Job Opening - Postdoctoral Researcher

Deep Learning, Satellite Images, Information Fusion and Applications in Disaster Risk Reduction ([DLISCES](#))

The LIMOS ([Laboratoire d'Informatique, de Modélisation et d'Optimisation des Systèmes](#)) and the CERDI ([Centre d'Etudes et de Recherches sur le Développement International](#)) are seeking a researcher who has recently defended or should be very close to finishing a PhD in Computer Science or Applied Mathematics. The candidate will be part of a multidisciplinary team working on Artificial Intelligence for Good and Disaster Science in the scope of the [DLISCES](#) project.

The candidate should possess strong skills in deep learning and machine learning, specifically with applications in computer vision. Ideal qualifications include solid experience in manipulating and analyzing satellite images using deep learning models. Additionally, a keen interest in collaborating with scholars in economics and management within the context of disaster risk reduction is essential. The candidate should demonstrate the ability to conduct high-level research for publication in international peer-reviewed conferences and journals. Proficiency in either English or French is required.

The candidate will join the LIMOS and collaborate closely with the CERDI.

The LIMOS is the Laboratory of Informatics, Modelling, and Optimization of Systems in Clermont-Ferrand and comprises over 240 scholars specializing in computing and more generally in sciences and technologies of information and communication. A significant portion of the LIMOS research focuses on artificial intelligence and data science, encompassing deep learning, machine learning, computer vision, computer geometry, time series analysis, and knowledge representation. Research applications span diverse areas such as the environment, health, smart transport, and industry 4.0. The candidate will be immersed in a vibrant scientific environment dedicated to artificial intelligence.

The CERDI is recognized as a leading institution in research dedicated to international development economics. A research program has existed for several years at the CERDI on sustainable development issues embedding risk economics, natural resources and environmental economics. The candidate should also benefit from the stimulating environment of the CERDI, which hosts many doctorate, post-doctorate and tenure researchers.

Research Project Description

The project contributes to the study of the complex interactions between societies and natural disasters, in particular in developing countries and the path between research and political decision-making, which is the objective of the [International Research Center of Disaster Science and Sustainable Development of the University Clermont Auvergne](#) that funds the DLISCES project.

To define policies aimed at reducing the risk associated with natural disasters within a territory exposed to climate-related hazards, it is crucial to have comprehensive and robust maps of indicators assessing various dimensions of vulnerability. However, the conventional construction of vulnerability indicators is partial and relies on economic and social data gathered through household surveys. Field surveys are time and resource-intensive and are often scarce, especially in Southern countries. This lack of spatial and temporal information hampers the accurate modeling and understanding of vulnerabilities related to the population, housing, and infrastructure in the face of climate risk.

In this context, the DLISCES project seeks to leverage deep learning and machine learning techniques to analyze readily available satellite images (e.g., Copernicus data) in conjunction with socio-economic data (e.g., LSMS data) and/or environmental data. The goal is to estimate human and material vulnerability indicators across an entire territory. Advanced artificial intelligence methods can significantly contribute to sustainability science and natural risk management by effectively combining unstructured, heterogeneous, and massive data to infer complex models capable of efficiently estimating various types of spatial indicators.

In our context, the objective is to jointly exploit satellite images, georeferenced socio-economic data, and various spatialized information to estimate different variables across the entire considered region and ultimately produce comprehensive and accurate maps of vulnerability indicators.

Application procedure

The position is for 2 years starting September 2024 or earlier. The gross annual salary is €31,500-34,000 depending on experience and includes a benefits package (health insurance plus retirement and unemployment benefits). Review

of applications will start immediately and continue until the position is filled. The closing date for applications is 31st of May 2024.

Applications containing a CV including publications (max 2 pages), and a cover letter (max 2 pages) should be sent electronically to Julien Ah-Pine (julien.ah-pine@sigma-clermont.fr) and Pascale Phélinas (pascale.phelinas@ird.fr). Two reference letters or the contacts of two referees are also required.

References (illustrative)

[Jean et al, 2016] Jean, N., Burke, M., Xie, M., Davis, W. M., Lobell, D. B., & Ermon, S. (2016). Combining satellite imagery and machine learning to predict poverty. Science, 353(6301), 790-794

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[Lee et al, 2020] Lee, J., Xu, J. Z., Sohn, K., Lu, W., Berthelot, D., Gur, I., ... & Kowatsch, B. (2020). Assessing Post-Disaster Damage from Satellite Imagery using Semi-Supervised Learning Techniques. arXiv preprint arXiv:2011.14004.

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[Valentijn et al, 2020] Valentijn, T., Margutti, J., van den Homberg, M., & Laaksonen, J. (2020). Multi-hazard and spatial transferability of a cnn for automated building damage assessment. Remote Sensing, 12(17), 2839.

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