

STOCHASTIC METHODS IN WATER RESOURCES

Unit 1: Introduction to probability and statistics

Lecture 4a: Model estimation and testing

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Generalities

- ▶ Statistical inference deals with statistical estimations based on a **sample** from the **population**.
- ▶ Some definitions:
 - ▶ **Population**: consist of all possible observations of a process (e.g. air temperature at certain location). Some of the observations in the in the population may not have any physical sense, perhabs, due to sensor errors.
 - ▶ **Sample**: is a subset of the population (e.g. instantaneous daily streamflow for a certain period in a station). A **random sample** is thus a sample that is representative of the population.
 - ▶ **Random variables**: is a **real-valued function** defined on a **sample space**. Wheather a random variable is **discrete** or **continuous** depends on how the sample space is defined.
 - ▶ **Statistic**: is a function of the observations that is quantifiable and does not contain any unknown parameter. Note that a **statistic** is also a random variable that provides an **estimation**.
 - ▶ **Estimator**: is the method or rule of estimation. For instance, the **sample mean** \bar{X} is a point estimator of the **population mean** μ .
 - ▶ **Estimate**: is the value yielded by the estimator.
- ▶ Suppose that the population of variable X follows a **Normal distribution** and the distribution parameters θ are unknown. Thus, a random sample of X of size n .
- ▶ Parameters θ can be described by a number or a range; this last include an uncertainty.