## Review of HSMM R and Python software

Caroline Bérard<sup>1</sup>, Marie-Josée Cros<sup>2</sup>, Jean-Baptiste Durand<sup>3</sup>, Corentin Lothodé<sup>4</sup>, Sandra Plancade<sup>2</sup>, Ronan Trépos<sup>2</sup>, and Nicolas Vergne<sup>4</sup>

<sup>1</sup>LITIS, Université de Rouen Normandie, Rouen, France <sup>2</sup>Université de Toulouse, INRAE-MIAT, Toulouse, France <sup>3</sup>AMAP, CIRAD, Montpellier, France <sup>4</sup>Université d'Angers, CNRS, LAREMA, SFR MATHSTIC, F-49000 Angers, France

## Abstract

This work aims to provide a comprehensive review of the various software and packages available for Hidden Semi-Markov Models (HSMM), or with a particular focus on those related to the following themes: multichain models, coupled chains, and the incorporation of covariates. A thorough survey has been conducted to compile both R and Python packages that are specifically designed to handle HSMMs, along with those related to these key themes. The comparison of these packages is based on their functionalities, particularly in relation to the modeling of sojourn time distributions and emission distributions for HSMMs. To further illustrate the practical application of these tools, we demonstrate the use of two selected packages. A Python package is applied to discrete emission distributions in a case study involving squirrels, while an R package is employed for conitnuous emission distributions in a case study on deers. These examples highlight the diversity and the range of options available when working with HSMMs across different software environments.

Keywords: Hidden Semi Markov Models, R, Python