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Levy Batista, Yaël Kolasa, Thierry Bastogne

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i-Cellulo: a SaaS platform for the automatic statistical analysis of cell impedance signals

L. BATISTA^{1,2,3}, Y. KOLASA³, T. BASTOGNE^{1,2,3}
¹CRAN, ²INRIA BIGS, ³CYBERnano

Objectives. Label-free methods such as **cell impedance assays** are *in vitro* tests increasingly used in drug development. An indirect difficulty with those technologies is the large amount of kinetic responses to be processed. Our objective is to **automate the processing and analysis** of those data with a web computational server available to all biologists and able to perform multivariate tests, response profile clustering and dynamic AC50 estimation.



Methods

The proposed solution relies on a SaaS platform in which R-language algorithms have been implemented for the on-line processing of cell impedance signals. Three generic statistical problems are addressed: clustering of response profiles to screen compounds, multivariate testing to compare their activity and AC50 estimation to determine their concentration effects. ANOVA, Kruskal-Wallis and Tuckey's range tests have been implemented for the multivariate testing. Hierarchical clustering based on Singular Spectrum Analysis were used for the non-supervised response profile classification. A Hill's model structure and a maximum likelihood estimator were adopted for the AC50 calculation.

Results

Hundreds of tests were carried out on real in vitro signals to assess the practical relevance of i-Cellulo for the fast analysis and characterization of anti-cancer activities in early steps of drug development. Results clearly show the ability of this web-based solution to correctly discriminate, classify, compare and rank the anti-cancer responses of tested compounds compared to gold standards.

Conclusion

With the advent of real-time cell measurement technologies in preclinical tests, new services for the analysis of **high-content data** are needed. **i-Cellulo** is a solution to that challenge and allows biologists to speed up their data analysis and facilitate interpretation of their results.

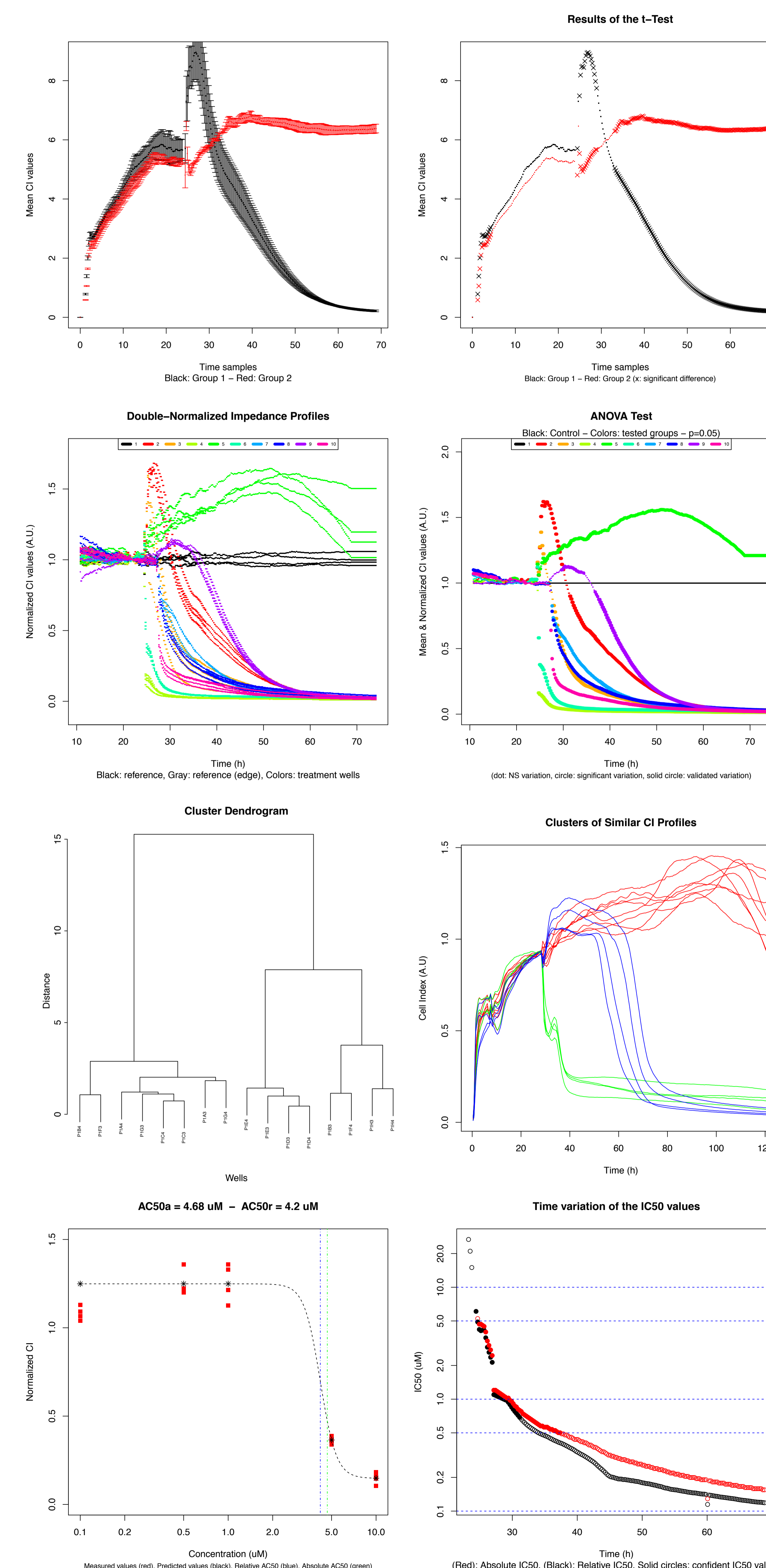


Fig.1: Comparing 2 groups of cell impedance profiles. Left: original CI responses to be compared. Right: t-Test results

Fig.2: Multiple test of CI responses. Left: groups of CI responses to be compared. Right: ANOVA results

Fig.3: Clustering Cell Index Profiles for Screening Applications. Left: dendrogram of culture wells. Right: 3 clusters of response.

Fig.4: Estimation of the AC50 profiles. Left: AC50 values estimation based on the Hill's model. Right: time profil of the AC50 estimates