function apri_chiudi_div(id, tipo) { if(tipo == true) {
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document.getElementById("link_"+id).innerHTML = " [no abstract] "; } else {
document.getElementById("div_"+id).style.display = "none";
document.getElementById("link_"+id).innerHTML = " [abstract] "; } }

Journals [all BibTeX]

2021

N. Dal Fabbro, M. Rossi, G. Pillonetto, L. Schenato, G. Piro. **Model-free radio map estimation in massive MIMO systems via semi-parametric Gaussian regression.** *IEEE Wireless Communications Letters*, 2021 [url] [BibTeX]

2020

M. Todescato, A. Carron, R. Carli, G. Pillonetto, L. Schenato. **Efficient Spatio-Temporal Gaussian Regression via Kalman Filtering.** *Automatica*, vol. 118pp. 1-14, 2020 [url] [BibTeX]

2019

D. Varagnolo, G. Pillonetto, L. Schenato. **Distributed multi-agent Gaussian regression via finite-dimensional approximations.** *IEEE Transactions on Pattern Analysis and Machine Intelligence*, vol. 41(9), pp. 2098-2111, 2019 [url] [pdf] [BibTeX]

2017

G. Prando, G. Pillonetto, A. Chiuso. **Maximum Entropy Vector Kernels for MIMO system identification.** *Automatica (accepted as regular paper)*, 2017 [url] [BibTeX]

M. Todescato, A. Carron, R. Carli, G. Pillonetto, L. Schenato. **Multi-Robots Gaussian Estimation and Coverage Control: from Server-based to Peer-to-Peer Architecture.** *Automatica*, vol. 80pp. 284--294, 2017 [url] [pdf] [BibTeX]

2016

T. Chen, T. Ardeshiri, F.P. Carli, A. Chiuso, L. Ljung, G. Pillonetto. **Maximum entropy properties of discrete-time first-order stable spline kernel.** *Automatica*, 2016 [BibTeX]

D. Varagnolo, F. Zanella, A. Cenedese, G. Pillonetto, L. Schenato. **Newton-Raphson Consensus for Distributed Convex Optimization.** *IEEE Transactions on Automatic Control*, vol. 61(4), pp. 994--1009, 2016
Abstract:

We address the problem of distributed unconstrained convex optimization under separability assumptions, i.e., the framework where a network of agents, each endowed with local private multidimensional convex cost and subject to communication constraints, wants to collaborate to compute the minimizer of the sum of the local costs. We propose a design methodology that combines average consensus algorithms and separation of time-scales ideas. This strategy is proven, under suitable hypotheses, to be globally convergent to the true minimizer. Intuitively, the procedure lets the agents distributedly compute and sequentially update an approximated Newton-Raphson direction by means of suitable average consensus

ratios. We show with numerical simulations that the speed of convergence of this strategy is comparable with alternative optimization strategies such as the Alternating Direction Method of Multipliers. Finally, we propose some alternative strategies which trade-off communication and computational requirements with convergence speed.

[abstract] [url] [pdf] [BibTeX]

G. Pillonetto, T. Chen, A. Chiuso, G. De nicolao, L. Ljung. **Regularized linear system identification using atomic, nuclear and kernel-based norms: the role of the stability constraint.** *Automatica*, 2016 [url] [BibTeX]

2015

G. Pillonetto, A. Chiuso. **Tuning complexity in regularized kernel-based regression and linear system identification: the robustness of the marginal likelihood estimator.** *Automatica (accepted)*, 2015 [BibTeX]

2014

A. Aravkin, J. Burke, A. Chiuso, G. Pillonetto. **Convex vs non-convex estimators for regression and sparse estimation: the mean squared error properties of ARD and GLasso.** *Journal of Machine Learning Research*, (15), pp. 1-36, 2014 [BibTeX]

D. Varagnolo, G. Pillonetto, L. Schenato. **Distributed cardinality estimation in anonymous networks.** *IEEE Transactions on Automatic Control*, vol. 59(3), pp. 645-659, 2014
Abstract:

The knowledge of the size of a network, i.e.\ of the number of nodes composing it, is important for maintenance and organization purposes. In networks where the identity of the nodes or is not unique or cannot be disclosed for privacy reasons, the size-estimation problem is particularly challenging since the exchanged messages cannot be uniquely associated with a specific node. In this work, we propose a totally distributed anonymous strategy based on statistical inference concepts. In our approach, each node starts generating a vector of independent random numbers from a known distribution. Then nodes compute a common function via some distributed consensus algorithms, and finally they compute the Maximum Likelihood (ML) estimate of the network size exploiting opportune statistical inferences. In this work we study the performance that can be obtained following this computational scheme when the consensus strategy is either the maximum or the average. In the max-consensus scenario, when data come from absolutely continuous distributions, we provide a complete characterization of the ML estimator. In particular, we show that the squared estimation error decreases as $1/M$, where M is the amount of random numbers locally generated by each node, independently of the chosen probability distribution. Differently, in the average-consensus scenario, we show that if the locally generated data are independent Bernoulli trials, then the probability for the ML estimator to return a wrong answer decreases exponentially in M. Finally, we provide a discussion as how the numerical errors may affect the estimators performance under different scenarios.

[abstract] [pdf] [BibTeX]

T. Chen, M. Andersen, L. Ljung, A. Chiuso, G. Pillonetto. **System identification via sparse multiple kernel-based regularization using sequential convex optimization techniques.** *IEEE Transactions on Automatic Control*, 2014 [BibTeX]

2013

D. Varagnolo, L. Schenato, G. Pillonetto. **A variation of the Newton-Pepys problem and its connections to size-estimation problems.** *Statistics & Probability Letters*, (83), pp. 1472-1478, 2013
Abstract:

This paper considers a variation of the 17$^{\text{th}}$ century problem commonly known as the Newton-Pepys problem, or the John Smith's problem. We provide its solution, interpreting the result in terms of maximum likelihood estimation and Ockham's razor. In addition, we illustrate the practical relevance of these findings for solving size-estimation problems, and in particular for determining the number of agents in a wireless sensor network.

[abstract] [pdf] [BibTeX]

G. Pillonetto. **Consistent identification of Wiener systems: a machine learning viewpoint.** *Automatica (provisionally accepted)*, 2013 [BibTeX]

D. Varagnolo, S. Del Favero, F. Dinuzzo, L. Schenato, G. Pillonetto. **Finding Potential Support Vectors in linearly separable classification problems.** *IEEE Transactions on Neural Networks and Learning Systems*, vol. 24(11), pp. 1799-1813, 2013
Abstract:

The paper considers the classification problem using Support Vector Machines, and investigates how to maximally reduce the size of the training set without losing information. Under linearly separable dataset assumptions, we derive the exact conditions stating which observations can be discarded without diminishing the overall information content. For this purpose, we introduce the concept of Potential Support Vectors, i.e., those data that can become Support Vectors when future data become available. Complementary, we also characterize the set of Discardable Vectors, i.e., those data that, given the current dataset, can never become Support Vectors. These vectors are thus useless for future training purposes, and can eventually be removed without loss of information. We then provide an efficient algorithm based on linear programming which returns the potential and discardable vectors by constructing a simplex tableau. Finally we compare it with alternative algorithms available in the literature on some synthetic data as well as on datasets from standard repositories.

[abstract] [pdf] [BibTeX]

G. Bottegal, G. Pillonetto. **Regularized spectrum estimation using stable spline kernels.** *Automatica*, vol. 11(49), pp. 3199-3209, 2013 [pdf] [BibTeX]

2012

A. Chiuso, G. Pillonetto. **A Bayesian approach to sparse dynamic network identification.** *Automatica*, vol. 48(8), pp. 1553–-1565, 2012 [pdf] [BibTeX]

C. D'Avanzo, A. Goljahani, G. Pillonetto, G. De nicolao, G. Sparacino. **A multi-task learning approach for the extraction of single-trial evoked potentials.** *Computer methods and programs in biomedicine*, 2012 [BibTeX]

D. Varagnolo, G. Pillonetto, L. Schenato. **Distributed parametric and nonparametric regression with on-line performance bounds computation.** *Automatica*, vol. 48(10), pp. 2468 -- 2481, 2012

Abstract:

In this paper we focus on collaborative wireless sensor networks, where agents are randomly distributed over a region of interest and collaborate to achieve a common estimation goal. In particular, we introduce two consensus-based distributed linear estimators. The first one is designed for a Bayesian scenario, where an unknown common finite-dimensional parameter vector has to be reconstructed, while the second one regards the nonparametric reconstruction of an unknown function sampled at different locations by the sensors. Both of the algorithms are characterized in terms of the trade-off between estimation performance, communication, computation and memory complexity. In the finite-dimensional setting, we derive mild sufficient conditions which ensure that distributed estimator performs better than the local optimal ones in terms of estimation error variance. In the nonparametric setting, we introduce an on-line algorithm that allows the agents both to compute the function estimate with small computational, communication and data storage efforts, and to quantify its distance from the centralized estimate given by a Regularization Network, one of the most powerful regularized kernel methods. These results are obtained by deriving bounds on the estimation error that provide insights on how the uncertainty inherent in a sensor network, such as imperfect knowledge on the number of agents and the measurement models used by the sensors, can degrade the performance of the estimation process. Numerical experiments are included to support the theoretical findings.

[abstract] [pdf] [BibTeX]

G. Pillonetto, G. Erinc, S. Carpin. **Online estimation of covariance parameters using extended Kalman filtering and application to robot localization.** *Advanced Robotics*, vol. 18(26), pp. 2169--2188, 2012 [BibTeX]

G. Quer, R. Masiero, G. Pillonetto, M. Rossi, M. Zorzi. **Sensing, Compression and Recovery for WSNs: Sparse Signal Modeling and Monitoring Framework.** *IEEE Transactions on Wireless Communications*, vol. 11(10), pp. 3447--3461, 2012 [BibTeX]

2011

G. Pillonetto, M.H. Quang, A. Chiuso. **A new kernel-based approach for nonlinear system identification.** *IEEE Transactions on Automatic Control [accepted]*, 2011 [BibTeX]

A. Aravkin, B. Bell, J. Burke, G. Pillonetto. **An l1-Laplace robust Kalman smoother.** *IEEE Trans. on Automatic Control*, vol. 56(12), pp. 2898--2911, 2011 [BibTeX]

S. Peruzzo, F. Zanderigo, A. Bertoldo, G. Pillonetto, M. Cosottini, C. Cobelli. **Assessment on clinical data of nonlinear stochastic deconvolution versus Singular Value Decomposition for quantitative Dynamic Susceptibility Contrast-Magnetic Resonance Imaging.** *Magnetic Resonance Imaging*, vol. 7(29), 2011 [BibTeX]

F. Dinuzzo, G. Pillonetto, G. De nicolao. **Client-server multi-task learning from distributed datasets.** *IEEE Transactions on Neural Networks*, vol. 22(2), pp. 290--303, 2011 [BibTeX]

G. Pillonetto, A. Chiuso, G. De nicolao. **Prediction error identification of linear systems: a nonparametric Gaussian regression approach.** *Automatica*, (47), pp. 291-305, 2011 [BibTeX]

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Automatica, vol. 46(1), pp. 81-93, 2010 [BibTeX]

G. Pillonetto, F. Dinuzzo, G. De nicolao. **Bayesian on-line multi-task learning of Gaussian processes.** *IEEE Transactions on Pattern Analysis and Machine Intelligence*, vol. 32(2), pp. 193-205, 2010 [pdf] [BibTeX]

G. Pillonetto, A. Caumo, C. Cobelli. **Dynamic index of insulin sensitivity: importance in diabetes.** *American Journal of Physiology: Endocrinology and Metabolism*, vol. 298(3), pp. E440-E448, 2010 [BibTeX]

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B. Bell, J. Burke, G. Pillonetto. **An inequality constrained nonlinear Kalman-Bucy smoother by interior point likelihood maximization.** *Automatica*, vol. 45pp. 25--33, 2009 [pdf] [BibTeX]

G. Pillonetto, G. De nicolao, M. Chierici, C. Cobelli. **Fast algorithms for nonparametric population modeling of large data sets.** *Automatica*, vol. 45pp. 173--179, 2009 [BibTeX]

G. Pillonetto, A. Chiuso. **Fast computation of smoothing splines subject to equality constraints.** *Automatica*, vol. 45pp. 2842--2849, 2009 [pdf] [BibTeX]

F. Zanderigo, A. Bertoldo, G. Pillonetto, C. Cobelli. **Nonlinear Stochastic Regularization to Characterize Tissue Residue Function in Bolus-Tracking MRI: Assessment and Comparison With SVD Block-Circulant SVD and Tikhonov.** *IEEE Transactions on Biomedical Engineering*, vol. 56pp. 1287--1297, 2009 [BibTeX]

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G. Pillonetto. **Identification of time-varying systems in Reproducing Kernel Hilbert Spaces.** *IEEE Transactions on Automatic Control*, vol. 53pp. 2209, 2008 [BibTeX]

G. Pillonetto, B. Bell. **Optimal smoothing of non-linear dynamic systems via Monte Carlo Markov chains.** *Automatica*, vol. 44pp. 1676--1685, 2008 [BibTeX]

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E. Cinquemani, G. Pillonetto. **Wavelet estimation by Bayesian thresholding and model selection.** *Automatica*, vol. 44pp. 2288--2297, 2008 [BibTeX]

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2006

G. Pillonetto, A. Caumo, G. Sparacino. **A new dynamic index of insulin sensitivity.** *IEEE Transactions on Biomedical Engineering*, vol. 53pp. 369--379, 2006 [BibTeX]

G. Pillonetto, M. Saccomani. **Input estimation in nonlinear dynamic systems using differential algebra techniques.** *Automatica*, vol. 42pp. 1117--1129, 2006 [BibTeX]

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S. Carpin, G. Pillonetto. **Motion planning using adaptive random walks.** *IEEE Transactions on Robotics*, vol. 21pp. 129--136, 2005 [BibTeX]

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G. Pillonetto, B. Bell. **Deconvolution of nonstationary physical signals: a smooth variance model for insulin secretion rate.** *Inverse Problems*, vol. 20pp. 367--383, 2004 [BibTeX]

B. Bell, G. Pillonetto. **Estimating parameters and stochastic functions of one variable using nonlinear measurements models.** *Inverse Problems*, vol. 20pp. 627--646, 2004 [BibTeX]

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G. Pillonetto, G. Sparacino, C. Cobelli. **Numerical non-identifiability regions of the minimal model of glucose kinetics: superiority of Bayesian estimation.** *Mathematical Biosciences*, vol. 184pp. 53--67, 2003 [BibTeX]

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G. Pillonetto, G. Sparacino, C. Cobelli. **Handling non-negativity in deconvolution of physiological signals: a nonlinear stochastic approach.** *Annals of Biomedical Engineering*, vol. 8pp. 1077--1087, 2002 [BibTeX]

G. Pillonetto, P. Magni, R. Bellazzi, C. Cobelli. **Minimal model S(I)=0 problem in NIDDM subjects: nonzero Bayesian estimates with credible confidence intervals..** *American Journal of Physiology*, vol. 282pp. 564--573, 2002 [BibTeX]

G. Sparacino, G. Pillonetto, M. Capello, G. De nicolao, C. Cobelli. **Winstodec: a stochastic deconvolution interactive program for physiological and pharmacokinetic systems.** *Computer Methods and Programs in Biomedicine*, vol. 67pp. 67--77, 2002 [BibTeX]

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function apri_chiudi_div(id, tipo) { if(tipo == true) { document.getElementById("div_"+id).style.display = ""; document.getElementById("link_"+id).innerHTML = " [no abstract] "; } else { document.getElementById("div_"+id).style.display = "none"; document.getElementById("link_"+id).innerHTML = " [abstract] "; } }

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G. Pillonetto, A. Chiuso. **Identification of Stable Linear Systems Via the Sequential Stabilizing Spline Algorithm.** *Proceedings of SYSID 2018 (accepted)*, 2018 [BibTeX]

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M. Todescato, A. Dalla Libera, R. Carli, G. Pillonetto, L. Schenato. **Distributed Kalman Filtering for Time-Space Gaussian Processes (with proofs).** *20th World Congress of International Federation of Automatic Control (IFAC)*, pp. 13234--13239, 2017 [pdf] [BibTeX]

D. Varagnolo, G. Pillonetto, L. Schenato. **Statistical bounds for distributed Gaussian regression algorithms.** *56th IEEE Conference on Decision and Control (CDC17)*, 2017 [BibTeX]

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G. Prando, D. Romeres, G. Pillonetto, A. Chiuso. **Classical vs. Bayesian methods for linear system identification: point estimators and confidence sets.** *Proc. of ECC 2016*, 2016 [BibTeX]

T. Chen, G. Pillonetto, A. Chiuso, L. Ljung. **DC kernel - a stable generalized first order spline kernel.** *Proc. of CDC 2016 - accepted*, 2016 [BibTeX]

M. Todescato, A. Carron, R. Carli, L. Schenato, G. Pillonetto. **Machine Learning meets Kalman Filtering (with proofs).** *55th IEEE Conference on Decision and Control (CDC16)*, pp. 4594--4599, 2016 [pdf] [BibTeX]

D. Romeres, G. Prando, G. Pillonetto, A. Chiuso. **On-line Bayesian System Identification.** *Proc. of ECC 2016*, 2016 [BibTeX]

2015

D. Varagnolo, G. Pillonetto, L. Schenato. **Auto-tuning procedures for distributed nonparametric regression algorithms.** *European Control Conference ECC15*, 2015 [pdf] [BibTeX]

D. Romeres, G. Pillonetto, A. Chiuso. **Identification of stable models via nonparametric prediction error methods.** *Proc. of the European Control Conference*, 2015
Abstract:

A new Bayesian approach to linear system identification
has been proposed in a series of recent papers. The
main idea is to frame linear system identification as predictor
estimation in an infinite dimensional space, with the aid of
regularization/Bayesian techniques. This approach guarantees
the identification of stable predictors based on the prediction
error minimization. Unluckily, the stability of the predictors
does not guarantee the stability of the impulse response of
the system. In this paper we propose and compare various
techniques to guarantee that the final model identified following
this Bayesian approach is stable. First, we consider the socalled
“LMI - constraint” approach and adapt it to constrain
the eigenvalues of the estimated model within the unit circle.
A second possibility which is being considered is to add to the
“classic” Stable-Spline algorithm a penalty term, depending on
the maximum absolute value of the eigenvalue of the system.

This last technique has the advantage of being integrated directly inside the pre-existing optimization problem and not to simply post-process the estimated model to guarantee stability. Finally, we considered a Monte Carlo Markov Chain approach sampling in both the space of hyper-parameters and of impulse responses. Simulations results comparing these techniques will be provided.

[abstract] [BibTeX]

A. Carron, M. Todescato, R. Carli, L. Schenato, G. Pillonetto. **Multi-agents adaptive estimation and coverage control using Gaussian regression.** *European Control Conference (ECC'15)*, pp. 2490--2495, 2015 [pdf] [BibTeX]

G. Prando, G. Pillonetto, A. Chiuso. **On the role of rank penalties in linear system identification.** *Prof. of SYSID 2015*, 2015 [BibTeX]

T. Chen, G. Pillonetto, A. Chiuso, L. Ljung. **Spectral analysis of the DC kernel for regularized system identification.** *IEEE CDC 2015*, 2015 [BibTeX]

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T. Chen, M. Andersen, A. Chiuso, G. Pillonetto, L. Ljung. **Anomaly detection in homogenous populations: a sparse multiple kernel-based regularization method.** *IEEE CDC 2014*, 2014 [BibTeX]

A. Chiuso, G. Pillonetto. **Bayesian and nonparametric methods for system identification and model selection.** *Proc. of ECC 2014*, 2014 [BibTeX]

G. Prando, A. Chiuso, G. Pillonetto. **Bayesian and regularization approaches to multivariable linear system identification: the role of rank penalties.** *Proc. IEEE CDC*, 2014 [BibTeX]

A. Chiuso, T. Chen, L. Ljung, G. Pillonetto. **On the design of Multiple Kernels for nonparametric linear system identification.** *IEEE CDC 2014*, 2014 [BibTeX]

G. Bottegal, A. Aravkin, H. Hjalmarsson, G. Pillonetto. **Outlier robust system identification: a Bayesian kernel-based approach.** *IFAC World Congress*, 2014 [pdf] [BibTeX]

G. Pillonetto, A. Chiuso. **Tuning complexity in kernel-based linear system identification: the robustness of the marginal likelihood estimator.** *Proc. of ECC 2014*, 2014 [BibTeX]

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T. Chen, A. Chiuso, G. Pillonetto, L. Ljung. **Rank-1 kernels for regularized system identification.** *Proc. of IEEE Conf. on Dec. and Control (CDC2013)*, 2013 [BibTeX]

A. Chiuso, T. Chen, L. Ljung, G. Pillonetto. **Regularization strategies for nonparametric system identification.** *Proc. of IEEE Conf. on Dec. and Control (CDC2013)*, 2013 [BibTeX]

2012

F. Zanella, D. Varagnolo, A. Cenedese, G. Pillonetto, L. Schenato. **Asynchronous Newton-Raphson Consensus for Distributed Convex Optimization.** *3rd IFAC Workshop on Distributed Estimation and Control in Networked Systems (NecSys'12)*, 2012
Abstract:

We consider the distributed unconstrained minimization of separable convex costfunctions, where the global cost is given by the sum of several local and private costs, eachassociated to a specific agent of a given communication network. We specifically address anasynchronous distributed optimization technique called Newton-Raphson consensus. Besidehaving low computational complexity, low communication requirements and being interpretableas a distributed Newton-Raphson algorithm, the technique has also the beneficial properties ofrequiring very little coordination and naturally support time-varying topologies. In this workwe analytically prove that under some assumptions it shows local convergence properties, andcorroborate this result by means of numerical simulations.

[abstract] [url] [pdf] [BibTeX]

S. Del Favero, D. Varagnolo, G. Pillonetto. **Bayesian learning of probability density functions: a Markov chain Monte Carlo approach.** *IEEE Conference on Decision and Control (CDC 2012)*, 2012
Abstract:

The paper considers the problem of reconstructing a probability density function from a finite set of samples independently drawn from it. We cast the problem in a Bayesian setting where the unknown density is modeled via a nonlinear transformation of a Bayesian prior placed on a Reproducing Kernel Hilbert Space. The learning of the unknown density function is then formulated as a minimum variance estimation problem. Since this requires the solution of analytically intractable integrals, we solve this problem by proposing a novel algorithm based on the Markov chain Monte Carlo framework. Simulations are used to corroborate the goodness of the new approach.

[abstract] [pdf] [BibTeX]

D. Varagnolo, G. Pillonetto, L. Schenato. **Consensus based estimation of anonymous networks size using Bernoulli trials.** *2012 American Control Conference*, 2012
Abstract:

To maintain and organize distributed systems it is necessary to have a certain degree of knowledge of their status like the number of cooperating agents. The estimation of this number, usually referred as the network size, can pose challenging questions when agents' identification information cannot be disclosed, since the exchanged information cannot be associated to who originated it. In this paper we propose a totally distributed network size estimation strategy based on statistical inference concepts that can be applied under anonymity constraints. The scheme is based on the following paradigm: agents locally generate some Bernoulli trials, then distributedly compute averages of these generated data, finally locally compute the Maximum Likelihood estimate of the network size exploiting its probabilistic dependencies with the previously computed averages. In this work we study the statistical properties of this estimation strategy, and show how the probability of returning a wrong evaluation decreases exponentially in the number of locally generated trials. Finally, we discuss how practical implementation issues may affect the estimator, and show that there exists a neat phase transition between insensitivity to

numerical errors and uselessness of the results.

[abstract] [pdf] [BibTeX]

F.P. Carli, A. Chiuso, G. Pillonetto. **Efficient algorithms for large scale linear system identification using stable spline estimators.** *Proc. of SYSID 2012*, 2012 [BibTeX]

F. Zanella, D. Varagnolo, A. Cenedese, G. Pillonetto, L. Schenato. **Multidimensional Newton-Raphson consensus for distributed convex optimization.** *2012 American Control Conference*, 2012
Abstract:

In this work we consider a multidimensional distributed optimization technique that is suitable for multiagents systems subject to limited communication connectivity. In particular, we consider a convex unconstrained additive problem, i.e. a case where the global convex unconstrained multidimensional cost function is given by the sum of local cost functions available only to the specific owning agents. We show how, by exploiting the separation of time-scales principle,the multidimensional consensus-based strategy approximates a Newton-Raphson descent algorithm. We propose two alternative optimization strategies corresponding to approximations of the main procedure. These approximations introduce tradeoffs between the required communication bandwidth and the convergence speed/accuracy of the results. We provide analytical proofs of convergence and numerical simulations supporting the intuitions developed through the paper.

[abstract] [url] [pdf] [BibTeX]

F.P. Carli, T. Chen, A. Chiuso, L. Ljung, G. Pillonetto. **On the estimation of hyperparameters for Bayesian system identification with exponential kernels.** *51st IEEE Conference on Decision and Control (CDC 2012)*, 2012 [BibTeX]

A. Aravkin, J. Burke, A. Chiuso, G. Pillonetto. **On the estimation of hyperparameters for Empirical Bayes estimators: Maximum Marginal Likelihood vs Minimum MSE.** *Proc. of SYSID 2012*, 2012 [BibTeX]

A. Aravkin, J. Burke, A. Chiuso, G. Pillonetto. **On the MSE Properties of Empirical Bayes Methods for Sparse Estimation.** *Proc. of SYSID 2012*, 2012 [BibTeX]

G. Bottegal, G. Pillonetto. **Regularized spectrum estimation in spaces induced by stable spline kernels.** *Proc. of IEEE ACC*, 2012 [pdf] [BibTeX]

T. Chen, L. Ljung, M. Andersen, A. Chiuso, F.P. Carli, G. Pillonetto. **Sparse multiple kernels for impulse response estimation with majorization minimization algorithms.** *51st IEEE Conference on Decision and Control (CDC 2012)*, 2012 [BibTeX]

F. Zanella, D. Varagnolo, A. Cenedese, G. Pillonetto, L. Schenato. **The convergence rate of Newton-Raphson consensus optimization for quadratic cost functions.** *IEEE Conference on Decision and Control (CDC 2012)*, 2012
Abstract:

We consider the convergence rates of two peculiar2 convex optimization strategies in the context of multi

agent3 systems, namely the Newton-Raphson consensus optimization4 and a distributed Gradient-Descent opportunely derived from5 the first. To allow analytical derivations, the convergence6 analyses are performed under the simplificative assumption of7 quadratic local cost functions. In this framework we derive8 sufficient conditions which guarantee the convergence of the9 algorithms. From these conditions we then obtain closed form10 expressions that can be used to tune the parameters for11 maximizing the rate of convergence. Despite these formulae12 have been derived under quadratic local cost functions13 assumptions, they can be used as rules-of-thumb for tuning14 the parameters of the algorithms in general situations.

[abstract] [url] [pdf] [BibTeX]

2011

A. Aravkin, J. Burke, A. Chiuso, G. Pillonetto. **Convex vs nonconvex approaches for sparse estimation: Lasso, Multiple Kernel Learning and Hyperparameter Lasso.** *IEEE CDC 2011 (accepted)*, 2011 [pdf] [BibTeX]

F. Zanella, D. Varagnolo, A. Cenedese, G. Pillonetto, L. Schenato. **Newton-Raphson consensus for distributed convex optimization.** *IEEE Conference on Decision and Control (CDC 2011)*, 2011
Abstract:

In this work we study the problem of unconstrained distributed optimization in the context of multi-agents systems subject to limited communication connectivity. In particular we focus on the minimization of a sum of convex cost functions, where each component of the global function is available only to a specific agent and can thus be seen as a private local cost. The agents need to cooperate to compute the minimizer of the sum of all costs. We propose a consensus-like strategy to estimate a Newton-Raphson descending update for the local estimates of the global minimizer at each agent. In particular, the algorithm is based on the separation of time-scales principle and it is proved to converge to the global minimizer if a specific parameter that tunes the rate of convergence is chosen sufficiently small. We also provide numerical simulations and compare them with alternative distributed optimization strategies like the Alternating Direction Method of Multipliers and the Distributed Subgradient Method.

[abstract] [pdf] [BibTeX]

S. Del Favero, D. Varagnolo, F. Dinuzzo, L. Schenato, G. Pillonetto. **On the discardability of data in Support Vector Classification problems.** *IEEE Conference on Decision and Control (CDC 2011)*, 2011

Abstract:

We analyze the problem of data sets reduction

for support vector classification. The work is also motivated

by distributed problems, where sensors collect binary mea-

surements at different locations moving inside an environment that needs to be divided into a collection of regions labeled in two different ways. The scope is to let each agent retain and exchange only those measurements that are mostly informative for the collective reconstruction of the decision boundary. For the case of separable classes, we provide the exact conditions and an efficient algorithm to determine if an element in the training set can become a support vector when new data arrive. The analysis is then extended to the non-separable case deriving a sufficient discardability condition and a general data selection scheme for classification. Numerical experiments relative to the distributed problem show that the proposed procedure allows the agents to exchange a small amount of the collected data to obtain a highly predictive decision boundary.

[abstract] [pdf] [BibTeX]

2010

D. Varagnolo, G. Pillonetto, L. Schenato. **Distributed consensus-based Bayesian estimation: sufficient conditions for performance characterization.** *2010 American Control Conference*, 2010 [pdf] [BibTeX]

D. Varagnolo, G. Pillonetto, L. Schenato. **Distributed statistical estimation of the number of nodes in Sensor Networks.** *Conference on Decision and Control CDC10*, 2010
Abstract:

The distributed estimation of the number of active sensors in a network can be important for estimation and organization purposes. We propose a design methodology based on the following paradigm: some locally randomly generated values are exchanged among the various sensors and thus modified by known consensus-based strategies. Statistical analysis of the a-consensus values allows estimation of the number of participant sensors. The main features of this approach are: algorithms are completely distributed, since they do not require leader election steps; sensors are not requested to transmit authenticative information (for example identificative numbers or similar data), and thus the strategy can be implemented whenever privacy problems arise. After a rigorous formulation of the paradigma we analyze some practical examples, fully characterize them from a statistical point of view, and finally we provide some general

theoretical results and asymptotic analyses.

[abstract] [pdf] [BibTeX]

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