



healthware[■] international

Communicators
Connectors
Builders of Future Health



11.29.2021

Predict Parkinson Disease using Wearable Data

Who we are



In our vision digital technology & innovation are the driving forces behind the transformation in healthcare, leading to a world of increasingly relevant, human-sized, solutions to health challenges

Roberto Ascione, CEO & Founder



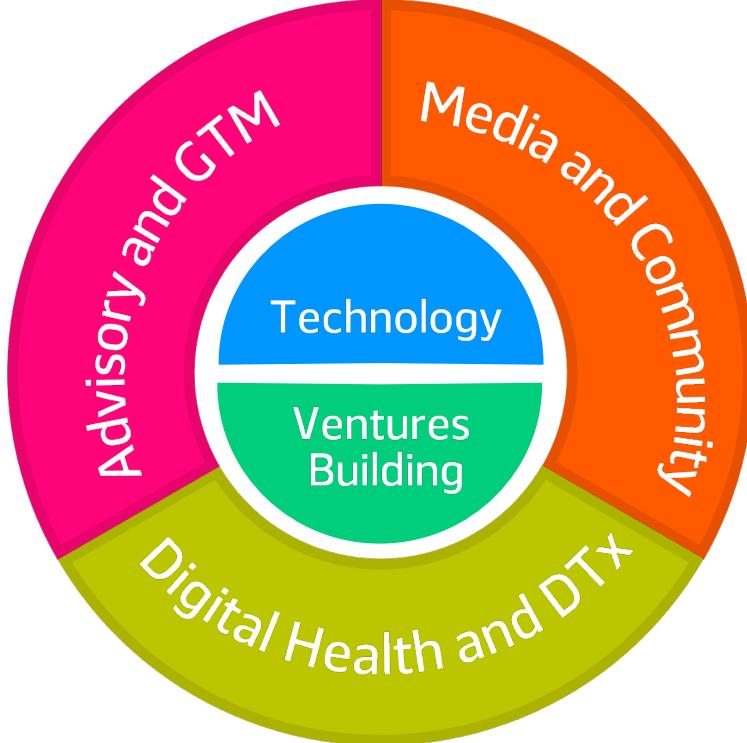
healthware

INTOUCH GROUP[®]

**At scale digital health player with 200
associates and a global joint venture for a
total of 1300 people across 14 offices**

New York | Boston | Kansas City | Chicago | San Diego | San Francisco | London | Barcelona | Cologne | Milan | Rome | Salerno | Cosenza | Helsinki | Mumbai

Healthware Group



- Healthware Group is a global health innovation and technology leader providing transformational advisory and technology services for commercial, medical, and R&D operations of life-sciences and digital health companies, combined with design and development of owned digital medicines and digital therapeutics products. Proprietary software platforms, specialized media and educational assets as well as a corporate venturing arm, ensure accelerated product development, close integration within the innovation ecosystem, continuous pipeline development and superior market access capabilities.

Business Lines and Brands

ADVISORY, MARKETING & MEDICAL COMMUNICATIONS, MEDIA, TECHNOLOGY



Full-Service Agency



Media & Audience Engagement



A HEALTHWARE GROUP & INTOUCH GROUP JOINT VENTURE

Full-Service Agency



Virtual and Hybrid Experiences
Agency & Consultancy

DIGITAL HEALTH, DIGITAL THERAPEUTICS



Innovation Advisory



Digital Therapeutics
R&D

VENTURE BUILDING



Corporate Venture Capital
and Studio



Accelerator

PUBLISHING, EDUCATION, EVENTS



Innovation Events and Data



Industry Media and Content Factory



Industry Media and Education



Industry Media



Co-working and Events

World class clients



BIONTECH



Johnson & Johnson



Boston
Scientific



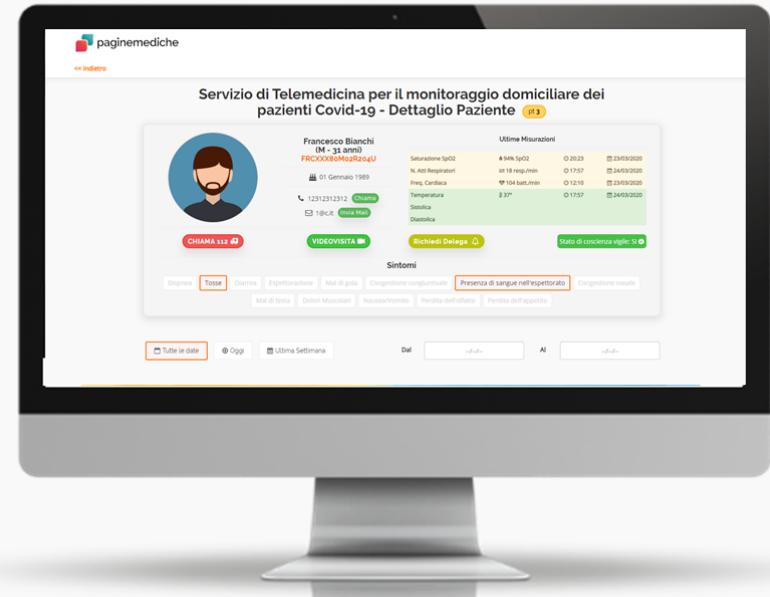


paginemediche

PagineMediche

Who We Are

- **Paginemediche** is a Telemedicine platform, able to support both **telemonitoring** and **teleconsulting** activities and **telehealth** projects to improve patient care and treatment.
- **Paginemediche allows to improve the care of patients**, guaranteeing them the monitoring of their health parameters wherever they are, the continuity of care in any condition and, therefore, **a more modern care close to the needs of patients**.
- Paginemediche in this sense proposes itself in this sector with an **innovative offer of software solutions for public and private health care**, nursing homes, RSAs, Hospitals and all structures in the health sector.

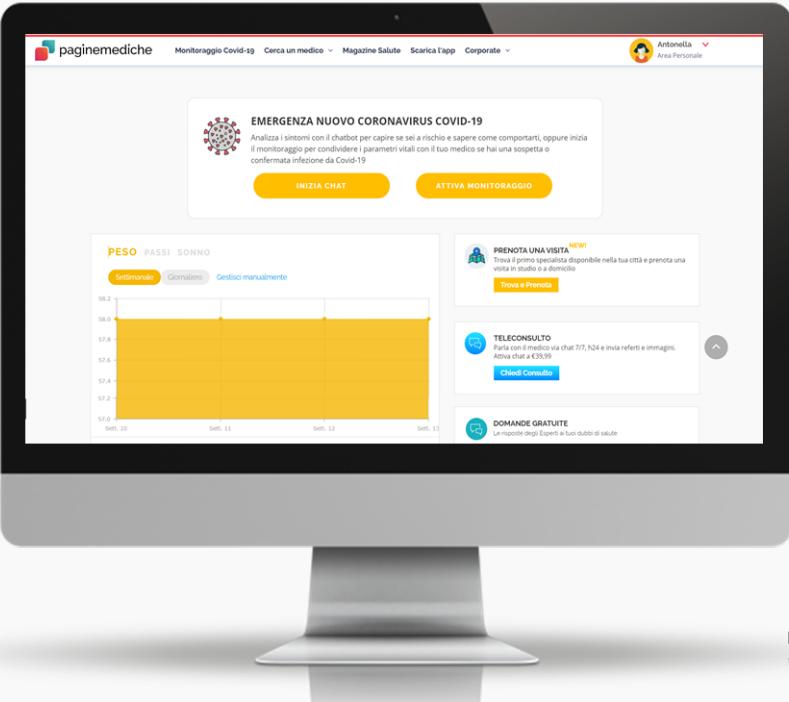


PagineMediche

Some Facts

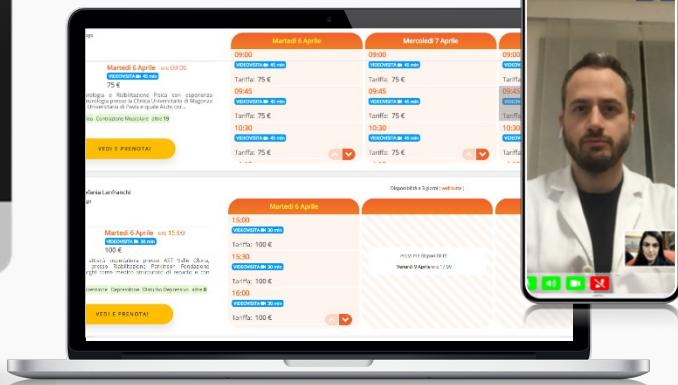
Magazine Health

More than 2.7 million users per month



Dashboard Health

Over 100K users with active health profile



Telemedicine

Over 12K active physicians and over 400K managed visits

Data Science Team

The Sila Valley

Healthware Data Science Team

- **The Data Science team of Healthware covers with its expertise the entire design process:** Data Ingestion, Data Analysis and Analytics, Algorithms (NLP, ML/AI, DeepLearning, Statistics), Data Visualization.
- The team has deep expertise not only on models and algorithms, but also on architectures: Big Data and Cloud in particular.
- **The Healthware Data Science Team, is located in a district of ICT particulary focused on Artificial Intelligence:** Cosenza is a very stimulating environment due to the presence of **Universities and Research Centers, Startups and Communities**, other companies in the Artificial Intelligence sector.
- The medical campus of the **Magna Graecia University** offers, among other research lines, also a **research center in neuroscience and medical science**.



Our Philosophy

Healthware Data Science Team

- **From Big to Smart Data.** Giving meaning to data is, therefore, the element that distinguishes us.
- **From Artificial to Augmented Intelligence.** Big data, NLP, machine learning, neural networks to support doctors to improve the quality of life.
- **Explainable Artificial Intelligence (XAI).** XAI can improve the user experience of a product or service by helping end users trust that the AI is making good decisions.



Members

Data Science Team



Rosario Curia

Head of Data Science
Technology



Nicola Procopio

Senior Data Scientist



Tina Dell'Armi

Senior Data Analyst



Alfonso Mirko Paturzo

Senior Big Data Engineer



Maria Stillo

Data Analyst



Carmela Coscarella

Data Scientist



Carlo Ronsisvalle

Jr Data Scientist

Data Science



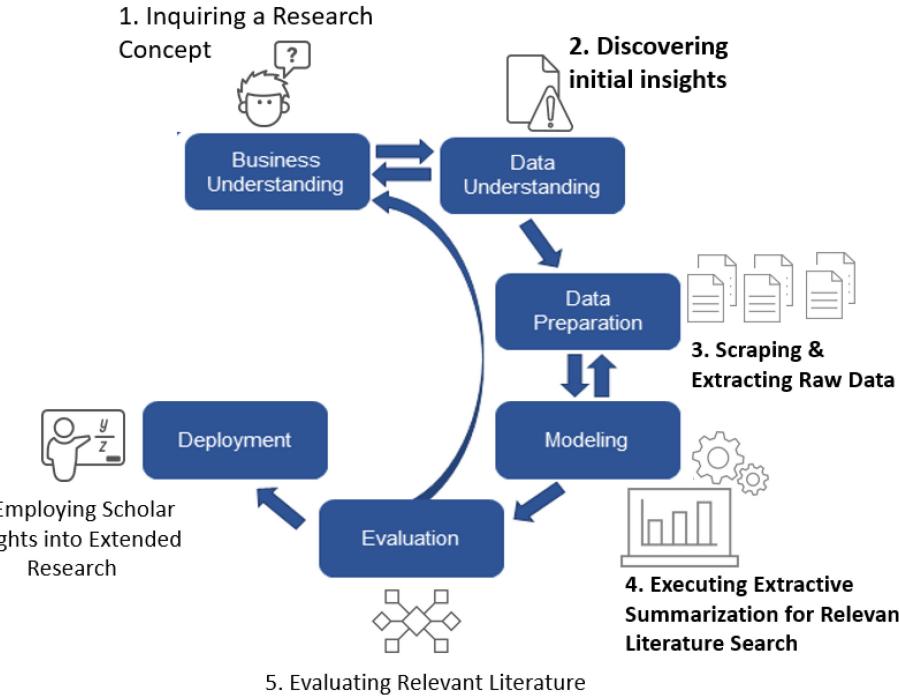
Team Competencies



CRISP - DM



Methology for prototype

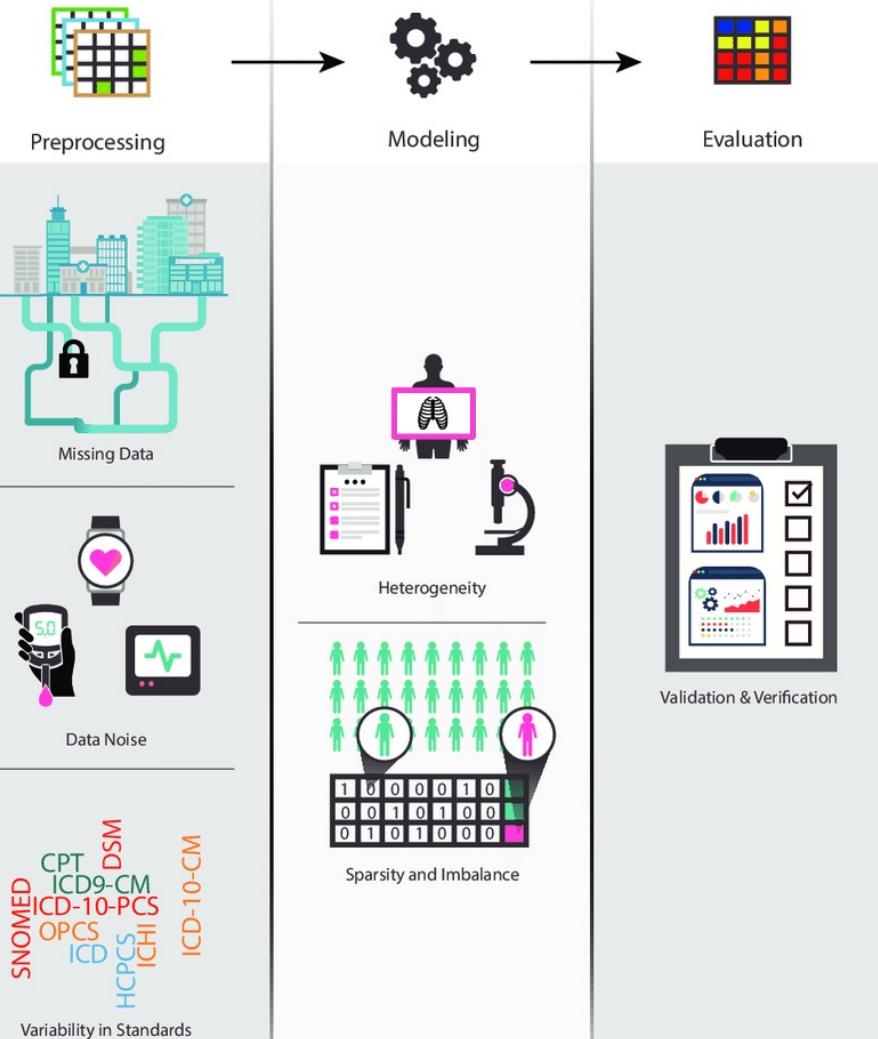


CRISP – DM Framework

Metodology
CRoss Industry Standard Process for Data Mining

An **open standard process model** that describes common approaches used by data mining experts.

The Problem

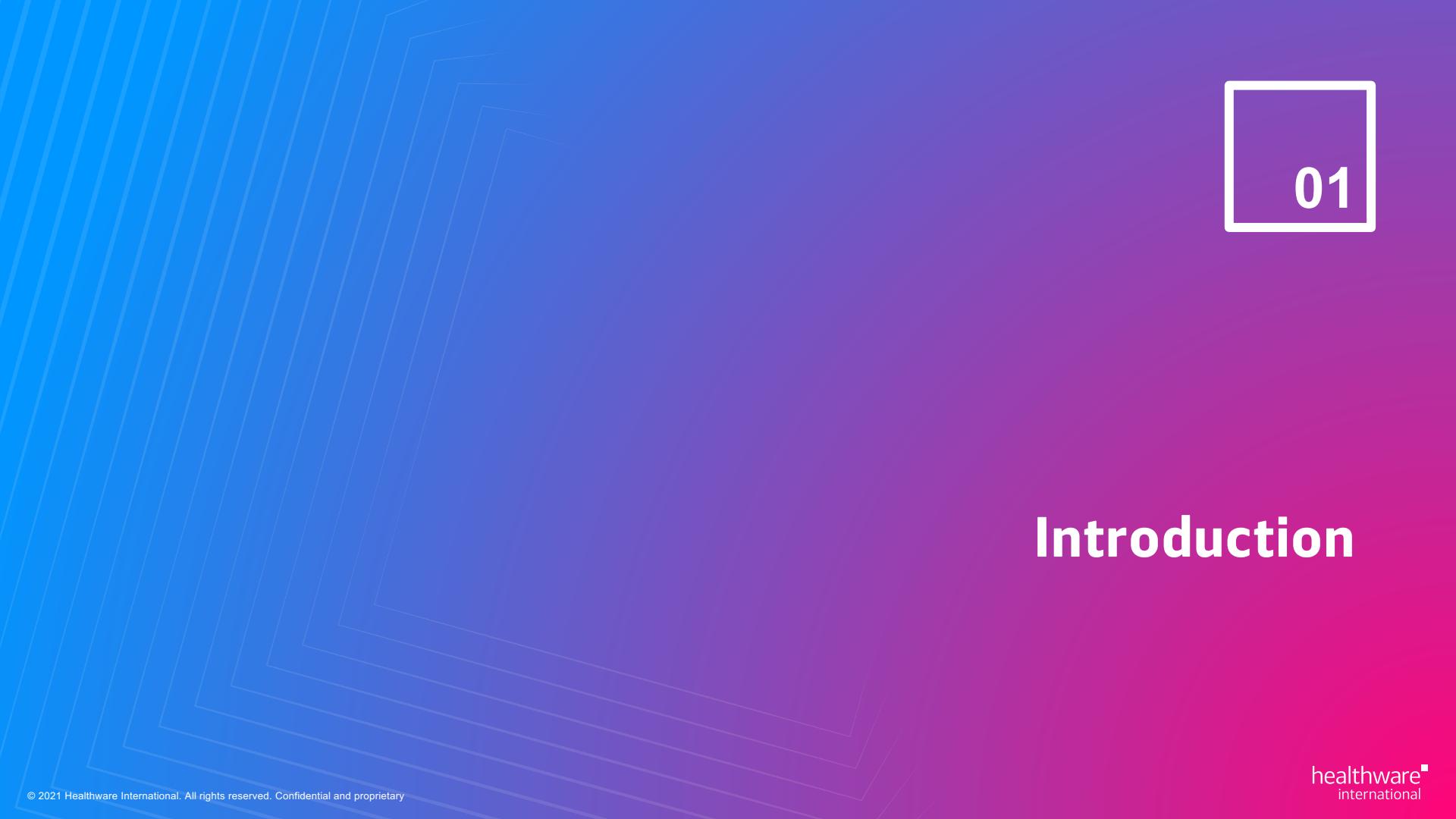


Getting from questions to answers

1. Define the problem to solve.
2. Define your approach:
 - a. What data?
 - b. What preprocessing strategy?
 - c. What kind of models?
 - d. What validation metrics?
3. Define and share short/long period strategies.

Why?

Parkinson disease, the second most common neurological disorder that causes significant disability, reduces the quality of life and has no cure.



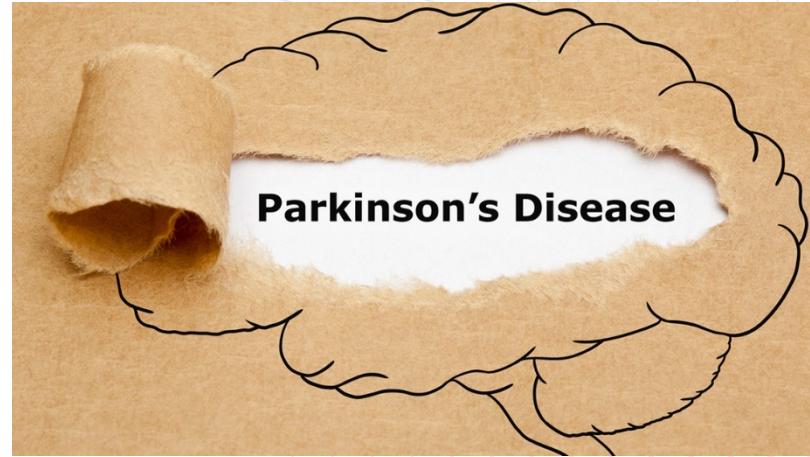
01

Introduction

Why?



- Approximately, 90% affected people with Parkinson have speech disorders.
- The medical dataset contains heterogeneous data in the form of text, numbers, and images that can be mined, but the next level is the ***Real World Evidence***.
- Big Data has the potential to give valuable information after processing that can be discovered through deep analysis and efficient processing of data by decision-makers.



OFF Periods



Main Problem

Identification of **OFF symptoms** perceived by the study subject with reasonable accuracy from real-world data collected.



What are OFF periods?

OFF periods are times when Parkinson's disease (PD) medication, namely levodopa, is not working optimally. As a result, symptoms return.



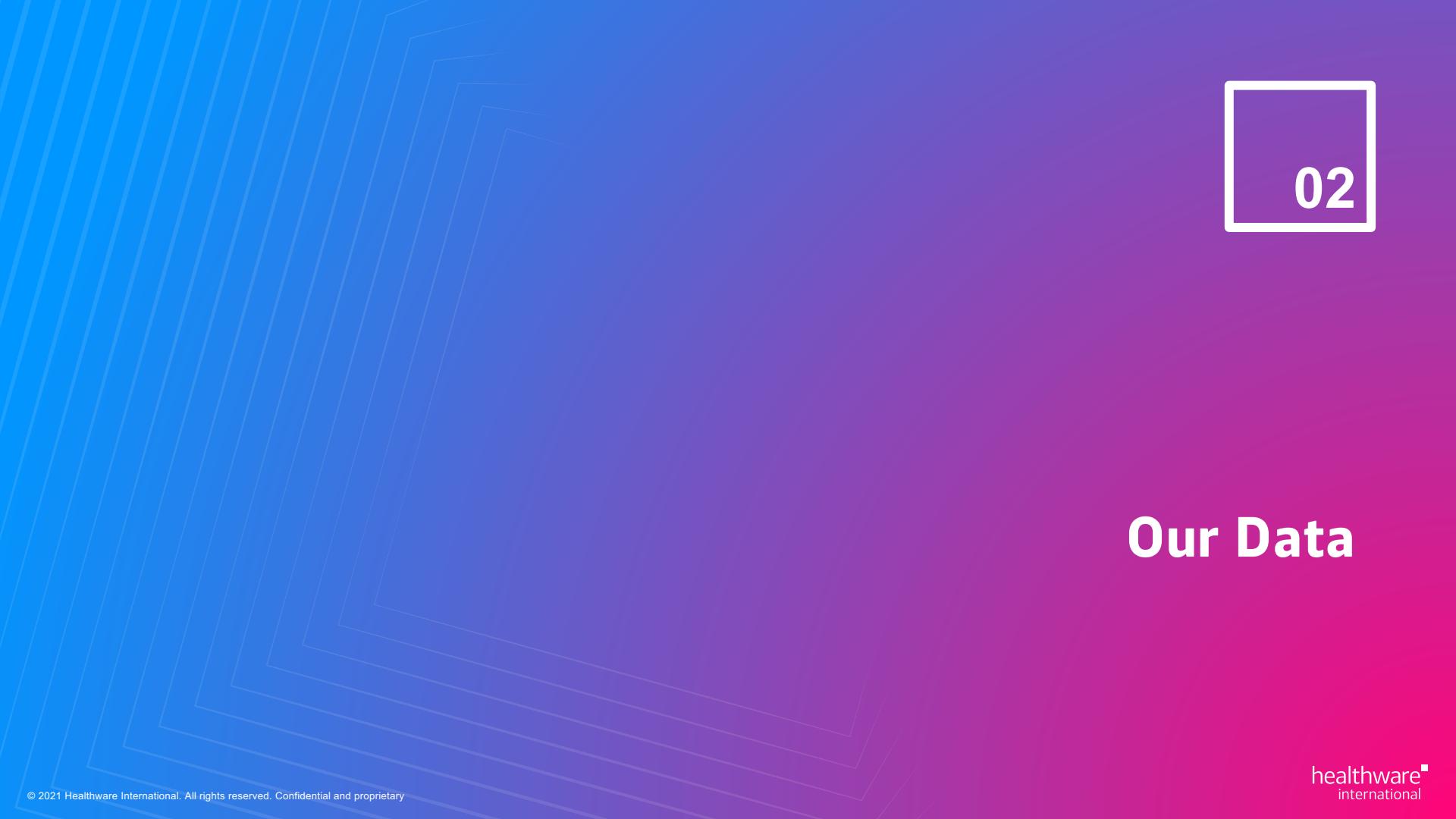
What kind of symptoms we want?

OFF periods can include both motor symptoms, such as tremor and rigidity, and non-motor symptoms, such as anxiety. We focused on motor symptoms, tremors in particular.



What is our goal?

Consolidate data collection by identifying the most important variables to solve the problem.



02

Our Data

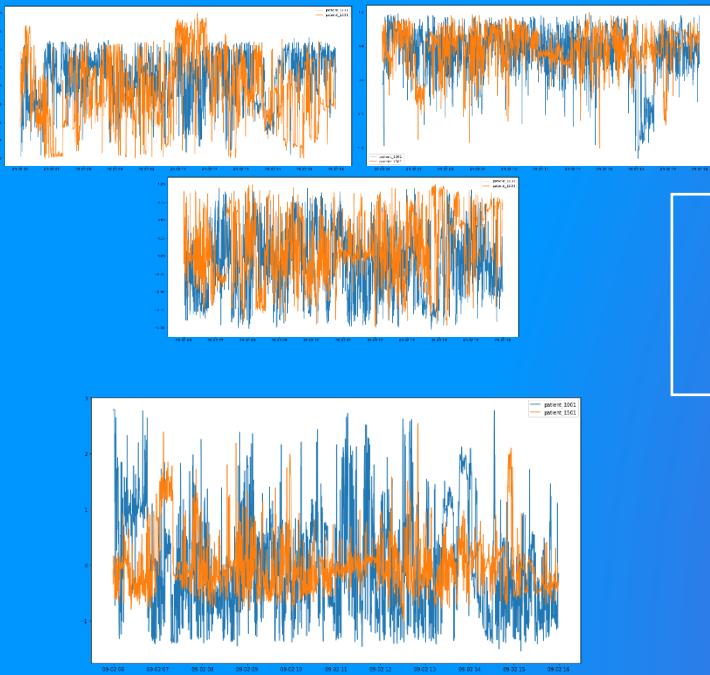
RWE Data Collection



WEARABLE DEVICE DATA RAW
DAISY APP DATA RAW

- **Target:** classification to get OFF status from real patient data
- **Dataset:** 40 patients:
 - 24 with Parkinson's disease
 - 3 with advanced Parkinson's disease
 - 13 without Parkinson's disease
- **Data from wearable:** accelerometer, heart rate, stress, SPO2, steps, quality of sleep, ...
- **Patient feedback:** intake time, OFF status, symptoms

Our Preprocessing



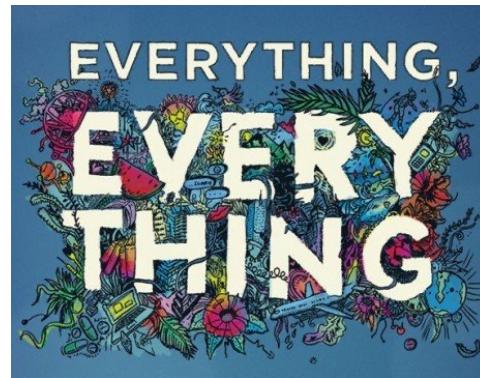
- We chose a deliberately non-invasive preprocessing and features engineering phase to don't introduce artificial information/variability.
- Uniform granularity: aggregation by mean at 1 second
- Features Enrichment:
 - Collapsed: number of accelerometer event in 1 second
- Filter:
 - Patient only with Parkinson's disease (not advanced)
 - Only OFF by tremor symphoms
- Missing data: drop observation
- Resampling: resampling by mean at 10 seconds

Software and Goals



We used

In our research we focused on Keras for Deep Learning and Scikit-learn for Machine Learning (in general the numpy stack).



You can use...

...any programming language and framework in agreement with the teachers.



Expected Goals

Verify if these data can be treated with deep learning approaches for time series.

Thank you.

@healthware_intl | @healthware_ita
linkedin.com/company/healthwaregroup/
facebook.com/healthwareintl
instagram.com/healthware_intl

www.healthwaregroup.com

healthware international ■ Communicators
Connectors
Builders of Future Health

Q&A

@healthware_intl | @healthware_ita
linkedin.com/company/healthwaregroup/
facebook.com/healthwareintl
instagram.com/healthware_intl

www.healthwaregroup.com

healthware international ■ Communicators
Connectors
Builders of Future Health