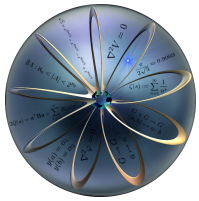

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genetic nets

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Classification	msc 55U99
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Synonym	genome network
Synonym	genome
Synonym	entity of all interacting genes in a living organism
Related topic	DirectedGraph
Related topic	AlgebraicCategoryOfLMnLogicAlgebras
Related topic	OrganismicSets3
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Related topic	JanLukasiewicz
Related topic	SupercategoriesOfComplexSystems
Related topic	MolecularSetTheory
Related topic	CategoryTheory
Related topic	OrganismicSetTheory
Related topic	FunctionalBiology
Defines	gene net
Defines	Bayesian model
Defines	genetic network
Defines	N-state net models
Defines	two-state models
Defines	genome Boolean models
Defines	category of genetic nets

0.1 Introduction

Genetic 'nets', or networks, GN – that represent a living organism's genome –are mathematical models of functional genes linked through their non-linear, dynamic interactions.

A simple genetic (or gene) network GN_s may be thus represented by a directed graph G_D whose nodes (or vertices) are the genes g_i of a cell or a multicellular organism and whose edges (arcs) are arrows representing the actions of a gene a_g^i on a linked gene or genes; such a directed graph representing a gene network has a canonically associated biogroupoid $\mathcal{G}_B$ which is generated or directly computed from the directed graph G_D.

0.2 Boolean vs. N-state models of genetic networks in LM_n- logic algebras

The simplest, Boolean, or two-state models of genomes represented by such directed graphs of gene networks form a proper subcategory of the category of n-state genetic networks, $\mathbf{GN}_{\mathbf{Ł}M_n}$ that operate on the basis of a Łukasiewicz-Moisil n-valued logic algebra LM_n. Then, the category of genetic networks, $\mathbf{GN}_{\mathbf{Ł}M_n}$ was shown in ref. [**?**] to form a subcategory of the `http://planetmath.org/AlgebraicCategoryOfLMnLogicAlgebras`algebraic category of Łukasiewicz algebras, $\mathcal{LM}$ [**?**, **?**]. There are several published, extensive computer simulations of Boolean two-state models of both genetic and neuronal networks (for a recent summary of such computations see, for example, ref. [**?**]. Most, but not all, such mathematical models are Bayesian, and therefore involve computations for random networks that may have limited biological relevance as the topology of genomes, defined as their connectivity, is far from being random.

The category of automata (or sequential machines based on Chrysippean or Boolean logic) and the category of (M, R)-systems (which can be realized as concrete metabolic-repair biosystems of enzymes, genes, and so on) are subcategories of the category of gene nets $\mathbf{GN}_{\mathbf{Ł}M_n}$. The latter corresponds to organismic sets of zero-th order S_0 in the simpler, Rashevsky's theory of organismic sets.

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