

The Gaussian Mixture Model Universal Background Model (GMM-UBM) approach is used to assess the Parkinson's disease (PD) progression per speaker. The disease progression is assessed individually per patient following a user modeling-approach. Speech recordings from 62 PD patients (34 male and 28 female) were captured from 2012 to 2015 in four recording sessions. The validation of the models is performed with recordings of 7 patients.

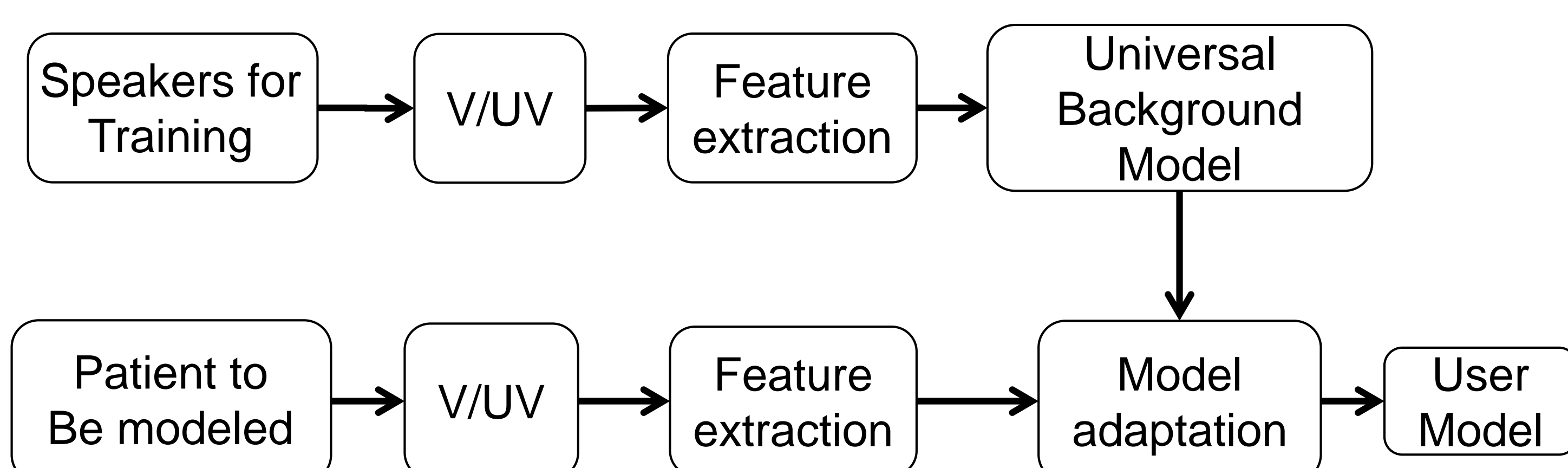
## Introduction

The main hypothesis is that the changes in the voice of PD patients can be track from the individual speaker models.

The background model is considered as the baseline to assess the disease progression according to its distance to the adapted speaker.

Three different version of the universal background model are considered: (1) with recordings of PD patients, (2) with healthy speakers, and (3) with both groups of speakers.

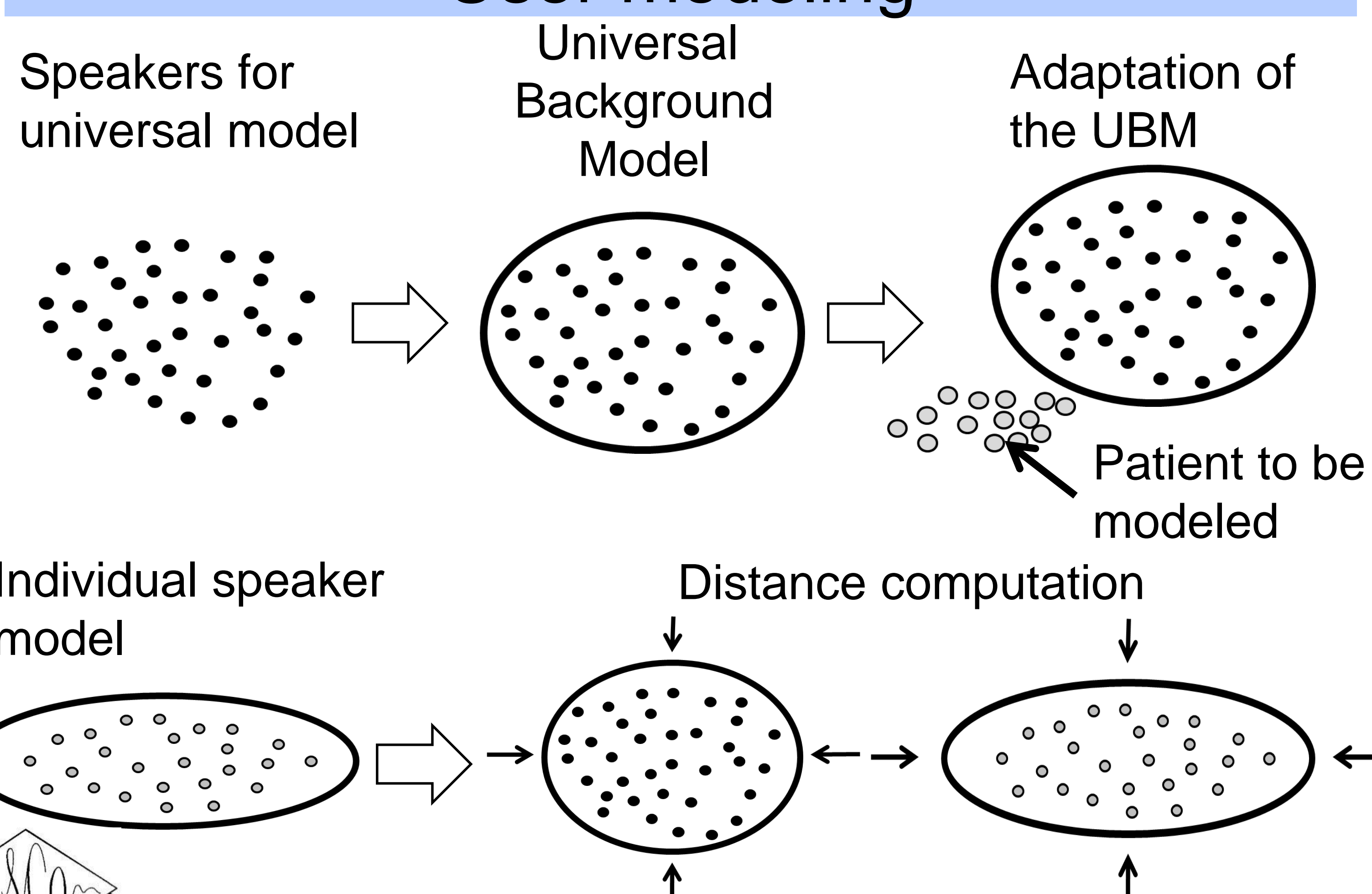
## General methodology



## Data description

Patient	Age	Gender	S1	S2	S3	S4
P1	69	M	14	25	16	7
P2	66	M	28	19	16	13
P3	56	F	29	26	26	26
P4	56	F	43	10	14	19
P5	51	F	38	49	46	44
P6	58	F	41	35	34	33
P7	60	M	6	8	16	24

## User modeling

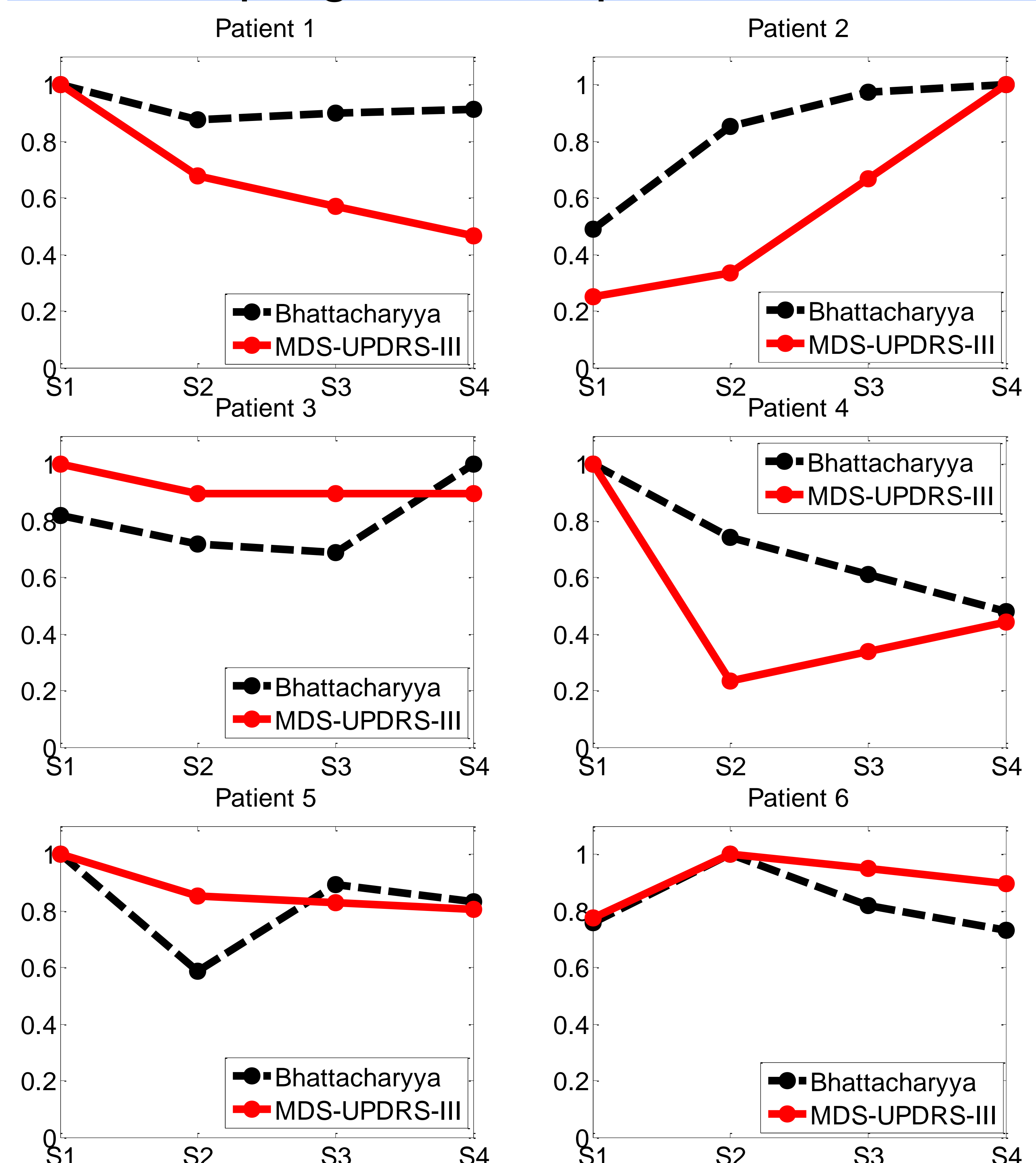


## Experiments

The performance of the user models is evaluated estimating the Pearson's correlation between the Bhattacharyya distance and the MDS-UPDRS-III for each patient.

UBM	Seg	P1	P2	P3	P4	P5	P6	P7	Avg
PP	V	0.88	-0.83	0.01	0.41	0.58	0.31	0.79	0.31
	UV	0.95	-0.49	0.99	-0.33	0.84	0.65	0.48	0.44
HC	V	0.92	-0.99	0.91	0.95	0.70	-0.87	0.15	0.25
	UV	0.67	-0.81	0.64	0.34	0.40	0.14	0.68	0.29
PP+HC	V	0.87	0.01	0.90	0.97	0.24	-0.99	0.54	0.36
	UV	0.78	0.79	0.06	0.73	0.50	0.74	0.59	0.60

## PD progression representation



## Conclusions

- A methodology to assess Parkinson's disease progression from speech using the GMM-UBM approach is presented. The method allows the assessment of the disease progression of a specific patient.
- The Bhattacharyya distance between the speaker models and the UBM was computed to represent the progression of the disease.
- This paper is a step forward in the development of computer aided tools for the continuous and unobtrusive monitoring of people with Parkinson's disease.

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