

Training Set for non- Invasive and minimally- Intrusive (*nImI*) Blood Pressure estimates.

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Version 1.0. Minimally documented Training Set

The acronym *nImI* was created to characterize non- Invasive and minimally- Intrusive technologies that could be used in Medical Applications to estimate Blood Pressure *BP*.

Estimations should be performed using supervised Machine Learning (*ML*) algorithms requiring “big data” Training Sets (*TS*).

The accompanied file, “*Training_Set_nImI_estimates*”, is organized in eight primary sub-files containing nearly 250 dissimilar secondary sub- files with non-structured, non- invasive Cardio Vascular Data (*CVD*) obtained from Healthy subjects, and from Patients affected by Parkinson Disease (*PK*) or Diabetic Neuropathies (*DN*) and their controls.

The eight primary sub-files are named and contain:

24H, with *CVD* recorded in 24 hours sessions of healthy subjects

DNC, with *CVD* recorded in Diabetic Neuropathic Control sessions of healthy subjects

DNP, with *CVD* recorded in Diabetic Neuropathic Patient sessions of ill subjects

HGP, with *CVD* recorded in Handgrip sessions of healthy subjects

HMH, with *CVD* recorded in Handgrip/Movie/Handgrip sessions of healthy subjects

PKC with *CVD* recorded in Parkinson Control sessions of healthy subjects

PKP with *CVD* recorded in Parkinson Disease sessions of ill subjects

TOC with *CVD* recorded in right/left Toc occlusion sessions of healthy subjects

CVD has been recorded mainly using Finapres NOVA and Biopac System medical devices. A detailed description of the methodology for very specific cases can be find in:

G. Tapia, M. Salinas, J. Plaza, D. Mellado, R. Salas, C. Saavedra, A.Veloz, A., J.Idiáquez, A.Glaría (2017) “Photoplethysmogram Fits Finger Blood Pressure Waveform for non-Invasive and minimally-Intrusive Technologies Evaluation of Derivative Approaches” Accepted to be published in the Annals of the 10th. International Conference. on Bio-Inspired Systems and Signal Processing, BIOSIGNAL 2017, 21- 23 February, Porto, Portugal.

Signals referred in this paper are in:

<https://physionet.org/works/Noninvasiveandminimallyinvasivebloodpressureestimates>

CVD in each final file are in TXT and ACQ format. ACQ® is the extension of BIOPAC System proprietary software Acknowledge provided to visualize and analyze data.

The structure of the data is a table of twelve columns and “*n*” rows, where each row corresponds to the value at instant “*i*”, (with $0 \leq i \leq n$), of a Cardiovascular waveform or trend. Trends are evaluated within each heartbeat.

Cardiovascular waveforms are two Photoplethysmograms (PPG_1 and PPG_2) recorded at two external body locations, a single ECG channel, at Einthoven lead I, as well as the recorded finger pressure (*fiAP*) and/or reconstructed Brachial Pressure waveform, *reBP*.

PPGs are continually recorded using BIOPAC System whereas *fiAP* is continually recorded using the “*volume clamp technique*” developed by J. Penaz in 1973, and improved by Finapres Medical System using their NOVA device.

Details of different column templates for each specific session, as well as the beginning and end of clinical essay are expected to be published during 2017 second term, in the second version of the Training Sets for non- Invasive and minimally- Intrusive (nlml) Blood Pressure estimates.

By the end of 2017, or the beginning of 2018, a third version of the Training Set should be published. In this opportunity, the *TS* would contain unstructured and structured data to conform an Analytic Data Base®, as defined by Google Labs for Big Data.

The Training Set was conceived to estimate *BP* from PPG or its deviations. Input Vectors are expected to be PPG_1 and/or PPG_2 , coded in different forms, whereas the Target Vectors should be the ordered pair Systolic/Diastolic Blood Pressure estimated as a trend within a heartbeat, or the BP waveforms measured in *fiAP* or *reBP*.

In the following table the different recording templates for the 12 columns used are shown:

Template	BW Filter	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12
T1	0.3/10	Sample	PPGh ND	PPGf ND	reBP	CO	BSA	LVET	ZAo	Cwk	ECG	Rp	HR
T2	0/10	Sample	PPGh ND	PPGf ND	reBP	CO	BSA	LVET	ZAo	Cwk	ECG	Rp	HR
T3	0/10	Sample	PPGf D	PPGf ND	reBP	CO	BSA	LVET	ZAo	Cwk	ECG	Rp	HR
T4	0/10	PPGh ND	PPGf ND	reBP	Resp	CO	BSA	LVET	ZAo	ECG	Cwk	Rp	HR
T5	0/10	PPGf D	PPGf ND	reBP	Resp	CO	BSA	LVET	ZAo	ECG	Cwk	Rp	HR
T6	0/10	PPGh ND	PPGf ND	reBP	Resp	CO	fiAP	LVET	ZAo	ECG	Cwk	Rp	HR
T7	0/10	PPGf D	PPGf ND	reBP	Resp	CO	fiAP	LVET	ZAo	ECG	Cwk	Rp	HR

Where:

BW is the Band Wide Pass filter used for the corresponding signals

BSA is the Body Surface Area estimated as a trend by FINAPRES

CO is the Cardiac Output estimated as a trend by FINAPRES

Cwk is the Windkessel Compliance estimated as a trend by FINAPRES

D applies for the deft hand or foot

ECG is lead I Einthoven electrocardiogram recorded by Bionomadix

fiaBP is the finger arterial Blood Pressure waveform measured by FINAPRES in the main finger

HR is the Heart Rate @ ppm estimated as a trend by FINAPRES

LVET is the Left Ventricular Ejection Time estimated as a trend by FINAPRES

ND applies for the Non Deft hand or foot

PPGh is the PPG recorded in the hand, using BIONOMADIX

PPGf is the PPG recorded in the foot, using BIONOMADIX

reBP is the reconstructed Brachial Blood Pressure waveform calculated by FINAPRES

Rp is the Peripheral Resistance estimated as a trend by FINAPRES

Resp is the Respiratory Signal recorded using BIONOMADIX

Sample is the sampling number

ZAo is the Aortic Impedance estimated as a trend by FINAPRES

Templates (T) are used per session and subject:

T1 is for 24H session, only for subject 00

T2 is for 24H session, for subjects 01 to 07 and PKP and PKC sessions, all subjects

T3 is for TOC session, all subjects

T4 is for Handgrip session, subjects 00 to 02 and for HMH session subject 00

T5 and DNC session, subject XX to YY

T6 is for Handgrip session, subjects 03 to 10 and is for HMH session subjects 01 to 09

T7 is for DNP session, all subjects and DNC sessions, subjects YY+1 to ZZ

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