

Computation and Econometrics Workshop

The objective of the workshop is to bring together researchers in the fields of statistical computation and econometrics and promote the exchange of information between these areas. The workshop aims to be a forum that fosters communication and discussions of the relative merits of new computational strategies, with a particular focus on their application to econometrics and economic policy making.

We had two workshops:

First Workshop:

Organizers: Norikazu Ikoma (NIT), Roberto Leon-Gonzalez (GRIPS), Takashi Tsuchiya (GRIPS)

Date: 27th July 2018

Venue: The National Art Center, Roppongi, Tokyo

Program: http://pf.sozolab.jp/July_2018_ComputationAndEconometricsWorkshop.pdf

Second Workshop:

Organizer: Roberto Leon-Gonzalez

Date: 27-28th February 2019

Venue: National Graduate Institute for Policy Studies (GRIPS)

Program: <https://sites.google.com/site/compecono/home/program-27-28-february-2019>

First Workshop

The workshop was attended by 10 people. Among them there were 2 faculty members from GRIPS, 1 student from GRIPS, and the other 9 participants came from other universities and research institutes.

There were 4 invited presentations, each one consisting of one hour including question time. The topics related to new computational strategies for building faster algorithms for the analysis of data. Takashi Tsuchiya (GRIPS) presented research about reducing computation time through more efficient use of memory in the context of state-space models. Jeremy Heng (Harvard University) presented research that uses iterative optimization to build better proposal densities for Sequential Monte Carlo. Roberto León-González presented research on new models and computational methods for time-series data with time-varying variance-covariance matrices with common heteroskedasticity. Arnaud Doucet (University of Oxford) presented new techniques to speed up the estimation of models in which the likelihood cannot be evaluated, such as models with many latent variables.

After the workshop the participants went together for dinner.

Photos of the Workshop: 27th July 2018



Program:

Computation and Econometrics Workshop @ The National Art Center, Tokyo (July 27, 2018) Agenda

(13:00-13:05)

Opening remarks

1. (13:05-14:05)

“A few topics on state space modeling”

Prof. Takashi Tsuchiya (National Graduate Institute for Policy Studies)

Abstract: In this talk, we present two specific topics on state space modeling; one on algorithm, the other on application. The first topic is an application of check-pointing to smoothing in particle filter. Check-pointing is a technique proposed by Griewank to save memory required in a generic forward-backward computational procedure. If we apply the technique to particle filter smoothing, we can reduce the required memory from $O(TM)$ to $O(M \log T)$ at the cost of $O(\log T)$ times of filtering (instead of once), where T is the length of the time series and M is the number of particles. We show an easy implementation of this procedure using binary number representation. The second topic is an application of space-state model for analyzing the video image of two mice moving around in a cage. Human observers are asked to score the degree of social interaction from zero to a hundred point. We develop a hidden Markov model to segment the video according into two states "interactive" and "indifferent" automatically. We analyze how this binary time series is related to the aforementioned score by observers. The first part is a joint work with Kazuyuki Nakamura, and the second part is a joint work with Toshiya Arakawa, Aki Takahashi and Tsuyoshi Koide.

2. (14:10-15:10)

“Controlled sequential Monte Carlo”

Jeremy Heng, Ph.D. (Harvard University)

(<https://arxiv.org/pdf/1708.08396.pdf>)

Joint work with:

Adrian N. Bishop: Data61 (CSIRO) and the University of Technology, Sydney, Australia

George Deligiannidis: Department of Statistics, Oxford University, UK

Arnaud Doucet: Department of Statistics, Oxford University, UK

Abstract: Sequential Monte Carlo (SMC) methods are a set of simulation-based techniques used to approximate high-dimensional probability distributions and their normalizing constants. They have found

numerous applications in statistics as they can be applied to perform state estimation for state-space models and inference for complex static models. Like many Monte Carlo sampling schemes, they rely on proposal distributions which have a crucial impact on their performance. In this talk, I will introduce a class of controlled SMC algorithms where the proposal distributions are determined by approximating the solution of an associated optimal control problem using an iterative scheme. Connections to existing work and some theoretical results on our proposed methodology will be discussed. Significant gains over state-of-the-art methods at a fixed computational complexity will also be illustrated on a variety of applications.

3. (15:20-16:20)

“Multivariate Stochastic Volatility with Partial Homoscedasticity”

Prof. Roberto Leon-Gonzalez (National Graduate Institute for Policy Studies)

Joint work with:

Joshua Chan : University of Technology Sidney

Arnaud Doucet: University of Oxford

Rodney W. Strachan: University of Queensland

Abstract: This paper develops a new methodology that decomposes the shocks into homoscedastic and heteroscedastic components. The heteroscedastic part of the model uses a multivariate stochastic volatility inverse Wishart process. The model is invariant to the ordering of the variables, and allows estimation in relatively high-dimensions. The computational strategy uses a novel particle filter algorithm and a reparameterization that substantially improves algorithmic convergence. We apply the methods to a large VAR using US macroeconomic variables, and estimate the impact of monetary policy on the homoscedastic and heteroscedastic components of macroeconomic variables.

4. (16:25-17:25)

“The Correlated Pseudo-Marginal Method”

Prof. Arnaud Doucet (University of Oxford)

Abstract: The pseudo-marginal algorithm is a popular Metropolis–Hastings-type scheme which samples asymptotically from a target probability density when we are only able to estimate unbiasedly an unnormalised version of it. However, for the performance of this scheme not to degrade as the number T of data points increases, it is typically necessary for the number N of Monte Carlo samples to be proportional to T to control the relative variance of the likelihood ratio estimator appearing in the acceptance probability of this algorithm. The correlated pseudo-marginal algorithm is a modification of the pseudo-marginal method using a likelihood ratio estimator computed using two correlated likelihood estimators. For random effects models, we show under regularity conditions that the parameters of this scheme can be selected such that the relative variance of this likelihood ratio estimator is controlled when N increases sublinearly with T and we provide guidelines on how to optimize the parameters of the algorithm based on a non-standard weak convergence analysis. The efficiency of computations for Bayesian inference relative to the pseudo-marginal method empirically increases with T and is higher than two orders of magnitude in some of our examples.

(17:25-17:30)

Closing remarks

Names	Affiliation	Title
Norikazu Ikoma	Nippon Institute of Technology	Professor
Toshiya Arakawa	Aichi University of Technology	Professor
Junichiro Hagiwara	NTT Docomo and Hokkaido University	Visiting Professor, Senior Manager
Tahashi Tsuchiya	GRIPS	Professor
Roberto Leon-Gonzalez	GRIPS	Professor
Jeremy Heng	Harvard University	Postdoctoral Fellow
Koichiro Suzuki	DENSO IT LABORATORY	Researcher
Kei Takahashi	Gunma University	Associate Professor
Le Ha Thu	GRIPS	PhD Student
Arnaud Doucet	University of Oxford	Professor

Second Workshop

The workshop was attended by 50 people. Among them there were 22 GRIPS students, 3 faculty members from GRIPS and 25 participants from other universities.

The workshop aimed to be a venue where participants could not only present their research, but also get to know each other, share opinions, talk about the merits of new computational and statistical methods, and get ideas for new research directions and potential collaborations. For this purpose, the timetable allowed ample time for the presentations with discussions and also included social activities such as coffee breaks, lunch and dinner. One more important characteristic of the workshop is that it gathered not only researchers specialized in econometrics but also researchers specialized in statistics and computation, so as to promote the exchange of information between these areas. The presenters came from many diverse countries, such as Australia, France, Germany, Japan, Russia, UK and US.

In the first day of the workshop there were 5 hours and 15 minutes of presentations, 45 minutes for coffee breaks, a lunch break of 1 hour and 30 minutes, and a conference dinner that lasted about 2 hours. In the second day of the workshop there were 6 hours and 5 minutes of presentations, 30 minutes for coffee breaks and a lunch break of 1 hour and 30 minutes.

There were in total 5 keynote presentations, and 11 contributed presentations. Each keynote talk lasted 1 hour, consisting of a 40 minutes presentation, 10 minutes interaction of the keynote speaker with the discussant, and 10 additional minutes for question/answers from the other participants. Each contributed talk lasted 35 minutes, with 30 minutes for the presentation and 5 minutes for questions and answers.

The contents of the presentations were about new developments in statistical and econometric methods, with a special focus on new computational strategies to analyze more complex models and bigger datasets. The talks of the keynote speakers related to new algorithms to optimize complex functions of the data using state-space methods (Rong Chen, Rutgers University), new algorithms that scale better with the number of unknown parameters and can better handle big data (Arnaud Doucet, University of Oxford), new algorithms that make better use of parallel computing architectures (Pierre Jacob, Harvard University), faster and more efficient algorithms to analyze complex models with many latent variables (Robert Kohn, University of New South Wales), and new strategies to analyze a large number of macroeconomic time series with more complex models with the purpose of improving forecasting and the analysis of macroeconomic policy (Gary Koop, University of Strathclyde).

The contributed presentations were related to a variety of topics, such as new fast methods to find approximations of complex models through variational Bayes (Pierre Alquier (ENSAE), Ramis A. Khabibullin (Bank of Russia and HSE)), new strategies to estimate policy responses exploiting time-varying variances and new computational strategies (Robin Braun (University of Konstanz), Eric Eisenstat (University of Queensland) and Mengheng Li (University of Technology Sydney)), new and more flexible

stochastic volatility models (Roberto Leon-Gonzalez (GRIPS) and Minh-Ngoc Tran (The University of Sydney)), new models to analyze large datasets of sales using factor models (Yinxing Li (Tohoku University)), new models to analyze the data with minimum assumptions and convenient algorithms (Dale Poirier (University of California, Irvine)), new methods to reduce the number of parameters in complex models (Rodney Strachan (University of Queensland)), and new methods to analyze the sensitivity of the estimates to the prior distribution and to analyze algorithmic convergence (Dan Zhu (Monash University)).

Photos of the Workshop: 27-28th February 2019



Keynotes:



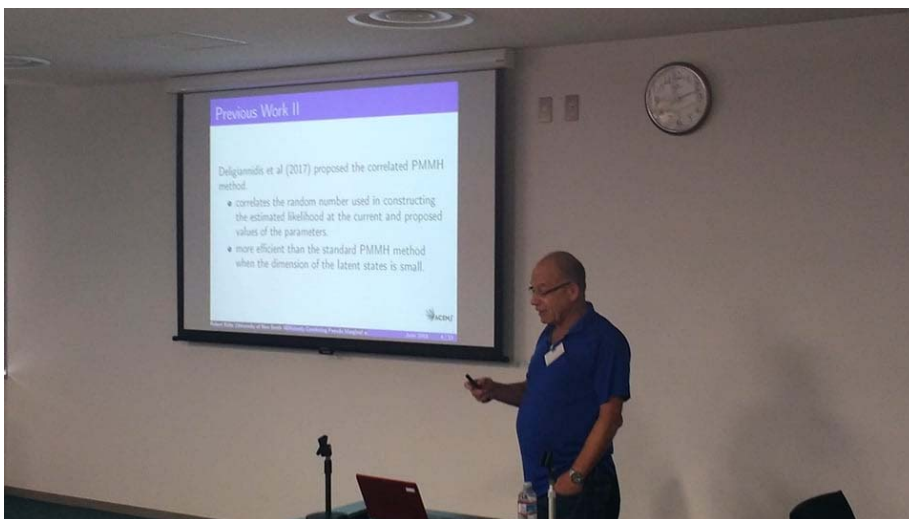
Rong Chen (Rutgers University)



Arnaud Doucet (University of Oxford)



Pierre E. Jacob (Harvard University)



Robert Kohn (University of New South Wales)



Gary Koop (University of Strathclyde)

Photos of Coffee Breaks:



Pierre E. Jacob and Dale Poirier



Rodney Strachan and Gary Koop



Katsuhiro Sugita and Yasuhiro Omori



Minh-Ngoc Tran and Robert Kohn



Dan Zhu and Arnaud Doucet

Photos of Contributed Presentations:



Pierre Alquier, ENSAE



Robin Braun (University of Konstanz)



Eric Eisenstat, University of Queensland



Ramis A. Khabibullin, Bank of Russia and HSE



Roberto León-González (GRIPS)



Yinxing Li, Tohoku University



Dale Poirier, University of California, Irvine



Rodney Strachan (University of Queensland)



Minh-Ngoc Tran, University of Sydney



Dan Zhu, Monash University

Program, 27-28 February 2019

Venue: GRIPS, Room 3C

Wednesday, 27th February 2019

9:00→9:15 Welcome Coffee

Session 1

Chair: Eric Eisenstat (University of Queensland)

9:15→9:50 Dale Poirier, University of California, Irvine

Title: "Mostly Harmless Bayesian Econometrics"

9:50→10:25 Pierre Alquier, ENSAE

Title: "[Concentration of tempered posteriors and of their variational approximations](#)"

Coauthor: James Ridgway (Capital Fund Management, Paris)

10:25→10:40 Coffee break

Session 2

Chair: Rodney Strachan (University of Queensland)

10:40→11:40 Keynote Talk: Gary Koop, University of Strathclyde

Title: "[Variational Bayesian Inference in Large Vector Autoregressions with Hierarchical Shrinkage](#)"

Coauthors: Deborah Gefang (University of Leicester) and Aubrey Poon (University of Strathclyde)

Discussant: Pierre Alquier, ENSAE

Lunch Break

Session 3

Chair: Dale Poirier (University of California, Irvine)

13:25→14:00 Dan Zhu, Monash University.

Title: "Automated Sensitivity Analysis for Bayesian Inference via Markov Chain Monte Carlo:
A New Approach for Prior Robustness and Convergence Analysis"

Coauthors: Liana Jacobi (University of Melbourne), Mark Joshi (University of Melbourne)

14:00→15:00 Keynote Talk: Robert Kohn, University of New South Wales

Title: "[Efficiently Combining Pseudo Marginal and Particle Gibbs Sampling](#)"

Coauthors: David Gunawan (University of New South Wales) and Chris Carter (University of New South Wales)

Discussant: Yasuhiro Omori (University of Tokyo)

15:00→15:15 Coffee break

Session 4

Chair: Katsugiro Sugita (University of the Ryukyus)

15:15→15:50 Rodney Strachan, University of Queensland.

Title: [“Reducing Dimensions in a Large TVP-VAR”](#)

Coauthors: Eric Eisenstat (University of Queensland), Joshua C.C. Chan (Purdue University)

15:50→16:50 **Keynote Talk: Pierre E. Jacob, Harvard University**

Title: [“Unbiased Markov chain Monte Carlo”](#)

Coauthors: John O’Leary (Harvard University), Yves F. Atchadé (Boston University)

Discussant: Minh-Ngoc Tran (The University of Sydney)

Conference Dinner (by invitation only)

Thursday, 28th February 2019

Session 5

Chair: Genya Kobayashi (University of Chiba)

9:00→9:35 Ramis A. Khabibullin, Bank of Russia and National Research University, Higher School of economics.

Title: “Stochastic Gradient Variational Bayes for the Estimation of Macroeconomic Models”

Coauthor: Sergei Seleznev (Bank of Russia)

9:35→10:10 Yinxing Li, Tohoku University.

Title: [“Measuring Large-Scale Market Responses and Forecasting Aggregated Sales -Regression for High-Dimensional Sparse Data -”](#)

Coauthor: Nobuhiko Terui (Tohoku University)

10:10→10:45 Minh-Ngoc Tran, The University of Sydney.

Title: “A long short-term memory stochastic volatility model”

10:45→11:00 Coffee Break

Session 6

Chair: Norikazu Ikoma (Nippon Institute of Technology)

11:00→12:00 **Keynote Talk: Arnaud Doucet, University of Oxford**

Title: [“Piecewise Deterministic Markov chain Monte Carlo”](#)

Coauthors: Paul Vanetti (U. of Oxford), Alexandre Bouchard-Côté (U. of British Columbia) and George Deligiannidis (U. of Oxford)

Discussant: Roberto Leon-Gonzalez (GRIPS)

Session 7

Chair: Jau-er Chen (Tokyo International University)

13:45→14:20 Eric Eisenstat, University of Queensland,

Title: "Structural Bayesian Inference and Efficient Computation Using VARMA with Heteroskedastic Errors"

Coauthor: Gregor Kastner (Vienna University of Economics and Business)

14:20→15:20 **Keynote Talk: Rong Chen, Rutgers University**

Title: "High Dimensional Optimization through State Space Emulation and Sequential Monte Carlo"

Discussant: Mengheng Li (University of Technology Sydney)

15:20→15:35 Coffee break

Session 8

Chair: Badr-Eddine Chérif-Abdellatif (Université Paris-Saclay, CREST-ENSAE)

15:35→16:10 Roberto Leon-Gonzalez, GRIPS

Title: "[Multivariate Stochastic Volatility with Co-Heteroscedasticity](#)"

Coauthors: Joshua C.C. Chan (Purdue University), Arnaud Doucet (University of Oxford), Rodney W. Strachan (University of Queensland)

16:10→16:45 Robin Braun, University of Konstanz,

Title: "[Identification of Structural Vector Autoregressions by Stochastic Volatility](#)"

Coauthor: Dominik Bertsche (University of Konstanz)

16:45→17:20 Mengheng Li, University of Technology Sydney.

Title: "Identifying interactions between permanent and transitory shocks via multivariate simultaneous unobserved components models with heteroskedasticity"

Coauthor: Ivan Mendieta-Muñoz (University of Utah)