



# COMPUTATIONAL BIOLOGY WEBINAR @ IMSc

## HACKING GOD'S OWN PROGRAM WITH SYNTHETIC GENETIC CIRCUITS: ARTIFICIAL NEURAL NETWORKS TO MICROGRAVITY SENSORS IN LIVING BACTERIA

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THURSDAY, 20 AUGUST 2020, 4 PM IST

The molecular connectivity between genes and proteins inside a cell shows a good degree of resemblance with complex electrical circuits. This inspires the possibility of engineering a cell similar to an engineering device. In this talk, we discuss our recent effort to hardware implement artificial neural network (ANN) with engineered bacteria. The abstract mathematical rules of artificial neural network (ANN) are implemented through software, various material based neuromorphic chips, photonics and in-vitro DNA computation. Here we demonstrate the physical realization of ANN in living bacterial cells. We created a single layer ANN using engineered bacteria, where a single bacterium works as an artificial neuron and demonstrated complex chemical information processing with decoders and encoders. To our knowledge, this is the first ANN created by artificial bacterial neurons. Thus, it may have significance creating engineered biological cells as ANN enabled hardware.

On the other hand, synthetically engineered microbial cells have numerous projected applications in space bioengineering. Microgravity is a unique property of space. Biological solutions to space travel must consider microgravity as an important component. Here we have created the first biological or biochemical or molecular microgravity sensor in *Escherichia coli* applying synthetic gene circuits.

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