Microsoft Research 4-year PhD Scholarship

Exploring motif-based design patterns for biological computation

Supervisor: Dr Thomas Gorochowski (School of Biological Sciences, University of Bristol, UK)
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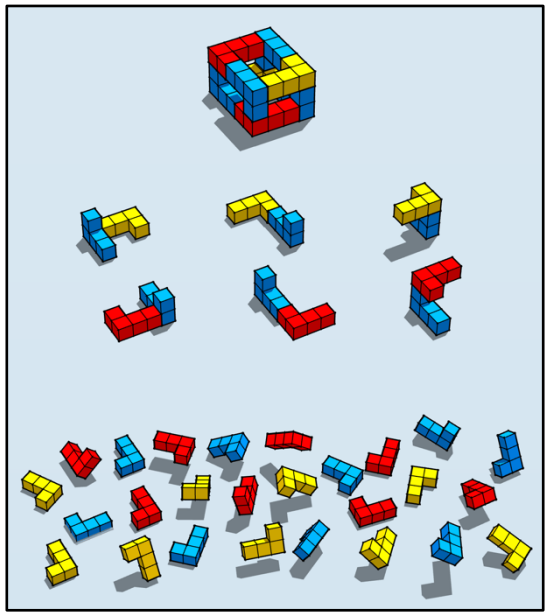
Project description:



In computer software engineering, design patterns provide reusable solutions to frequently encountered problems that are independent of the programming language used for implementation. In this project, we will explore whether biology also exploits design patterns in the regulatory programs controlling cellular behaviours. Focusing on the role of small regulatory motifs that are known to be enriched in living systems, and which cluster in specific ways, we will employ formal methods to study the cellular functions that motifs support and their robustness to being used in different ways. A new regulatory system based on engineered RNA interactions will be developed to allow for the reliable creation of large regulatory circuits, which will then be used to explore the ability synthesise novel regulatory programs from motif-based design rules tackling a broad range of functionalities (*e.g.* decision making, oscillations, and pulse generation). Insight from this work will fuel exciting new approaches for the design of our own biological programs that go beyond the complexity of current approaches, while also providing a deeper understanding of the way biology harnesses the computational substrate of life itself.

The project will be based in the Biocompute Lab (www.biocomputelab.org) at the University of Bristol and performed in collaboration with the Biological Computation Group at Microsoft Research Cambridge (https://www.microsoft.com/en-us/research/group/biological-computation/).

Requirements and eligibility:

The successful candidate must fulfil EPSRC requirements (*i.e.* UK/EU citizen with the right to live in the UK for the duration of the PhD) and will have, or soon receive, a degree in a relevant subject area (*e.g.* natural sciences, biology, computer science, physics, chemistry, etc). They will also have a strong interest in engineering biology, and ideally some experience of working in a laboratory environment or are able to demonstrate their passion for learning the necessary experimental skills. They will be highly motivated, collaborative, an excellent communicator, with a desire to work within a diverse multi-disciplinary team.

For further information about the project, to find out if you might be a good fit and how to apply, please contact: thomas.gorochowski@bristol.ac.uk