

# Introduction to Machine Learning

## NPFL 054

<http://ufal.mff.cuni.cz/course/npfl054>

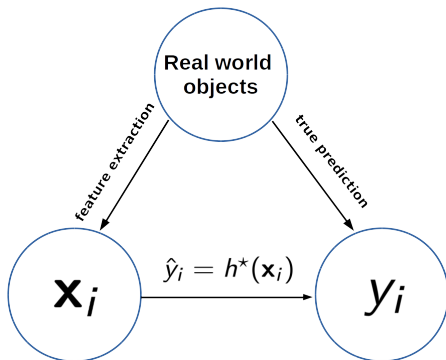
Barbora Hladká  
hladka@ufal.mff.cuni.cz

Martin Holub  
holub@ufal.mff.cuni.cz

Charles University,  
Faculty of Mathematics and Physics,  
Institute of Formal and Applied Linguistics

# Remarks on Bayes classifier and Bayes error

Imagine that you are able to develop a really optimal classifier. Is the zero test error always feasible?



# Bayes classifier and Bayes error

Imagine that you are able to develop a really optimal classifier.  
Is the zero test error always feasible?

The **Bayes classifier** minimises the probability of misclassification

Thus, by definition, error produced by the Bayes classifier is irreducible and is called *Bayes error*.

# What is the lowest possible error rate

**Bayes classifier** assigns each example to the most likely class, given its feature values

$$\hat{y} = \max_y \Pr(y | \mathbf{x})$$

The Bayes classifier produces the lowest possible test error rate, so called **Bayes error rate**

$$1 - E (\max_y \Pr(y | \mathbf{x}))$$

# What is the lowest possible error rate

## Practical view on your development data

Are there identical feature vectors in your data set?

- Get the same feature vectors
- How many of them have the same target value?

# Examination requirements

- Bayes classifier and Bayes error – definition and meaning