Computational Communication Science 2
Week 7 - Lecture
»Rule-based vs. Automated Text Classification«

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Today

Rule-based Text Classification

Automated Text Classification: SML

The principles behind SML

SML step by step

Rule-based Text Classification

Text Classification

Text classification: To assign a label to a text.

For example, to distinguish between:

- newspaper articles about sports vs. economics.
- reliable vs. unreliable information about vaccination.
- webpages about holding companies vs. financing companies.
- positive vs. negative movie reviews.

Studying Flaming (Example)

RQ: How problematic is flaming on Twitter?

Bag-of-words approach:

1. Create a list with all the swearwords that exist.
2. For each tweet in the dataset, use the list to count the number of swearwords

Sentiment Analysis

We can add nuance by creating more rules.

For example, in sentiment analyses, we can include a rule telling the machine what to do in case of negation or modifiers.

"This movie is really not good."
"This movie is really good."

Rule-based Text Classifcation

Advantages of rule-based text classification:

- Simple and therefore transparent
- Cheap

Challenges of rule-based text classification:

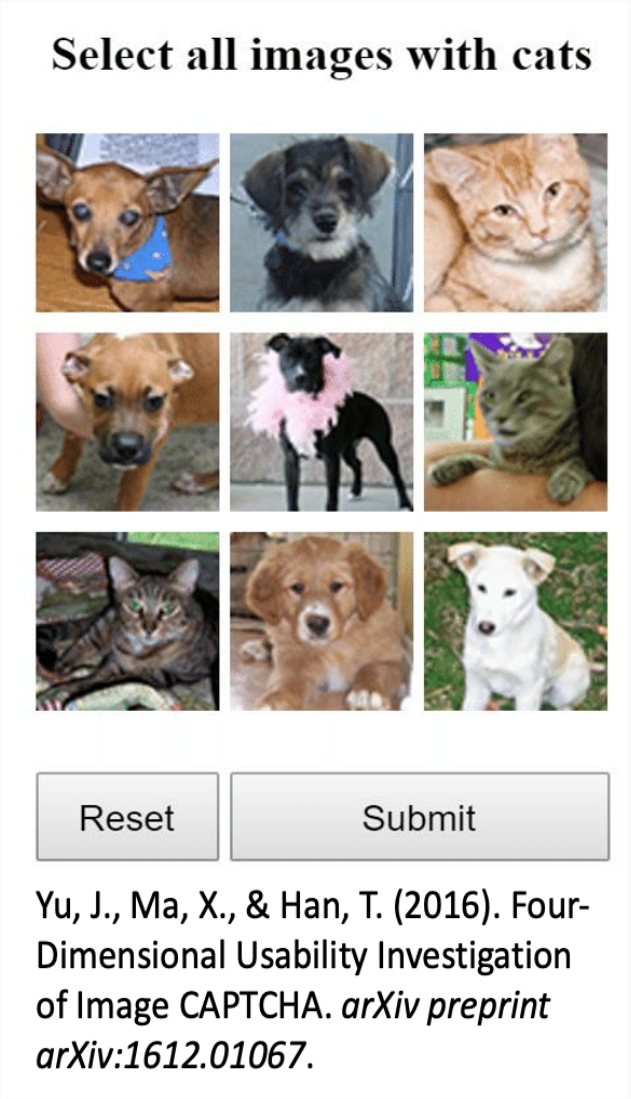
- Not a suitable way to anayze latent or abstract variables
- You must know all the categories beforehand

From Rule-based to Automated

When it is easy for humans to decide to what class a text belongs, but we struggle to translate our decision process into straight-forward rules, we are likely to be better of using a form of automated text classification: Supervised Machine Learning.

Automated Text Classification: SML

What is SML?



Yu, J., Ma, X., & Han, T. (2016). Four-Dimensional Usability Investigation of Image CAPTCHA. *arXiv preprint arXiv:1612.01067*.

What is SML?

Read more about this project in: Sermanet, P., Eigen, D., Zhang, X., Mathieu, M., Fergus, R., & LeCun, Y. (2014). OverFeat: Integrated recognition, localization and detection using convolutional networks. *arXiv:1312.6229 [cs]*. Retrieved December 23, 2021, from http://arxiv.org/abs/1312.6229

What is SML?

Machine Learning: A process whereby a machine learns how to predict a variable.

What is SML?

Supervised Machine Learning (SML): "A form of machine learning, where we aim to predict a variable that, for a least part of our data is known."

"The goal of Supervised Machine Learning: estimate a model based on some data, and then use the model to predict the expected outcome for some new cases, for which we do not know the outcome yet."

Van Atteveldt, W., Trilling, D., & Calderon, C. A. (2022). *Computational analysis of communication*.

Wiley-Blackwell

What is SML?

Machine Learning has a lot of similarities to regression analysis!

The principles behind SML

The principles behind SML

$$y = constant + b_1 * x_1 + b_2 * x_2$$

x_1 = bark? (0= no, 1 = yes)

x_2 = tail? (0 = no, 1 = yes)

y = Is this a dog? (0 = definitely no, 1 = definitely yes)

The principles behind SML

$$y = constant + b_1 * x_1 + b_2 * x_2$$

$$y = 0 + 0.8 * x_1 + 0.2 * x_2$$

$$y = 0 + 0.8 * 1 + 0.2 * 0$$

The principles behind SML

$$y = 0 + 08 * 1 + 0.2 * 0$$

$$0.8 = 0 + 0.8 * 1 + 0.2 * 0$$

The principles behind SML

$$0.8 = 0 + 0.8 * 1 + 0.2 * 0$$

Classification: a predictive modeling problem where a class label is predicted for a given example of input data.

The principles behind SML

Machine Learning Lingo	Statistics Lingo
Feature	Independent variable
Label	Dependent variable
Labeled dataset	Dataset with both independent and dependent variables
To train a model	To estimate
Classifier	Model to predict nominal outcomes
To annotate	To (manually) code

Adapted from: Van Atteveldt, Trilling, & Arcilla (2021)

The principles behind SML

Machine Learning: using a (regression) formula to predict a label.

Traditional usage of formulas in CS: to explain

Usage of formulas in ML: to predict

Zooming out

We talked about:

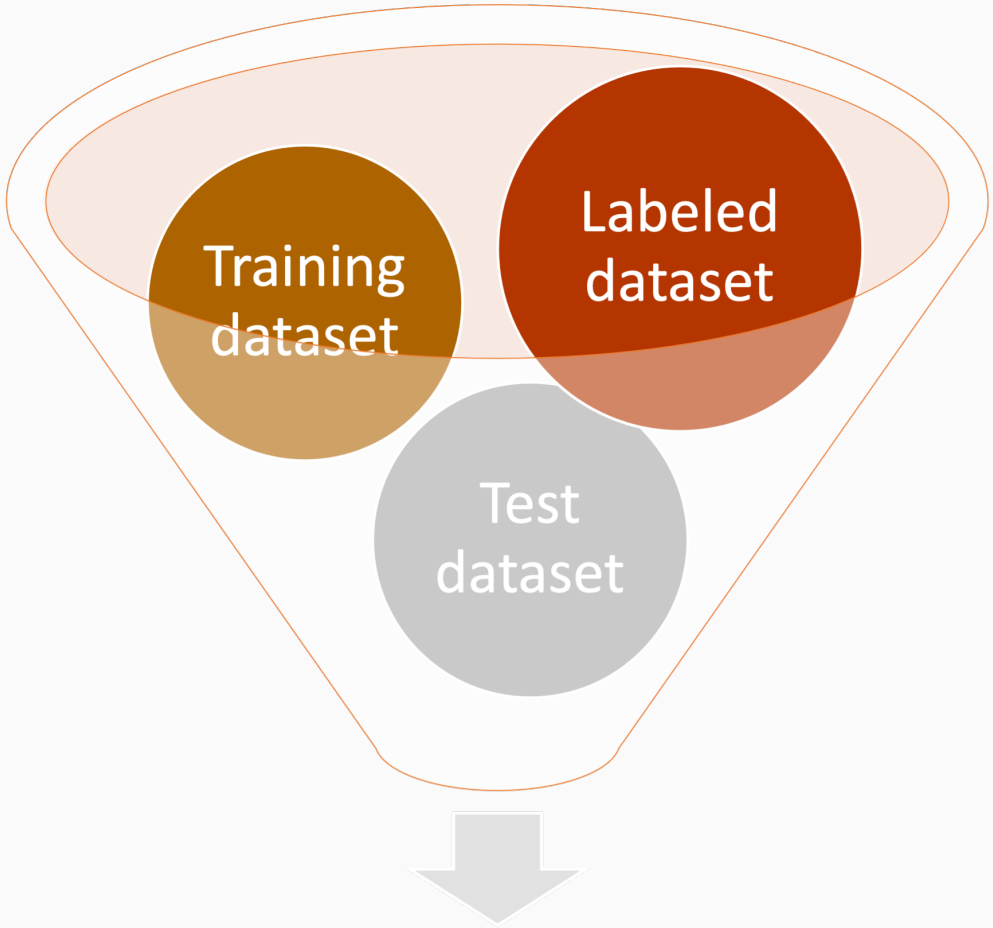
- The principles behind SML

Next, we will talk about:

- The steps of SML

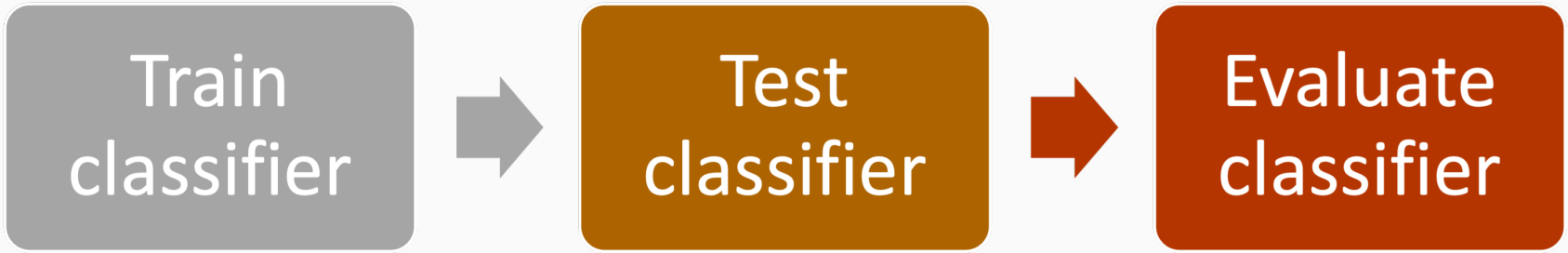
SML step by step

SML step by step

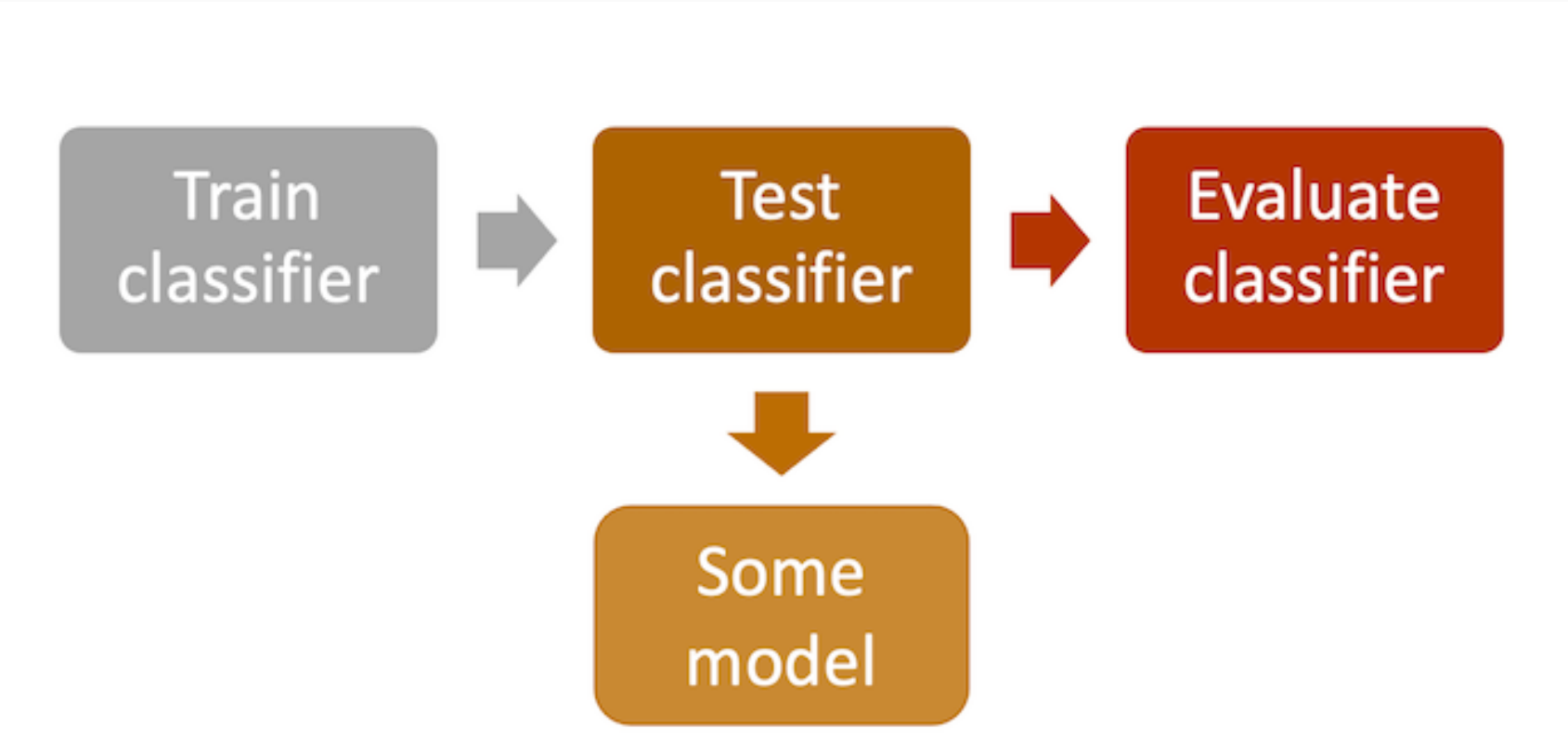


Machine Learning Process

SML step by step



SML step by step



Next class, we look at some commonly used ML models and at the process of evaluating classifiers.

Zooming out

Today, we talked about:

- The principles behind SML
- The steps of SML

Next, we will talk about:

- Some commonly used ML models
- Validating models
- The strengths and challenges associated to ML