NEW DIAGNOSTIC MODEL FOR THE EARLY DIAGNOSIS OF ALZHEIMER'S DISEASE AND OTHER DEMENTIAS, BASED ON LOGIC MINING OF CLINICAL VARIABLES

I. Arisi\textsuperscript{1}, M. D'Onofrio\textsuperscript{1}, R. Brandi\textsuperscript{1}, A. Cattaneo\textsuperscript{2,3}, G. Drovandi\textsuperscript{4,5}, G. Felici\textsuperscript{4}, E. Weitschek\textsuperscript{4,5}, P. Bertolazzi\textsuperscript{4}, S. Brancorsini\textsuperscript{6}, S. Ercolani\textsuperscript{6}, F. Mangialasche\textsuperscript{6,7}, P. Mecocci\textsuperscript{6}

\textsuperscript{1}Genomics Facility, European Brain Research Institute 'Rita Levi-Montalcini', Roma, \textsuperscript{2}Scuola Normale Superiore, Pisa, \textsuperscript{3}European Brain Research Institute 'Rita Levi-Montalcini', \textsuperscript{4}Istituto di Analisi dei Sistemi ed Informatica 'Antonio Ruberti', University of Roma Tre, \textsuperscript{5}Università degli Studi Roma Tre, Roma, \textsuperscript{6}Department of Clinical and Experimental Medicine, University of Perugia, Perugia, Italy, \textsuperscript{7}Aging Research Center, Karolinska Institutet, Stockholm, Sweden

Neurodegenerative diseases already constitute a major public health issue in Europe, because of the progressive population ageing and the growing social and economic burden. Though a very early and precise diagnosis of dementia would be of crucial importance, this challenge is only partially solved, in particular at the MCI stage, where sensitivity and specificity are still quite low. In fact, general and neurological examination, psychometric tests, blood tests and multimodal imaging not always lead to an accurate diagnosis, especially in the early stage of disease.

Our goal is to find a new diagnostic mathematical model by mining a large database of clinical variables of MCI (converter and non converter), AD, other demented patients and healthy subjects. The proposed model should be able to discriminate between different types of dementias and to optimize differential diagnosis.

The database is a standardized curated collection of psychometric and blood tests, imaging and other clinical data belonging to over 4000 patients, from several Geriatrics and Alzheimer's departments in Italy. Data mining of database is based on the Logic Mining method, able to separate patients into different classes by extracting salient variables from the whole set and processing together continuous, discrete and categorical data.

The model is composed by logic formulas connecting few clinical variables, able to classify each patient into a diagnostic category.

In conclusion this model allows to focus just on essential clinical variables and to obtain a good differential diagnosis, being a potential outline for a new faster and cheaper diagnostic work-flow.