LASAR 3
Laboratory of Analysis of Systems for the Assessment of Reliability, Risk and Resilience

MSc thesis proposal

Title of the research

Deep Learning for Spatial Hydrogeochemical Groundwater Pattern Recognition to mitigate the Risk of Aquifer Radioactive Contamination

Objectives of the research

Radionuclide contamination of aquifers involves the migration of contaminants, governed by the hydrogeochemical properties of the subsurface. Characterizing the hydrogeochemical patterns that limit/retard contaminant migration is essential for developing risk-informed mitigation strategies for aquifer radionuclide contamination.

Convolutional Neural Networks (CNNs) are effective deep learning tools that can be used to extract information from images, such as those of heterogeneous subsurface fields. The extracted subsurface hydrogeochemical patterns can be clustered to identify those hydrogeochemical parameters values that may limit the contamination in terms of solute arrival times and peak concentrations, so that, decision support can be provided for contaminated groundwater management.

References

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- Zhan, C., Dai, Z., Soltanian, M. R., & de Barros, F. P. "Data-worth analysis for heterogeneous subsurface structure identification with a stochastic deep learning framework". *Water Resources Research* (2022).

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