



**GALAXY**  
COMMUNITY  
CONFERENCE

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# A Galaxy-Based framework for online streaming data analytics in Heart Rate Variability Analysis

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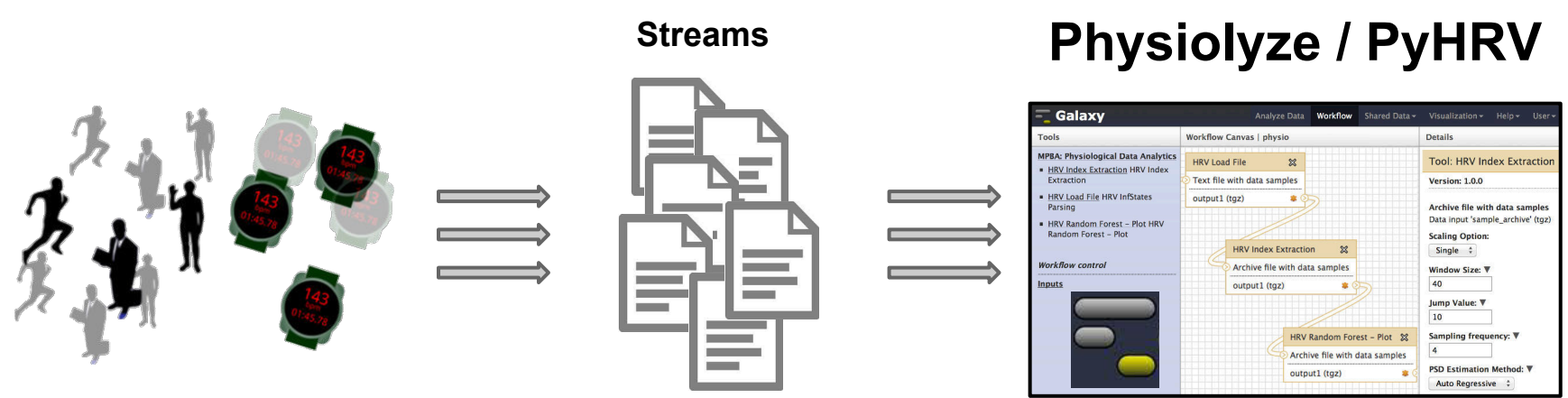
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<sup>3</sup>SKIL Telecom Italia, Trento, Italy

<sup>4</sup>RIKEN BSI, Wako-Shi, Japan

# Starting Point: The Physiolyze Platform



Physiological Sensors

Logged data

Galaxy Workflows for Sensor data analytics

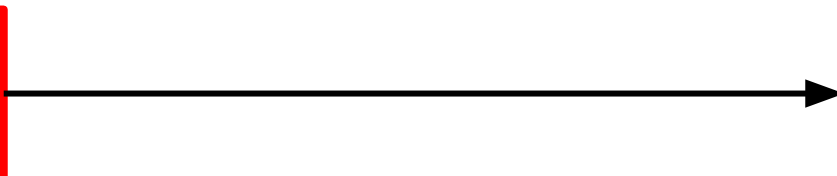


# Goal: Streaming data Analytics

## Physiolyze

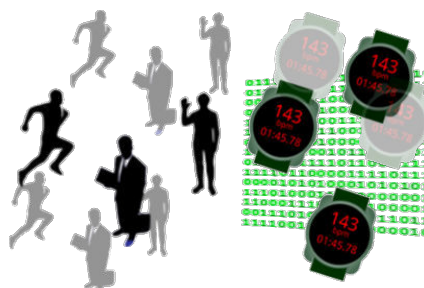


**HRV  
Data-Acquisition**

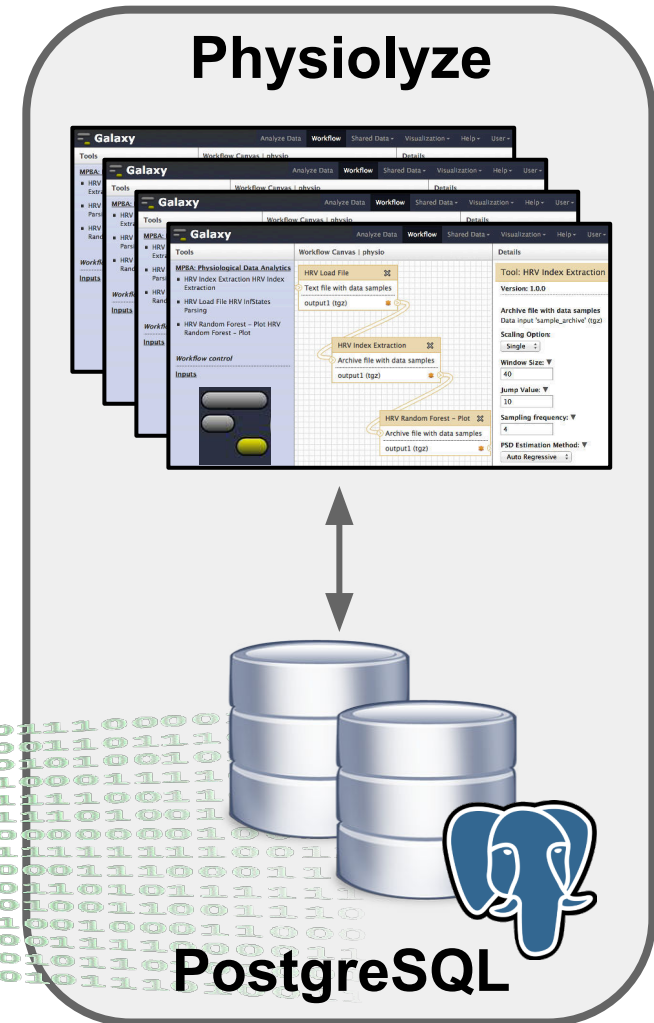


**Online  
Data-Processing**

# On-Line Architecture



**Stream Monitoring  
Daemon**  
Python thread tested on up to 100 simultaneous  
streams



# On-Line Architecture

## BioBlend


Python library based on the Galaxy API


- Process status monitoring
- Stream-workflow binding
- Workflow execution

## Stream Monitoring Daemon

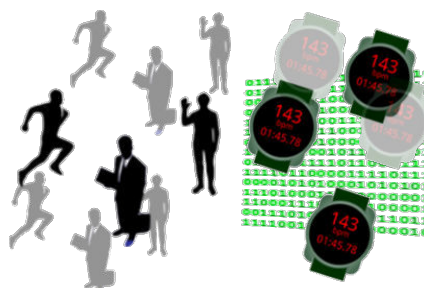
Python thread tested on up to 100 simultaneous streams

## Physiolyze

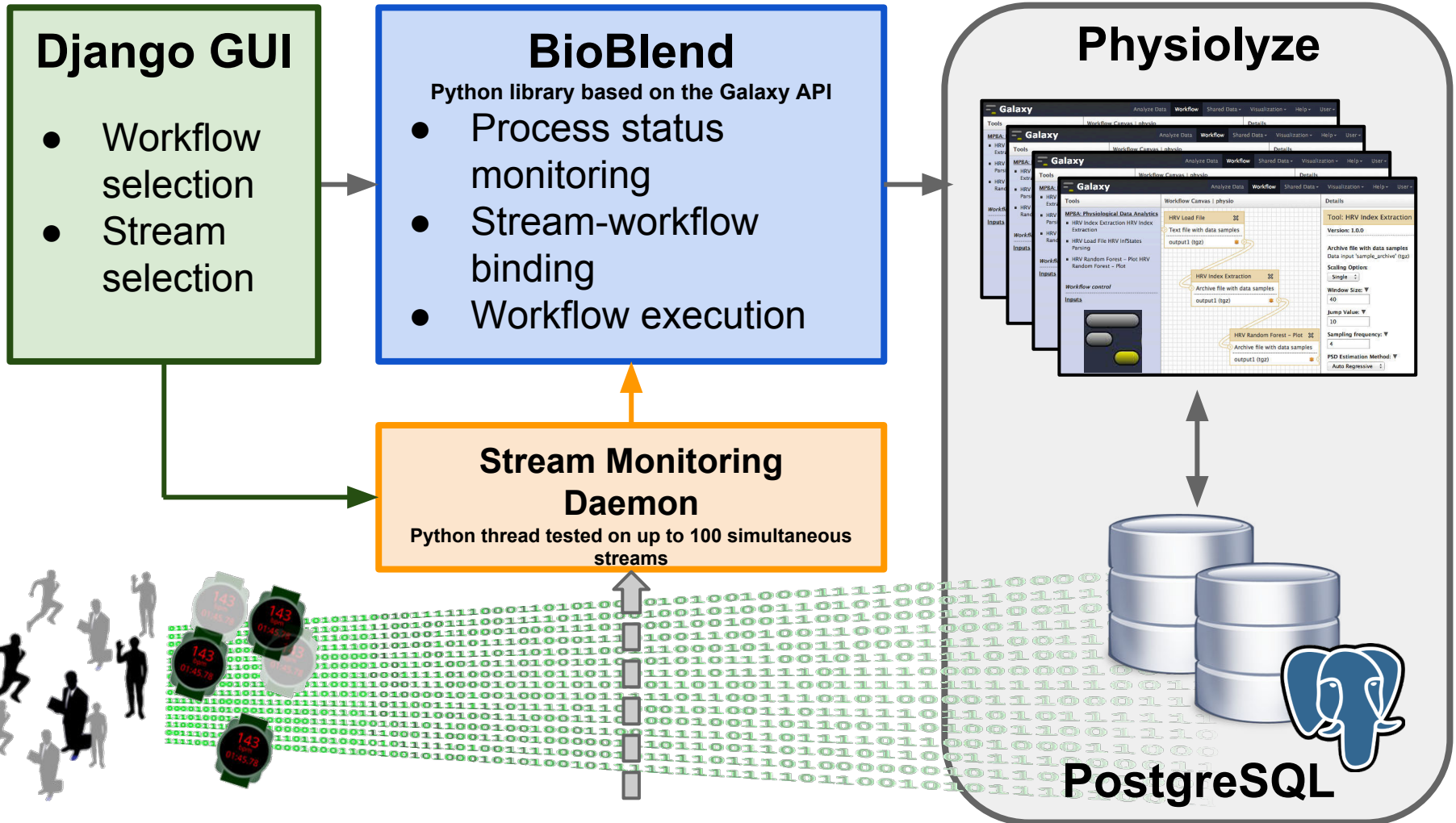




**PostgreSQL**



# On-Line Architecture



# Django GUI: <https://hrvonline.fbk.eu/>

(Developed by Paolo Branchi - MPBA/FBK, Trento, Italy)

## On-line HRV Analysis

Web-application for Online Heart Rate Variability analysis on wearable sensor data streams Designed for Galaxy

Pipeline Online-Streaming Data Analysis Plan for Physiolyze on User A05 already existent: a copy will be added

All jobs submitted correctly

Insert your Key here:

[Get Workflows](#)

### Submit New Jobs

Here below you can select which pipeline to submit on which data stream. Remember that every pipeline selected will be launched on every data stream selected.

Available Pipelines:

Online-Streaming Data Analysis Plan for Physiolyze

Available Users:

A05  
 A06  
 A07

[Submit Jobs](#)

### Submitted Process

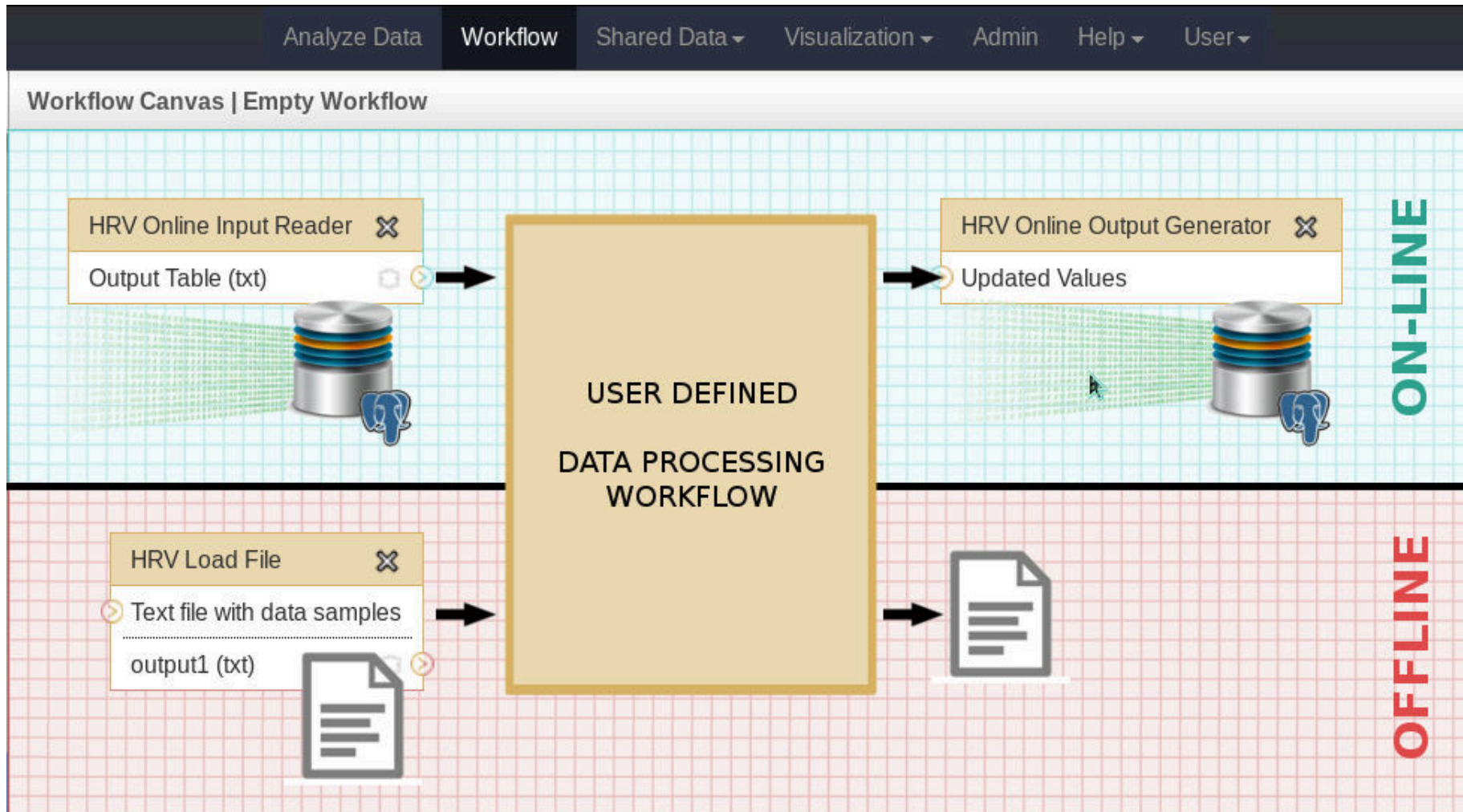
From this list you can restart a process you've already submitted, on updated data

Process List

2014-06-30 23:46:02 Online-Streaming Data Analysis Plan for Physiolyze / A05

[Start](#)

# New modules for online analytics





# Data and results

- 1**
- RRdata**  
(Light WP Holter)
- 25 infants
  - 3 behavioral states
  - 1178 samples

**2**

HRV Index Extraction ✕

Archive file with data samples

output1 (tgz) 🌸

RRmean , HRmean, RRSTD, HRSTD,  
RMSSD, NN50 , pNN50 , NN25 , pNN25  
NN10 , pNN10 , triang, TINN, MADRR

VLF(abs, %, peak) , LF(abs, %, peak) , HF(abs, %, peak) , LFn, HFn, LF/HF<sup>b</sup>

SD1, SD2, SD12, Sell, ApEn, SampEn, FI, DFAa1, DFAa2, CorrDim, pfd, maxLyap, FracDim, SpecEn, SVDEn, hurst

OOB Acc		Predicted		
		CL1	CL2	CL3
<b>84.3%</b>				
Actual	CL1	<b>295</b>	72	0
	CL2	48	<b>531</b>	25
	CL3	2	50	<b>155</b>

**3**

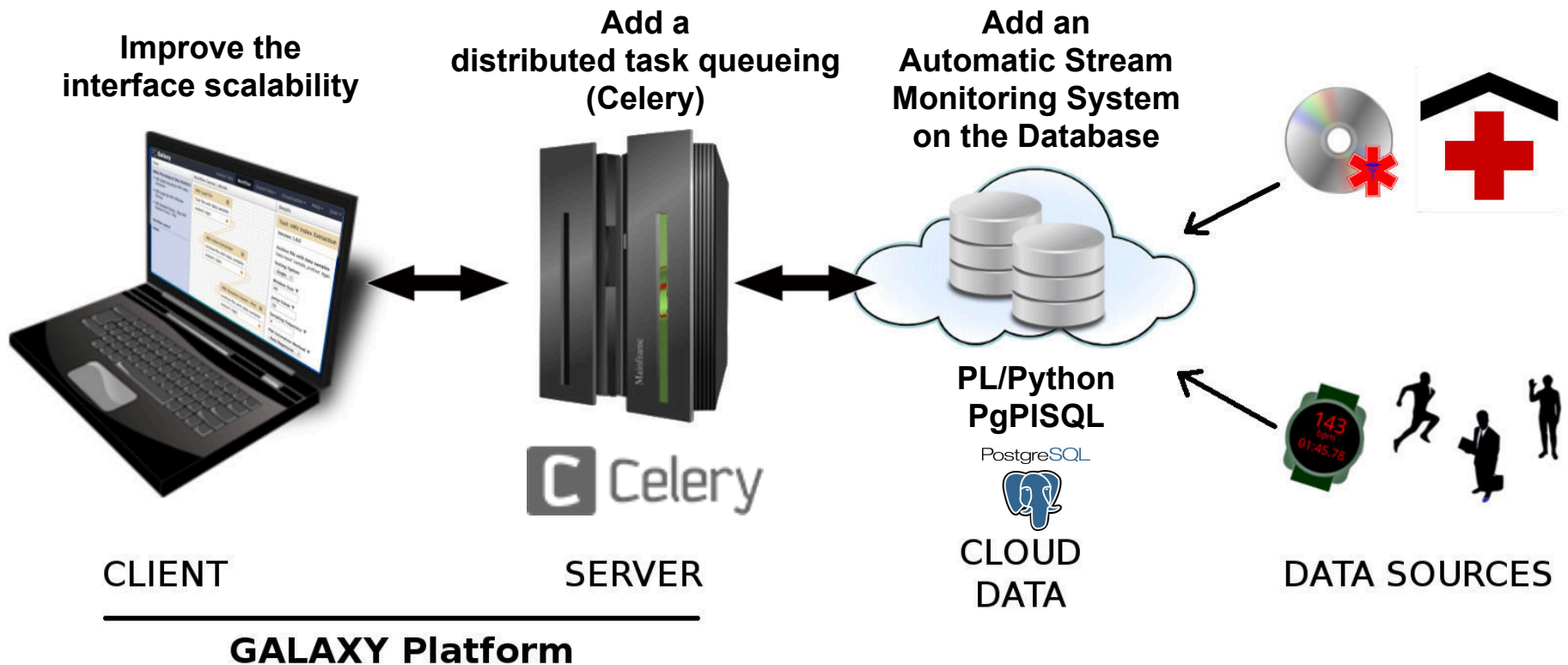
HRV Random Forest - Plot ✕

Archive file with data samples

output1 (tgz) 🌸

classification with the 'randomForest' R package

# Conclusions and future prospective





**Thank you**

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