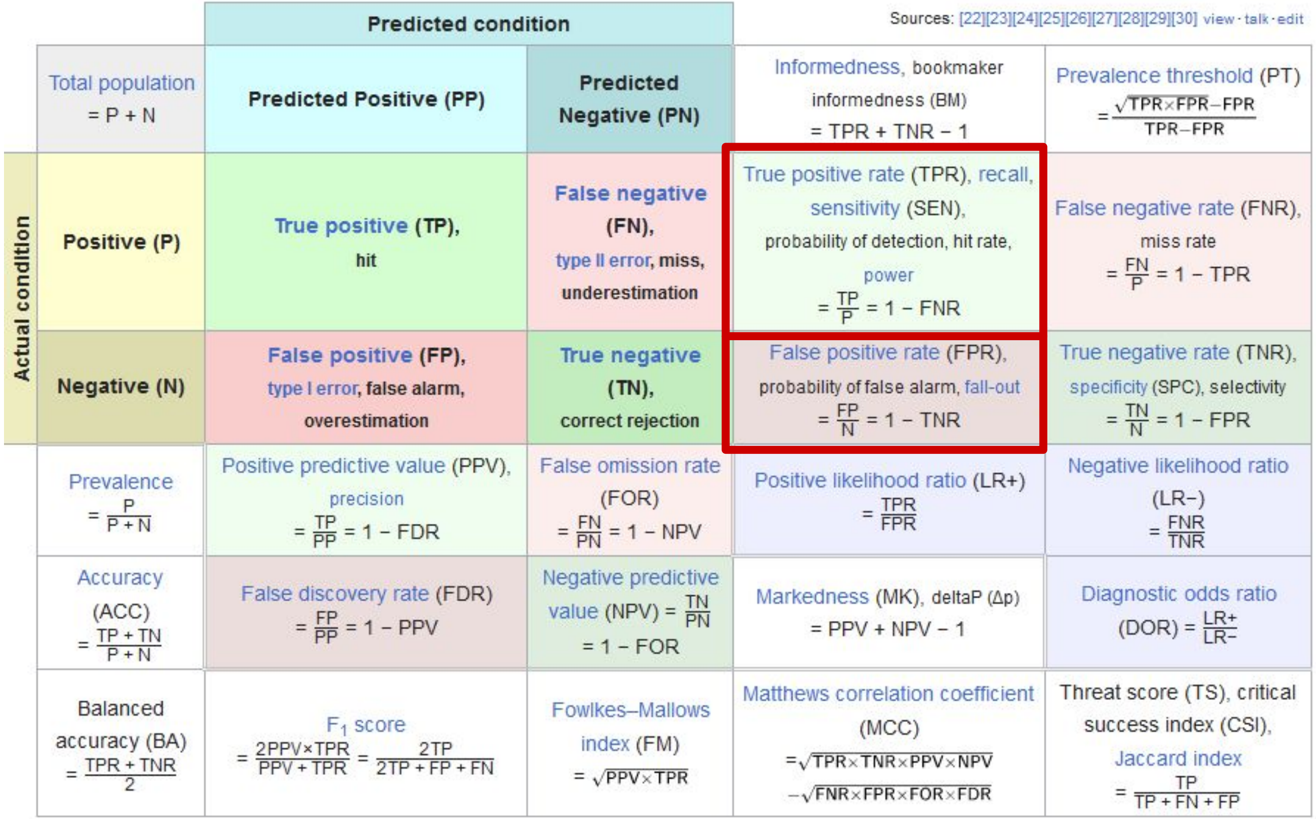
5. Evaluation

Classification metrics:

ROC curve



https://developers.google.com/machine-learning/crash-course/classification/roc-and-auc



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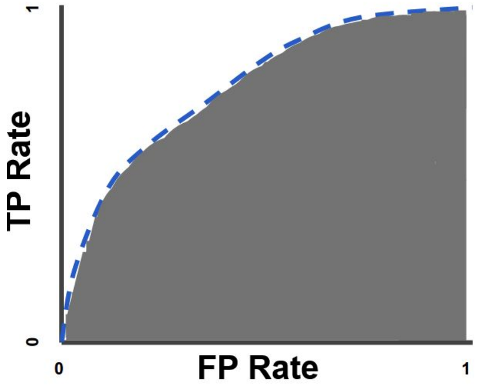
AUC



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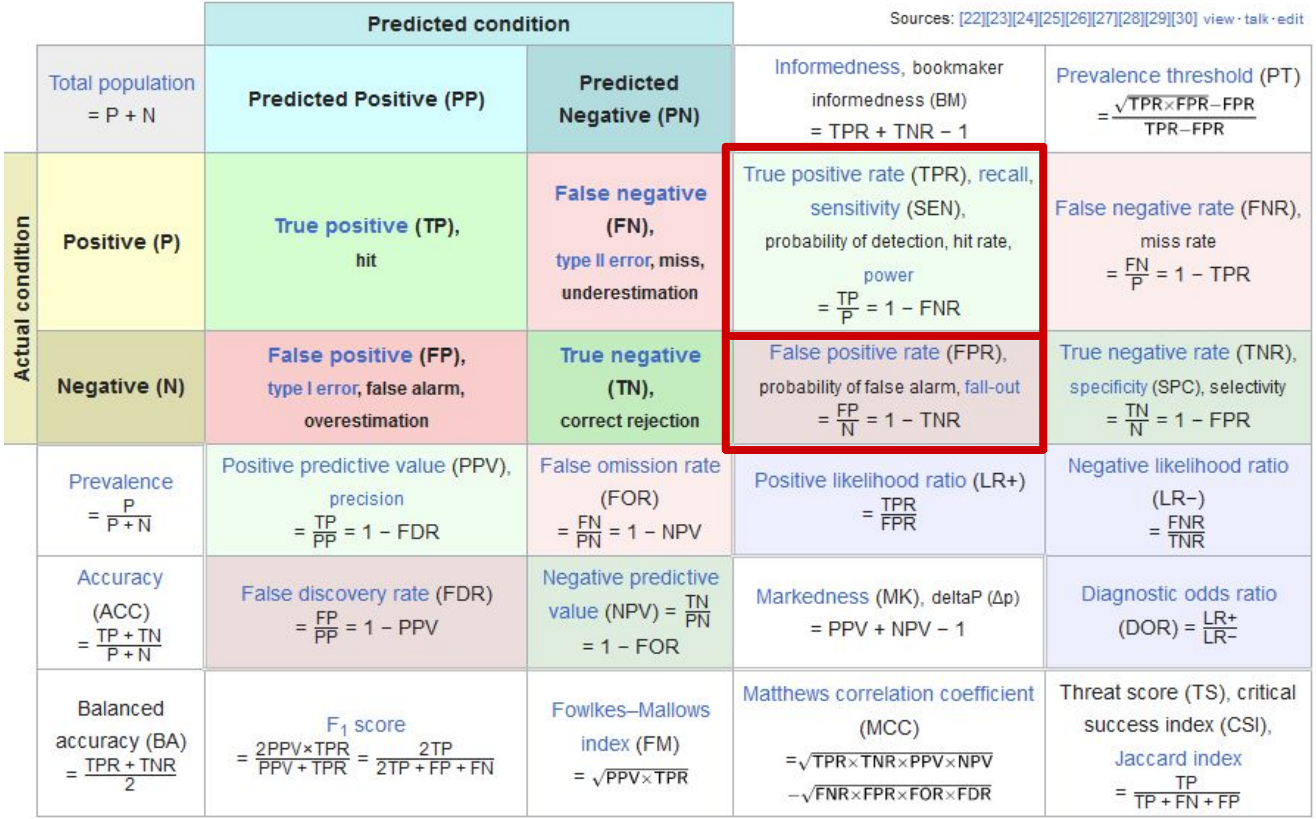

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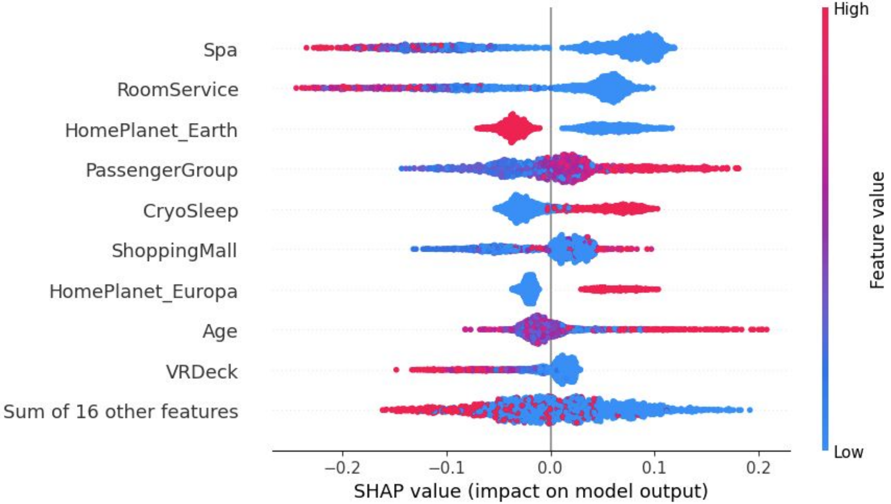
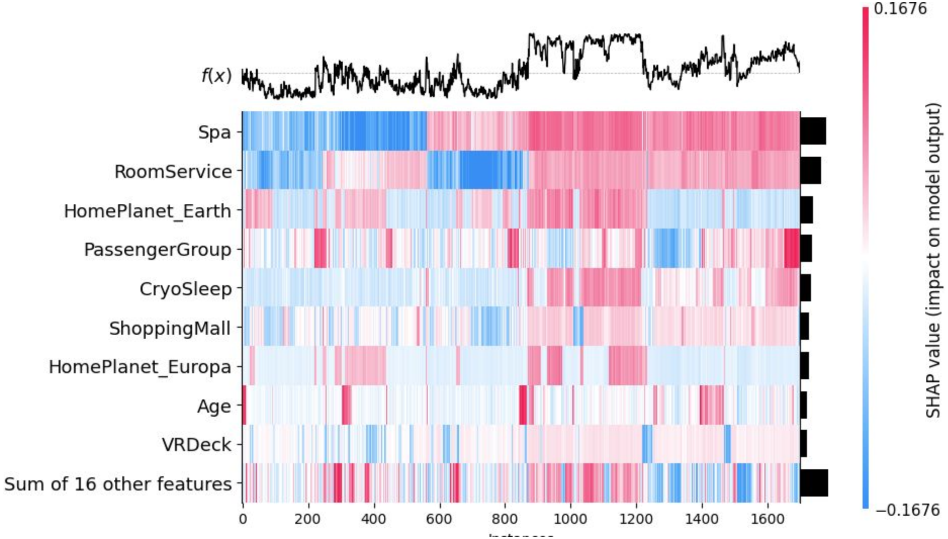
https://en.wikipedia.org/wiki/Confusion_matrix

6. Interpretability *(optional)*





Homework

1) Finish the Exercise (reach at least 80% accuracy) and send the link to your solution on GitHub through https://forms.gle/S4XVncJbSqwXtYJ36