Machine learning for regression problems

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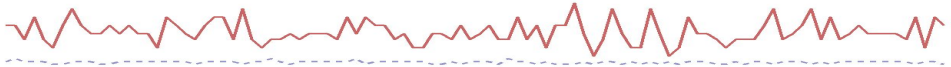
Introducing the dataset



DNA methylation and age in European bats

- Wild Bechstein's bats (*Myotis bechsteinii*)
- N = 62
- seven CpG sites (here)
- % methylation
- age: [0-14] years

Source: https://en.wikipedia.org/wiki/Bechstein%27s_bat

DNA methylation and age in European bats

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RESOURCE ARTICLE

WILEY MOLECULAR ECOLOGY RESOURCES

Application of a novel molecular method to age free-living wild Bechstein's bats

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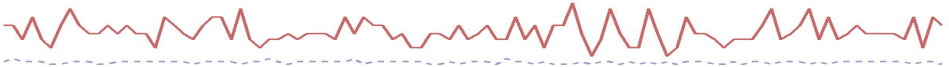
DNA methylation and age in European bats

Sample	Age	Age category	CpG 1 TET2	CpG 2 TET2	CpG 3 TET2	CpG 4 TET2	CpG GRIA2 1	CpG GRIA2 2	ASPA 1
BabyBechs_SHW	0	Age 0-3	29	21	26	31	2	2	61
Dd_Juv_Hamgreen	0	Age 0-3	30	21	24	32	1	2	59
A2402	1	Age 0-3	44	38	51	53	1	5	48
A2414-2014	1	Age 0-3	48	36	50	46	1	2	53
...	...	...	...	...	...	...	...	...	...

Regression problems

Demonstration 2.1

→ linear_regression.Rmd



Normalized discounted cumulative gain (NDCG)

NDCG is a **ranking metric** developed in information theory which has been applied to evaluation of genomic selection models

NDCG evaluates the **top** (e.g. 20%) **individuals in the ranking**, which are supposed to be the most relevant when comparing models

$$DCG@k = \sum_{i=1}^{k} y[\pi(\hat{y}_i)] \cdot d(i)$$

gain function

discount

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The higher the DCG, the better

However, DCG is difficult to interpret (unbounded) → **NDCG**

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$$NDCG(y, \hat{y}) = \frac{\sum_{i=1}^{k} \left(y[\pi(\hat{y})]_i \cdot d(i) \right)}{\sum_{i=1}^{k} \left(y[\pi(y)]_i \cdot d(i) \right)}$$

NDCG values lie in [0,1]

Regression problems

Exercise 2.1

→ linear_regression.Rmd