R/SHINY APPLICATIONS FOR A VISUAL AND FRIENDLY INTRODUCTION TO PROBABILITY AND STATISTICS IN METROLOGY

Christian Bouchot & Jesús Carlos Sánchez Ochoa
Instituto Politécnico Nacional - ESIQIE
UPALM Zacatenco, C.P. 07739, Ciudad de México
cbouchot@ipn.mx

Palabras clave: Uncertainty propagation, R/Shiny, GUM, Monte-Carlo

Resumen: *R* is a modern yet very interesting and powerful interpreted language not only to ease, or help with, statistical analysis and modeling in general, but also for learning. *R* can readily be thought as a fantastic tool to process mathematical and modelling analysis for metrology.

The huge collection of tools in *R* now allows to design new, interactive, efficient and attractive ways to teach some basic probability and statistical concepts and methods. For engineering students who appreciate the immediate applications and practical hands-on data analysis, *R/Shiny* applications can be designed to fit the above purpose in the metrology context.

The Monte - Carlo method is at the forefront of uncertainty propagation and requires probability and statistical concepts that can be approached in a visual way facilitating the understanding of the mathematical background. This approach can be achieved through computational tools which can be adapted to a metrology context.

In this paper we shall briefly present an overview of the tools available in *R* (for instance the *NIST* package, **metRology** and the "Uncertainty Machine"). However, the main purpose will be to present and discuss discuss a set of our own implementations of "R/Shiny - Apps" with the objective of teaching propagation of uncertainties at a graduate level.