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MATHEMATICS, INFORMATICS AND MACHINE LEARNING

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Category theoretical considerations on observation and understanding of non-trivial dynamics based on order and orientation

General theoretical considerations are presented for analysis of natural intelligence based on sector theory providing proper alignment of order and orientation in a coupled dynamics of adjunction, such as system of object and observer, employing mathematical tools such as flag manifold, Schubert variety, Thom and Chern classes, and gauge fields.

Hayato Saigo, Nagahama Institute of Bio-Science and Technology

Meanings, Metaphors, and Morphisms: Theory of Indeterminate Natural Transformation (TINT)

We propose a new theory named "Theory of indeterminate natural transformation (TINT)" to investigate the dynamical creation of meanings as association relationships between images, focusing on the metaphor comprehension as an example. TINT models the meaning creation as a kind of stochastic processes based on the mathematical structure defined by association relationships as morphisms in category theory, so as to represent the indeterminate nature of structure-structure interactions between the systems of the meanings of images. Such interactions are formulated in terms of so-called coslice categories and functors as structure-preserving correspondence between them. The relationship between such functors is "indeterminate natural transformation", the central notion in TINT, which models the creation of meanings in a precise manner. For instance, the process of metaphor comprehension is modeled by the construction of indeterminate natural transformation from a canonically defined functor which we call the base-of-metaphor functor. (This work is based on the collaboration with Miho Fuyama.)

Makoto Naruse, University of Tokyo

Category theoretic approach to physical intelligent architectures

Physical processes in nature are expected to enhance, accelerate, or even provide new functionalities in future computing systems and artificial intelligence. Category theoretic approach may provide foundations for systems where natural processes are composed with conventional digital systems. As our recent practices, categorical analysis of photon-based decision making and soft robotics will be reviewed.

Gli interessati sono invitati ad intervenire.