

Postdoc Ecodep

Application possibly until November 15,
position beginning as soon as possible
(One year renewable)

Post-Doc position in the research project Ecology and Dependence
Laboratory AGM-UMR 8088, University Cergy-Pontoise

gross revenue monthly 3081€, net before tax 2500€

How to apply

Contacts to apply online: doukhan@cyu.fr and jennifer.denis@cyu.fr

Needed documents:

- PhD or equivalent diploma
- cover letter
- detailed curriculum vitae
- copy(s) of the diploma(s)
- thesis defense report

Profile The post aims to support the EcoDep project <http://doukhan.u-cergy.fr/EcoDep.html> for both the theoretical point of view and the applications. Candidates will have strong stochastic potential support, including probability theory and mathematical statistics. Specific skills in time series analysis are welcome. In order to work on applied questions as well, R and Python knowledges are also necessary.

The post-doc position aims at supporting the Ecodep project with collaborations in the locations in France and abroad for collaborative work in relation with the project. This means that English (and maybe Spanish, too) are necessary: a candidate should thus be able to travel by periods

Indeed he/she is supposed to travel as soon as possible in different places among Columbia (NYC), Santiago (Chile), Iena (Germany) and several other European locations in order to work out research work on :

- 1- Extensions and applications of Taylor's law
- 2- Modeling of abundance
- 3- Population dynamics
- 4- Time series issues: isotonicity, causality, covariates, selection
- 5- Partly observed processes and applications
- 6- Random fields, space time models and their use
- 7- Risks and data based studies

It means that potential locations will depend on the skills and interests in those initial important questions which are not considered in all the Ecodep labs, but CYU will be a fixed point in this position .

The proposed position is therefore dedicated to a statistician wishing to be involved in issues and population dynamics This is why we report below several questions of importance in the project. The modelling of population dynamics is of paramount importance in many areas of application.

Qualification PhD in Mathematical Statistics

Aims In ecology, it is a matter to understand the dynamics and life history of various species through different environments. Indeed, environmental changes can generate rapid changes in the composition of a given population, its length, its phenotypic character or also its genotype distribution. Demography is generally concerned with predicting human lifespan as well as the population structure with critical involvement in pension systems and public policy decision making. However, these dynamics raise a number of problems to which historical experience does not provide an answer.

The research proposal is to model population growth and to predict biodiversity using innovative stochastic models with a specific focus on ecological problems. The relevant aspects are related to Taylor's laws [C1998]. In addition, the difficult problems facing marine ecology, in particular those related to the evolution of the environment and its impact on marine species will be of interest. Finally, the applications will be devoted, among others, to the effects of climate change on coral reefs, ecological abundance modelling and the prediction of marine ecosystems [CFM2006], [R2019], [GH2019]. The biostatistical models are also of interest for the project [DFL2017] and they deserve additional attention.

Some of the stylized facts encountered when working with real-world datasets will be enlightened in the postdoc practice. New modelling frameworks for populations dynamics will incorporate, for instance, covariates and we will investigate their statistical properties [GX2017], [KT2019]; see e.g observation models as in [GK2020]. These problems involve isotonic models parsimony in the presence of non-linearity and non-stationarity [FLN2018], [D2018]. To conclude, causality [W1954] is of importance also to reduce dimensions as noticed in [Z2018].

Bibliography

[CFM2006] Champagnat N, Ferrière R, Méléard S (2006). Unifying evolutionary dynamics: from individual stochastic processes to macroscopic models. Theoretical population biology.

[C1998] Cohen JE (1998). How Many People Can the Earth Support? Bulletin of the American Academy of Arts and Sciences

[D2018] Doukhan P (2018). Stochastic Models for Time Series. Springer, Mathematics and Applications 80.

- [DFL2017] Doukhan P, Feugeas JP, Li X (2017) Statistical inference for DNA sequences of promoters, a non stationary qualitative model. *Statistics*.
- [FLN2018] Fokianos K, Leucht A, Neumann MH (2018). On Integrated L^1 Convergence Rate of an Isotonic Regression Estimator for Multivariate Observations. arXiv:1710.04813v2.
- [GH2019] Goncalves B, Huillet T (2019). Scaling Features of Two Special Markov Chains Involving Total Disasters. *Journal of Statistical Physics*.
- [GK2020] Gorgi P, Koopman SJ (2020) Beta observation-driven models with exogenous regressors: a joint analysis of realized correlation and leverage effects. *TI 2020-004/III, Discussion Paper*; <https://www.tinbergen.nl>.
- [GX2017] Gouriéroux C, Zakoian JM (2017). Local explosion modelling by noncausal process. *Journal of the Royal Statistical Society: Series B*.
- [KT2019] Fokianos K, Truquet T (2019). On categorical time series models with covariates. *Stochastic Processes and their Applications*.
- [M2018] P Marquet et al. (2018). Modelling the current and future biodiversity distribution in the Chilean Mediterranean hotspot. *Diversity and Distributions*.
- [R2019] Rebolledo R et al. (2019) Open-System Approach to Complex Biological Networks. *SIAM*
- [W1954] Wold H (1954) Causality and Econometrics. *Econometrica*.
- [Z2018] Zhang Z (2018) *Multivariate Time Series Analysis in Climate and Environmental Research*, Springer.

Mobility in Laboratories associated to Ecodep project

Laboratories associated to Paris Seine Initiative

Department of Economics, University of Warwick, UK

Department of Economics and Statistics (FSSH), University of Mauritius

Laboratories in France

ISFA, University Lyon 1, Lyon

ENSAI/CREST, Rennes

LMBA, UBS, University of South Brittany, Vannes

Laboratories abroad

Laboratory of Populations, Rockefeller University and Columbia University, USA

Department of Statistics, Columbia University, New-York, USA

Pontificia Universidad Católica de Chile, Department of Ecology, Santiago, Chile

Pontificia Universidad Católica de Chile, Department of Statistics, Valparaiso, Chile

CIMFAV, University of Valparaiso, Valparaiso, Chile

Friedrich Schiller University Jena, Department of Mathematics, Germany