



**The Center for Control, Dynamical Systems, and Computation
University of California at Santa Barbara
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Seminar Series Presents**

Modeling, Analysis and Control of the Translational Initiation Regulation Process in Eukaryotic Cells

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Friday, February 29, 2008 3:00-4:00pm Harold Frank Hall 1104

Abstract:

It was found in the last decade that gene regulation in the level of translation is mainly effected by the initiation process. Eukaryotic initiation factors (eIF-) 2 and 4 are the main components that regulate gene expression, by enabling the 40S ribosomal subunit structure to bind to a pre-initiation complex eIF-4F. This process is complex and involves many different regulating components. This paper presents models for the eIF-2 and -4 regulation processes. A further simplification of the eIF-2 process is presented and nonlinear analysis proves L2 stability of the process. Simulations and analysis of the reduced model led to several conclusions about the affect of a few principle factors in the eIF-2 initiation process (namely eIF-2B, phosphorylated and non-phosphorylated eIF-2_γ and GCN2), consistent with recent experiments in yeasts. A nonlinear feedback control loop was proposed, which can drive the production of protein to a desired set-point using the states which can be controlled.

About the Speaker:

Nadav S. Bar is an associate professor of Systems Biology at the Department of Chemical Engineering, Norwegian University of Science and Technology, Norway. In his Master Thesis, he developed a novel algorithm to apply a rapid MPC using an offline nonlinear optimization problem and an efficient online Newton-Rapson. Later, a dynamic predictive model was developed in his Phd, which predicts nutrient pathways in fish. The model was commercialized to a software which predicts growth, body composition in fish in order to optimize feed. Dr. Bar also has several publications on translational control of gene expression. He is currently working on protein modeling transcription and translational control in prokaryotics and eukaryotics.
