conference program

chicago, usa
august 14-16, 2013

fifth international symposium on

recurrence plots

a multidisciplinary forum for recurrence methods & their applications

LOYOLA
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Scientific and Organisational Committee

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Aims

Advances in recurrence quantification analysis (RQA) and its applications in many fields of science and technology are accumulating at a very rapid rate. The Fifth International Symposium on Recurrence Plots will provide the community of recurrence analysis users a focused venue for communication and collaboration that cuts across interdisciplinary boundaries. Recurrence plots and RQA have proven to be valuable data visualization and analysis tools in the study of complex, time-varying dynamical systems in biology, mathematics, neuroscience, kinesiology, psychology, physiology, engineering, physics, geosciences, linguistics, finance, economics, and other disciplines. Consistent with this, the meeting will have a highly interdisciplinary focus. Special areas of emphasis will include applications to biological systems and the analysis of coupled systems using cross-recurrence methods. The symposium will be held August 14-16, 2013 at the Water Tower Campus of Loyola University Chicago. We hope everybody will enjoy the meeting and find new inspirations and cooperations.

Location

The symposium will be held at the the Water Tower Campus, 2 blocks from Michigan Avenue's Magnificent Mile and a short walk or ride from major Chicago attractions.

Lectures

The meeting rooms are in the Corboy Law Center on the 25 E. Pearson St. (#3 in the map).

The lecture room is 206. Posters and discussion will be in room 207 (adjacent rooms).

Practical Workshop

In the symposium, several approaches of analysing recurrences can be practically applied to one's own data under supervision. Instructive presentations introduce in the *RQA software* and the *CRP toolbox*. A comprehensive RQA, study of interrelations, synchronisations or dynamical invariants can be provided.

The practical workshop will take place in the computer lab 710 of the Corboy Law School.

Lunch

Lunch will be served at Nina's café in the lower level of Corboy Law School.

Social Events

Thursday, August 15

For Thursday, 19:30, we have organised an optional *Millennium Park Event* with a Picnic Dinner and Jazz Concert with Dana Hall and Black Fire. Please complete your order for your picnic meal with Connie Webber at the registration desk.

Friday, August 16

For Friday evening we have arranged an optional Chicago Architecture River Cruise. The meeting point is at the dock at 17:00. The boat leaves 17:30. The costs for conference participants is US$20, for guests US$40. Please pay the tour at Connie Webber at the registration desk.

After the boat trip, consider trying a Chicago style deep dish pizza at Gino's at 162 E. Superior Street (about 12 blocks north of Millennium Park and close to Michigan Ave.). More information on Ginos Pizza will be provided in the conference packet.

Internet Access

Open a web browser and go to

netreg1.luc.edu

(at the Lake Shore Campus) or

netreg2.luc.edu

(at the Water Tower Campus) in order to register your device. Follow the "REGISTER NOW" link and select the "Loyola Guests" option. Enter the following Conference ID and Conference Password:

Conference ID: FISymposium
Conference Password: lu449781

Finish the registration by entering your personal information.

Presentations

The speakers have to upload their presentation to the computer in the lecture hall in advance of their talk (in the morning of the day of their talk). The time for the talk is 17 min, plus 3 min discussion (invited talks are 40 min, plus 5 min discussion).

Both MacOS and Windows machines will be available, installed with standard presentation software (PowerPoint, Acrobat, Preview, and Keynote). You may also bring your own computer or presentation device provided that it is fitted with the appropriate VGA output and that you are capable of installing and testing the machine prior to the scheduled session time.

Collection of Presentations

The symposium will adhere to the rules of good scientific and ethical practice. This means that it is not allowed to copy presentations from the presentation computer. It is also forbidden to take photographs of oral presentations and presented posters without explicitly given permission of the presenter.

We will provide a platform for sharing the presentations after the symposium in a secure way (password protected web site, secured pdf documents). We will ask the authors of the presentations to give a written permission for this purpose during the symposium. Without such a written permission, presentation files on the presentation computer will be deleted after the symposium.

Note

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Program

Tuesday, August 13th

18:00 Registration reception (until 21:00)
Baumhart Residence Hall, Foyer

Wednesday, August 14th

8:00 Registration & pay for registrations
Corboy Law School, Classroom #207

Introduction

9:00 **Charles L. Webber, Jr.:**
Opening Greetings

9:15 **Norbert Marwan:**
Introduction Lecture Potential Pitfalls in Recurrence Plot Analysis

Methodological Aspects

9:30 **Hui Yang:**
Keynote Lecture Multiscale analysis of recurrence patterns

10:15 Oleg Granichin, Olga Granichina, **Vladimir Kiyaev:**
Recurrence plots and randomization possibilities

10:35 *Coffee/tea break*

11:10 **Elbert E. N. Macau**, Laurita dos Santos, Jose Roberto C. Piqueira:
Quantifying the complexity in a recurrence plot

11:30 **Leonardo Lancia:**
Application of recurrence and cross recurrence analysis to the study of nonstationary signals from speech production

11:50 **Ioana Cornel**, Alexandru Serbanescu, Angela Digulescu, Florin-Marian Birleanu, Ion Candel:
Recent advances in non-stationary signal processing using recurrence plots

12:10 J.H. Feldhoff, **R.V. Donner**, J.F. Donges, N. Marwan, J. Kurths:
Geometric signatures of complex synchronization scenarios – A recurrence network perspective

Abstracts

of the duration of an OR procedure, the muscle group experiencing the least fatigue has close DI values at the beginning and theend of the procedure; for the subject from which data has so far been analyzed, the bilateral trapezius seem to be the least fatigued.

Forecasting nonlinear dynamics of chaotic systems using conceptions of chaos and recurrence plots method *Poster*

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Nonlinear modeling of chaotic processes is based on the concept of a compact geometric attractor, which evolve with measurements. We present an advanced approach to analysis and forecasting nonlinear dynamics of chaotic systems, based on conceptions of chaos and recurrence plots method. As example, a few geophysical systems are studied. Since the orbit is continuously rolled on itself due to the action of dissipative forces and the nonlinear part of the dynamics can be found in the neighborhood of any point of the orbit $y(n)$ other points of the orbit $y_r(n)$, $r = 1, 2, \ldots, N$, that arrive neighborhood $y(n)$ in a completely different times than n. Then you can build different types of interpolation functions that take into account all the neighborhoods of the phase space, and explain how these neighborhoods evolve from $y(n)$ to a whole family of points about $y(n+1)$. Use of the information about the phase space in the simulation of the evolution of the physical process in time can be considered as a major innovation in the modeling of chaotic processes. This concept can be achieved by constructing a parameterized non-linear function $F(x, a)$, which transform $y(n)$ to $y(n+1) = F[y(n), a]$, and then use different criteria for determining the parameters a. Further, since there is the notion of local neighborhoods, we can create a model of the process occurring in the neighborhood, at the neighborhood and by combining together these local models to construct a global non-linear model to describe most of the structure of the attractor. In finding the coefficients of a there is a possible encounter a few problems, which at first glance seem to be purely technical, but are related to the nonlinear properties of the system. If the low-dimensional chaotic system, the data that can be used for fitting, normally cover any available locally dimension, but only a certain subspace. Therefore, the linear system of equations to be solved by fitting is "ill-conditioned". However, if the system noise is present, the equations formally are not ill-conditioned, but part of the decision relating to the "direction" of noise points to the future, is not having a sense.

Recurrence plots and randomization possibilities

Oleg Granichin, Olga Granichina, and Vladimir Kiyaev

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The report presents new theoretical aspects of possibilities which give randomizations in the context of recurrence methods. It focuses on new recent developments of authors based on a strong mathematical background. The related field is recurrence time statistics.

When choosing a paradigm of "randomization" in recurrent methods the random selection rules allow to get

1) the solution to a complex problem that requires a large number of searches (for example, the choice of a randomized point selection "view" of three-dimensional images, or random selection of graphics settings);

2) most importantly, if recurrence data output is possible then we can significantly reduce the effects of systematic errors due to randomization of the choice of system parameters, or graphics.

Randomized approach in recurrence methods is fundamentally different from the Bayesian one when problem uncertainties are "attributed to" the statistical properties.

In a Bayesian approach the probability is a part of the problem model. In contrast, the probability in a randomized approach is selected artificially. It exists only in our method, and therefore, there is no a traditional problem of "a bad model" as can happen with the Bayesian approach.

Further insights on the connectivity between money supply and interest rates

Catherine Kyrtsou, Angeliki Papana, Costas Vorlow

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The emergence of a new field of research found at the intersection of macroeconomics and finance supported the intrusion of complex dynamics in the money supply process, as well as its direct or indirect impact on economic and financial variables. This connectivity started exhibiting more interesting properties with the exorbitance of financial innovation, the stance of monetary policy and credit conditions. The dynamic role of money within the complex macro-financial network has recently pointed out by da Cruz and Lind (2012). The money creation and circulation processes take place through heterogeneous agents, so that its