

No.	P001
Title	FIPS 140-2 Statistical Test Suite Has Inappropriate Significance Levels
Author*	Song-Ju Kim
Author	Ken Umeno
Author	Akio Hasegawa
Presentation Style	poster
Abstract	We show that FIPS 140-2 statistical test suite for randomness does not have unique significance level, and also show that the runs test and the long-run test of FIPS 140-2 test suite have inappropriate significance levels for the further analyses, such as the checking of the success rate and of uniformity of P-values, which are used in NIST test suite.
Keywords	statistical test ,randomness ,pseudorandom bit generator
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No.	P002
Title	Validity Check of NIST 800-22 Statistical Test Suite for Randomness
Author*	Song-Ju Kim
Author	Ken Umeno
Author	Akio Hasegawa
Presentation Style	poster
Abstract	We evaluate the randomness of a set of sequences generated by various pseudo-random bit generators (PRBGs) using NIST statistical test suite. We show that Lempel-Ziv compression test and FFT test are invalid statistical tests among sixteen tests of this test suite. If we choose the sample size $m$ greater than 10000, we cannot find any PRBG that pass these two tests even in well-known good PRBGs.
Keywords	statistical test ,randomness ,pseudorandom bit generator ,NIST
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No.	P003
Title	Lebesgue Spectrum Analysis for Chaotic Monte Carlo Computation
Author*	Ken Umeno
Presentation Style	poster
Abstract	We show that statistical evaluation of chaotic Monte Carlo computation can be fully characterized in terms of Lebesgue Spectrum of ergodic theory. We give a necessary and sufficient condition for superefficiency having $O(1/N)$ mean error in Monte Carlo computation with chaotic random numbers. As a next step, we give a general algorithm for approaching chaotic Monte Carlo Integration with $O(1/N)$ mean error.
Keywords	Monte Carlo ,Chaotic Dynamics ,Ergodic Theory ,Mixing Property ,Lebesgue Spectrum
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No.	P004
Title	Spatial Analysis of Human Behavior in Ubiquitous Environment
Author*	SHIBUYA,Kazuhiko
Presentation Style	poster
Abstract	This paper aims to show my novel framework for multi-agent based services in ubiquitous computational room. This framework has some functions based on LBS (Location Based Services), spatial informatics and multi-agent systems in ubiquitous environment. It can assume to process data on social behavior of people and its dynamical network as historical patterns. Moreover it assumes to apply Bayesian network model for analyzing and estimation of human positions in the room. Thus I focus on exploring perspectives of spatial modeling and simulation. It appears that spatial model and statistical analyzing in the ubiquitous room enables to clarify various models such as Bayesian network and spatial network analysis. However there seems not enough to be spatial model and verification with considering methodological and theoretical backgrounds. Then I will attempt to present a part of my modeling and analysis for social and spatial behavior of people.
Keywords	Spatial Modeling ,Agent Based Model
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No.	P005
Title	Analysis of Effective Connectivity in fMRI Experiments by State Space Models
Author*	Moon-ho Ringo Ho
Presentation Style	poster
Abstract	Effective connectivity analysis aims to study the influence of one neuronal system over another. Structural equation modeling (SEM) and time-varying parameter regression (TVPR), have been used in the functional magnetic resonance imaging (fMRI) studies for modeling effective connectivity. Usually in SEM, a within-subject covariance matrix of the regions-of-interest (ROI) is derived and a path model is then fitted to this matrix. This approach ignores the temporal correlation in the data and assumes connectivity to be time-invariant. TVPR relaxes such assumption to allow time-varying connectivity but extensions to handle multiple brain regions have not been discussed. Both methods use observed fMRI signals in the connectivity analysis with the noise confounded in them. To handle these limitations, a new time series model will be proposed which can (1) handle multiple ROI, (2) use the fMRI signal without noise confounded, (3) allow modeling temporal correlation, (4) allow connectivity to vary over different experimental conditions or time. This new model has a State-Space(SS) representation and can be estimated by maximum likelihood via Kalman Filter. Extension to incorporate subject random effect within SS modeling framework will be discussed. We illustrate our model by testing an attentional control network hypothesis using an fMRI Stroop task experiment.
Keywords	functional magnetic resonance imaging ,effective connectivity ,state space models ,kalman filter ,system identification
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No.	P006
Title	Algebraic geometry, zeta functions, and marginal likelihood of Bayesian statistics
Author*	Sumio Watanabe
Author	Keisuke Yamazaki
Presentation Style	poster
Abstract	Mathematical relation among algebraic geometry, zeta function, and marginal likelihood of Bayesian statistics is established. Its application to artificial neural networks, normal mixtures, hidden Markov models, Bayesian networks, and reduced rank regression is introduced.
Keywords	Singularity ,algebraic geometry ,hierarchical model ,zeta function ,asymptotic expansion
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No.	P007
Title	Statistical inverse problem in feedback system and diagnosis of feedback paths
Author*	Kuniharu Kishida
Presentation Style	poster
Abstract	Stationary time series data of particular components by the decorrelation method of ICA are transformed into reorganized data. From the viewpoint of statistical inverse problem an innovation model is identified from the reorganized data. If the innovation model has a feedback structure, transfer functions between observable variables are identified via the innovation model under a sufficient condition. Feedback paths of transfer functions can be checked by taking advantage of scalar times transformations of the reorganized data. Then, we can diagnose feedback paths by examination of identified transfer functions, since transfer functions of real paths are invariant for the scalar times transformations. That is, feedback paths exist, if transfer functions are invariant for small changes of parameter values; otherwise, a feedback path does not exist. The scaling property of transfer functions is useful for diagnose feedback paths of activities between brain regions.! For magnetoencephalography of a somatosensory evoked field an example will be shown in the conference.
Keywords	statistical inverse problem ,feedback system ,innovation model ,ICA ,diagnosis
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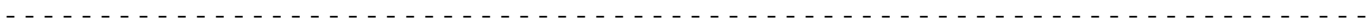
No.	P008
Title	Chaos Associative Memory
Author	Masahiro Nakagawa
Presentation Style	poster
Abstract	In this presentation we shall investigate the statistical property and the memory capacity of the chaotic autoassociation memory. The present artificial neuron model is properly characterized in terms of a time-dependent sinusoidal activation function to involve a transient chaotic dynamics as well as the energy steepest descent strategy. It is elucidated that the present neural network has a remarkable retrieval ability beyond the conventional models with such a monotonous activation function as sigmoidal one. This advantage is found to result from the property of the analogue periodic mapping accompanied with a chaotic behaviour of the neurons as well as the symmetry of the dynamics equation which may be shown in the invariant measure determined by the Frobenius-Perron equation.
Keywords	Chaos ,Association ,Memory ,Neural Network
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No.	P009
Title	Invariant Measure of Chaos Neuron Models
Author	Masahiro Nakagawa
Presentation Style	poster
Abstract	In this presentation, the Frobenius-Perron equations for a few chaos neurons are solved by means of the Fourier expansion scheme in order to derive the invariant measure. To explore the importance of the symmetry of invariant measure, i.e. chaos neuron dynamics proposed previously, the simultaneous linear characteristic equation for the expansion coefficients will be numerically evaluated. It is also concluded that the symmetry of the invariant measure, which is found to be different for each chaos neurons, may be closely related to the ability of the chaos neurons applied to the practical applications with the neural networks, e.g. associative memory and learning model etc.
Keywords	Invariant Measure ,Frobenius-Perron equation ,Chaos ,Neurons ,Symmetry
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No.	P010
Title	Extracting and screening activities in Space/Time/Frequency EEG data using Parallel Factor Analysis
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Author	Pedro A. Valde's-Sosa
Author	Nobuaki Nishiyama
Author	Hiroaki Mizuhara
Author	Yoko Yamaguchi
Presentation Style	poster
Abstract	<p>Finding the means to efficiently summarize electroencephalographic data has been a long-standing problem in electrophysiology. A popular approach is identification of component modes on the basis of the time-varying spectrum of multi-channel EEG recordings, in other words, a space/frequency/time atomic decomposition of the time-varying EEG spectrum. Previous work has been limited to only two of these dimensions. PCA and ICA have been used to create space/time decompositions; suffering an inherent lack of uniqueness that is overcome only by imposing constraints of orthogonality or independence of atoms. Conventional frequency/time decompositions ignore the spatial aspects of the EEG. Recognition of the data being a three-way array indexed by channel, frequency and time allows the application of a unique decomposition that is known as Parallel Factor Analysis (PARAFAC). Each atom is the trilinear decomposition into a spatial, spectral and temporal signature. We applied this decomposition to the EEG recordings of 5 subjects during the resting state, and during mental arithmetic. Common to all subjects were two atoms with spectral signatures whose peaks were in the theta and alpha range. These signatures were modulated by physiological state, increasing during the resting stage for alpha and during mental arithmetic for theta. Furthermore, we describe a new method (Source Spectra Imaging, SSI) to estimate the spectra of electric current sources from the EEG spectrum. The topography of the theta atom is frontal and the maximum of the corresponding SSI solution is located in the anterior frontal cortex. The topography of the alpha atom is occipital with maximum of the SSI solution in the visual cortex. We show that the proposed decomposition can be used to search for activity with a given spectral and topographic profile in new recordings, and the method may be useful for artifact recognition and removal.</p>
Keywords	Parallel Factor Analysis ,EEG space/frequency/time decomposition ,Principal Component Analysis ,Multiway analysis
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No.	P011
Title	Characterization of epileptic brain dynamics by impulse response function based on AR model
Author*	Fumikazu Miwakeichi
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Author	Andreas Galka
Author	Hiroshi Arakaki
Author	Nobuhide Hirai
Author	Taketoshi Maehara
Author	Kensuke Kawai
Author	Hiroyuki Shimizu
Presentation Style	poster
Abstract	<p>The purpose of this study is to establish a new method for discriminating between focal and non-focal hemispheres in intractable temporal lobe epilepsy, based on modeling the discharge-free background brain dynamics by multivariate time series analysis of electrocorticogram (ECoG) time series recorded during sleep. Five unilateral focal patients and one bilateral focal patient were studied. In order to detect the location of epileptic foci, linear multivariate autoregressive (MAR) models were fitted to the ECoG data; as a new approach for the purpose of summarizing these models in a single relevant parameter, the behavior of the corresponding impulse response functions was studied and described by attenuation coefficients (AC). In the majority of unilateral focal patients the averaged AC was found to be almost always significantly larger in the focal hemisphere, as compared to the non-focal hemisphere. Also the amplitude of the fluctuations of AC was larger in the focal hemisphere. Moreover, in one patient showing a typical regular sleep cycle, the value of AC at the focal hemisphere tended to be larger during REM sleep and smaller during non-REM sleep. In the bilateral focal patient no statistically significant distinction between the hemispheres was found. These results indicate that this newly proposed method can provide an improved detection of the focal hemisphere in unilateral focal patients, as compared to previous standard methods such as spike rate counting. Clinical application of this method is expected.</p>
Keywords	temporal lobe epilepsy ,electrocorticogram (ECoG) basic background activity ,multivariate AR model , impulse response function ,attenuation coefficient
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No.	P012
Title	On likelihood ratio tests for dimensionality selection
Author*	Yoshio Takane
Author	Peter G. M. van der Heijden
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Presentation Style	poster
Abstract	It has been pointed out that parameterized mixture models (e.g., normal mixtures, multi-layered neural networks, change point problems, etc.) have points of irregularity (singularities) in their parameter space, which may invalidate the use of likelihood ratio (LR) tests or AIC in some cases. We point out that the problem is much more ubiquitous. Virtually all the models requiring dimensionality selection (clusters, latent classes, canonical variates, discriminant functions, factors, components, dimensions, etc.) have similar problems. These models include reduced-rank regression models, factor analysis, multidimensional scaling, canonical correlation analysis, latent class models, RC-association and correlation models, and so on. Fortunately, many of these models have a saturated model that can always be used as the benchmark hypothesis when the LR statistic is formed. Nonetheless, there have been numerous instances of misuses of the LR tests, which are still accumulating daily. In this paper, we document them and show the severity of the problems by Monte-Carlo studies.
Keywords	asymptotic chi-square distribution ,regularity conditions ,canonical correlation analysis ,multidimensional scaling ,common factor analysis
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No.	P013
Title	Statistical Inference using Stochastic Switching Models for the Discrimination of Unobserved State
Author*	Tadahiko Sato
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Author	Genshiro Kitagawa
Presentation Style	poster
Abstract	The execution of price and/or display promotion has a significant effect on the sales of a brand sold in a supermarket. Information on price and/or sales is available from POS data. However, unless an investigator collects information on the execution of display promotions from every retail store, such information is unavailable. This paper presents a method of identifying whether display promotion has been executed without having to visit individual stores. We treat the execution/non-execution of a display promotion as a state variable. An unknown stationary probability matrix is assumed to describe the probability of a transition between states. Each state is characterized by a different stationary time series model with unknown parameters. The objective of the analysis is to identify the model and to assign a probability model for each state at each time instant. Finally, we provide a high precision estimator of a past execution/non-execution of a display promotion based on the proposed model.
Keywords	Markov Switching Model ,general state space model ,non-Gaussian filtering and smoothing ,POS data
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No.	P014
Title	Adaptive Learning Machines for Nonlinear Classification and Generalized Information Criteria
Author*	TOMOHIRO ANDO
Author	SADANORI KONISHI
Presentation Style	poster
Abstract	Regularization is a well-known method for the treatment of mathematically ill-posed problems. By using the method of regularization, we propose new machine learning algorithm, adaptive learning machine, to classify the high-dimensional data with complex structure. Crucial issue in the machine constructing process is the choice of a suitable machine among candidates. We extent Akaike information criterion that enables us to evaluate machines estimated by regularization. Real data analysis and Monte Carlo experiments show that our proposed machine learning methodology performs well in various situations.
Keywords	Classification ,Genetic algorithm ,Model selection ,Regularization theory
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No.	P015
Title	Information Criteria Applied to the Identification of Box-Cox Transformation Model
Author	Feng YAO
Presentation Style	poster
Abstract	This paper deals with the information criteria used for nonlinear model identification. The appropriate expressions of the general information criterion (GIC) and Akaike's information criterion (AIC) for the identification of the Box-Cox Transformation (BCT) model are proposed. To compare the power performances of the GIC and the AIC applied to the estimation of the BCT parameter and the clan of regressions, Monte Carlo simulation was conducted. It shows that as for the identification of the order of the BCT polynomial regression model, the AIC is a little precise than the GIC; but it is on the contrary for the estimate of the BCT parameter.
Keywords	AIC ,Box-Cox Transformation ,GIC ,Monte Carlo Simulation ,Nonlinear Model
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No.	P016
Title	Empirical Bayes adjustment of regularization in ill-posed linear inverse problems by ABIC
Author*	Yuji Mitsuata
Presentation Style	poster
Abstract	<p>Regularization is the most popular technique to overcome the null space of model parameters in geophysical inverse problems, and is implemented by including a constraint term as well as the data-misfit term in the objective function being minimized. The weighting of the constraint term relative to the data-fitting term is controlled by a regularization parameter, and its adjustment to obtain the best model has received much attention. The empirical Bayes approach discussed in this paper determines the optimum value of the regularization parameter from a given data-set. The regularization term can be regarded as representing a priori information about the model parameters. The empirical Bayes approach, and its more practical variant, Akaike's Bayesian Information Criterion, adjust the regularization parameter automatically in response to the level of data noise and to the suitability of the assumed a priori model information for the given data. When the noise level <math>\sigma</math> is large, the regularization parameter is made large, which means that the a priori information is emphasized. If the assumed a priori information is not suitable for the given data, the regularization parameter is made small. Both these behaviors are desirable characteristics for the regularized solutions of practical inverse problems. Four simple examples are presented to illustrate these characteristics for an underdetermined problem, a problem adopting an improper prior constraint and a problem having an unknown data variance, which are often encountered in geophysical inverse problems. Numerical experiments using Akaike's Bayesian Information Criterion for synthetic data provide results consistent with these characteristics. In addition, concerning the selection of an appropriate type of a priori model information, a comparison between four types of difference-operator models: the zero-th, first, second, and third order difference-operator models, suggests that the automatic determination of the optimum regularization parameter becomes more difficult with increasing order of the difference operators. Accordingly, taking the effect of data noise into account, it is better to employ the lower order difference-operator models for inversions of noisy data.</p>
Keywords	inverse problem ,regularization ,Bayesian inversion ,empirical Bayes ,ABIC
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No.	P017
Title	Modeling Correlated Noise Sources and Detection of Information Flows
Author*	Yoko Tanokura
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Presentation Style	poster
Abstract	Akaike's power contribution has been a useful concept in detecting influential noise sources of multivariate dynamic systems with feedback. However, it is not applicable to the systems with high serial correlations of noise as it requires the assumption that the variance covariance matrix of the innovations is of diagonal form. To address this problem, we propose a decomposition of the variance covariance matrix, modeling correlations among variables observed. Then the general form of the power spectrum is obtained and a new power contribution that extends Akaike's concept is defined. It was shown that the extended power contribution succeeds in detecting the mutual information flows among variables, and that Akaike's original power contribution precisely captures some part of them. By applying this method to the real data sets, new information on correlated noises was explicitly revealed with the known information. The extension has widened the applicable area of ! this approach.
Keywords	Detection of noise source ,Akaike's power contribution ,Multivariate AR modeling
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No.	P018
Title	4SID Identification of Continuous-Time Stochastic Systems via Distribution-based Approach
Author*	Kentaro Kameyama
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Presentation Style	poster
Abstract	<p>During the last two decades, subspace state space system identification (4SID) has been attracted a great deal of interest and many researches have been done. Most of these works are mainly concentrated on the discrete-time system and studies for the continuous-time system are very few. A typical approach for continuous-time deterministic (i.e., nonstochastic) system in the 4SID framework is to construct a couple of input and output data matrices which consist of higher time-derivatives of input and output data. This means that both input and output processes must be sufficiently smooth. However, for stochastic systems both input and output processes are differentiable nowhere, so that neither the state nor the output has time-derivatives.</p> <p>The authors propose a novel method to treat such a problem by introducing an idea of using the random distribution in the sense of Ito-Schwarz. Based on the distribution-based approach the 4SID method is developed for continuous-time stochastic systems.</p>
Keywords	subspace identification ,stochastic systems ,continuous-time system
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No.	P019
Title	Non-linear filtering with dynamic programming to adjust non-uniform sampling locations
Author*	Masako Kamiyama
Author	Tomoyuki Higuchi
Presentation Style	poster
Abstract	A procedure is described for adjusting sampling locations in one spatially discretized dataset to those in another when the value differences between these sets are mainly caused by the sampling intervals that locally lengthen and shorten. This adjustment is formulated into an optimization form that can be solved by dynamic programming. Unknown parameters involved in the form can be identified using the maximum likelihood procedure that employs non-linear filtering for a generalized state-space model. This procedure is based on the fact that the optimal solution in dynamic programming is equivalent to the “Maximum A Posteriori (MAP) estimation” in a Bayesian framework. The procedure is outlined as follows: 1) Select a supervised dataset and a training dataset that satisfy the several criteria for adjustment purposes. 2) Model a mechanism to yield the non-uniform sampling, i.e., the wheel rotation including slip and slide. 3) Formulate this model in an optimization problem that can be solved by dynamic programming, which is a general method for solving non-linear discrete optimization problems. However, this form contains unknown parameters. 4) Represent this non-linear optimization problem with a generalized state-space representation and identify the unknown parameters (called hyperparameters in a Bayesian framework) using a non-linear filtering algorithm based on the maximum likelihood method. 5) Adjust the sampling location differences by dynamic programming with the identified parameters. We applied this procedure to rail-geometric datasets obtained with a special rolling stock called the “track inspection car.”
Keywords	sampling interval ,optimization ,railway track ,wheel rotation
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No.	P020
Title	Prediction of daily sales of a restaurant based on the state space modeling
Author*	Rui Yamaguchi
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Author	Tomoyuki Higuchi
Presentation Style	poster
Abstract	Daily sales of a catering establishment is affected by several factors: A day of the week, national holidays, weather, events taken place near the site, etc. Therefore, it is no doubt beneficial to make a model decomposing a time series of the sales into such factors. Then the model allows us to predict the future sales with a good accuracy in order to plan various levels of management strategies such as purchase, staff assignments, new store openings, etc. In this study, we have proposed a prediction method for daily sales of a catering establishment by using a state space model which is evaluated by an information criterion; we have applied it to daily sales data for two years of a restaurant which is adjacent to a large-scale convention center and office buildings.
Keywords	state space model ,marketing ,knowledge discovery
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No.	P021
Title	Modeling Share Dynamics with Extracting Competition Structure
Author*	Masahiro Kimura
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Presentation Style	poster
Abstract	In this paper, we propose a probabilistic model of fluctuations in the numbers of visitors to given Web sites based on the competition structure, and construct its learning algorithm. This method is implemented for both categorizing the sites into groups of competitors and predicting the future shares of the sites, based on these observed time-series data. We confirmed experimentally, using synthetic data, that the proposed method successfully identifies the true model structure, and shows better predictive performance than more conventional methods. Also, we demonstrated experimentally, using real data, that the proposed method suggested a reasonable competition structure that conventional methods fail to find and that outperformed them on predictive performance.
Keywords	Web dynamics ,Multivariate time-series modeling ,Time-series clustering ,Replicator dynamics ,EM algorithm
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No.	P022
Title	Two Bayesian modeling approaches for an onset time determination of magnetic pulsations
Author*	Keiko Fukuyama
Author	Tomoyuki Higuchi
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Author	Hideaki Kawano
Author	Kiyohumi Yumoto
Presentation Style	poster
Abstract	<p>Pi2 magnetic pulsation is one of ULF (Ultra Low Frequency) waves in the geomagnetosphere and has been known as a good indicator of the onset of auroral substorm. Its wave characteristics, e.g., wave period (ranges from 40 to 150 seconds) and occurrence have been studied by many workers. However, its trigger process and propagation mechanism have not been well understood, and there is no definite determination method of the Pi2 onset time even now. Therefore, in this study, we constructed two different methods to determine the Pi2 onset time from ground magnetic field H-component (roughly northward-directed). One is based on such assumption that Pi2 is described as an “ initial perturbation + quasi-periodic ” oscillation. From our previous study, we were convinced that there exists a non-periodic fluctuation at Pi2’s initial stage, which we call an initial perturbation. Therefore, taking account of it, we improved the time-series analysis method by Higuchi et al. [2002], and applied it to Pi2 data. The other method relies on the description of Pi2 in literature [Saito,1961] such that Pi2 starts with <math>dH/dt \geq 0</math> at middle or low latitudes. We examined the differenced sequences of the H-component data and identified a positive variation in them. The two methods of this paper use raw data and estimate the onset time with information criterion, so the both methods overcome previous problems, and determines the onset time more accurately and objectively. To know differences between these two methods and the characteristics of Pi2, we compared the outputs of the two methods for each event, and made a histogram. The histogram shows that the time lag between two method’s onset times is centered around 0 second; however, it also has a wide distribution. This suggests that Pi2’s initial perturbation is very important in determining the Pi2 onset time and we have to know more about it.</p>
Keywords	Pi2 magnetic pulsation ,time-series ,information criterion ,maximum likelihood method ,Bayesian model
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No.	P023
Title	Knowledge Discovery Using Evolutionary Neural Networks
Author*	Paulito P. Palmes
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Abstract	<p>Artificial Neural Networks (ANN) have been successful in solving AI (Artificial Intelligence) problems such as classification, recognition, association, generalization, and learning. Studies have shown that the choice of ANN architecture has a significant impact in ANN computation. Too complex architecture has a tendency to overfit the data while too simple architecture suffers from poor generalization. Until now, however, there are no rules or criteria to ensure that the architecture chosen is optimal for a particular problem domain. To address this issue, SEPA (Structure Evolution and Parameter Adaptation) model is developed that evolves a population of ANNs. In SEPA, the search for optimal ANN is equivalent to a search in the architecture space with each point in the surface representing a particular ANN. SEPA's fitness or objective function is formulated to include ANN's performance factors such as network complexity, training, and validation performances such that finding an optimal ANN is equivalent to finding the fittest ANN. SEPA's evolution process relies heavily on the gaussian perturbations and uniform crossover operations on the weights and connections of ANN. Gaussian mutation introduces new information and helps in the exploration of the architecture space while uniformly distributed crossover operation recombines the existing solutions which aid in the refinement of the search process. Unlike the standard ANN learning that uses gradient information which is prone to local optima trap, SEPA is a population-based, stochastic, and global search algorithm. The adaptation embedded in the mutation operation allows SEPA to adjust automatically the complexity of ANN structure suitable to problem's difficulty. SEPA algorithm supports parallel, distributed, and grid computations which are becoming popular implementations to address complex AI problems. Simulation results show SEPA's ability to evolve optimal ANN structures with good generalization capabilities.</p>
Keywords	Artificial Neural Networks (ANN) ,Evolutionary Computing (EC) ,Evolutionary Strategies (ES) ,Hybrid Networks ,Evolutionary Neural Networks
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No.	P024
Title	Synchronization phenomena in a large population of integrate-and-fire neurons with a refractory period
Author*	Yasuomi Daishin Sato
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Presentation Style	poster
Abstract	In this study, the integrate-and-fire model that takes into account two types of firing property is utilized. The two firing properties are described as: (1) If one neuron receives an excitatory input, such as rapidly rising and slowly decaying synaptic responses from the other neuron, its membrane potential arrives at the threshold. After reaching this threshold, it starts firing. (2) The firing duration, which is equivalent to the width of an action potential. By utilizing the studies based on theoretical analysis and numerical simulation, we investigate a large population of the modified integrate-and-fire neurons with synaptic couplings. Thereby, we will be able to explain thoroughly how the two neuronal firing properties have effects on the synchronziation phenomena in the globally coupled neurons.
Keywords	synchronziation phenomena ,refractory period ,double integrate-and-fire ,coupled oscillator
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No.	P025
Title	An adaptive user interface based on online estimation of time-varying mixing weight of mixture model by particle filters
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Author	Norikazu Ikoma
Author	Hiroshi Maeda
Presentation Style	poster
Abstract	We propose a new approach to adaptive user interface based on user type, where the user type is defined as a group of users in which the users have the same preference for the interface. Mixture model is used to extract the user types by measuring the performance of the users in the operation where an assumption that users in the same group have the same performance has made. We can know the type of new-coming user by estimating the mixing weight of the mixture model, which may vary with time. The estimated weights are used for the adaptation of the interface. For the estimation of the weights, we use state space model of time-varying mixing weight with its time smoothness. State estimation of the model requires particle filters due to its nonlinear and non-Gaussian properties. Where, the nonlinearity appears in the mixture observation model and the non-Gaussianity arises from Dirichlet distribution on the mixing weights. User adaptation is done for new-coming user! by showing the interface that optimizes a weighted sum of performance index of each type where mixing weights estimated by particle filters are used. Touch panel application using the proposed method for intelligent wheel chairs system has been developed in order to show the efficiency of the method.
Keywords	adaptive user interface ,mixture model ,state space model ,particle filters
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No.	P026
Title	Structure from motion for multiple objects by Rao-Blackwellized particle filters
Author*	Yasutake Miyahara
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Author	Norikazu Ikoma
Author	Hiroshi Maeda
Presentation Style	poster
Abstract	We propose a new method for estimating structure and motion of multiple objects from trajectories of feature points in image sequence by using Rao-Blackwellized particle filters with a novel importance function. There are two difficulties in the problem of structure from motion for multiple objects that one is to reconstruct 3D information from image (2D) sequence, and second is unknown association between feature points and objects. We approach to this problem by estimating these two simultaneously by an elaborated state space model. In the state space model, system equation consists of the dynamics of objects in 3D space. Where each object is represented by its shape with positions of feature points belong to each object in a coordinate embedded in the object and its motion in the form of translation and rotation. The unknown association between feature points and objects is dealt with in the system equation as well. Observation equation represents a projection model of the camera. We use Rao-Blackwellized particle filters for the estimation in which structure and motion parts are estimated by extended Kalman filter(EKF) for given association and the association part is estimated by particle filter with the aid of EKF. We propose a novel sub-optimal importance function that effectively draw the candidate particles using the current observation with reduced computational cost compared with the optimal one. Simulation and experimental results show that the method effectively estimates 3D structure and motion of each object as well as the unknown association.
Keywords	Structure from motion ,image sequence ,particle filters ,Rao-Blackwellization ,state space model
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No.	P027
Title	Asymptotic Behavior of Least Squares for a Multi-layered Perceptron model
Author*	Masashi Kitahara
Author	Taichi Hayasaka
Author	Shiro Usui
Presentation Style	poster
Abstract	We studied the asymptotic property of a multi-layered Perceptron (MLP) model with one hidden unit by numerical and theoretical analyses. As a result, the asymptotic normality never holds for the least square estimators of connection weights in the model using Heaviside functions instead of sigmoidal. Moreover, we showed by analyzing the tail property of distribution of extremes that the asymptotic expectation of the least square error for Gaussian-distributed samples decreases with $O(\log \log N/N)$ in terms of the number of samples $N$ . The claims in those results are totally different from ones derived by traditional theory of mathematical statistics.
Keywords	Layered neural network ,Regression model ,Least squares ,Asymptotic normality ,Tube method
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No.	P028
Title	Simplex mixture models for multi-topic text
Author*	Naonori Ueda
Author*	Kazumi Saito
Presentation Style	poster
Abstract	We present a probabilistic generative model, called parametric mixture model (PMM), for multi-topic text. We show that PMM is effective for several applications including multiclass, multi-labeled text categorization, text-to-text retrieval, and topic clustering. We also discuss the differences between PMM and the other conventional text models such as probabilistic latent semantic analysis and latent Dirichlet allocation models
Keywords	text modeling ,PMM ,text classification ,multi-topic text
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No.	P029
Title	On Penalized Likelihood Estimation of Yield Curves
Author*	Yoshinori Kawasaki
Author	Tomohiro Ando
Presentation Style	poster
Abstract	The spline-based models are widely used in practice to estimate the term structure of interest rates from a set of observed coupon-bond prices. This paper proposes a penalized likelihood approach accompanied by generalized information criteria (GIC) that determine the desired level of smoothness of yield curves in a data-dependent way. Our approach is theoretically valid even if the regression functional is nonlinear with respect to the unknown coefficients of basis functions, of which typical case is the (penalized) exponential spline model. The derived GICs enable us to compare the models with various choices of basis functions under different regression functional forms in a unified manner. Monte Carlo simulations reveal that choosing the appropriate number of bases by GIC reduces MSE rather than controlling a plenty of bases by a single smoothing parameter.
Keywords	penalized likelihood ,nonlinear functional ,smoothing parameter ,information criteria ,term structure
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No.	P030
Title	Nonparametric Statistical Inference in Production Function
Author*	Yoko Konishi
Author	Yoshihiko Nishiyama
Author	Tomohiro Ando
Author	Yoshinori Kawasaki
Presentation Style	poster
Abstract	<p>Production functions play many important roles both in economic theory and in empirical econometrics. Usually, a production function is postulated as a mapping from several input variables to a scalar 'output'. In its simplest form, the output level (Y) is assumed to be dependent on capital (K) and labor (L). When it comes to empirical analysis, the most commonly used specification is so-called Cobb-Douglas function, which was extended to the translog production function long afterward. Though great bulk of past empirical works on the estimation of production function heavily relies on such a parametric specification as Cobb-Douglas or translog, it is often singled out as a major flaw that the statistical analysis under model misspecification may give rise to incorrect statistical inference and therefore, to fallacious economic implications. In consideration of this possible danger, this article addresses two issues. At first, we apply the nonparametric misspecification test (proposed by Hong and White, 1995) to investigate whether or not the parametric specifications (Cobb-Douglas and translog) are appropriate for the production functions of firms. Data are the cross section of Y, K, L by companies whose stocks are listed on the first division of Tokyo Stock Exchange. Firms are classified into two groups (manufacturing and non-manufacturing), and the misspecification test is performed separately on each group, year by year from 1965 to 2001. To summarize the results of the test, parametric specifications are considered reasonable and proper until 1970's while they do not fit well after 1980. Observing these results, we proceed to the nonparametric estimation of production function as the second step. We exploit the generalized additive models (GAM) employing B-spline basis functions. In model estimation, we make use of a penalized likelihood approach where smoothness constraints on the coefficients of basis functions are imposed. What is essential in the estimation of such smoothing spline models as the GAM is the objective choice of smoothing parameter. In this article a version of generalized information criteria (GIC) is derived to determine the smoothing parameter and the number of basis functions. One of the greatest merits of the use of GIC here is that we do not have to resort to the iterative algorithm like the alternating conditional expectation (ACE) in estimating the GAM models. As is expected, the estimated production functions exhibit substantial nonlinearities after 1980. As an application of nonparametric analysis, we investigate the inefficiency of the companies that went bankruptcy during the sample period.</p>
Keywords	Translog model ,Nonparametric Test ,Nonparametric Estimation ,Generalized Information Criteria
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No.	P031
Title	A statistical analysis for fundamental frequency patterns in infant language acquisition
Author*	Hiroko Kato
Author	Tomohiro Nakatani
Author	Sachiyo Kajikawa
Author	Shigeaki Amano
Presentation Style	poster
Abstract	Statistical methods are proposed to discriminate and evaluate the similarity of fundamental frequencies (F0) extracted from infant and parent speech. F0 values have voiced and silent parts, where the silent parts are treated as missing observations, and F0 patterns were categorized into predetermined patterns such as rising, flat, bell-shape, complex, etc. In previous studies, the similarities between patterns were mostly manually specified by a small number of data; and objective and effective statistical methods have never been applied. Our proposed procedure involves: 1) interpolating missing observations corresponding to silent parts of F0, 2) calculating distance matrices using J-divergence to evaluate similarity among F0 patterns, and 3) comparing similarities among infant and parents based on multidimensional scaling (MDS). A simulation study confirms the effectiveness of interpreting the results using MDS. We apply the procedure to a database of recorded conversations of Japanese infants and parents under a natural environment for five years. We follow the developmental change of the F0 pattern similarity among infants and parents for each month of the infants' age and discuss prosodic aspects of infant language acquisition.
Keywords	F0 analysis ,infant language acquisition ,trend model ,information theory ,multi-dimensional scaling
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No.	P032
Title	Extracting two factors of information from visual inputs by a product model of a self-organizing map and neural gas
Author*	Akira DATE
Author	Koji KURATA
Presentation Style	poster
Abstract	The visual input to a robot in a room is a function of two factors, the position and the direction of the robot. To separate these two factors of information in the observed images, we have developed a computational model based on two learning algorithms, the Kohonen's self-organizing map (SOM) and the neural gas (GAS). Our model, a product of these two models, is SOM-like in one dimension of the unit array and GAS-like in the other dimension. By putting these algorithms, we demonstrate, by computer simulation, that position and direction are extracted separately in different dimensions of the unit array.
Keywords	Self-organizing Map ,SOM ,Neural Gas ,Information Separation ,Neurocomputing
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No.	P033
Title	Bayesian Computaion via Parametric Adaptive Importance Sampling
Author*	Ryo Yoshida
Presentation Style	poster
Abstract	In Baysesian statistics, statistical physics, there has already exist the various proposals for the weighted sampling methods, i.e. Importance Sampling, Sampling Importance Resampling. To improve the simulation efficiency of them we have to construct the sampling function to be a well-approximation for a target distribution which is defined by a problem. Parametric Adaptive Importance Sampling is the method to learn the shape of target distribution by parametric models. The objective is to find the sampling function so as to minimize f-divergence between the target distribution and a parametric model.
Keywords	Importance Sampling ,Samplig Importance Resampling ,f-divergence ,EM algorithm ,Finite Mixture Model
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No.	P034
Title	Model analysis of the ion channel diseases for muscle
Author*	Terada Kazuko
Author	Nishimura Chiaki
Presentation Style	poster
Abstract	[AIM] To reveal the mechanism behind sodium channel and chloride channel diseases of muscles (scdm and ccdm). [METHODS] Dynamics of the Hodgkin-Huxley equations for muscle (HHM), a model for electrical activity of sarcolemma is studied. A parameter concern to sodium channel ( $V_h$ or $V_m$ ) and the leakage conductance ( $g_l$ ) are varied as bifurcation parameters in HHM. These parameters are physiologically known to change under some types of scdm and ccdm, respectively. [RESULTS] Three types of behaviors, (i)a normal action potential, (ii)a repetitive firing and (iii)a depolarized resting potential, are observed in HHM as functions of $V_h$ and $g_l$ . The behavior (i) appears in a parameter region including the normal values, and (ii) and (iii) appears in a parameter region of high sodium permeability (large $V_h$ or small $V_m$ ) and/or decreased chloride conductance (small $g_l$ ). These three parameter regions are meet at a point in the parameter plane of $V_h \times g_l$ or $V_m \times g_l$ . [CONCLUSION] The three types of behaviors in HHM correspond qualitatively well to the electrical activities of real muscles of (i)normal, (ii)myotonia (muscle stiffness) and (iii)paralysis, respectively. The results imply that a relatively small change of the parameters might cause drastic change of electrical activity of muscles. Such dynamics meet with the following physiological and medical observations. (1) Some types of scdm show both myotonia and paralysis, (2) the positions of point defects of different types of scdm mingled on muscle sodium channel gene, (3) some exercise or some changes of ionic environments cause myotonia or paralysis attack.
Keywords	the Hodgkin-Huxley equations ,dynamical system ,muscle ,ion channel diseases ,bifurcations
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No.	P035
Title	Bayesian estimation of interactions between individuals using MCMC method.
Author*	Okabe Masahilo.
Author	Tanemura Masaharu.
Presentation Style	poster
Abstract	Given a mapped spatial pattern of N points in a finite planar region, we consider Bayesian estimation of repulsive interaction potentials between individuals from the mapped data using MCMC (Markov Chain Monte Carlo) method. We also illustrate the application of this approach to the real data.
Keywords	MCMC method ,Gibbs distribution ,repulsive interactions ,Bayesian estimation
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No.	P036
Title	A new parametric approach to density estimation
Author*	Tadayoshi Fushiki
Author	Takashi Tsuchiya
Presentation Style	poster
Abstract	Density estimation is a classical and important problem in statistics. The non-parametric kernel method, mixture based method, and maximum penalized likelihood method are among well-known methods for density estimation. In this presentation, we propose a new parametric approach to this problem in one dimension where the density is represented as the product of a nonnegative polynomial and a kernel function such as Gaussian and exponential kernels. We estimate parameters with the maximum likelihood method and choose the best model by minimizing Akaike information criterion (AIC). A main feature of our approach is application of semidefinite programming (SDP) in computing the maximum likelihood estimation. SDP is a class of convex programming over the space of symmetric positive semidefinite matrices studied extensively in optimization recently. This novel technique enables us to handle in a very natural way nonnegativity of the polynomial and to compute “the global maximum” of the likelihood function in this case. Reasonable additional conditions such as symmetry and unimodality of the density function can also be treated within this framework. We demonstrate through several instances that our approach works reasonably well in practice.
Keywords	density estimation ,maximum likelihood estimation ,AIC ,Semidefinite programming
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No.	P037
Title	A method of multiple-case diagnostics in Cox proportional hazards model
Author*	Jimin SUNG
Author	Yutaka TANAKA
Presentation Style	poster
Abstract	So far influence analysis has been discussed by Cain and Lange(1984), Wei and Korosok(2000) among others. The former discusses single-case diagnostics using influence functions, and the latter multiple-case diagnostics using pairwise deletion and pairwise differentiation. The present paper proposes a method of multiple-case diagnostics in Cox regression with censored observations on the basis of PCA of influence functions with metric $V\hat{(-1)}$ ( $V$ : asymptotic covariance matrix of the estimated parameters), the basic idea of which is given by Tanaka(1994). The influence on the model selection is also discussed. A numerical example is given to show the usefulness of the proposed method.
Keywords	Cox proportional hazards model ,Local influence ,Influential subsets
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No.	P038
Title	Local Regression by Analytic Neural Network for Multiple View Shape Extraction
Author*	Mohamad Ivan Fanany
Author	Itsuo Kumazawa
Presentation Style	poster
Abstract	We introduce a local regression model of multiple-view 3D-shape reconstruction by an analytic NN. This model provides a framework to fuse few-view and erroneous depth maps information to form a more complete and more accurate shape representation. The main insight of this work is that the NN minimizes the depth map data error in one view using depth maps information obtained from other views observed under un-fixed light source positions relative to the object. The NN provides analytic mapping and learning of a polyhedron model to approximate the true shape of an object. We obtain exact and stable results through hierarchical reconstruction and annealing reinforcement. We provide the implementation of the NN used in this paper at <a href="http://kumazawa-www.cs.titech.ac.jp/~fanany/MV-SPRNN/mv-sprnn.html">http://kumazawa-www.cs.titech.ac.jp/~fanany/MV-SPRNN/mv-sprnn.html</a> .
Keywords	Local Regression ,Multiple View ,Shape Reconstruction
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No.	P039
Title	Multivariate Normal Mixture Model with Missing Regions
Author*	Nagatomo NAKAMURA
Author	Genta UENO
Author	Tomoyuki HIGUCHI
Author	Sadanori KONISHI
Presentation Style	poster
Abstract	Finite mixtures of multivariate distributions have been widely used as models in the fields of research such as biology, medicine, environmental science and so on. We consider the problem that normal mixture model is applied to the data which have a missing region in observation space. If we ignore the missing region, estimated parameters are biased. In order to overcome this problem, we construct the log-likelihood function with missing region probabilities, and show the estimators of the parameteres i.e. mixing proportions, mean vectors, and variance-covariance matrixes. Parameter estimation procedure via conditional EM algorithm is proposed. Moreover, we estimate number of observations in missing regions via estimated probabilities of missing region in mixture structure. It is applied to practical problems in plasma velocity data observed by GEOTAIL satellite.
Keywords	multivariate normal mixture ,missing region ,EM algorithm
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No.	P040
Title	Estimation of a number of components in multivariate normal mixture model using information criteria
Author*	Nagatomo NAKAMURA
Author	Sadanori KONISHI
Presentation Style	poster
Abstract	Finite mixtures of multivariate distributions have been widely used as models in the fields of research such as biology, medicine, environmental science and so on. When fitting finite mixture models to multivariate observations, the problem of estimating a number of components is fundamental and of importance. We consider the fitting of mixtures of multivariate normal distributions to classify data and propose the method of estimating the number of components based on information criteria. The clustering methods are used to find suitable initial structure of dataset, and then parameter estimates based on the classified data are taken as initial values in the EM algorithm (Nakamura, 1995). The bootstrap is applied to the bias correction for the log-likelihood of a predictive density in the estimation of the Kullback-Leibler information, for which we use the variance reduction technique in bootstrap simulation due to Konishi and Kitagawa (1996), Ishiguro, Sakamoto and Kitagawa (1997). Numerical comparisons are made to examine the efficiency of the proposed procedure. It is also applied to practical problems in medical diagnosis, taxonomy of species for continuous measurement datasets.
Keywords	Multivariate normal mixture ,EM algorithm ,bootstrap ,EIC
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No.	P041
Title	A Simple Scale for Modeling Additive and Multiplicative Phenomena
Author*	Shigeru KUMAZAWA
Presentation Style	poster
Abstract	The random quantities submitted to feedback have emerged progressively since the latter half of the 20th century. The distribution of individual doses to ionizing radiation shows a typical example of such quantities actually measured to avert the undue magnitude of risk. D. McAlister (1879) and J.C. Kaptein (1903) proved that there are many examples of random quantities under the law of proportionate effect in natural and sociological phenomena. However, now we often consider the consequence of human activities on the environment via a feedback mechanism. Based on dose distribution analyses, combining the law of proportionate effect and negative feedback, we have a simple model of two functions, respectively, similar to accelerator and brake pedals of automobiles. The law of proportionate effect produces the multiplicative random process but introducing a feedback mechanism into the process shifts it gradually from the multiplicative to the additive random process. Thus the law of proportionate effect with feedback mechanism results in random quantities that are normally distributed in a scale to unify the linear and the logarithmic scales, conveniently called " hybrid scale ". The paper presents how to use the hybrid scale for data analysis with the AIC statistics.
Keywords	Hybrid Scale ,Multiplicative ,Additive ,Feedback ,AIC
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No.	P042
Title	Nonstationary Bayesian times series analysis for network traffic by decomposition model into trend, periodic and AR components
Author	Taketomi Shimizu
Author*	Kazuyuki Imazu
Author	Norikazu Ikoma
Author	Kazuo Yana
Presentation Style	poster
Abstract	This paper describes a new statistical method for the analysis of dialup network traffic time series observed at a TCP/IP local area network. The target traffic is observed series of dialup access which is measured with SNMP at Hosei University. The logarithm of target traffic averaged on every one hour is used. We proposed a nonstationary Bayesian model that decompose the traffic series into trend, periodic and AR components. The components obtained by the model are as follows: trends which are smooth over several days and several hours; effect of days which has periodicity in a week, variation in a day which has periodicity in a day, and AR component. This paper revealed that nonstationary Bayesian times series analysis is suitable for decomposing the traffic series into trend, periodic and AR components.
Keywords	nonstationary Bayesian model ,time series decomposition ,network traffic ,TCP/IP ,Dialup access
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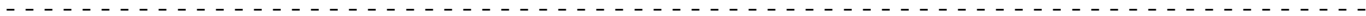
No.	P043
Title	The Model of Structural Analysis for Subdivided Cultures
Author*	Tetsuya ONODA
Presentation Style	poster
Abstract	It is hard to understand cultures nowadays which are too much diversified. Therefore we need following methods to grasp them. At First, we develop the social research site. If we call subdivided culture "sub-culture", sub-culture analysis needs a large amount of data that consisted of both various items and users as questions and respondents. It is impossible to get them by use of traditional "Paper Survey". However the data gathered through the Internet has huge noises. We must remove them by statistical technique. Sub-culture analysis ought to deal with not only popular items but also minor ones. Nevertheless it is true that items differ in characteristics with popularity. Therefore, the layer division based on the rates of cognition is indispensable. Furthermore, we carry out clustering items in each layer. The reason why that method required is because there are too many items especially in lower layers. To grasp their characteristics more effectively, the number of objects should be reduced. The above-mentioned process also means equalization about the amount of users included in every cluster between layers. Finally we execute the Kohonen-Network and draw Self-Organization-Map made of whole clusters. It tells us the structure of the phenomenon in the culture visually.
Keywords	Network Research ,Kohonen Network ,Self Organization Map ,Lifestyle Analysis ,Sub-Culture
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No.	P044
Title	Multiple current sources estimation by Akaike Information Criterion
Author*	Akira Tachikawa
Author	Shoogo Ueno
Presentation Style	poster
Abstract	With an array of high sensitive magnetic sensors, which are made by SQUID - Superconductive QUantum Interference Device, the higher-order function of human brain is measured and evaluated. However, when the current sources, which are caused by the activity of neurons, are analysed from the obtained time series data, the single or up to two or three current sources are usually assumed in the estimation. As an inverse-problem, the method of analyzing multiple current sources is an ill-posed problem. Then, the number of current sources was examined by using Akaike information criterion. Concretely, the renormalized factor analysis model under a physically constricted condition is used. Moreover, it has been devised to obtain the transition of the number of current sources when applying to not the entire time series data but the local time regional data. This method is tentatively named "MiSERU - Multiple current Source Estimation by Renormalized Untangler" meaning "to visualize" and hoping "to be attractive" for the science of modeling.
Keywords	current source estimation ,Akaike Information Criterion ,inverse problem ,factor analysis ,renormalization
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No.	P045
Title	Selecting optimal subset autoregressive models in possibly misspecified autoregressive time series
Author*	Ching-Kang Ing
Presentation Style	poster
Abstract	<p>In the literature, model selection problems are usually classified into two different categories according to whether the data generating process (DGP) is included among the family of candidate models. The first category (referred to as the category I) assumes that the DGP belongs to the candidate family. Under this assumption, the goal of model selection is usually placed on the correctness of selection. A model selection criterion is said to be consistent if it can choose the DGP with probability tending to 1. In the linear regression or linear time series models with finite-variance errors, BIC has been shown to possess this property. On the other hand, AIC, tending to choose a larger model, is not consistent in category I (Shibata, 1976). Category II assumes that the DGP is not one of the candidate models. In this case, choosing the model having the optimal prediction ability seems to be the most important issue. Shibata (1980, 1981) considered model selection problems along this direction. He showed that when the DGP is an <math>AR(\infty)</math> model or an infinite-parameter linear regression model and the number of the candidate models grows to <math>\infty</math> (at a certain rate) with the sample size, <math>n</math>, AIC is asymptotically efficient (AE) in the sense that it can choose a model with the smallest finite-sample mean-squared prediction error as <math>n</math> is sufficiently large. He also showed that BIC is not AE under the same settings. While being undoubtedly of theoretical interest, the results mentioned above suffer from the difficulty that judging which type of selection problem (category I or II) one encounters is nearly impossible. Therefore, the choice between AIC and BIC becomes a challenging problem. So far, no existing model selection rule has been shown to be optimal in both categories. This paper aims to resolve this difficulty. In particular, we propose a modification of accumulated prediction error (APE) of Rissanen and show that the proposed model selection criterion can choose the optimal subset autoregressive model (from the prediction point of view) in both categories. Some empirical results are also given to illustrate this theoretical result.</p>
Keywords	Misspecified autoregressive model ,Optimal forecasting ,Model selection ,Consistency ,Asymptotic efficiency
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No.	P046
Title	On association problem for sensor fusion in dynamic situation using particle filters
Author*	Wataru Ito
Author	Norikazu Ikoma
Author	Hiroshi Maeda
Presentation Style	poster
Abstract	Sensor fusion has possibility for intelligent data processing to recognize the world by integrating various information from multiple sensors, e.g., cameras, microphones and radars. It generally involves a problem where associations among sensors and/or between sensor and state are unknown. Here the number of combinations in the associations even for one sensor is factorial of the number of targets. Furthermore, the combination number increases drastically when there are missing and false detection in observation process. Our method estimates the unknown association and the target state simultaneously, while conventional ideas such as gating estimate the target state by firstly determining the association using current observation and then estimating the state by Kalman filter with given association. We employ a situation with cameras and microphones to track targets in 3D motion, and develop a novel model to achieve the tracking purpose. We use Rao-Blackwellised particle filter for the estimation since the model is conditionally linear with respect to the state for given associations. Efficiency of the proposed method has been illustrated by simulation experiment.
Keywords	sensor fusion ,association ,particle filters ,Rao-Blackwellization
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No.	P047
Title	A kernel method for hierarchical and non-hierarchical clustering
Author*	Kenji Fukumizu
Presentation Style	poster
Abstract	A new approach to define a similarity matrix for clustering is proposed. The method can be used for preprocessing of standard hierarchical methods, and also used for some non-hierarchical methods such as spectral clustering. The proposed approach uses the covariance operators in reproducing kernel Hilbert spaces to define the similarity of two data vectors. Thus, the similarity matrix can incorporate all the nonlinear correlation of given data in principle. The performance of this clustering method is compared with conventional methods through experiments on various data sets, including gene expression data.
Keywords	clustering ,similarity matrix ,kernel ,gene expression
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No.	P048
Title	An example of sequential Monte Carlo block sampling method
Author	Doucet, A.
Author*	Senecal, S.
Presentation Style	poster
Abstract	Sequential Monte Carlo methods are powerful algorithms to sample from sequences of complex probability distributions. They are mainly based on a combination of importance sampling and resampling techniques. The efficiency of these methods depends crucially on the sampling strategies adopted. In this paper, we present an extended importance sampling framework which allows much more freedom than standard techniques to impute random samples. This makes it possible to develop efficient and original sampling strategies. Applications to optimal filtering problems illustrate this approach.
Keywords	Monte Carlo ,sequential sampling ,optimal filtering
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No.	P049
Title	Adaptive Model Selection and Assessment for Exponential-Family Models
Author*	Hsin-Cheng Huang
Presentation Style	poster
Abstract	In many scientific and engineering problems, selecting the optimal model from a large pool of candidate models is important, particularly in data mining. In the literature, model assessment in a context of non-Normal distributions has not yet received a lot of attention. Indeed, many existing model selection criteria such as BIC and CP, which were developed based on the Normal distribution, may not be suitable for a situation in which the conditional mean and variance of the response are dependent, for instance, in the generalized-linear-model regression. In this article, we propose a new adaptive model selection criterion and construct an approximately unbiased Kullback-Leibler loss estimator for model assessment, in a context of exponential family distributions. This permits comparing any arbitrary complex modeling procedures. Our proposal utilizes a concept, we called generalized degrees of freedom, which generalizes the concept that was originally proposed for the Normal distribution. The proposed procedure is implemented for the Binomial and Poisson distributions and its small sample operating characteristics is examined via simulations. The usefulness of the method is demonstrated by an application to a study of the effect of air pollution on certain respiratory diseases. Numerical analyses supported the utility of the methodology.
Keywords	Adaptive Penalty ,AIC ,CV ,Generalized Degrees of Freedom ,Variable Selection
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No.	P050
Title	Convergence tests for MCMC draws
Author*	Hiroki Tsurumi
Author	Elena Goldman
Author	Elmira Valieva
Presentation Style	poster
Abstract	We examine three convergence tests for one dimensional chain of MCMC draws: two types of Kolmogorov-Smirnov tests and Geweke's test. Find that all of these tests are sensitive to the existence of autocorrelation in the draws, we modify the tests for autocorrelated draws and find that the fluctuation test, a version of Kolmogorov-Smirnov tests, performs best in terms of sizes and powers of the test. We suggest that we should use plots of draws and the fluctuation test to judge on convergence.
Keywords	monte carlo markov chain ,kolmogorov-Smirnov tests ,size of test ,power of test
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No.	P051
Title	Bayesian Inference in Smooth Transition Autoregressive Models
Author*	Hedibert Freitas Lopes
Author	Esther Salazar
Presentation Style	poster
Abstract	Our main goal is to perform fully Bayesian inference for the Logistic Smooth Transition Autoregressive model of order $k$ , LSTAR( $k$ ). We take into account the uncertainty about all the model's parameters and as well as the the model order, $k$ . A novel Reversible Jump Monte Carlo Markov Chain (RJMCMC) is tailored and its validity is tested in several simulated and real applications.
Keywords	nonlinear time series models ,objective prior ,gibbs sampling ,deviance information criterion ,canadian lynx
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No.	P052
Title	Analyzing earthquake clustering features by using stochastic reconstruction
Author*	Jiancang Zhuang
Author	Yosihiko Ogata
Author	David Vere-Jones
Presentation Style	poster
Abstract	Based on the ETAS (epidemic type aftershock sequence) model and the thinning procedure, this paper gives the methods on how to classify the earthquakes in a given catalogue into different clusters stochastically. The key technical points are the probabilities of one event being triggered by another previous event or being a background event. Making use of these probabilities, we reconstruct the functions associated with the characteristics of earthquake clusters, which enable us to test a number of important hypotheses about the earthquake clustering phenomena. The results show the following assertions: (a) The formulations for the clustering components in the ETAS model are good enough as a first approximation in describing earthquake clustering features; (b) the background events trigger offspring in a different way from the triggered events; (c) the magnitude distribution of a triggered event depends on the magnitude of its direct ancestor; (d) The diffusion of the aftershock sequence is mainly caused by the cascades of individual triggering processes, while each individual triggering process is not diffusive; (e) the spatial scales of the locations of the triggered events are not proportional to the triggering abilities of their direct ancestors, but proportional to the cubic roots of the energies released by their direct ancestors.
Keywords	stochastic declustering ,stochastic reconstruction ,earthquake cluster ,point process ,ETAS model
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No.	P053
Title	Network Structure Within Link Distribution Suitable For Packet Flow
Author*	Chiaki Yamaguchi
Author	Tsuyoshi Horiguchi
Presentation Style	poster
Abstract	Network structure is responsible for efficient communication through the network and robustness of the network by fault and attack. In order to investigate network structure for optimal communication on the network, we propose a simple numerical method for construction of the network. In this method, we introduce a cost function for the efficiency of packets communication and optimize the cost function by reconnecting links in the network. We apply this method to a routing control model for a packet flow proposed by Horiguchi and Ishioka, and find an optimal network for the packet flow. It turns out the obtained network has a small-world property but a different structure from Erdős and Rényi's random graph and the real Internet.
Keywords	Network ,Neural Network ,Packet Flow ,Graph Theory ,Statistical Mechanics
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