PhD studentship in bioinformatics: Biology-informed Robust AI Methods for Inferring Complex Gene Regulatory Networks

at the Science for Life Laboratory in Stockholm, Sweden, which is a strong research environment for large-scale life science research, and a joint physical center for a number of computational and life science groups at Stockholm University, KTH, and Karolinska Institutet. The research project will be supervised by Professor Erik Sonnhammer (http://sonnhammer.org/).

The project encompasses several challenges in the gene regulatory network (GRN) field, from simulating realistic networks and data to accurate inference of GRNs from noisy gene expression data. The student will work in a group addressing all these challenges, developing new AI-based methods to improve biological realism in simulations which will lead to more accurately inferred GRNs from real data. The project will develop fundamental theory and tools that will be key for understanding biological mechanisms causing diseases that are due to gene dysregulation, such as cancer. The core of the project is a digital biological system for generating labeled data using biology-informed DNNs and GenAI. The objectives will be achieved by combining methods and techniques from separate research fields - (a) biological knowledge about GRNs from bioinformatics and system biology, (b) graph theory and topological data analysis for network modeling from mathematics, and (c) robust machine learning (ML) and GenAI from AI / ML. The unique inter-disciplinary combination will enable: (i) a-priori biological knowledge infusion for GRN modeling and developing GenAI methods for generating GRNs; (ii) generating simulated gene expression data using biology-informed GenAI; and (iii) robust learning of DNN-based GRN inference methods using the combined data - real and simulated gene expression data - in a semi-supervised learning approach.

The successful candidate must be highly motivated and have an M.Sc. in bioinformatics or related field, and knowledge of molecular biology. Alternatively, an M.Sc. in molecular biology or related field and at least 1 year of documented practical experience in bioinformatics research and programming. Extensive experience with Python, Matlab, and R, and good UNIX knowledge are essential skills, as well as familiarity with biological omics data analysis techniques.

To apply, follow the instructions on https://sonnhammer.org/download/ads/open.html. The position is fully funded for 4 years of full-time study and offers a competitive salary and excellent computational resources. For further information about the research project, contact Erik.Sonnhammer@scilifelab.se, Tel: +46-(0)70-5586395, http://sonnhammer.org