

## Proposal for a workshop at the IMPS 2011 in Hong Kong Monday July 18<sup>th</sup> 2011

### Bayesian Evaluation of Informative Hypotheses

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#### Introduction

Are you *happier* if a p-value is .049 rather than .051? Did you ever have *trouble* finding a meaningful interpretation upon finding one or more significant test results? Did you ever *worry* about the interpretation of p-values when testing more than one hypothesis? Do you *like* large sample sizes because more tests will be significant? Did you ever *quit* a research project because none of the tests were significant? If you answer “yes” to one or more of these questions, and if you have one or more theories with respect to the state of affairs in your research domain, this course may be useful because it will temper your *happiness*, reduce your *trouble*, address your *worries*, discuss your *liking*, and provide an alternative for *quitting* by teaching you a new way to analyze your data: Bayesian evaluation of informative hypotheses.

#### Outline of the Workshop

Null-hypothesis testing is an important tool in social scientific research. It can be used to make inferences with respect to the unknown state of affairs in a population of interest. The null-hypothesis is usually of the type “nothing is going on” and the alternative hypothesis usually states “something is going on but I don’t know what”, to give an example:  $H_0: m_1=m_2=m_3=m_4$ , that is, the four means are equal, versus  $H_1: m_1, m_2, m_3, m_4$ , that is, the four means are not all equal. First of all it is questionable whether a population where “nothing is going on” is a serious option (“something which is irrelevant is going on” is probably a better option). Secondly, if a test indicates that  $H_0$  should be rejected, we have to conclude that “something is going on but I don’t know what”, which is not very informative.

In this course Bayesian evaluation of informative hypotheses will be introduced as an alternative for null-hypothesis testing. An informative hypothesis contains a researcher’s expectation with respect to the state of affairs in the population of interest. If he expects four means to be ordered the hypothesis might be  $H_{2a}: m_1 > m_2 > m_3 > m_4$ , where  $>$  denotes larger than. If another scientist has other expectations, a competing hypothesis can be formulated e.g.  $H_{2b}: m_1 < m_2 > m_3 = m_4$ . It will be shown that Bayesian model selection can be used to evaluate  $H_{2a}$ ,  $H_{2b}$  and, if desired, in addition  $H_0$  and  $H_1$ , without suffering from the drawbacks of hypothesis testing using p-values sketched in the introduction.

Further information about informative hypotheses (applications, publications, dissertations and software) can be found at <http://tinyurl.com/informativehypotheses>. The slides to be used during the workshop and an accessible paper worthwhile reading before attending the workshop can be found at <http://tinyurl.com/hoijtink> under “Side line activities” at the bottom of the page, in the first week of June 2011.

## Program

- 9:30- 9.45 Welcome and Introduction of the Workshop  
9:45-11.00 An Evaluation of the Classical Null Hypothesis and Null Hypothesis Significance Testing  
11.00-11.30 Break  
11:30-12.30 Bayesian Evaluation of Informative Hypotheses (part I: hypotheses constructed using linear inequality constraints)  
  
12.30-14.00 Break  
  
14:00-15:00 Bayesian Evaluation of Informative Hypotheses (part II: hypotheses constructed using linear inequality and equality constraints)  
15.00-15.30 Break  
15.30-16.30 Examples of Applications of Informative Hypotheses  
16.30-17.00 Beyond the Workshop and Discussion

**References** (go to <http://tinyurl.com/informativehypotheses> for more information)

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