

<b>Title</b>	Analysis of metabolite concentration time profiles for systems health applications
<b>Group</b>	Systems and Synthetic Biology
<b>Project type</b>	thesis
<b>Credits</b>	36
<b>Supervisor(s)</b>	Dr. Edoardo Saccenti (SSB), Dr Leonardo Tenori (University of Florence)
<b>Examiner(s)</b>	Dr. Edoardo Saccenti, Dr. Robert Smith
<b>Contact info</b>	edoardo.saccenti@wur.nl
<b>Begin date</b>	

**Used skills:** Analysis of time series, data analysis and multivariate statistics; programming; relating results to existing or novel biological knowledge.

**Requirements:** Ability to program in R and basic statistics and biological knowledge as well are desired skills.

**Description:** Humans can be characterized almost univocally by their individual metabolic profiles and it has been shown that statistical models able to classify subjects with almost perfect accuracy can be built if a sufficient number of samples per subject are acquired on consecutive days. However, little is known about the day-to-day variability of metabolites in biofluids and if and to which extent this variability, that we can assume to be subjects specific, contributes to the definition of what is called "Individual metabolic phenotype". In this project, working on a data set that collects metabolite profiles measured on 40 occasions for 31 healthy subjects on multiple years, we aim to answer to the following questions: are the time profiles, i.e. the way metabolite concentrations changes over time, specific for each individual? Are they different between males and females? Are they constant over a pan of 2 to 10 years? Can be this information used to describe subjects or to find subjects with similar characteristics?

This project is collaboration between the Laboratory of System and Synthetic and Biology and the Centre for Nuclear Magnetic Resonance of the University of Florence.

## References

- Assfalg, M., I. Bertini, D. Colangiuli, C. Luchinat, H. Schafer, B. Schutz and M. Spraul (2008). "Evidence of different metabolic phenotypes in humans." Proc Natl Acad Sci U S A **105**(5): 1420-1424.
- Bernini, P., I. Bertini, C. Luchinat, S. Nepi, E. Saccenti, H. Schafer, B. Schu tz, M. Spraul and L. Tenori (2009). "Individual human phenotypes in metabolic space and time." J. Proteome Res **8**(9): 4264-4271.

Ghini, V., E. Saccenti, L. Tenori, M. Assfalg and C. Luchinat (2015). "Allostasis and Resilience of the Human Individual Metabolic Phenotype." Journal of Proteome Research **14**(7): 2951-2962.

Saccenti, E., G. Menichetti, V. Ghini, D. Remondini, L. Tenori and C. Luchinat (2016). "Entropy-Based Network Representation of the Individual Metabolic Phenotype." Journal of Proteome Research **15**(9): 3298-3307.