Center for Network Science | CENTRAL EUROPEAN UNIVERSITY

DYNAMICAL HIERARCHY AND NOISE IN BIOLOGICAL REGULATORY NETWORKS

A TALK BY

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ABSTRACT | Understanding the complexity of the biological makeup of living organisms is one of the main challenges of today's scientific world. This understanding could impact the very foundation of modern medicine and provide unprecedented insight into currently incurable diseases such as cancer or genetic disorders. The knowledge about the inner workings of living organisms is ever growing, but despite the tremendous effort and resources poured into life sciences, there has been no breakthrough in curing or understanding the most prominent and troubling diseases of our time. On the contrary: evidence shows that the number of new drugs approved by the FDA for one billion dollars spent on research and development halves every nine years. This trend suggests that we may need a more principled way of understanding the complex mechanisms governing life.

In the talk, I would like to give an introduction to the framework of biological regulatory networks and an outline of our upcoming research project. My focus will be applying the results of the regulatory network literature to a wider scope of empirical networks mapped in living cells. For instance, I will look for the recently discovered *stable motifs* in the mammalian cell cycle network. We will explore the effects of the different types of noise on the predictive capabilities of the network dynamics. Last but not least, I would like to further develop the framework of understanding the hierarchical decision-making processes of cells, where the dynamically autonomous modules of the complex cellular dynamics can be treated as simple switches of higher order systems.

BIO | Dávid studies the complex regulatory networks governing living cells. His main inquiries include the identification of stable motifs and their ability to control both empirical and synthetic regulatory networks, the effects of different types of noise on regulatory systems and their stability, as well as the hierarchical organisation of the decision making processes, more specifically, how can very complicated interactions be responsible for simple, discrete decisions on multiple levels.

Dávid is a physicist by training and had previous collaborations with Babes Bolyai University, Beth Israel Deaconess Medical Center - Harvard Medical School, University of Notre Dame and the College of Wooster.