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Development of a method for inferring regulatory networks of genes time and specific location: application and comparative studies in *D. melanogaster*.

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Abstract: The regulation of gene expression is one of the determining factors in the development and maintenance of life in all organisms. This regulation is carried out mainly through the action of Transcription Factors (TFs), although other elements are also involved. Notably, any new knowledge on the regulation of the expression is key to unravel the functioning of the various organisms at the molecular level. This knowledge also has direct application in the understanding of the processes that trigger different diseases, allowing the development of new therapeutic strategies. Gene regulation is usually represented in the form of Gene Regulatory Networks (GRNs). These networks are a simplified representation of how genes are controlled allowing the characterization and study of the different interdependencies of the various factors that are involved in the regulation of the expression of genes.

Given the abundance of experimental data on the various factors involved in the regulation of gene expression and the little specific knowledge of this regulation in different tissues and cell types forming organisms in certain stages of development, the creation of new computational methods to integrate all this information into site and time specific networks is a key element for future studies. In this work, time and condition specific GRNs will be conducted to study the development of the embryo of Drosophila melanogaster. D. melanogaster, is a model organism widely studied, given its short generation time and easy culture. In this way, different networks of each stage of development will be created by integrating experimental data from various databases. Finally, GRNs obtained will be characterized and studied employing graphlets based techniques to identify

specific elements whose relationship with the rest of the network vary over time during the development of the fly embryo.

Conflicts of Interest

The authors declare no conflict of interest.