

# Model assessment

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## Table of contents

|   |   |
|---|---|
| loss functions . . . . .                | 1 |
| classification loss functions . . . . . | 2 |
| selection vs assessment . . . . .       | 2 |
| train-validation-test . . . . .         | 2 |

```
## use help("image-methods", "Matrix")
## lattice graphics: ?lattice:xyplot for details on scales
ifun <- function(x, title = "", ck = FALSE, raster = TRUE) {
  image(Matrix(x),
    sub = "", xlab = "", ylab = "",
    colorkey = ck,
    aspect = "fill",
    scales = list(x = list(draw = FALSE),
                  y = list(draw = FALSE)),
    main = title,
    useRaster = raster
  )
}
```

## loss functions

- continuous: L2, L1
- test error (generalization error): prediction error over a **fixed** independent sample

- **expected** prediction error: test error averaged over test sets
- training error (within-sample): expectation

## classification loss functions

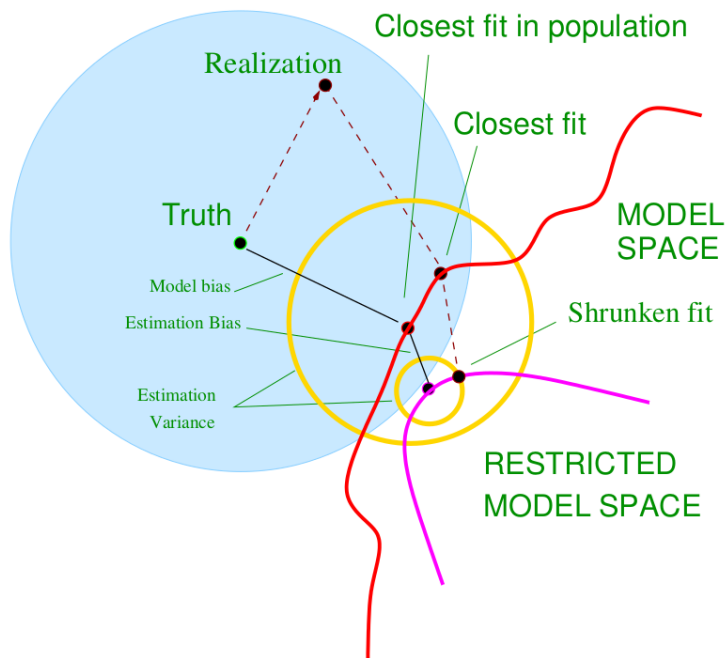
- 0-1
- $-2 \sum I(G = k) \log \hat{p}_k = -2 \log\text{-likelihood}$  (deviance)
- (generalizes to other distributions)

## selection vs assessment

### train-validation-test

$$E[f(x_0) - x_0^\top \beta^*]^2 + E[x_0^\top \beta^* - E x_0^\top \hat{\beta}_\alpha]^2$$

- estimation bias = 0 for linear regression etc., positive for ridge etc.



- in-sample error:
  - $C_p = \text{err} + 2 d/N\sigma_\epsilon^2$
- leakage:
  - non-independence
  - data-dependence of training