



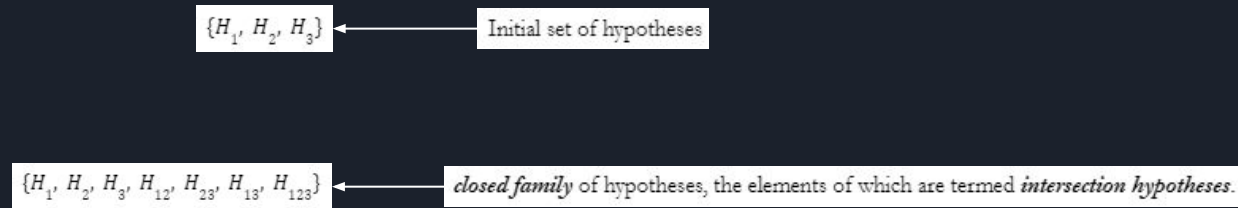
# Notes on MTP Contd.

## *2.3.4 Properties of Closed Testing Procedures*

*Neel Kurupassery*

# Closed Testing Procedures

Review of *closed testing procedures*:



A *closed testing procedure*:

- rejects a hypothesis (ex.  $H_1$ ) if and only if all containing intersection hypotheses are rejected (ex.  $H_1, H_{12}, H_{13}, H_{123}$ ).
- Strong FWER control
- Methods reduce complexity from  $2^m$  steps to order  $m$  or order  $m^2$



# Properties of Closed Testing Procedures

A closed testing procedure could be

1) *Monotone*:

$$p_i < p_j \Rightarrow (\text{rejection of } H_j \Rightarrow \text{rejection of } H_i)$$

2) *Consonant*:

$$\text{rejection of } H_I \text{ where } I \subseteq \{1, \dots, m\} \text{ and } |I| > 1 \Rightarrow \text{reject } H_J, \text{ where } J \subset I$$

3)  *$\alpha$ -exhaustive*:

$$P(\text{Reject } H_I) = \alpha \quad \forall H_I, I \subseteq \{1, \dots, m\}$$



## 2.3.4 Properties of Closed Testing Procedures

- Hommel procedure is *non-consonant closed* as the global null can be rejected without rejecting intersection hypotheses.
- *Non- $\alpha$ -exhaustive* procedures such as fallback and Hochberg may be chosen for other reasons such as computational simplicity.