

## Classification of Parkinson's disease patients through voice parameters collected by mobile devices

M. Giuliano Giuliano<sup>1</sup>, F. Díaz Pérez<sup>3</sup>, A. García-López<sup>3</sup>, S. Noemí Pérez<sup>1</sup>, G. Blanco<sup>1</sup>, S. Sandonato<sup>2</sup>, E. Maldonado<sup>2</sup>

<sup>1</sup>*Ingeniería e Investigaciones Tecnológicas, Universidad Nacional de La Matanza, Argentina*

<sup>2</sup>*Ciencias de la Salud, Universidad Nacional de La Matanza, Argentina*

<sup>3</sup>*Sistemas Informáticos, Universidad Politécnica de Madrid, Spain*

The mPower: Mobile Parkinson Disease Study is an observational study developed to evaluate the feasibility of remotely collecting information about Parkinson's disease (PD) symptoms. With the mPower App, voice recordings have been collected by volunteer participants with their own smartphones, which was then added to each individual PD diagnosis. In this paper we present a basic analysis of the voice data and a feature extraction process on a sample of 2218 participants. OpenSMILE software was used to extract 62 parameters in each recording. Statistical analysis was performed to identify diagnosis through such parameters and some demographical variables. Principal component analysis (PCA), analysis of variance (ANOVA), and multilayer perceptron (MLP) were used in order to build a prediction model. The 62 initial parameters were reduced to 5: Mean of logarithmic F0 on a semitone frequency scale. Mean of the ratio of the energy of the spectral harmonic peak at the first formant's center frequency to the energy of the spectral peak at F0 in voiced regions. Coefficient of variation of the ratio of the energy of the spectral harmonic peak at the first formant's center frequency to the energy of the spectral peak at F0 in voiced regions. Mean of linear regression slope of the logarithmic power spectrum within 0–500 Hz band entropy. Mean Jitter of the deviations in individual consecutive F0 period lengths. Diagnostic prediction models obtained similar predictive capacity with 62 or 5 parameters (approximately at 0.67). Such value increases to 0.82 if gender and age are taken into consideration. The use of acoustic voice parameters has been proposed as an objective and non-invasive method for the early diagnosis of the disease. This work contributes to identify voice parameters that allow, through prediction models, remote monitoring of patients, reducing costs and inconveniences.