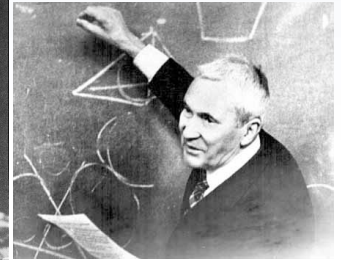
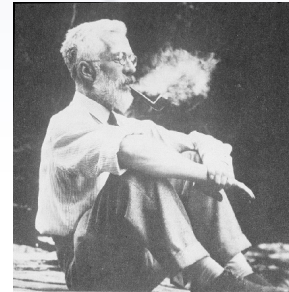
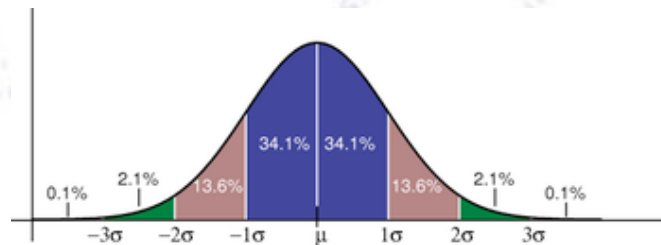


# Big Data Analysis

## Loss Functions



Troels C. Petersen (NBI)



*“Statistics is merely a quantisation of common sense - Big Data is a sharpening of it!”*

# What loss function to use?

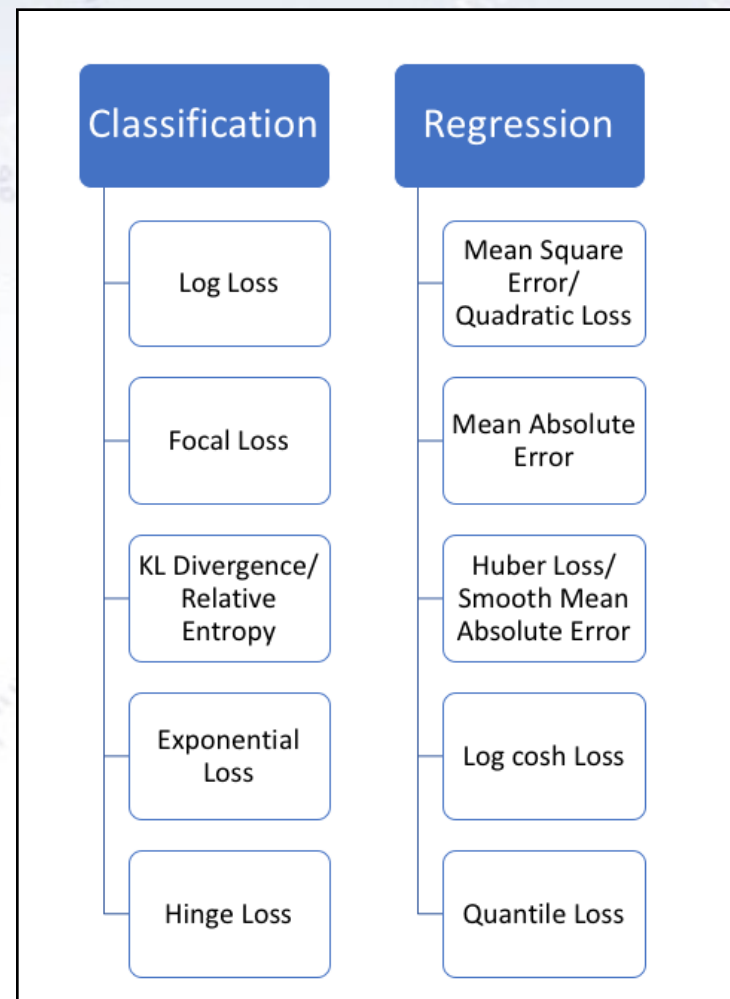
The choice of loss function depends on the problem at hand, and in particular what you find important!

## In classification:

- Do you care how wrong the wrong are?
- Do you want pure signal or high efficiency?
- Does it matter what type of errors you make?

## In regression:

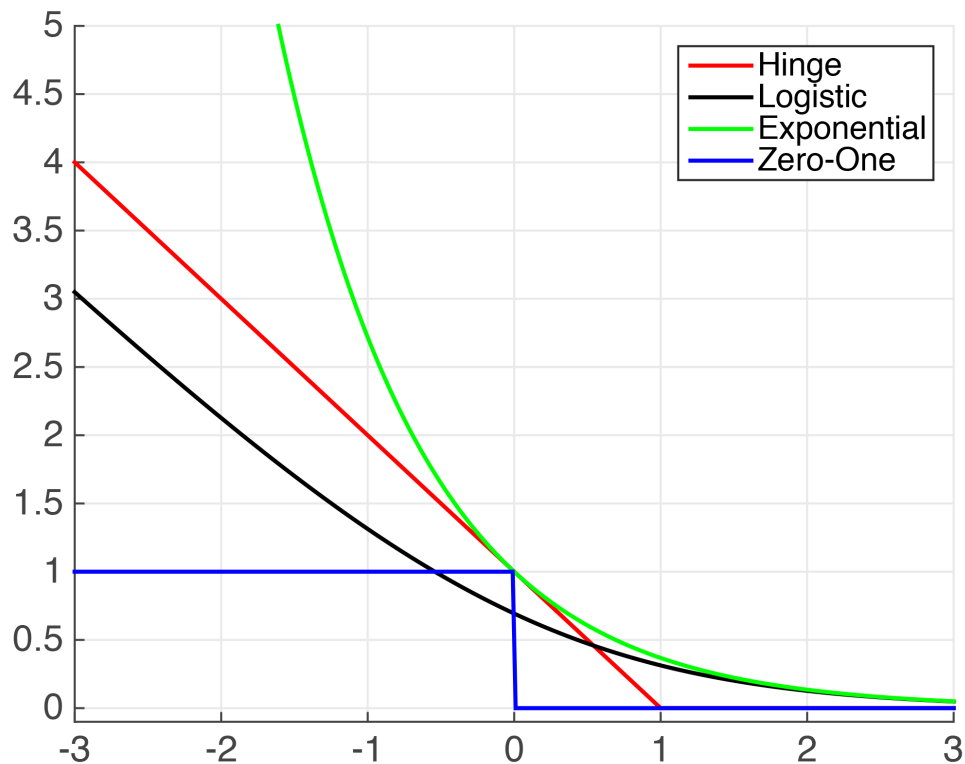
- Do you care about outliers?
- Do you care about size of outliers?
- Is core resolution vital?



# What loss function to use?

The choice of loss function depends on the problem at hand, and in particular what you find important!

## Loss functions for classification



## Classification

Log Loss

Focal Loss

KL Divergence/  
Relative  
Entropy

Exponential  
Loss

Hinge Loss

## Regression

Mean Square  
Error/  
Quadratic Loss

Mean Absolute  
Error

Huber Loss/  
Smooth Mean  
Absolute Error

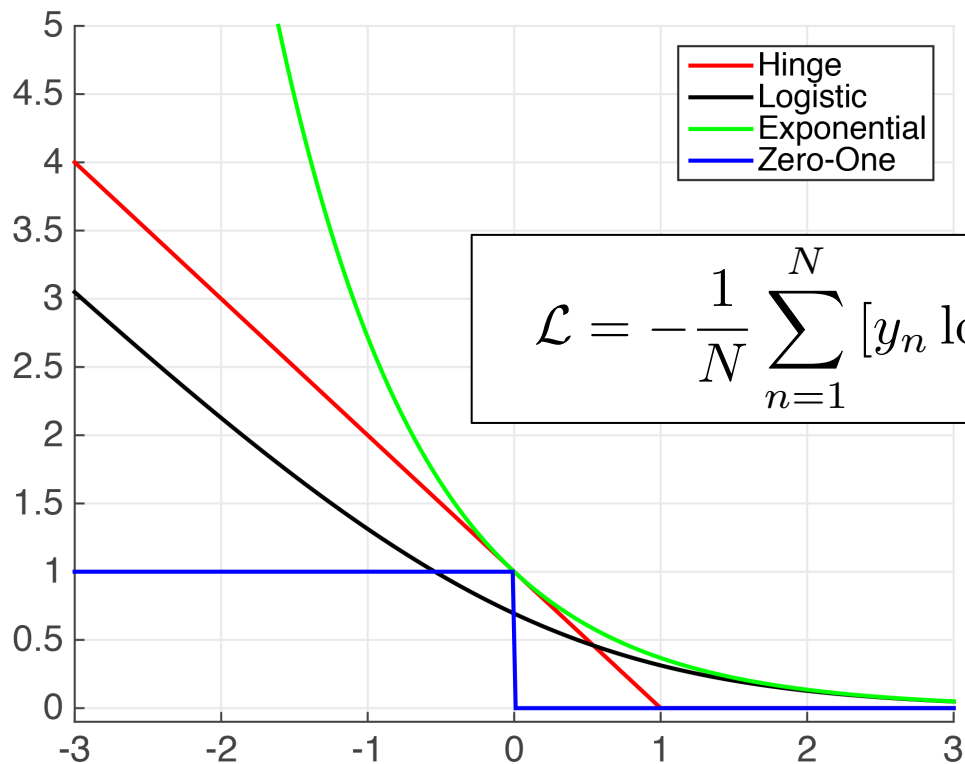
Log cosh Loss

Quantile Loss

# What loss function to use?

The choice of loss function depends on the problem at hand, and in particular what you find important!

## Loss functions for classification



$$\mathcal{L} = -\frac{1}{N} \sum_{n=1}^N [y_n \log \hat{y}_n + (1 - y_n) \log(1 - \hat{y}_n)]$$

### Classification

Log Loss

Relative Entropy

Exponential Loss

Hinge Loss

### Regression

Mean Square Error/  
Quadratic Loss

Smooth Mean Absolute Error

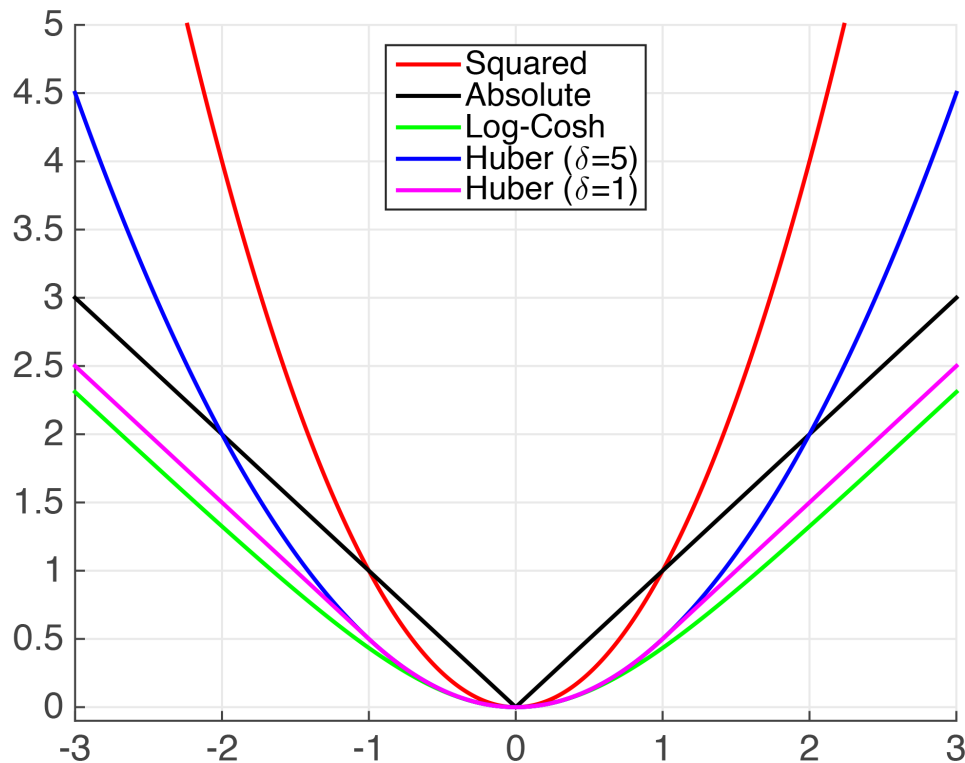
Log cosh Loss

Quantile Loss

# What loss function to use?

The choice of loss function depends on the problem at hand, and in particular what you find important!

## Loss functions for regression



Discussion of regression loss functions

## Classification

Log Loss

Focal Loss

KL Divergence/  
Relative  
Entropy

Exponential  
Loss

Hinge Loss

## Regression

Mean Square  
Error/  
Quadratic Loss

Mean Absolute  
Error

Huber Loss/  
Smooth Mean  
Absolute Error

Log cosh Loss

Quantile Loss

# What loss function to use?

The choice of loss function depends on the problem at hand, and in particular what you find important!

## In classification:

- Do you care how wrong the wrong are?
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- Does it matter what type of errors you make?

## In regression:

- Do you care about outliers?
- Do you care about size of outliers?
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Ultimately, the loss function should be tailored to match the wishes of the user. This is however not always that simple, as this might be hard to even know!

