한국물리학회

회보

BULLETIN OF THE KOREAN PHYSICAL SOCIETY

제 17 제 1호

제75회 총회프로그램, 논문초록집

1999년 4월

사단법인 한국물리학회
THE KOREAN PHYSICAL SOCIETY

F-P014 **Learning of neural networks with different architectures** *권철안(명지대 물리학과), 김형균(명지대 물리학과)* We present our study of learning of neural networks with different architectures. We use both the analytic calculation and the Monte Carlo simulation. A two-layer neural network with large M hidden units learns the input-output rule generated by the target network with M_T hidden units. We study the two cases; $M > M_T$ and $M < M_T$. Similar to the known case $M = M_T$, the network undergoes a first-order phase transition towards the better learning phase as the number α' of training sets per input unit per hidden unit increases. Before the transition occurs, the learning curves for both cases are the same as that for $M = M_T$. For $M > M_T$, α' at the transition point is the same as that for $M = M_T$. In the other case, the transition occurs at lower α'. We discuss about the different learning processes for the two cases.

F-P015 **Power-law Distribution of Family Names in Japanese Societies** *YOUNGKI LEE (Boston Univ.), SASUKE MIYAZIMA, TOMOMASA NAGAMINE(Chubu Univ) and HIROAKI MIYAJIMA (Ohio State Univ.)* We study the distributions of family names in Japanese societies. We define a *family* as a group of people who share the same family name and the size of a family s as the number of people in the family. We find that (i) the total number of families, N, and the total population, S, in a society, are related as $N \sim S^{0.65}$, (ii) the number of families $n(s)$ of the size s decreases as $n(s) \sim s^{-1.75}$, and (iii) the size s and the rank r of a family are also related as $s \sim r^{-0.75}$. These scaling properties are found to be well consistent for five different regional societies investigated. We compare our results with the cluster size distribution of two dimensional site percolation.

F-P016 **Barrier Crossing of a Linear Chain** *이승균, 성우경 (포항공대 물리학과)* We consider the Krammers' rate of activated barrier crossing of N($\gg$)1 linearly coupled degrees of freedom, or a chain. Under the general framework of multi-dimensional overdamped Kramers' rate theory we calculate the barrier crossing rate for a wide range of double well potential and chain parameters. For both harmonic and anharmonic coupling within the chain, we show that the chain flexibility in the unfolded state can greatly enhance the crossing rate. Application to polymer dynamics and relation to the array-enhanced stochastic resonance are discussed.

F-P017 **Bicritical Scaling Behavior in Unidirectionally Coupled Pendulums** *김상윤, 임우창 (강원대)* We study the scaling behaviors of period doublings in a system of two parametrically forced pendulums with unidirectional coupling near a bicritical point corresponding to a border of chaos in both subsystems. Using both a direct numerical method and a renormalization group mehtod, we obtain the scaling factors associated with the bicritical behaviors in both subsystems. It is thus found that the second response subsystem exhibits a new type of non-Feigenbaum scaling behavior, while the first drive subsystem is in the Feigenbaum critical state. We also note that these bicritical scaling behaviors are the same as those in the abstract system of the unidirectionally-coupled one-dimensional maps.

F-P018 **Nonlinear Dynamics of A Damped Magnetic Oscillator** *김상윤, 임우창 (강원대)* We consider a damped magnetic oscillator, consisting of a permanent magnet in a periodically oscillating magnetic field. A detailed investigation of the dynamics of this dissipative magnetic system is made by varying the field amplitude A. As A is increased, the damped magnetic oscillator, albeit simple looking, exhibits rich dynamical behaviors such as symmetry-breaking pitchfork bifurcations, period-doubling transitions to chaos, symmetry-restoring attractor-merging crises, and saddle-node bifurcations giving rise to new periodic attractors. Besides