

DISCOVERING DEPENDENCE BETWEEN RANDOM VARIABLES AND RANDOM VECTORS

Ruth Heller (Tel Aviv University, Israel)

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I will start by introducing the elements of a statistical hypothesis testing problem: the objective, to maximize discovery power; the constraint, which is that the probability of a false positive is at most a pre-specified magnitude; and the decision rule, the data that lead to discovery or non-discovery.

Then, I will concentrate on the independence problem where the aim is to discovery dependence between pairs of random variables or random vectors. A false positive occurs if the random variables/vectors are declared dependent even though they are independent. I will present an approach for discovering that two univariate random variables are dependent, that has excellent discovery power for any type of dependency between the variables. I will also present a powerful approach for discovering that two multivariate random vectors are dependent, which builds upon the approach for univariate random variables.

Motivation and usefulness of the methodology presented will also be provided. Specifically, I will discuss the application of this approach towards discovering associations of the microbiome profile with phenotypes or genotypes of interest, as well as towards discovering which pairs of gene expressions are co-dependent.