Computational Communication Science 2 Week 8 - Lecture »A Deep Dive into Supervised Machine Learning«

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Today

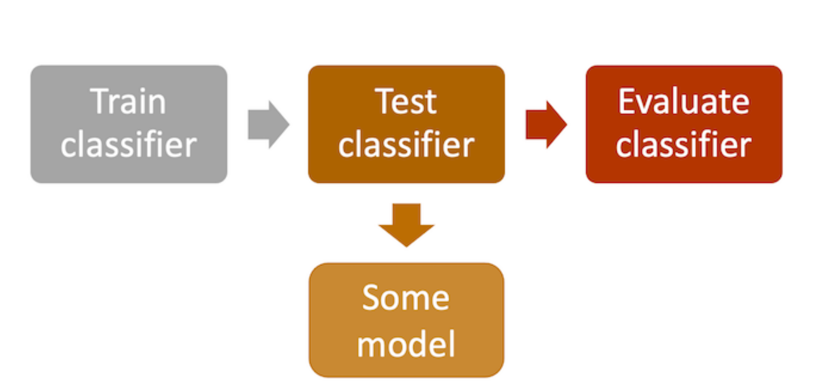
Recap

Recap

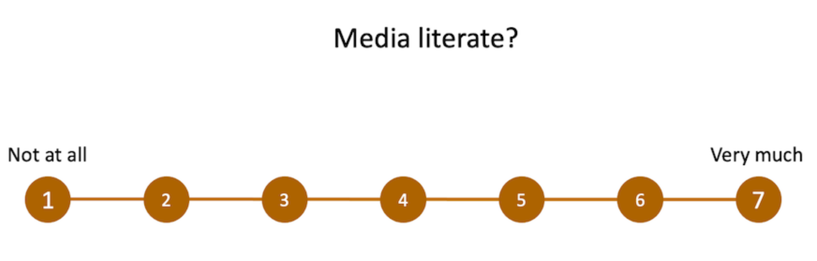
Short recap of last week.

Some classical ML models

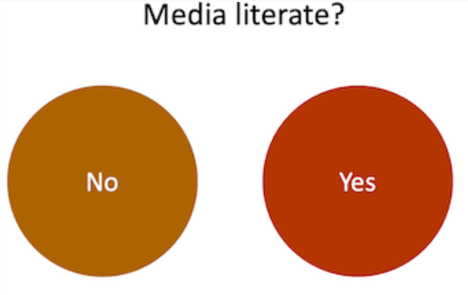
Regression


Train classifier
Test classifier
Evaluate classifier
Some model

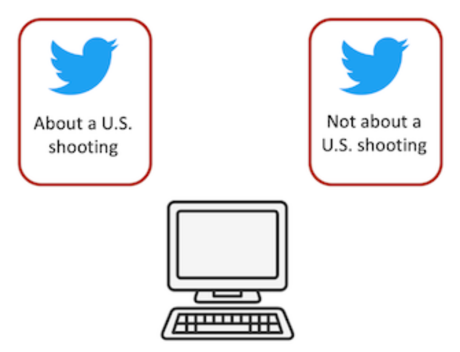
Regression



Regression

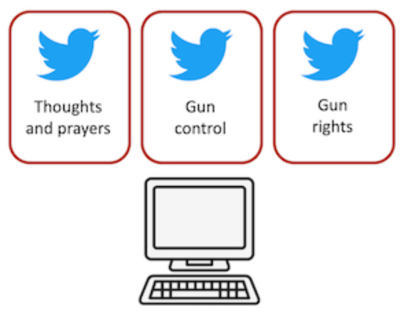


Regression



Zhang, Y., Shah, D., Foley, J., Abhishek, A., Lukito, J., Suk, J., Kim, S. J., Sun, Z., Pevehouse, J., & Garlough, C. (2019). Whose lives matter? mass shootings and social media discourses of sympathy and policy, 2012–2014. *Journal of Computer-Mediated Communication*, *24*(4), 182–202. https://doi.org/10.1093/jcmc/zmz009

Regression



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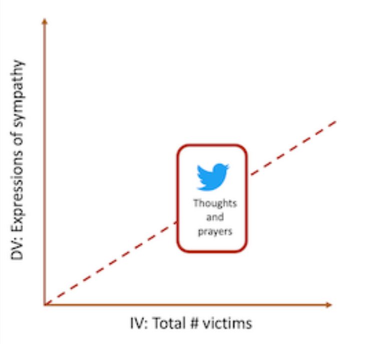
Regression



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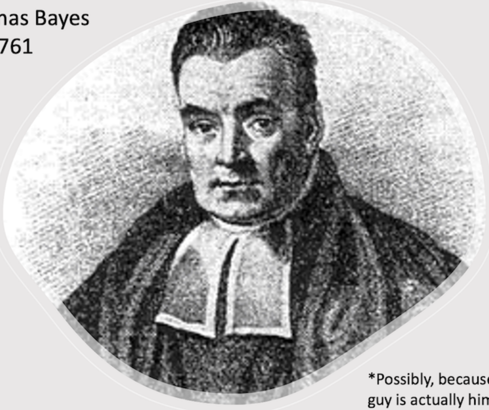
Naïve Bayes

Possibly* Thomas Bayes
1702 – 1761



*Possibly, because it is unclear if this guy is actually him, but there is no other (claimed) portrait of him.

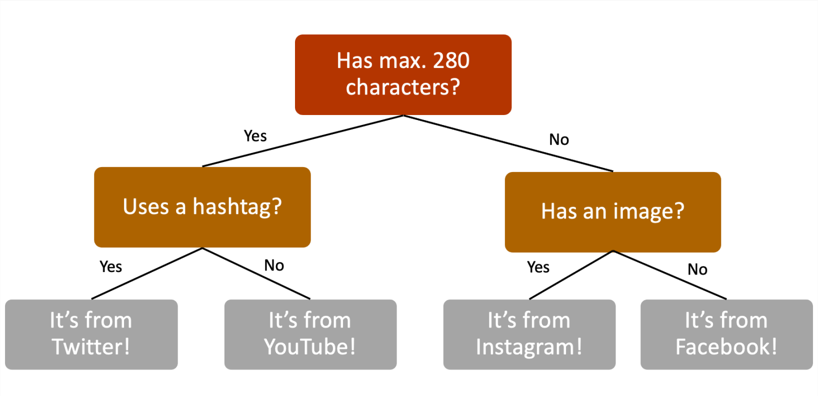
Naïve Bayes

$P(\mathrm{A} \mid \mathrm{B}) = \frac{\mathrm{P(B|A) \cdot P(A)}}{\mathrm{P(B)}}$

Mathematicians' language for: the probability of A is B is the case/present/true.

$P(\mathrm{label} \mid \mathrm{features}) = \frac{\mathrm{P(features|label) \cdot P(label)}}{\mathrm{P(features)}}$

Decision Trees and Random Forests



Decision Trees and Random Forests

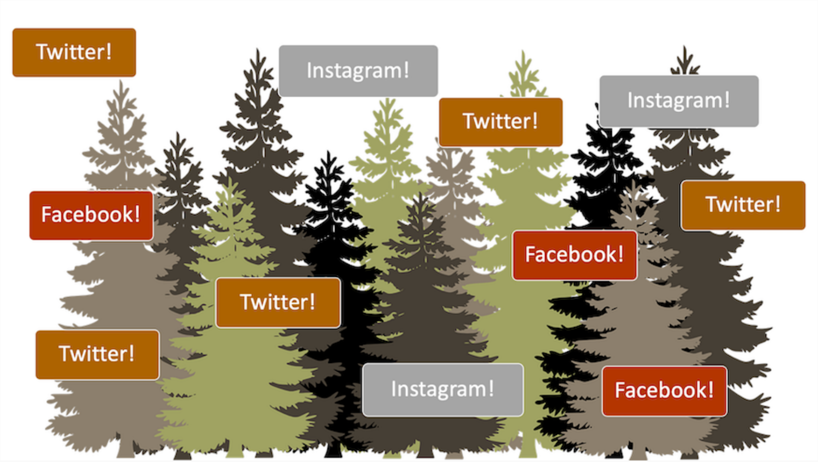
Advantages of decision trees:

- Transparency
- Suitable for non-linear relationships

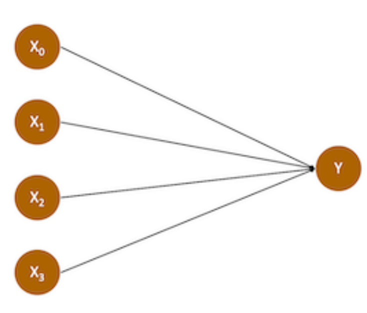
Disadvatanges of decision trees:

- Loss of nuance due to yes/no-design
- Cannot correct early mistakes
- Prone to overfitting

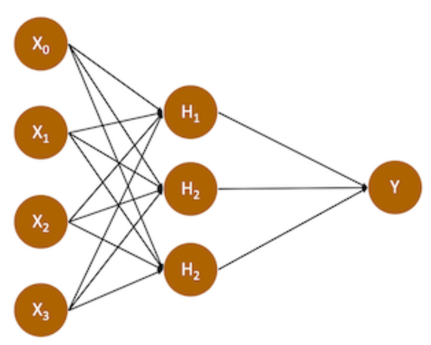
Decision Trees and Random Forests



Neural Networks



Neural Networks



Ha, Y., Park, K., Kim, S. J., Joo, J., & Cha, M. (2021). Automatically detecting image–text mismatch on instagram with deep learning. *Journal of Advertising*, *50*(1), 52–62. https://doi.org/10.1080/00913367.2020.1843091

Recap

Many different models available for machine learning.

How do you know what is the best for your case? Try it out and validate!

Zooming out

We talked about:

- The principles behind SML
- The steps of SML
- Some commonly used ML models

Next, we will talk about:

- Validating models

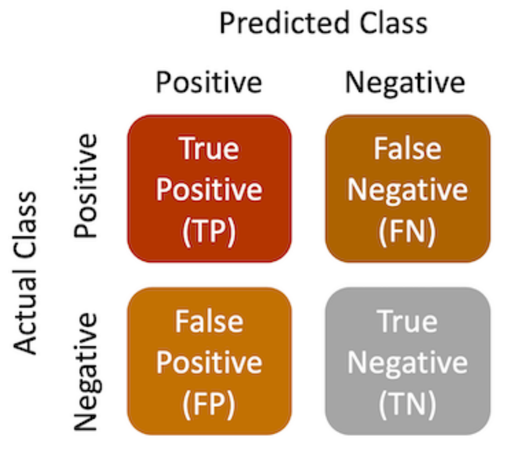
Validating models

Validating Models

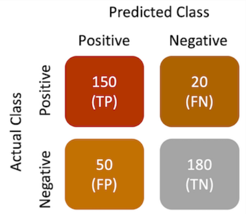
Precision quantifies the number of positive class predictions that actually belong to the positive cases.
OR: How much of what we found is actually correct?

Recall quantifies the number of positive class prediction made out of all positive examples in the dataset.
OR: How many of the cases that we wanted to find did we actually find?

Validating Models



Validating Models



Precision is calculated as: $\frac{\mathrm{TP}}{\mathrm{TP}+\mathrm{FP}}$

In our case $\frac{150}{150+50}$ which is 0.75

Recall is calculated as $\frac{\mathrm{TP}}{\mathrm{TP}+\mathrm{FN}}$

In our case $\frac{150}{150+20}$ which is 0.88

Validating Models

Table 2
Relationship classification performance and number of training tweets, random sampling approach.

		100	200	500	1000	2000	3000	4000
Linear support vector machine classifier	AC	0.63	0.65	0.70	0.73	0.80	0.84	0.91
	PC	0.45	0.48	0.59	0.62	0.76	0.80	0.90
	RC	0.38	0.43	0.51	0.59	0.71	0.79	0.86
	AUC	0.41	0.45	0.59	0.61	0.69	0.76	0.85
	KA	0.09	0.10	0.39	0.41	0.54	0.65	0.79
Naïve Bayes classifier	AC	0.63	0.65	0.71	0.75	0.82	0.86	0.91
	PC	0.42	0.46	0.62	0.68	0.81	0.86	0.92
	RC	0.27	0.33	0.47	0.49	0.61	0.69	0.79
	AUC	0.33	0.38	0.60	0.62	0.69	0.77	0.84
	KA	0.08	0.13	0.39	0.40	0.56	0.67	0.78
Logistic regression classifier	AC	0.66	0.67	0.71	0.74	0.79	0.85	0.89
	PC	0.48	0.51	0.63	0.70	0.78	0.89	0.93
	RC	0.04	0.22	0.35	0.39	0.53	0.64	0.73
	AUC	0.08	0.31	0.51	0.55	0.62	0.74	0.82
	KA	0.01	0.09	0.21	0.32	0.48	0.64	0.74

Van Zoonen, W., & Van der Meer, T. G. (2016). Social media research: The application of supervised machine learning in organizational communication research.. *Computers in Human Behavior*, *63*, 132–141.

https://doi.org/10.1016/j.chb.2016.05.028

Validating Models

Slide about accuracy. Discuss class imbalance (https://machinelearningmastery.com/what-is-imbalanced-classification/)

Validating Models

Slide about F1-score.

Validating Models

Slide about Area Under the Curve.

Validating Models

Slide about Cross-validation and grid search.

Zooming out

We talked about:

- The principles behind SML
- The steps of SML
- Some commonly used ML models
- Validating models

Next, we will talk about:

- Strengths and challenges associated to SML

SML: Strenghts and Challenges

Strengths and Challenges

Strengths:

- Easier to code large datasets
- Enhances replicable research
- Easier to study ”natural” human behavior

Disadvantages:

- Resource constraints
- Ethical considerations
- Criticism required (see next slide)

Strengths and Challenges

Belastingdienst koos voor extra controle vooral burgers met lage inkomens

23 november 2021 00:47
Laatste update: 1 dag geleden

761 NUjij-reacties

Het systeem van de Belastingdienst koos ervoor om de kinderopvangtoeslag vooral bij mensen met een laag inkomen extra te controleren. Dat heeft de fiscus toegegeven in antwoord op vragen van *Trouw* en *RTL Nieuws*.

Trouw

Toeslagen

Belastingdienst ging vooral achter lage inkomens aan

Om toeslagen te controleren op fouten en fraude gebruikte de Belastingdienst een zelflerend algoritme. Dat selecteerde vooral lage inkomens voor controle.

Jan Kleinnijenhuis 22 november 2021

De Belastingdienst heeft jarenlang specifiek burgers met een laag inkomen geselecteerd voor extra controle op

Fraudejacht bij Toeslagen

Belastingdienst controleerde extra bij lage inkomens in jacht op fraude

22 november 2021 22:59

Zooming out I

We talked about:

- The principles behind SML
- The steps of SML
- Some commonly used ML models
- Validating models
- Strengths and challenges associated to SML

Zooming out II

This week's tutorial:

- Hands-on approach to take a further look into validating models
- Tutorial goals:
  - To get you some experience with the SML process and selecting a model
  - To provide a stepping stone so that you can (independently) advance your machine learning skills