

RANDOM SELECTIONS

The sigmoidal transfer function and the gain-threshold exponential dependence for neurons from statistical mechanics treatment

L. Andrey and R. Erzan

Czech. J. Phys., 2002, **52**, 1349–1356.

A nonlinear sigmoidal gain curve is obtained by treating a system of non-interacting neurons as the ideal Fermi gas. The gain-threshold dependence is expressed as an exponential function that approximates neuronal dynamics with a non-monotone transfer function.

The interaction between a lightning flash and an aircraft in flight

Anders Larsson

CR Physique, 2002, **3**, 1423–1444.

Lightning strike to aircraft in flight is not an infrequent phenomenon. In-flight data have been available lately that describe the interaction of the airplanes flying through thunderstorm regions. An algorithm for swept-stroke simulations is reported, that requires an approximate database to make the predictive model effective.

Chiral self-discrimination in a M3L2 subphthalocyanine cage

C. G. Claessens and T. Torres

J. Am. Chem. Soc., 2002, **124**, 14522–14523.

Subphthalocyanines (SubPcs), the 14 pi-electron aromatic macrocycles with a central boron atom, are ideal building blocks for making homodimeric capsules. Synthesis and characterization of one subphthalocyanine and its dimerization in presence of palladium salts is described in this report.

Microfluidic peroxidase biochip for polyphenol synthesis

A. Srinivasan *et al.*

Biotechnol. Bioeng., 2003, **81**, 563–569.

A microfluidic biochip, consisting of a simple T junction channel of net reaction

volume of 90 nL, is fabricated by etching a glass surface with a HF-based solution during conventional photolithographic techniques. The chip is used for oxidative polymerization of phenol with soybean peroxidase as a biocatalyst. Controlled deposition of polymers on the walls of micro reactors can be obtained in the reaction chamber during a phenolic resin synthesis.

Genetic algorithms applied to multi-class prediction for the analysis of gene expression data

C. H. Ooi and P. Tan

Bioinformatics, 2003, **19**, 37–44.

A genetic algorithm-based approach is applied to the problem of multi-class prediction that achieves higher classification accuracies. The new algorithm can become powerful in analysis and classification of gene expression datasets that can pose problems due to the presence of ‘inherent’ noise in the datasets involving multiple classes.

Fuzzy techniques for system identification and modeling from input–output data

S. Himavathi and B. Umamaheswari

Inst. Eng. India J., 2002, **83**, 230–236.

A fuzzy-logic based technique is described for a ‘relaxed system’ with multiple inputs and single output. The model assumes no a-priori knowledge of the system and uses the linear form of first order Sugeno inference. The model can be extended to a system with multiple inputs and multiple outputs.

Fatigue damage, remodeling, and the minimization of skeletal weight

R. Bruce Martin

J. Theor. Biol., 2003, **220**, 271–276.

Despite providing for the rigid skeletal support during the evolution of vertebrates, the calcified bony skeletons suffer from the disadvantages of fatigue failure and heavy weight. Modeling of the fatigue life is reported herein to focus on

the implications of remodeling the fatigue life and muscle mass during an animal’s lifetime. The hypothesis will find use in understanding comparative vertebrate biology.

Mechanosynthesis of P/M nano-composite hard metals

F. Arcuri and P. Matteazzi

Int. J. Powder Metallurg., 2002, **39**, 47–52.

Nanophase WC/Co-based inserts can be recycled by P/M route-based mechano-synthesis utilizing two alternative cycles of cold isostatic pressing followed by sintering, and cold isostatic pressing followed by hot isostatic pressing. The mechanical properties of the recycled inserts are comparable to those of the new ones.

Competitive exclusion and coexistence of universal grammars

W. G. Mitchener and M. A. Nowak

Bull. Math. Biol., 2003, **65**, 67–93.

Human babies learn languages based on the lexicon and the grammar they receive as linguistic inputs. The universal grammar (UG) defines the innate constraints to be learned by the child. Human brain is postulated to accommodate the variation of UG during evolution. This study compares the specific variations in the UG and concludes that ‘accurate learning stabilizes UGs that admit large numbers of candidate grammars’.

Group decision-making in animals

L. Conradt and T. J. Roper

Nature, 2003, **421**, 155–158.

Gregarious animals make communal decisions that cost subordinate group members. Two extremes of communal decision making, namely ‘despotism’ and ‘democracy’, are modeled to demonstrate that the costs to individuals and the group are higher for following the decision of a domineering ‘despot’ in comparison to that of a ‘democrat’.