



# **ISBA Key Facts and Figures**

**Academic Year 2019-2020  
(September 2019 – August 2020)**

Institute of Statistics,  
Biostatistics and Actuarial  
Sciences

**Key figures**  
**September 2019-August 2020**

## ISBA Facts and Key Figures Academic Year 2019-2020 (September 2019– August 2020)

During the academic year 2019-2020, ISBA counted 10 full-time and 4 part-time faculty members, as well as about 30 researchers and administrative officers. Research programs conducted by ISBA members lead to publications in top actuarial and statistical journals, as well as in related fields (mathematical economics, operations research, life sciences or mathematical finance, for instance). More precisely, ISBA members published 36 papers in international refereed journals and 3 book chapters. Moreover, a second part of the trilogy “Effective Statistical Learning Methods for Actuaries” has been published with Springer. Research to appear soon, or under evaluation, was reported in 34 discussion papers (ref. DP2019/20-DP2020/25).

ISBA members are involved in editorial boards of reference journals in their respective fields, including

- Annals of Statistics, Annual Review of Statistics and its Application, Computational Statistics and Data Analysis, Electronic Journal of Statistics, Extremes, and Statistical Modelling in probability and statistics;
- Biometrics, Biometrika and Biostatistics in biostatistics;
- Econometrics and Statistics, Journal of Risk and Financial Management, Studies in Nonlinear Dynamics and Econometrics, Econometrics, Journal of Business and Economic Statistics, and Digital Finance in finance and econometrics;
- as well as ASTIN Bulletin, European Actuarial Journal and Insurance: Mathematics and Economics in risk and insurance.

They also regularly act as reviewers for international, peer-reviewed journals or as members of scientific committees for international conferences. This is a clear mark that their expertise is recognized worldwide. Besides fundamental research, ISBA members are also very active in addressing societal issues such as sustainability of pension systems and insurability of long-term cancer survivors. ISBA members are also involved into different types of services to the society, as members of boards of public, non-profit organizations

(scientific committee of the Fondation Contre le Cancer, Commission des Assurances or Conseil Académique des Pensions, for instance). Several members have also contributed to the public information about the actual Covid crisis through different media.

Training junior researchers is a key activity for ISBA senior academic members. In 2019-2020, ISBA has hosted 24 PhD students and 4 post-doc researchers. Manon Martin and Florian Pechon successfully defended their PhD theses and were awarded the degree of Doctor in Science, specializing in Statistics and in Actuarial Science, respectively.

Due to the pandemic and associated travel restrictions in 2020, ISBA only welcomed 19 foreign visitors during the academic year 2019-2020. Research activities were carried in a hybrid mode, combining on-site and remote activities during the lockdown period. There have been 8 regular ISBA research seminars, in the statistics series or in the actuarial series in 2019-2020. Three scientific events were also organized: 2 Pension’s Mornings in the framework of the UCLouvain Excellence Chair in Pensions and a 1-day workshop devoted to the design of experiments. Also, there have been 13 Applied Statistics workshops focusing on problem-driven statistics organized at ISBA and 3 short courses devoted to longevity, pension and long-term care, to individual loss reserving methods in property-casualty insurance, and on data stream and monitoring.

Scientific activities developed by ISBA members continue to be supported by various programs funded by the Belgian French-speaking Community (Fédération Wallonie-Bruxelles) including the Fonds National de la Recherche Scientifique (FNRS), the Walloon Region of Belgium (Région wallonne), the Belgian Federal Government (Belgian Science Policy) and the European Union (H2020 and ERC). In addition to the ongoing ARC projects “Sustainable, adequate and safe pensions” and “Negative and ultra-low interest rates: behavioral and quantitative modelling”, ISBA members were selected for a new ARC project entitled “Imperfect Data: From Mathematical Foundations to Applications in Life Sciences” running over 2020-2025.

Besides public support, ISBA also benefited from fruitful collaboration with private partners mainly from the pharmaceutical and insurance sectors (e.g., SAS, CluePoints, GSK, Generali, AG Insurance, Axa Research Fund). A new research chair “Fully funded Pension Systems” has been awarded by the Belgian insurance company Ethias.

The excellence of the research programs conducted at ISBA is recognized internationally. ISBA again ranks 3 over the last 2015-19 period and remained in the top 10 since 2000 in the University of Nebraska at Lincoln (UNL) ranking listing the top 50 universities worldwide based on the number of papers published in leading actuarial journals. ISBA is also among the 20 centers from around the world designated by the International Insurance Society as Global Centers of Insurance Excellence (GCIE). This certification recognizes outstanding risk management and insurance programs that play an integral role in promoting insurance knowledge and research.

Catherine Legrand, ISBA Chairwoman  
Michel Denuit, ISBA Research Director

# Contents

<b>1. Publications</b>	<b>10</b>
1.1. Reprints	
1.2. Discussion Papers	
<b>2. People</b>	<b>19</b>
2.1. PhD students	
2.2. Post-doc researchers	
2.3. Visitors - Research visit	
2.4. Visitors - Seminar/Workshop	
<b>3. Seminars and Workshops</b>	<b>21</b>
3.1. Seminars	
3.2. Applied Statistics Workshops	
<b>4. Scientific Events</b>	<b>24</b>
<b>5. Short courses</b>	<b>28</b>
<b>6. Doctoral Dissertations</b>	<b>28</b>
<b>7. Projects</b>	<b>29</b>

# 1. Publications

## 1.1. Reprints (36 publications)

### Journal Articles

1. Barigozzi, Matteo; Hallin, Marc; Soccorsi, Stefano; von Sachs, Rainer. Time-Varying General Dynamic Factor Models and the Measurement of Financial Connectedness. In: *The Journal of Econometrics*, to appear.  
<http://hdl.handle.net/2078.1/224107>
2. Beyene, Kassu M.; El Ghouh, Anouar; Oulhaj, Abderrahim. On the validity of time-dependent AUC estimation in the presence of cure fraction. In: *Biometrical Journal*, Vol. 61, no. 6, p. 1430-1447 (2019).  
<http://hdl.handle.net/2078.1/219626>
3. Bouezmarni, Taoufik; Camirand Lemyre, Félix; El Ghouh, Anouar. Estimation of a bivariate conditional copula when a variable is subject to random right censoring. In: *Electronic Journal of Statistics*, Vol. 13, no.2, p. 5044-5087 (2019).  
<http://hdl.handle.net/2078.1/224329>
4. Chau, Joris; von Sachs, Rainer. Intrinsic wavelet regression for curves of Hermitian positive definite matrices. In: *Journal of the American Statistical Association*, to appear.  
<http://hdl.handle.net/2078.1/224111>
5. Chen, Cathy Yi-Hsuan; Hafner, Christian. Sentiment-Induced Bubbles in the Cryptocurrency Market. In: *Journal of Risk and Financial Management*, Vol. 12, no. 2, p. 1-12 (2019).  
<http://hdl.handle.net/2078.1/227966>
6. Colling, Benjamin; Van Keilegom, Ingrid. Estimation of fully nonparametric transformation models. In: *Bernoulli : a journal of mathematical statistics and probability*, Vol. 25, no. 4B, p. 3762-3795 (2019).  
<http://hdl.handle.net/2078.1/219441>
7. Daouia, Abdelaati; Florens, Jean-Pierre; Simar, Léopold. Robustified expected maximum production frontiers. In: *Econometric Theory*, p. 1-42 (2020).  
<http://hdl.handle.net/2078.1/229043>
8. De Backer, Mickaël; El Ghouh, Anouar; Van Keilegom, Ingrid. An Adapted Loss Function for Censored Quantile Regression. In: *Journal of the American Statistical Association*, Vol. 114, no. 527, p. 1126-1137 (2019).  
<http://hdl.handle.net/2078.1/219403>
9. De Backer, Mickaël; El Ghouh, Anouar; Van Keilegom, Ingrid. Linear Censored Quantile Regression: A Novel Minimum-Distance Approach. In: *Scandinavian Journal of Statistics*, Vol. 47, p. 1275-1306 (2020).  
<http://hdl.handle.net/2078.1/230891>
10. Denuit, Michel; Mesfioui, Mhamed; Trufin, Julien. Concordance-based predictive measures in regression models for discrete responses. In: *Scandinavian Actuarial Journal*, Vol. 2019, no.10, p. 824-836 (2019).  
<http://hdl.handle.net/2078.1/222032>
11. Denuit, Michel; Sznajder, Dominik; Trufin, Julien. Model selection based on Lorenz and concentration curves, Gini indices and convex order. In: *Insurance: Mathematics and Economics*, Vol. 89, p. 128-139 (2019).  
<http://hdl.handle.net/2078.1/220948>
12. Escobar-Bach, Mikael; Van Keilegom, Ingrid. Non-parametric cure rate estimation under insufficient follow-up by using extremes. In: *Journal of the Royal Statistical Society: Series B (Statistical Methodology)*, Vol. 81, no. 5, p. 861-880 (2019).  
<http://hdl.handle.net/2078.1/219454>
13. Féraud, Baptiste; Martineau, Estelle; Leenders, Justine; Govaerts, Bernadette; de Tullio, Pascal; Giraudeau, Patrick. Combining rapid 2D NMR experiments with novel pre-processing workflows and MIC quality measures for metabolomics. In: *Metabolomics*, Vol. 16, no.4 (2020).  
<http://hdl.handle.net/2078.1/230906>
14. Gao, Zhengyuan; Hafner, Christian. Looking Backward and Looking Forward. In: *Econometrics*, Vol. 7, no.2, p. article 27 (2019).  
<http://hdl.handle.net/2078.1/218030>
15. Hainaut, Donatien. Fractional Hawkes processes. In: *Physica A: Statistical Mechanics and its Applications*, Vol. 549, p. 124330 (2020).  
<http://hdl.handle.net/2078.1/230888>

16. Hainaut, Donatien; Denuit, Michel. Wavelet-based feature extraction for mortality projection. In: *ASTIN Bulletin*, Vol. 50, no. 3, p. 675-707 (2020). <http://hdl.handle.net/2078.1/230890>
17. Hainaut, Donatien; Leonenko, Nikolai. Option pricing in illiquid markets: a fractional jump-diffusion approach. In: *Journal of computational and applied mathematics*, Vol. 381 (2021). <http://hdl.handle.net/2078.1/227948>
18. Hanbali, Hamza; Claassens, Hubert; Denuit, Michel; Dhaene, Jan; Trufin, Julien. Once covered, forever covered: The actuarial challenges of the Belgian private health insurance system. In: *Health Policy*, Vol. 123, no.10, p. 970-975 (2019). <http://hdl.handle.net/2078.1/220112>
19. Mammen, Enno; Van Keilegom, Ingrid; Yu, Kyusang. Expansion for moments of regression quantiles with applications to nonparametric testing. In: *Bernoulli*, Vol. 25, no.2, p. 793-827 (2019). <http://hdl.handle.net/2078.1/219400>
20. Martin, Manon; Govaerts, Bernadette. LiMM-PCA: Combining ASCA+ and linear mixed models to analyse high-dimensional designed data. In: *Journal of Chemometrics*, Vol. 34, no.6 (2020). <http://hdl.handle.net/2078.1/230905>
21. Mathieu, Sophie; von Sachs, Rainer; Ritter, Christian; Delouille, Véronique; Lefèvre, Laure. Uncertainty Quantification In Sunspot Counts. In: *The Astrophysical Journal*, Vol. 886, no. 1, p. 14 pp (2019). <http://hdl.handle.net/2078.1/220927>
22. Narasimhaiah, Deepti; Legrand, Catherine; Damotte, Diane; Remark, Romain; Munda, Marco; De Potter, Patrick; Coulie, Pierre; Vikkula, Miikka; Godfraind, Catherine. DNA alteration-based classification of uveal melanoma gives better prognostic stratification than immune infiltration, which has a neutral effect in high-risk group. In: *Cancer medicine*, Vol. 8, no.6, p. 3036-3046 (2019). <http://hdl.handle.net/2078.1/216871>
23. Neumeyer, Natalie; Van Keilegom, Ingrid. Bootstrap of residual processes in regression: to smooth or not to smooth?. In: *Biometrika*, Vol. 106, no.2, p. 385-400 (2019). <http://hdl.handle.net/2078.1/219402>
24. Pechon, Florian; Trufin, Julien; Denuit, Michel. Preliminary selection of risk factors in P&C ratemaking. In: *Variance : advancing the science of risk*, Vol. 13, no.1, p. 124-14 (2020). <http://hdl.handle.net/2078.1/231272>
25. Pircalabelu, Eugen; Claeskens, Gerda. Community-Based Group Graphical Lasso. In: *Journal of Machine Learning Research*, Vol. 21, p. 1-32 (2020). <http://hdl.handle.net/2078.1/228780>
26. Pircalabelu, Eugen; Gerda Claeskens. Zoom-in/out joint graphical lasso for different coarseness scales. In: *Journal of the Royal Statistical Society. Series C, Applied statistics*, Vol. 69, no. 1, p. 47-67 (2019). <http://hdl.handle.net/2078.1/219725>
27. Racine, Jeffrey S.; Van Keilegom, Ingrid. A Smooth Nonparametric, Multivariate, Mixed-Data Location-Scale Test. In: *Journal of Business & Economic Statistics*, , p. 1-12 (2019). <http://hdl.handle.net/2078.1/219436>
28. Schokkaert, Erik; Devolder, Pierre; Hindriks, Jean; Vandenbroucke, Frank. Towards an equitable and sustainable points system. A proposal for pension reform in Belgium. In: *Journal of Pension Economics and Finance*, Vol. 19, no. 1, p. 49-79 (2020). <http://hdl.handle.net/2078.1/200754>
29. Simar, Léopold; Wilson, Paul. Hypothesis Testing in Nonparametric Models of Production using Multiple Sample Splits. In: *Journal of Productivity Analysis*, Vol. 53, 287-303 (2020). <http://hdl.handle.net/2078.1/229044>
30. Simar, Léopold; Zelenyuk, Valentin. Improving Finite Sample Approximation by Central Limit Theorems for DEA and FDH efficiency scores. In: *European Journal of Operational Research*, Vol. 284, p. 1002-1015 (2020). <http://hdl.handle.net/2078.1/229042>
31. Wunsch, Guillaume; Mouchart, Michel; Russo, Federica. Examining Cause-Effect Relations in the Social Sciences A Structural Causal Modelling Approach. In: *STATOR*, Vol. 3, no.September, p. 18-22 (2019). <http://hdl.handle.net/2078.1/223038>

32. von Sachs, Rainer. Nonparametric Spectral Analysis of Multivariate Time Series. In: Annual Review of Statistics and Its Application, Vol. 7, no. 1, p. 361-386 (2020).

<http://hdl.handle.net/2078.1/224113>

### Book Chapters

1. Govaerts, Bernadette; Francq, Bernard G.; Marion, Rebecca; Martin, Manon; Thiel, Michel. The Essentials on Linear Regression, ANOVA, General Linear and Linear Mixed Models for the Chemist. In: Comprehensive Chemometrics, Chemical and Biochemical Data Analysis, Elsevier, p. 431-463 (2020).

<http://hdl.handle.net/2078.1/230895>

2. Legrand, Catherine; Bertrand, Aurélie. Cure models in oncology clinical trials. In: Textbook of Clinical Trials in Oncology : A Statistical Perspective (1st Edition), Chapman & Hall/CRC Press I Taylor & Francis Group, p. 465-492 (2019).

<http://hdl.handle.net/2078.1/220045>

3. Mastromarco, Camilla; Simar, Léopold; Wilson, Paul. Nonparametric Statistical Analysis of Production. In: The Palgrave Handbook of Economic Performance Analysis, Springer International Publishing, p. 301-381 (2020).

<http://hdl.handle.net/2078.1/229045>

### Books

1. Denuit, Michel; Hainaut, Donatien; Trufin, Julien. Effective Statistical Learning Methods for Actuaries III : Neural Networks and Extensions. Springer: Springer Nature Switzerland AG, 9783030258269. 250 pages (2019).

<http://hdl.handle.net/2078.1/222289>

## 1.2. Disussion Papers (34 publications)

1. DP2020/25 - D. HAINAUT  
An actuarial approach for modeling pandemic risk
2. DP2020/24 - DENUIT, M. and C. Y. ROBERT  
Risk reduction by conditional mean risk sharing with application to collaborative insurance
3. DP2020/23 - DENUIT, M. and C. Y. ROBERT  
Efron's asymptotic monotonicity property in the gaussian stable domain of attraction
4. DP2020/22 - WUNSCH, G., RUSSO, F., MOUCHART, M. and R. ORSI  
Time and Causality in the Social Sciences
5. DP2020/21 - MOUCHART, M., ORSI, R. and G. WUNSCH  
Causality in econometric modeling From theory to structural causal modeling
6. DP2020/20 - GRESSANI, O. and P. LAMBERT  
The Laplace-P-spline methodology for fast approximate Bayesian inference in additive partial linear models
7. DP2020/19 - PLASSIER, V., PORTIER, F. and J. SEGERS  
Risk bounds when learning infinitely many response functions by ordinary linear regression
8. DP2020/18 – DENUIT, M. and C. Y. ROBERT  
Conditional tail expectation decomposition and conditional mean risk sharing for dependent and conditionally independent risks
9. DP2020/17 – DENUIT, M. and C. Y. ROBERT  
From risk sharing to risk transfer: the analytics of collaborative insurance
10. DP2020/16 – DENUIT, M. and Y. LU  
Wishart-Gamma mixtures for multiperil experience ratemaking, frequency-severity experience rating and micro-loss reserving



11. DP2020/15 - DENUIT, M. and C. Y. ROBERT  
From risk sharing to pure premium for a large number of heterogeneous losses
12. DP2020/14 - DENUIT, M. and C. Y. ROBERT  
Ultimate behavior of conditional mean risk sharing for independent compound Panjer-Katz sums with gamma and Pareto severities
13. DP2020/13 - GRESSANI, O. and P. LAMBERT  
Laplace approximation for fast Bayesian inference in generalized additive models based on penalized regression splines
14. DP2020/12 - GOVAERTS, R., FRANCO, B., MARION, R., MARTIN, M. and M. THIEL  
The essentials on linear regression, ANOVA, general linear and linear mixed models for the chemist
15. DP2020/11 - MARION, R., GOVAERTS, B. and R. VON SACHS  
AdaCLV for Interpretable Variable Clustering and Dimensionality Reduction of Spectroscopic Data
16. DP2020/10 - G. MORDANT  
A Random Assignment Problem: Size of Near Maximal Sets and Correct Order Expectation Bounds
17. DP2020/09 - KACZYNSKA, S., MARION, R. and R. VON SACHS  
Comparison of Cluster Validity Indices and Decision Rules for Different Degrees of Cluster Separation
18. DP2020/08 - PIRCALABELU, E. and A. ARTEMIOU  
The LassoPSVM approach for sufficient dimension reduction using principal projections
19. DP2020/07 - PIRCALABELU, E. and A. ARTEMIOU  
Graph informed sufficient dimension reduction
20. DP202/06 - HALLIN, M., MORDANT, G. and J. SEGERS  
Multivariate Goodness-of-Fit Tests Based on Wasserstein Distance
21. DP2020/05 - ASENOVA, S., MAZO, G. and J. SEGERS  
Inference on extremal dependence in a latent Markov tree model attracted to a Hüsler-Reiss distribution
22. DP2020/04 - EINMAHL, J. and J. SEGERS  
Empirical tail copulas for functional data
23. DP2020/03 - HAINAUT, D. and N. LEONENKO  
Option pricing in illiquid markets: a fractional jump-diffusion approach
24. DP2020/02 - D. HAINAUT  
Credit risk modelling with fractional self-excited processes
25. DP2020/01 - D. HAINAUT and M. DENUIT  
Wavelet-based feature-engineering for mortality projection
26. DP2019/28 - M. DENUIT  
Investing in your own and peers' risks: The simple analytics of p2p insurance
27. DP2019/27 - D. HAINAUT  
Credit risk modelling with fractional self-excited processes
28. DP2019/26 - HAINAUT, D. and M. DENUIT  
Wavelet-based feature-engineering for mortality projection
29. DP2019/25 - BIBAL, A., MARION, R., FRENAY, B. and R. VON SACHS  
BIOT: Explaining Multidimensional MDS Embeddings Using the Best Interpretable Orthogonal Transformation
30. DP2019/24 - BARIGOZZI, M., HALLIN, M., SOCCORSI, S. and R. VON SACHS  
Time-Varying General Dynamic Factor Models and the Measurement of Financial Connectedness
31. DP2019/23 - MASTROMARCO, C., SIMAR, L. and V. ZELENYUK  
Predicting Recessions: A New Measure of Output Gap as Predictor

32. DP2019/22 - MATHIEU, S., VON SACHS, R., RITTER, C., DELOUILLE, V. and L. LEFÈVRE  
Uncertainty quantification in sunspot counts.
33. DP2019/21 - MARTIN, M. and B. GOVAERTS  
LiMM-PCA : combining ASCA+ and linear mixed models to analyse high dimensional designed data
34. DP2019/20 - MARTIN, M. and B. GOVAERTS  
Feature Selection in metabolomics with PLS-derived methods

## 2. People

### 2.1. PhD students

1. Al-Hassan, Hassana
2. Annoye, Hugues
3. Asenova, Stefka Kirilova
4. Beyene, Kassu Mehari
5. Diakite, Keivan
6. Gressani, Oswaldo
7. Hanna, Vanessa
8. Jacquemain, Alexandre
9. Ketelbuters, John-John
10. Lucas, Nathalie
11. Marion, Rebecca
12. Martin, Manon
13. Mathieu, Sophie
14. Mordant, Gilles
15. Morsomme, Hélène
16. Nesakati, Ensiyeh
17. Ngugnie, Pauline
18. Niyigena, Emmanuel
19. Njike, Charles-Guy
20. Pechon, Florian
21. Soetewey, Antoine
22. Taverne, Cédric
23. Thiel, Michel
24. Zeddouk, Fadoua

### 2.2. Post-doc researchers

1. De Backer, Mickaël
2. Desmet, Lieven
3. Garcia Barrado, Leandro
4. Kyriakopoulou, Dimitra

## 2.3. Visitors (Research visit)

1. Camilla Mastromarco, University of Salento, Italy  
28/08/2019 - 06/09/2019 and 17/02/2020 - 22/02/2020 Invited by Van Keilegom / L. Simar
2. Peter Hieber, Universität Ulm, Germany  
08/10/2019 - 15/09/2020, Invited by P. Devolder
3. Yang Lu, Université Paris 13  
16/10/2019 - 18/10/2019, Invited by M. Denuit and D. Hainaut
4. Nikolai Leonenko, Cardiff University, United Kingdom  
03/11/2019 - 11/11/2019, Invited by D. Hainaut
5. Christian Haedo, CIDETI, Argentina  
03/02/2020 - 01/03/2020, Invited by M. Mouchart
6. Rémy Leluc, Télécom Paris, France  
09/02/2020 - 15/02/2020, Invited by J. Segers
7. Mathieu Pigeon, Université du Québec à Montréal, Canada  
10/02/2020 - 15/02/2020, Invited by M. Denuit
8. Daniel Rademacher, Technische Universität Braunschweig, Germany  
11/02/2020 - 14/02/2020, Invited by R. von Sachs
9. Antonino Abbruzzo, University of Palermo, Italy  
02/03/2020 - 29/05/2020 - invited by B. Govaerts
10. Ansgar Steland, RWTH Aachen, Germany  
04/03/2020 - 06/03/2020, Invited by R. von Sachs

## 2.4. Visitors (Seminar/Workshop)

1. Andreas Alfons, Erasmus Universiteit Rotterdam, The Netherlands
2. Ansgar Steland, RWTH Aachen, Germany
3. Catherine Péters, Commission Nationale pour les Droits de l'Enfant
4. Ernst Wit, Università della Svizzera Italiana (USI), Switzerland
5. Libei Chen, Stone DCB, Brussels
6. Nikolai Leonenko, Cardiff University, United Kingdom
7. Radia Belhocine, Business & Decision
8. Wolfgang Härdle, Humboldt-Universität zu Berlin, Germany
9. Yang Lu, Université Paris 13, France

## 3. Seminars and Workshops

### 3.1 Seminars

04/10/2019 : Statistics seminars

**Michel Mouchart, ISBA-UCLouvain and Guillaume Wunsch, DEMO-UCLouvain**  
«Pharmacological and residual effects in randomized placebo-controlled trials. A structural causal modelling approach»

18/10/2019 : Joint seminar ISBA/LFIN

**Yang Lu, Université Paris 13, France**

«Noncausal Affine Process with Applications to Derivative Pricing»

25/10/2019 : Joint seminar ISBA/CORE

**Wolfgang Härdle, Humboldt-Universität zu Berlin, Germany**

«SONIC: SOcial Network with InDuencers and Communities»

08/11/2019 : Statistics seminars

**Nikolai Leonenko, Cardiff University, United Kingdom**

«Fractional Pearson Diffusions»

15/11/2019 : Joint seminar ISBA/CORE

**Andreas Alfons, Erasmus Universiteit Rotterdam, The Netherlands**

«A projection pursuit approach for robust maximum association measures with an extension for sparsity»

05/12/2019 : Statistics seminars  
**Ernst Wit, Università della Svizzera Italiana (USI), Switzerland**  
«High-dimensional inference in graphical models»

11/02/2020 : Statistics seminars  
**Mathieu Pigeon, Université du Québec à Montréal (UQAM), Canada**  
«Inclusion des dossiers ouverts lors de la modélisation individuelle des réserves en assurance non-vie»

13/03/2020 : Statistics seminars  
**Ansgar Steland, RWTH Aachen**  
«Inference for High-Dimensional Covariance Matrices: Testing and Estimating Changes for Time Series»

## 3.2 Applied Statistics Workshops

12/10/2019  
**Christian Ritter, SMCS and Ritter & Danielson Consulting**  
«See and Show: Statistical graphics and tabulation to discover and communicate»

18/10/2019  
**Kaleidoscope SMCS :**  
«Les statistiques bayésiennes, pas rien qu'un effet de mode...» La plateforme de Support en Méthodologie et Calcul Statistique va présenter 3 études de cas de domaines différents faisant appel à l'inférence bayésienne.  
**Christian Ritter, SMCS and Ritter & Danielson Consulting**  
«Statistics at your fingertips: A tour of web platforms providing data about the world and your village»

08/11/2019  
**Catherine Péters, Commission Nationale pour les Droits de l'Enfant**  
«Etude spécifique enfants dans la migration: mettre dans la lumière ces enfants restés dans l'ombre des statistiques»

22/11/2019  
**Libei Chen, Stone DCB, Brussels**  
«Artificial Intelligence and Chatbots: What's in there for us Statisticians?»

**Cameron Todd and Jonathan Moriau, Intys, Brussels**  
«How to automatically identify UBOs (Ultimate Beneficiary Owners) on a worldwide scale?»

29/11/2019  
**Radia Belhocine, Business & Decision et Séverine Guisset, SMCS**  
«Atelier d'introduction au text mining»

13/12/2019  
Présentations d' alumni récents de la formation 'Junior Data Analyst':  
• **Florian Royers, Fluxis**  
• **Loïc Bernar, Business&Decision**  
• **Jessica Vandenbosch, StepUp Consulting**

07/02/2020  
**Robin Lovelace, Geostats**  
Part 1 : Seminar-Presentation: «Transport Data Science: from regional to street levels»  
Part 2 : Hands-on workshop

06/03/2020  
**Fabien Francis, Micropole**  
«Les avantages du cloud : créer et déployer rapidement des modèles de Machine Learning avec les services PaaS (Platform-as-a-Service) d'AWS ou Azure»

27/03/2020 - *Online*  
**Brecht Devleesschauwer, Sciensano and Ghent University**  
«Belgian national burden of disease study: preliminary results and moving forward»

24/04/2020 - *Online*  
**Antoine Soetewey, ISBA and Eugen Pircalabelu, ISBA**  
«How can we predict the evolution of COVID 19 in Belgium ?»

08/05/2020 - *Online*  
**Lieven Desmet, SMCS**  
«Efficient statistical detection of fraud in multicentre experiments»

## 4. Scientific Events

**13/12/2019**

### LES ASPECTS COMMUNAUTAIRES DES DÉPENSES ET DU FINANCEMENT DU SYSTÈME DE PENSIONS

Par Maxime Fontaine, ULB (Dulbea) | 10h30 -12h30 | UCLouvain (MONT03)

**07/02/2020**

### ACTUALITÉS EN DROIT EUROPÉEN DES PENSIONS

Par Quentin Detienne, ULiège | 10h30 -12h30 | UCLouvain (MONT03)

**21/02/2020**

### WORKSHOP ON DESIGN OF EXPERIMENTS

The workshop consists of four speakers that will handle a wide range of topics in DOE that are relevant for a broad audience from academia and industry. The keynote will be given by Prof. Peter Goos, author of the book «Optimal design of experiments: a case study approach». After this keynote lecture, three dedicated talks will guide the participants through several case studies that are presented by experienced researchers from industry.

#### Program schedule:

13h30 - 14h00: Welcome with coffee

14h00 - 15h15: Speaker 1 - P. Goos (KU Leuven, Division MeBioS)

15h45 - 16h15: Speaker 2 - E. Rozet (Pharmalex) abstract

16h15 - 16h45: Speaker 3 - B. Francq (GSK) abstract

16h45 - 17h15: Speaker 4 - J. De Wolf (Highwoods) abstract

#### Location:

UCLouvain (Auditorium BARB 93)

#### Webpage:

<https://www.biw.kuleuven.be/biosyst/mebios/biostatistics-group/bENBIS/>



**CHAIRE d'excellence sur les PENSIONS**

# PENSIONS' MORNINGS

## Cycle de séminaires 2019-2020

Louvain-la-Neuve | Auditoire Montesquieu 3 | Place Montesquieu

Sous la direction académique des professeurs Alexia Autenne et Pierre Devolder, UCLouvain

**Vendredi 13 décembre 2019 | 10h30-12h30**  
**LES ASPECTS COMMUNAUTAIRES DES DÉPENSES ET DU FINANCEMENT DU SYSTÈME DE PENSIONS**  
Par Maxime Fontaine, chercheur au Département des sciences appliquées de l'ULB (Dulbea)

**Vendredi 7 février 2020 | 10h30-12h30**  
**ACTUALITÉS EN DROIT EUROPÉEN DES PENSIONS**  
Par Quentin Detienne, professeur, ULiège

**Vendredi 27 mars 2020 | 10h30-12h30**  
**BELGIAN AND EUROPEAN PROSPECTS ON COMPLEMENTARY PENSIONS**  
By Yves Stevens, Professor, KU Leuven

**THE NEW PENSION DEAL IN THE NETHERLANDS**  
By Aneuk Bollen-Mandemakers, Director of the MIRA Unit for Transnational and European Cross-Border Cooperation in the Mobility, Maastricht University and Bastiaan Starink, Director of the Competence Centre for Pension Research, Tilburg University and partner at PwC Netherlands

**Vendredi 29 mai 2020 | 10h30-12h30**  
**L'INFORMATION ET LA TRANSPARENCE DANS LES SYSTÈMES DE PENSIONS**  
Par Steven Tanssen, Directeur général, Sigedio, Alexia Autenne et Pierre Devolder professeurs, UCLouvain

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Belgian branch of the  
European Network for Business  
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# WORKSHOP bENBIS on DESIGN OF EXPERIMENTS

FEB 21<sup>ST</sup>, 2020 at UCLouvain  
Auditoire BARB 93 (Place Sainte Barbe) Louvain-la-Neuve

The workshop consists of four speakers that will handle a wide range of topics in DOE that are relevant for a broad audience from academia and industry. The keynote will be given by Prof. Peter Goos, author of the book «*Optimal design of experiments: a case study approach*». After this keynote lecture, three dedicated talks will guide the participants through several case studies that are presented by experienced researchers from industry.

## Program

Welcome coffee : 13h30 - 14h00

Introduction : 14h00 - 14h10

**14h10 - 15h15**

**Peter Goos (KU Leuven)** : «*21st Century Response Surface Designs*»

Coffee break : 15h15 - 15h45

**15h45 - 16h15**

**Eric Rozet (Pharmalex)** : «*Design of Experiments: the launch of a journey to optimize your process*»

**16h15 - 16h45**

**Bernard Francq (GSK Vaccines)** : «*Equivalence approach in Design of Experiments for robustness evaluation (flatness) in vaccine development*»

**16h45 - 17h15**

**Joris De Wolf (Highwoods)** : «*Application of optimal design principles in the design of extensive field trials*»

**17h15 : Closing**

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## WORKSHOP bENBIS on DESIGN OF EXPERIMENTS FEB 21<sup>ST</sup>, 2020 at UCLouvain - Abstracts

**Peter Goos (KU Leuven)**

«*21st Century Response Surface Designs*»

Response surface designs are a core component of the response surface methodology, which is widely used in the context of product and process optimization. In this presentation, we present a new class of 3-level response surface designs, which can be viewed as matrices with entries equal to -1, 0 and +1. Because the new designs are orthogonal for the main effects and exhibit no aliasing between the main effects and the second-order effects (two-factor interactions and quadratic effects), we call them orthogonal minimally aliased response surface designs or OMARS designs. We constructed an extensive catalog of OMARS design for commonly used numbers of factors using integer programming. Also, we characterized each design in the catalog extensively in terms of estimation and prediction efficiency, identified interesting designs and investigated trade-offs between the different design evaluation criteria. Finally, we developed a multi-attribute decision algorithm to select designs from the catalog and built OMARS designs with two-level categorical factors as well. In the presentation, we compare the new OMARS designs to benchmark designs constructed using commercial software.

**Eric Rozet (Pharmalex)**

«*Design of Experiments: the launch of a journey to optimize your process*»

Process optimization starts with smart and adequate experimental planning. With respect to all industrial constraints, adequate Designs of Experiments (DoEs) are selected and performed by the scientists. In the (bio)pharmaceutical industry, since the adoption of the ICH Q8 document concerning the development of pharmaceutical processes following a quality by design (QbD) approach, there has been great emphasis in relevant experimental planning. This is however only the start of the journey to (bio)processes optimization. Now that properly organized experiments provide useful experimental data, what to do with them, how to analyze them to obtain the required fit for purpose decisions for the (bio)process optimization? This presentation aims at proposing a different statistical analysis of DoEs by stepping aside of the frequentist interpretations relying on statistical significance and p-values, mean modeling as well as desirability functions for multicriteria optimization. Rather, a Bayesian modeling of the data is proposed, taking into account the multivariate reality of optimizing a (bio)process and strongly relying on the multivariate predictive distributions and probability of success. A biopharmaceutical example of application will illustrate the proposed approach.

**Bernard Francq (GSK Vaccines)**

«*Equivalence approach in Design of Experiments for robustness evaluation (flatness) in vaccine development*»

Current state-of-the-art vaccines development is based on the "Quality-by-Design" paradigm, where risk-based and data driven decisions are key. A prominent example is the classification of process parameters into "critical" and "non-critical" based on a series of Designs of Experiments (DoE) performed during vaccine development. This helps to understand the relationship between Critical Process Parameters (CPPs) and "Critical Quality Attributes" (CQAs) and then to establish the "Design space". Design spaces are defined according to the ICH guidance Q8 as a subspace of process parameter combinations "that have been demonstrated to provide assurance of quality." In that context, the robustness of a process is its property to stay within the specification limits (target  $\pm \Delta$ ) after a change in experimental conditions. In analog to the classical equivalence test (see e.g. Schuirmann's Two One-Sided Test (TOST) procedure [1]), a "DOE for flatness" extends the equivalence test to the multi-dimensional case (multiple continuous or categorical factors, e.g. temperature or type of protein). We discuss adaptation of the significance level and tackling the multiplicity issue for the entire experimental domain by using contrasts of mean responses between every experimental condition and the reference point (e.g., the standard experimental condition). The design space is then the subset of the multi-dimensional space where the predicted mean responses are equivalent to the reference level, i.e., confidence intervals of mean contrasts of every experimental condition vs. the reference lie within  $\pm \Delta$ . Performance of our methodology will be evaluated by means of simulations and applications to case studies within CMC statistics and vaccines development at GSK.

**Joris De Wolf (Highwoods)**

«*Application of optimal design principles in the design of extensive field trials*»

Field experiments are an essential tool in crop improvement. Modern statistical analysis methods, the availability of genetic markers and the cheap genetic characterization, as well as novel remote sensing methodology makes field trials an exciting area of new developments. Crop improvement programs carry out field trials in early phases to select material (parent lines for hybrids, varieties) phenotypically or to phenotype lines in the context of genomic selection. Although the objective seems simple, the practice is not. Whatever the target may be, in all cases there are lots of entries (hundreds) to be tested for which seed availability is limited, while ideally they are evaluated in a wide range of environments. As a result, limited or no replication is possible, despite large variability due to field heterogeneity and uncontrollable biology. On several levels these experiments can be optimized, and principals of optimal design have been tried with more or less success. The presentation provides an introduction to the many challenges of various aspects of the design of extensive field trials, the current practical solutions and the potential of optimal design methodology to improve these designs.

## 5. Short courses

1. 10/12-11/12/2019  
Massimiliano Menzetti, Università della Calabria  
«Longevity, pension and long term care»
2. 11-12-13/02/2020  
Mathieu Pigeon, Université du Québec à Montréal  
«Modélisation individuelle des réserves en assurance non-vie»
3. 9/03, 11/03/2020  
Ansgar Steland, RWTH Aachen, Germany  
«Data Stream and Monitoring»

## 6. Doctoral Dissertations

04/12/2019  
Pechon, Florian  
«Risk classification of households with multiline P&C insurance claim frequency models»  
Promotor: Denuit Michel, Trufin Julien, <http://hdl.handle.net/2078.1/225603>

17/01/2020  
Martin, Manon  
«Uncovering informative content in metabolomics data : from pre-processing of 1H NMR spectra to biomarkers discovery in multifactorial designs»  
Promotor: Bernadette Govaerts, <http://hdl.handle.net/2078.1/227671>

## 7. Projects

### Modeling of jump clustering for managing interest rates and creditrisks

Promoter: Donatien Hainaut  
Sponsor: FNRS CDR (2019-2020)

### Optimal transport in nonparametric statics: Copulas for non-Euclidean data and multivariate tail quantile countours

Promoter: Johan Segers  
Sponsor: FNRS CDR (2019-2020)

### Quantile regression for censored data

Promoter: Anouar El Gouch & Ingrid Van Keilegom  
Sponsor: Partnership KULeuven - UCLouvain (2020-2024)

### Fully funded Pension Systems

Promoter: Pierre Devolder  
Sponsor: ETHIAS Chair (2019-2022)

### Imperfect Data : From Mathematical Foundations to Applications in Life Sciences (ARC Project : IMAL)

Promoters : Catherine Legrand (porte-parole, UCLouvain),  
Anouar El Gouch (UCLouvain),  
Philippe Lambert (UCLouvain / ULiège),  
Eugen Pircalabelu (UCLouvain),  
Germain Van Bever (UNamur),  
Ingrid Van Keilegom (UCLouvain / KU Leuven)  
Sponsor: Federation Wallonie-Bruxelles (2020-2025)

### Using biomarkers to enrich interim analyses in cancer clinical trials

Promotor: Catherine Legrand  
Sponsor: Subvention FIRST Région Wallonne (2019-2021)