

BOUAZIZ Olivier

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Position

Associate professor at MAP5, UMR 8145 and IUT University Paris Descartes, since September 2010.

Background

2018-2019 : **Habilitation à Diriger des Recherches** (Diploma that grants the ability to supervise PhD students) at University Paris Descartes. Defense on November, 29th, 2018.
TITLE : *Theoretical and applied work on time to event analysis*.
Reviewers : Per Kragh Andersen, Pierre Joly, Pascale Thuber-Bitter.

2006-2009 : **PhD in Statistics** at LSTA laboratory, Paris VI. Defense on November, 24th, 2009 under the supervision of Professor Denis Bosq and Professor Michel Delecroix.
TITLE : *Single-Index Models for time to event analysis*.
Reviewers : Ingrid Van Keilegom, Peter Hall.

Lecturer at Créteil, Paris XII (62 hours of teaching per year).

2005-2006 : **Research Master on Mathematics and Applications, Speciality Statistics**, University Paris VI.

Research topics

My research focuses on survival analysis for incomplete data (right-censoring, interval-censoring, recurrent events). My work concerns both the development of new statistical methods to answer an original problem as well as the study of the performance of the methods from a theoretical point of view or the application of these methods on medical data. Specifically, my research topics are :

- mathematical statistics on non-parametric estimation methods (kernel estimators, model selection), semi-parametric estimation (Cox model, Aalen or single-index), with asymptotic type results (empirical processes) or finite distance results (oracle inequalities proved using concentration inequalities).
- computational statistics with focus on heterogeneity in survival analysis (EM algorithm, breakpoint detection method based on hidden Markov chains), regression estimation for interval-censored data or the use of penalized methods for high-dimensional data (LASSO or ridge type methods).
- biomedical applications in collaboration with doctors or biologists, on malaria, diabetes, cardiology, cancer diseases, dental complications ... with publications in medical journals.

In October 2018 I also started a new research theme on optimal transport methods for co-clustering. This research subject is carried out as part of a thesis co-supervision with Antoine Chambaz (Professor at MAP5) and Christian Neri (INSERM Research Director at IBPS).

Publications and preprints

- (1) BOUAZIZ O., LAURIDSEN E., NUEL G. *Regression modelling of interval censored data based on the adaptive ridge procedure*. **Submitted**.
- (2) GOEPP V., BOUAZIZ O., NUEL G. *Spline Regression with Automatic Knot Selection*. **Submitted**.
- (3) GOEPP V., THALABARD J-C., NUEL G., BOUAZIZ O. *Regularized bidimensional estimation of the hazard rate*. **Submitted**.
- (4) LAURIDSEN E., ANDREASEN J., O. BOUAZIZ, ANDERSSON L. *Risk of ankylosis of 400 avulsed and replanted human teeth in relation to length of dry storage. A re-evaluation of a previous long-term clinical study*. **Dental Traumatology**, 2019.
- (5) BOUAZIZ O., BRUNEL E., COMTE F. *Nonparametric survival function estimation for data subject to interval censoring case 2*. **Journal of Nonparametric Statistics**, Volume 31, Issue 4, 2019, Pages 952-987.
- (6) SCHRODER J., BOUAZIZ O., AGNER R., MARTINUSSEN T., MADSEN PL., LI D., NEDAEI F., DIXEN U. *Recurrent event survival analysis predicts future risk of hospitalization in patients with paroxysmal and persistent atrial fibrillation*. **PLoS ONE**, Volume 14, Month 6, 2019.
- (7) BOUAZIZ O., COURTIN D., COTTRELL G., MILET J., NUEL G., GARCIA A. *Is placental malaria a long term risk factor for mild malaria attack in infancy? A Beninese observational cohort study*. **Clinical Infectious Diseases**, Volume 66, Issue 6, 2018, Pages 930-935.
- (8) NUEL G., LEFEBVRE A., BOUAZIZ O. *Computing Individual Risks based on Family History in Genetic Disease in the Presence of Competing Risks*. **Computational and Mathematical Methods in Medicine**, Volume 2017, 2017.
- (9) BOUAZIZ O., NUEL, G. *A Change-Point Model for Detecting Heterogeneity in Ordered Survival Responses*. **Statistical Methods in Medical Research**, Volume 27, Issue 12, 2017.
- (10) BOUAZIZ O., NUEL, G. *L_0 regularization for the estimation of piecewise constant hazard rates in survival analysis*. **Applied Mathematics**, Volume 8, Number 3, 2017, Pages 377-394.
- (11) CLAUSEN T., BERGHOLT T., BOUAZIZ O., ARPI M., ERIKSSON F., RASMUSSEN S., KEIDING N., LØKKEGAARD E. *Broad-Spectrum Antibiotic Treatment and Subsequent Childhood Type 1 Diabetes : A Nationwide Danish Cohort Study*. **PLoS ONE**, Volume 11, Month 8, 2016.
- (12) BOUAZIZ O., GUILLOUX, A. *A penalized algorithm for event-specific rate models for recurrent events*. **Biostatistics**, Volume 16, Issue 2, 2015, Pages 281-294.
- (13) BOUAZIZ O., GEFFRAY S., LOPEZ O. *Semiparametric inference for the recurrent event process through a single-index model*. **Statistics**, Volume 49, Issue 2, 2015, Pages 361-385.
- (14) BOUAZIZ O., COMTE F., GUILLOUX, A. *Nonparametric estimation of the intensity function of a recurrent event process*. **Statistica Sinica** Vol. 23, No. 2, 2013, p. 635-665.
- (15) BOUAZIZ O., LOPEZ O. *Conditional density estimation in a censored single-index regression model*. **Bernoulli**, Volume 16, Issue 2, 2010, Pages 514-542.

R Packages

- **pchsurv** models the instantaneous hazard rate using a piecewise constant function for right-censored and / or interval data while combining the adaptive ridge regularization method described in papers (1) and (10). This makes it possible to automatically choose from the data the instants of jumps, to estimate the values of the hazard rate and to estimate the parameters of regression of the covariates.
- **test** includes corrected versions of all standard tests (Pearson, Kendall, Spearman correlation tests, Wilcoxon independent and matched samples, variance test, median test). These new tests are asymptotically well calibrated, which means that the rejection ratio of a α test under the null

hypothesis is asymptotically equal to α .

The `pchsurv` and `test` packages are available here : <https://github.com/obouaziz>

Awards

2019-2023 : Prime d'Encadrement Doctoral et de Recherche (PEDR), Université de Paris.

sept. 2011 : Prix du meilleur exposé au 17ème European Young Statistical Meeting (EYSM), Lisbonne (Portugal).

LNCC, IRESP and ANR projects

- From January 2020 to December 2022, I am the principal investigator for the grant project entitled “New Gene-Environment Interaction Detection Method for Cancer diseases”. The grant (240 k€) is funded by the **French National League Against Cancer (LNCC)** and is a methodological project in genetic epidemiology. The proposed approach will detect groups of individuals characterized by their environmental factors with different cancer risks. It is based on the breakpoint model developed in paper (9). The method will be applied to the EPIC dataset on breast cancer in women and to the UK Biobank dataset for different cancers. This project is in collaboration with Vivian Viallon, lecturer in statistics at the University Claude Bernard, Lyon and biostatistician at the International Agency for Research on Cancer (IARC) and Grégory Nuel (Research Director CNRS, affiliated at LPSM)
- From September 2013 to June 2016 I participated in the IRESP (French Public Health Research Institute) project called DECURION (DEscartes-CURie and ONcogenetics) led by Grégory Nuel (Research Director CNRS, LPMA affiliate). The project aimed to develop cancer risk prediction models (breast cancer and ovarian cancer in women) based on the family history of patients. The team consisted mainly of MAP5 members and members of the Curie Institute.
- From January 2009 to December 2012, I took part in the ANR (National Research Agency) Prognostic project (Point pROcess : learninG, NONparametric STatistics and appliCations) led by Agathe Guilloux (LSTA lecturer). The team consisted mainly of members of LSTA (Paris 6) and LPMA (Paris 6 and Paris 7).
<http://www.lsta.upmc.fr/prognostic/index.php?main=publications>

Phd students and Interns

2018-2021
(3 years) : I am currently **supervising a PhD student**, Thi Thanh Yen Nguyen, graduate of the Paris 13 Master of Mathematics. The subject is on “data-driven” mathematical modeling of the dynamics of vulnerability and brain senescence in neurodegenerative diseases. This thesis began in October 2018 and is co-supervised by Antoine Chambaz (University Professor, MAP5) and Christian Neri (INSERM Research Director at IBPS).

- 2016-2019
(3 years) : **Supervision of a PhD student**, Vivien Goepp, former CentralSupélec engineer and graduate of the master of statistics of UPMC. The subject focused on a new regularised method with applications to time to event analysis and statistics. This thesis began in October 2016, was co-supervised by Grégory Nuel (Research Director, LPSM) and was defended on September, 27th.
- 2019
(6 month) : I am currently **supervising a Master 2 student**, Pierre Clavier, graduated from the Ecole Centrale de Lille and 2nd year Master's student at "applied and computational mathematics" in KTH, Sweden, on the topic "sum-product networks for time to event data". This internship is co-supervised by Grégory Nuel (Research Director, LPSM) and will end in March 2020.
- 2018
(3 month) : **Supervision of a Master 2 student**, Arthur Carcano, graduate of ENS Paris in computer science and student of the 1st year Master AIV (Life Sciences Master) of the CRI (Center for Interdisciplinary Research), on the detection of heterogeneity in relation to the date of diagnosis for survival after cancer. This internship was co-supervised by Grégory Nuel (Research Director, LPSM).
- 2017
(2 month) : **Supervision of a Licence 3 student** Suzanne Sigalla, first-year student at ENSAE Paristech, on the study of interval-censored data estimation methods, with a review of existing packages and an application to a dental dataset.
- 2016-2017
(6 month) : **Supervision of a Master 2 student**, Niklas Nyboe Maltzahn, of the 2nd year Master of the University of Copenhagen on a review of survival analysis models with random effect ("frailty models"), with a comparison study of the different R packages for frailty models. This internship was co-supervised by Grégory Nuel (Research Director, LPSM).
- 2016
(2 month) : **Supervision of a Licence 3 student**, Aldéric Fraslin, 1st year student at ENSAE Paristech, on the estimation of the incidence of breast cancer in women in France from 1989 to 2010, taking into account the cohort effect, from a database of the MGEN. This internship was co-supervised by Grégory Nuel (Research Director, LPSM) .
- 2014
(6 month) : **Supervision of a Master 2 student**, Hajer Ben Tamansourt, 2nd year Master student in Mathematical Engineering on the study of joint modeling with application to the detection of premature birth on a database from the Necker-Enfants malades Hospital. This internship was co-supervised with Julien Stirnemann (Head of Clinic, Hospital Assistant at Necker Hospital).
- 2013
(6 month) : **Supervision of a Master 2 student**, Fouad Khellaf, 2nd year Master student in Mathematical Engineering on the study of the Cox model with fragility. Application on a multicenter dataset of patients with B-lymphoma who had a marrow bone transplant. This internship was co-supervised with Julien Stirnemann (Head of Clinic, Hospital Assistant at Necker Hospital) .

Teaching

I am a **lecturer at the STID (Statistics and Informatics for Decision)** department, IUT Paris Descartes, I am teaching 192 hours per year. Since September 2019, I am **Head of the Health Professional License** of the STID department.

- 2019-2020 : I teach for **1st year**, **2nd year** and **Health Professional Licence** students.
- Lecture on inferential statistics (confidence intervals and tests) for students of the Professional Health License (24H).
 - Lecture on linear model for students of the Professional Health License (18H).
 - Lectures / Seminars / Workshops (R software) of parametric tests for second year students (18H lectures, 24H seminars/workshop).
 - Workshop (R software) on time series for first year students (54H)
- 2017-2019 : I was on research leave for those two years and had only half of my teaching duty (125H in 2018-2019, 117H in 2017-2018).
- Lectures/workshops/seminars (R software) on parametric tests for second-year students (20H lectures, 42H workshops/seminars).
 - Follow-up of internships of second year students in standard training and work-study programs and of students of Health Professional License and Data-Mining (company visits and phone calls).
- 2010-2017 : I taught in **1st year**, **2nd year**, **2nd year work-study program**, **special year** (DUT in 1 year), **Health Professional License** at STID and in **Master 2** at the Mathematics and Computer Science Faculty of Paris Descartes University.
- Lecture on survival analysis (R software), for students of the Master 2 professional Mathematical Engineering, at the Mathematics and Computer Science Faculty of the University Paris Descartes (20H lectures / workshop).
 - Lectures / Seminars / Workshop (R software) on parametric tests for the second year students (22.5H lectures, 33H workshops/seminars).
 - Workshop on descriptive statistics, statistical inference and tests, for the students of the health professional license with IUT Paris Descartes (18H).
 - Lectures / Seminars / Workshop (R software) on linear model for second year students work-study program (28H).
 - Lectures on survival analysis (SAS software), for students of the professional license of health and business intelligence, at the IUT Paris Descartes (18H).
 - Seminar on descriptive statistics (36H) and lecture on probabilities for first-year students (42H).
 - Lectures / Seminars / Workshop (R software) for non-parametric tests for second-year students (40H).
 - Lectures / Seminars on statistical inference for students in special year (32H).
 - Workshop on descriptive statistics, statistical inference and tests, for students of the health professional license (21H).
 - Supervision of a project for students of the professional master of Mathematical Engineering, at the Mathematics and Computer Science faculty of the University Paris Descartes (10H).
 - Project supervision for survival data analysis of a real database, for second-year students (15H).
 - Project supervision on the analysis of an R database, for first-year students (10H).
 - Follow-up of internships of second year students and health professional license students (company visits for the health professional license).
- 2009-2010 : ATER (temporary lecturer) at the University of Nanterre, Paris X, 192 hours. Workshops (R software) and seminars on chronological series for first year students of ISIFAR Master 1. Seminars of descriptive statistics for first and second year students in psychology. Seminars for 2nd year psychology license students and third year (Licence 3) MIA students.

2006-2009 : Lecturer during my PhD at the University of Créteil, Paris XII, 64 hours of seminars. Mathematics with applications to economy for first year students.

Mobility

2017-2019 : 6 month CNRS research leave each year, at LPSM, UMR 8001.
<https://www.lpsm.paris>

2015 : Visiting professor at the Section of Biostatistics in Copenhagen, Denmark for 6 month.
<https://biostat.ku.dk>

Responsibilities

Since 2019 : **Head of the Health Professional License** of the STID department, IUT Paris Descartes. A dozen students in a work and study program. I follow-up students throughout the year, I coordinate student-teacher relationships, I organize students recruitment, I find lecturers for each course, I build the schedule and I organize the end-of-year jury.

Avril 2018 : **External member of the selection committee** for the recruitment of a lecturer in statistics at LPSM (University Paris 6 and 7).

Since 2018 : **Associate Editor** of The International Journal of Biostatistics.

Nov. 2017 : **Internal member of the selection committee** for the recruitment of a PRAG / PRCE (lecturer performing 384 hours of teaching a year) in expression-communication at the STID department of the IUT Paris Descartes.

2016-2019 : **Member of the PhD supervisory committee** of Emmanuel Caron, PhD student under the supervision of Jérôme Dedecker (MAP5) and Bertrand Michel (Ecole Centrale Nantes, Jean-Leray Mathematical Laboratory, Nantes).

Nov. 2016 : **External member of the PhD committee** of Mathilde Wanneveich, INSERM team of biostatistics ISPED, Bordeaux.

2015-2019 : **Head of second year students program** STID department, IUT Paris Descartes. Between 60 and 70 students a year, I followed-up students throughout the year, coordinated student-teacher relations, and organized juries (two per year) to validate the students diploma.

2013-2015 : **In charge of the tutored projects of the Health Professional License** at the IUT Paris Descartes. I was in charge of contacting health professionals to supervise students' projects, organize the various oral defenses that take place around projects and coordinate the progress of projects between students and tutors. These two years I also participated in the recruitment of students of the Professional Health License with Jérôme Dedecker (Professor, MAP5).

Avril 2014 : **Internal member of the selection committee** for the recruitment of two assistant professors in statistics at MAP5 (UFR Mathematics and Computer Science department and IUT STID department).

Depuis 2013 : **Organizer of the statistical seminar** of MAP5 laboratory.

- 2013-2016 : **External member of the Local Scientific Council** of the UFR Mathematics and Computer Science of Paris Descartes University.
- 2013 : **French Correspondent of the organizing committee** of the 18th European Young Statistician Meeting (26-30 August 2013, Osijek, Croatia).
- Since 2012 : **Peer-reviewing** for the following scientific journals : *Statistics (2)*, *Computational Statistics and Data Analysis*, *Journal of Nonparametric Statistics*, *Sankhya (The Indian Journal of Statistics)*, *Statistics and Probability Letters*, *The International Journal of Biostatistics*, *Journal of the Royal Statistical Society (Series B)*, *Journal of the Royal Statistical Society (Series C)*, *Metrika*, *Biometrical Journal*, *Journal of Applied Statistics*, *Communication in Statistics - Theory and Methods*, *Lifetime Data Analysis (2)*, *Biometrics*.
- 2011-2014 : **Member of the Department Council** of STID Department of IUT Paris Descartes.

Talks as an invited speaker

- (1) Statistics and probability seminar at JA Dieudonné laboratory (Université Côte d'Azur), January 2020.
Penalized estimation methods for time to event data based on the adaptive-ridge procedure
- (2) Statistics seminar at CépiDc (INSERM), June 2019.
New methods based on the adaptive ridge procedure to take into account age, period and cohort effects
- (3) Statistics seminar at ERIC laboratory (Lyon 1 and 2), March 2019.
Penalized estimation methods for time to event data based on the adaptive-ridge procedure
- (4) Statistics seminar at AgroParisTech, January 2019.
Penalized estimation methods for time to event data based on the adaptive-ridge procedure
- (5) Statistics and probability seminar at Paul Painlevé (Lille) laboratory, January 2019.
Penalized estimation methods for time to event data based on the adaptive-ridge procedure
- (6) Applied Mathematics seminar at Jean-Leray laboratory (Nantes), November 2018.
Penalized estimation methods for time to event data based on the adaptive-ridge procedure
- (7) Statistics seminar at LPSM (Paris 6 et 7), March 2018.
New Methods for Detecting and Modelling Heterogeneity in Survival Responses
- (8) 1st International Conference on Econometrics and Statistics, Hong-Kong, June 2017.
A penalized algorithm for event-specific rate models for recurrent events
- (9) 2017 Conference on Lifetime Data Science, Connecticut (USA), May 2017.
A change-point model for detecting heterogeneity in ordered survival responses
- (10) Workshop at CRC, Université Paris Descartes, INSERM team, February 2016.
A review of recurrent events methods with application to a Danish dataset on Atrial Fibrillation
- (11) Biostatistics workshop, Institut Claude Bernard, Hôpital Bichat (Paris), INSERM team, February 2016.
A review of recurrent events methods with application to a Danish dataset on Atrial Fibrillation
- (12) Workshop at the department of Biostatistics, University of Copenhagen, Denmark, May 2015.
Regression based methods on interval censored event times
- (13) Seminar of the department of Biostatistics, University of Copenhagen, Denmark, December 2014.
A penalized algorithm for event-specific rate models for recurrent events
- (14) Econometry and Statistics seminar at EQUIPPE laboratory, Université Lille 1, November 2012.
Estimation non-paramétrique de l'intensité du processus de comptage des évènements récurrents

- (15) MAP5 seminar, Université Paris Descartes, November 2012.
Estimation non-paramétrique de l'intensité du processus de comptage des évènements récurrents
- (16) Journées MAS, Clermont-Ferrand, August 2012.
Estimation de la densité conditionnelle dans un modèle à direction révélatrice unique en présence de censures
- (17) The 17th European Young Statistician Meeting (EYSM), Lisbon (Portugal), September 2011.
Conditional density estimation in a censored single-index regression model.
- (18) Workshop at ECAIS, Université Paris Descartes, January 2011.
Inférence semi-paramétrique pour des évènements récurrents en présence de censure et d'un évènement terminal
- (19) Workshop at MAP5, Université Paris Descartes, December 2010.
Inférence semi-paramétrique pour des évènements récurrents en présence de censure et d'un évènement terminal
- (20) Seminar at MODAL'X, Université Paris X (Nanterre), January 2010.
Propriétés des intégrales Kaplan-Meier et application à l'estimation de la densité conditionnelle en présence de censure.
- (21) Seminar at IRMA, Université de Strasbourg, January 2010.
Estimation de la densité conditionnelle dans un modèle à direction révélatrice unique en présence de censure.
- (22) Statistics seminar at MAP5, Université Paris V, December 2009.
Propriétés des intégrales Kaplan-Meier et application à l'estimation de la densité conditionnelle en présence de censure
- (23) Statistics and probability seminar, Université Montpellier II, November 2009.
Inférence semi-paramétrique pour des évènements récurrents en présence de censure et d'un évènement terminal.
- (24) Statistics and probability seminar, Université Montpellier II, October 2008.
Estimation de la densité conditionnelle dans un modèle à direction révélatrice unique en présence de censure.

Peer-reviewed talks

- (1) The International Biometrics Conference, Barcelone (Spain), July 2018.
Regression modeling of interval censored data with a cure fraction
- (2) The International Workshop of Applied Probability, Budapest (Hungary), June 2018.
A change-point model for detecting heterogeneity in ordered survival responses
- (3) The International Biometrics Conference, Victoria Islands (Canada), July 2016.
Cohort effect in survival analysis : a change-point perspective
- (4) The International Biometrics Conference, Florence (Italy), July 2014.
A penalized algorithm for event-specific rate models for recurrent events
- (5) Dynstoch workshop, Copenhagen (Denmark), April 2013.
A LASSO estimator for event-specific rate models for recurrent events
- (6) 43èmes Journées de Statistique de la SFDS, Tunis (Tunisia), May 2011.
Estimation nonparamétrique de l'intensité du processus de comptage des évènements récurrents
- (7) Troisièmes rencontres des jeunes statisticiens, Aussois (France), September 2009.
Inférence semi-paramétrique pour des évènements récurrents en présence de censure et d'un évènement terminal.
- (8) 41èmes Journées de Statistique de la SFDS, Bordeaux (France), May 2009.
Inférence semi-paramétrique pour des évènements récurrents en présence de censure et d'un évènement terminal.
- (9) International Workshop on Applied Probability, Compiègne (France), July 2008.
Conditional density estimation in a single-index censored regression model.

- (10) Journées de Statistique, SSC-SFDS, Ottawa (Canada), May 2008.
Conditional density estimation in a single-index censored regression model.