TTT4275 Summary for January 14th

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Lecturer: Magne Hallstein Johnsen,

IES, NTNU

NTNU

Basic estimation 1

- General form for observation and estimator

  $x = f(\theta) + w \quad$ and $\quad \hat{\theta} = g(x)$

- How to evaluate the estimator quality ?
  - Not so smart : by a lot of observations $x(n),\ n = 0, \ldots$
  - Our choice : by theory; i.e. no observations required!

- Defining two important properties :
  - Unbiased : $b(\hat{\theta}) = E\{\hat{\theta}\} - \theta = 0$
  - Variance : $= E\{(\hat{\theta} - E\{\hat{\theta}\})^2\}$

Basic estimation 2

- The overall best criterium for quality is $mse(\hat{\theta}) = E\{(\hat{\theta} - \theta)^2\}$
- We showed that $mse(\hat{\theta}) = var(\hat{\theta}) + b^2(\hat{\theta})$
- However minimizing $mse(\hat{\theta})$ seldom gives feasible estimators
- We therefore choose a suboptimal strategy; i.e. restrict ourselves to unbiased estimators $b(\hat{\theta}) = 0$ which results in $mse(\hat{\theta}) = var(\hat{\theta})$!
- Thus we want to find the unbiased estimator with minimum $mse = var$, and thereby shortened to MVU estimator.
- We also would like to find the smallest possible variance for any problem. This lower bound for the MVU is called the Cramer-Rao Lower Bound (CRLB).