Curriculum Vitae

Thomas Laloë

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Married, two children (2014, 2017)

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Professional situation

Associate professor at the University Nice Cote d'Azur.

Research interests : Statistical learning ; Functional data ; Level set estimation ; Risk Theory ; Neurosciences and cognitive sciences.

Diplomas

2018 : **French Habilitation à Diriger des Recherches**, *On some problems of statitical learning, level set estimation and neurosciences.* University Cote d'Azur.

jury's composition

Antonio Cuevas	-	Universidad Autónoma de Madrid	-	*Rapporteur*
Michael Kohler	-	Universität Darmstadt	-	*Rapporteur*
Mathilde Mougeot	-	ENSIIE Paris-Evry	-	*Rapporteur*
Gérard Biau	-	Sorbonne Université	-	*Examinateur*
Charles Bouveyron	-	Université de Nice Sophia Antipolis	-	*Président*
Delphine Blanke	-	Université d'Avignon	-	*Examinateur*
Anne-Laure Fougères	-	Université Claude Bernard Lyon 1	-	*Examinateur*
Patricia Reynaud-Bouret	-	Université de Nice Sophia Antipolis	-	*Examinateur*

2006 - 2009 : **PhD, under the suppervition of Gérard Biau and Benoît Cadre.** *On some problems of supervised and unsupervised learning.* University of Montpellier, France.

Community functions

2019 - ... : **Elected member of the Laboratory Council,** Laboratory J.A. Dieudonné

Vice-president of the organizing committee of the 52nd "Journées de Statistique" in Nice https://jds2020.sciencesconf.org/

2018 - ... : **Expert for the French National Health Security Agency (ANSES)** https://www.anses.fr/fr/content/biotechnologie

Member of the Scientific Council of the Academy of Excellence « systèmes complexes », IDEX University Côte d'Azur http://univ-cotedazur.fr/fr/idex/academies/complex-systems

2015 - 2016 : **Organization of my laboratory Probability and Statistics Team Seminar**

Teaching activities

Since 2018 : **University Côte d'Azur.**

Cours « Unsupervised Learning », MSC Data Science.

Since 2017 : **University Côte d'Azur, IUT Business and Administration Management Department.**

Head of the continuing education.

Since 2010 : **University Côte d'Azur, IUT Business and Administration Management Department.**

Regular supervision of internships.

Descriptive Statistics, Courses and Guided Work.

Inferential Statistics, Courses and Guided Work.

Head of the probability and statistics courses of the continuing education.

University Côte d'Azur, UFR Science.

Supervision of master internships.

Advanced statistics course (Master Mathematical Engineering, Second Year).

Distinctions

2017 - 2018 : **Full delegation at CNRS**

2016 **Scientific Excellence Award**

2013 **Semi delegation at CNRS**

Supervisory activities

Since my appointment as a Associate Professor in Nice, I have been able to supervise various students in internship and/or PhD programs. These supervision have covered various themes, both on theoretical aspects and very applied through extra-disciplinary or industrial collaborations.

PhD of Giulia Mezzadri :

This PhD is devoted to the modeling of (human) learning of categorization tasks. These tasks consist in learning a rule to classify objects (or stimuli). In other words, given a category A and an object x, we try to model the probability $\mathbb{P}(A|x)$ of classifying x in A, according to a lived experience (i.e. previous objects whose category has been known).

This PhD is interdisciplinary between statistics and cognitive psychology. It is co-supervised with Patricia Reynaud-Bouret (research director in statistics at the Dieudonné laboratory in Nice), and Fabien Mathy (professor in cognitive sciences at the « Bases, Corpus, Langage »laboratory in Nice).

In cognitive psychology, the literature has shown that the manipulated ordering of stimuli appears to determine the quality and speed of learning in humans, as shown by recent work on massaged or distributed learning (Kornell and Bjork {1}). In contrast, less work has focused on more detailed examination

of stimulus prescription in a given category. A few preliminary results seem to show that participants perform better when stimulus scheduling follows a logic of rule abstraction (Mathy and Feldman {2}).

A first work of this thesis was to perform suitable statistical tests in order to verify (without an underlying model at first) the effect of these presentation orders. A second objective is to formalize and compare the numerous models used by psychologists. In addition, a likelihood study will make it possible to compare the results obtained by the models.

Bibliography

{1} N. Kornell and R.A. Bjork. Learning concepts and categories : is spacing the enemy of induction ? *Psychological Science.* (2008)

{2} F. Mathy and J. Feldman. A rule-based presentation order facilitates category learning. *Psychonomic Bulletin & Review.* (2009)

Master internship of Elisabeth Armaut :

In 1975, to solve problems of linear multivariate regression, John Tukey generalized the median to the multivariate case through the notion of depth. Since then, this idea has proven to be extremely fruitful, supported by applications in exploratory data analysis, outlier detection, robust estimation, classification and quality control. Thus a rich statistical methodology based on data depth for a $\mathbb{R}^d$ point cloud has been developed and different variants of the concept of depth have been introduced. Depending on their properties, they can be adapted to particular applications with varying degrees of computability, robustness and ability to reflect asymmetric data shapes.

Depth level sets describe a distribution through location, scale and shape, with the deepest region serving as the mean. The estimation of level sets is a widely studied subject in the literature. In particular, the estimation of level sets of density has been widely studied. The level sets of a depth function provide a separation of space between central and extreme regions, widely used to robustify classification methods or to eliminate extreme values.

The goal of this internship is to propose a notion of depth on a functional space then to study the sets of levels in order to propose an efficient method of classification of functions. Indeed, the recent technological progresses allowed, thanks to the automatization and the computerization of the measurement procedures, to increase considerably the recording frequencies and lead us to use the functional nature of certain data (sounds, images, words). The difficulty will therefore be to work in a functional space. We will try to adapt the method proposed by Di Bernarnido et al. {1} for the estimation of level sets of the distribution function. This will require the manipulation of advanced stochastic computational tools such as It's integral and Girsanov's theory.

This internship is ongoing and is scheduled to continue as a Ph.

Bibliography

{1} E. Di Bernardino, T. Laloë, V. Maume Deschamps and C. Prieur. Plug-in estimation of level sets in a non compact setting with applications in multivariate risk theory *ESAIM P& S* (2012)

Master internship of Dau Hai Dang :

I co-supervised this internship for a polytechnic student with Rémi Servien (INRA Research Fellow, Toulouse). During this internship we studied the problem of estimating sets of levels of the regression function. More precisely given a regression function r and an i.i.d sample $\{(X_i, Y_i)\}_{i=1^n}$ we wanted to estimate the level set $\mathcal{L}(t) = \{x : r(x) \geq t\}$ by a plug-in approach (i.e. replacing r by an estimator r_n). By using a kernel estimator for r_n we were able to obtain an exact limit for the volume of the symmetric difference, with a speed of the order of $\sqrt{nh^d}$ (where $h = h_n$ is the window of the kernel estimator).

We were also able to obtain equivalent results in the case where the t level is given by the probability $p = \mathbb{P}[X \in \mathcal{L}(t)]$. A paper was published as a result of this internship.

Internship and contract of Sofiane Ali :

As part of an industrial collaboration with the « Option Way »company, I had the opportunity to co-supervise with two members of my research team (Roland Diel and François Delarue) the internship and then the fixed-term contract as engineer for Sofiane Ali. The objective was to propose a method to anticipate a drop in the price of an air ticket, in order to optimize its purchase. The internship and the contract were financed by the company, within the framework of a collaboration contract.

Internship and contract of José Bonnet :

Under a contract between my laboratory and EDF, I co-supervised (with Christine Tuleau-Malot, Patricia Reynaud-Bouret, and in partnership with EDF's Group « Aléa sismique ») José Bonnet's internship and fixed-term contract as engineer in 2013-2014. The subject was to propose and validate methods for reconstructing magnitude as a function of seismic intensity.

Industrial collaborations

In parallel with my academic research activity, I have the chance to participate in stimulating industrial collaborations. These collaborations are not necessarily aimed at producing scientific articles but potentially at helping companies to develop innovative products by providing them with statistical expertise that they sometimes lack. Moreover, these collaborations can represent a significant source of funding for other research activities. I have chosen here to present my most significant collaboration, and then to introduce the projects that have just started.

Collaboration avec Option Way :

I was also able to participate in a close industrial collaboration with the Sophia Antipolis-based company Option way (`https://www.optionway.com/`). The aim was to develop a method for anticipating future price drops on airline tickets. This collaboration enabled the company to secure significant financing from the Public Investment Bank via the second digital innovation competition. Part of this sum (150,000 euros) was allocated to our research team and enabled us, among other things, to recruit an engineer, whom we co-supervised with Roland Diel and François Delarue.

Autre collaboration, Deligeo :

A collaboration is underway with the company Deligeo (`http://www.deligeo.fr/`). The aim is to model the total cost of ownership of transport systems (buses, trams, etc.). In particular, we wish to model and estimate the failure rate of various components and their link with preventive maintenance schedules, in order to provide a prediction of the overall cost of the maintenance strategies selected.

List of my Publications

All articles published or submitted can be downloaded from my web page : `http://math.unice.fr/~laloe/publications.html`

Published articles

[TL1] T. Laloë. A k-nearest neighbor approach for functional regression, *Statistics and Probability Letters* (2008), 78, 1189-1193.

[TL2] T. Laloë. L_1-quantization and clustering in Banach spaces , *Mathematical Methods of Statistics* (2010), 19, 136-150.

[TL3] J. Guillard, P. Fernandes, T. Laloë, P. Brehmer. Three-dimensional internal spatial structure of young-of-the-year pelagic freshwater fish provides evidence for the identification of fish school species, *Limnology and Oceanography : Method's* (2011), 9, 322-328.

[TL4] E. Di Bernadino, T. Laloë, V. Maume- Deschamps, C. Prieur. Plug-in estimation of level sets in a non-compact setting with applications in multivariate risk theory, *ESAIM : Probability and Statistics* (2013), 17, 236-256.

[TL5] T. Laloë, R. Servien. Non parametric estimation of regression level set, *Journal of the Korean Statistical Society* (2013), 42(3), 301-311.

[TL6] T. Laloë, R. Servien. The X-Alter Algorithm : A Parameter-Free Method of Unsupervised Clustering, *Journal of Modern Applied Statistical Methods* (2013), 12(1), 90-102

[TL7] J. Chevallier, T. Laloë. Detection of dependence patterns with delay, *Biometrical Journal* (2015), 57, 1110-1130.

[TL8] T. Laloë, R. Servien. A note on the asymptotic law of the histogram without continuity assumptions, *Brazilian Journal of Probability and Statistics* (2015), 4, 562-569

[TL9] E. Di Bernardino, T. Laloë, R. Servien. Estimating covariate functions associated to multivariate risks : a level sets approach, *Metrika* (2015),5, 497 ?526

[TL10] G. Chagny, T. Laloë, R. Servien. Multivariate adaptive warped kernel estimation *Electronic Journal of statistics*(2019), 13, 1759-1789.

[TL11] D.H. Dau, T. Laloë, R. Servien. Exact asymptotic limit for kernel estimation of regression level sets, *Statistics and probability letters* (2020), in press.

Submitted paper

[TL12] T. Laloë, Quantization based clustering : an iterative approach (soumis, *preprint disponible sur HAL :*`https://hal.archives-ouvertes.fr/hal-02490120`).

Articles in preparation

[TL13] E. Di Bernardino, T. Laloë, R. Servien, R.Torres. Estimating covariate functions associated to extreme multivariate risks using a level set approach.

[TL14] R. Diel, T. Laloë Clustering Using Functional Depth.

PhD and HDR

[PHD] T. Laloë. Sur quelques problèmes d'apprentissage supervisé et non supervisé.

[HDR] T. Laloë. Sur quelques problèmes d'apprentissage statistique, d'estimation d'ensembles de niveaux et de neurosciences.

List of Oral Communications :

Conferences :

06/2019 : *Estimation plug-in d'ensembles de niveau de la fonction de régression.*
51e Journées de la Statistique, Nancy, France.

05/2017 : *Estimation adaptative de la régression multivariée par noyaux déformés.*
49e Journées de la Statistique, Avignon, France.

12/2016 : *Estimating covariate functions associated to multivariate risks : A level set approach.*
9th International Conference of the ERCIM WG on Computational and Methodological Statistics, Seville, Spain.

06/2016 : *Detection of dependence patterns with delay.*
48th Scientific Meeting of the Italian Statistical Society, Salerno, Italy.

06/2015 : *Détection de motifs de dépendance avec Délai.*
47e Journées de la Statistique, Lille, France.

07/2013 : *Nonparametric Estimation of Regression Level Sets Using Kernel Plug-in Estimator.*
29th European meeting of Statisticians, Budapest, Hungary .

06/2012 : *Plug-in estimation of level sets in a non-compact setting with applications in multivariate risk theory.*
7th Conference in Actuarial Science & Finance, Samos, Grèce .

05/2012 : *Estimation de coût associé à de hauts niveaux de risque.*
44e Journées de la Statistique, Bruxelles, Belgique.

05/2011 : Deux communications : *Plug-in estimation of level sets in a non-compact setting with applications in multivariate risk theory* et *Accélération pratique de l'algorithme Alter : un outil efficace de classification L1.*
43e Journées de la Statistique, Gammarth, Tunisie.

09/2010 : *Three-dimensional internal spatial structure of young-of-the-year pelagic freshwater fish provides evidence for the identification of fish school species.*
FSAM 2010 - Fish sampling with active methods, Ceske Budejovice, Czech Republic .

06/2010 : *Estimation non paramétrique des ensembles de niveau de la régression.*
42èmes Journées de Statistique, Luminy, France.

Seminar and working groups :

01/2020 : *Estimation adaptative d'une fonction de régression multivariée et application à la théorie du risque.*
Séminaire de Statistique, Laboratoire Jean Kuntzmann, Grenoble, France.

03/2019 : *Estimation adaptative d'une fonction de régression multivariée et prédiction de tarif aérien.*
Séminaire de Statistique, Institut Mathématique de Toulouse, France.

03/2019 : *Détection de synchronisation neuronales et estimation adaptative d'une fonction de régression multivariée.*
Séminaire de probabilités et statistique, IRMAR, Rennes, France.

02/2019 : *Estimation adaptative d'une fonction de régression multivariée, de ses ensembles de niveau, et application à la théorie du risque.*
Séminaire de probabilités et statistique, Laboratoire Paul Painlevé, Lille, France.

01/2019 : *Apprentissage statistique : Clustering, régression et mesures de risques.*
Séminaire de Statistique, Laboratoire ERIC, Lyon, France.

12/2018 : *Estimation adaptative d'une fonction de régression multivariée, de ses ensembles de niveau, et application à la théorie du risque.*
Séminaire de Statistique, Laboratoire de mathématiques d'Avignon, France.

02/2013 : *Estimation plug-in d'ensembles de niveau et applications.*
Séminaire de Statistique, Institut de Mathématiques de Toulouse, France.

02/2010 : *Apprentissage statistique, Classification, Régression et applications.*
Groupe de travail en Statistique/Biostatistique, Institut Elie Cartan, Nancy, France.

02/2010 : *Introduction à la régression fonctionnelle.*
Rencontres Statistiques Lyonnaises, France.

02/2010 : *Apprentissage statistique, Classification, Régression et applications.*
Séminaire du département STID, IUT Avignon, France.

01/2010 : *Statistical Learning, Classification, Regression and applications.*
Séminaire de l'équipe SEQUEL, INRIA Lille-Nord Europe, France.

06/2009 : *Classification, Régression et applications.*
Groupe de Travail SPAAF, Université Lyon 1, France.

09/2008 : *Quantification L_1 dans un espace de Banach.*
Séminaire de l'Equipe de Probabilités et Statistique, Université Montpellier 2, France.

02/2008 : *Quantification dans un espace de Banach.*
Groupe de Travail des Thésards (GTT) du Laboratoire de Statistique Théorique et Appliquée, Université Paris 6, France.

01/2008 : *Quantification dans un espace de Banach.*
Séminaire des doctorants, Université Montpellier 2, France.

10/2007 : *Quantification en grande dimension.*
Moment de convivialité scientifique, Inra, UMR ASB, Montpellier, France.