

# A decision-theoretic framework for multiple testing controlling the familywise expected loss

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**Abstract:** We consider the problem of testing multiple null hypotheses where a decision to reject or retain is to be made for each individual hypothesis. Based on the decision-theoretic framework, we propose to control the familywise expected loss instead of the conventional familywise error rate (FWER). Various loss functions can be adopted and the FWER is seen to result as a particular choice of the loss function. We search for decision rules that satisfy certain optimality criteria within a broad class of rules for which the expected loss is bounded by a pre-specified threshold under any parameter configuration. This approach is different from the canonical decision theory of maximizing a single utility function, but in analogy to classical hypothesis testing. We illustrate the methods with the problem of establishing efficacy of a new medicinal treatment in non-overlapping subgroups of patients.