

## Parameter Learning via Estimation: Estimator Characteristics

### ■ Statistic:

- ◆ A *statistic* is any real or vector-valued function of the observation (e.g.,  $T(\mathbf{x})$ ).
  - ◆ E.g. X: Head/Tail of a fair coin; T: number of heads

### ■ Estimators:

- ◆ An estimator is a statistic calculated from sample data that provide either point estimates or interval estimates for some population parameter.

### ■ Unbiased:

- ◆ An estimator  $\hat{\theta}$  is unbiased if its mean is equal to the population parameter being estimated  $\theta$ , i.e.,  $E[\hat{\theta}] = \theta$

### ■ Efficiency:

- ◆ An estimator  $\hat{\theta}$  of  $\theta$  is said to be more efficient than any other unbiased estimator  $\hat{\theta}$  if  $\text{var}(\hat{\theta}) \leq \text{var}(\hat{\theta})$
- ◆ An estimator is a minimum variance unbiased estimator if the variance of its sampling distribution is the smallest of all other unbiased estimators.