

## Seismic resilience using artificial intelligence

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### Summary

Taking into account the researchers high interest regarding the increase of the buildings' seismic resilience in urban areas, the main objective of the Ph.D. thesis was shaped. Thus, the Ph.D. thesis assesses the possibility of using artificial intelligence methods, i.e. multi-agent systems MAS and artificial neural networks ANN, for improving the seismic resilience in an urban area.

The Ph.D. thesis has 212 pages and it is structured on 8 chapters: 7 thematic chapters and one chapter which includes 195 references. The dissertation contains 90 figures, 63 tables, 2 appendices, and the list of figures and tables. The research results and the reviews on the state-of-the-art regarding the thesis topic were published in national/ international academic journals, which are rated CNCISIS and ISI, and in national/ international conference proceedings. Thus, at present 12 scientific articles were published. Moreover, the Ph.D. thesis author obtained during the doctoral period a DAAD scholarship for 10 months and a prize at the 2016 UEFISCDI Competition.



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During the doctoral studies program, a set of personal scientific contributions have been done regarding the considered Ph.D. thesis subject, as follows:

- Computation of the possible Peak Ground Acceleration PGA values corresponding to the Iasi municipality, by using empirical methods;
- Analysis of the knowledge dynamics regarding the Romanian seismic norms provisions;
- Developing a database composed from the results of the Time-History nonlinear analyses, corresponding to the 243 reinforced concrete RC structures, which was used later in the artificial neural network ANN training;
- Assessing the influence of the ANN input parameters, both structural and seismic, on the Final Softening FS index and on the Interstory Drift Ratio IDR;
- Checking the possibility to apply ANN in estimating some output parameters related to the degradation of a RC structure, by analyzing the results of multiple case studies;
- Studying the current seismic risk in Iasi municipality, based on a series of technical surveys carried out until 2015 and on the seismic norm regulations according to which the buildings were designed;
- Studying of the population evacuation in Iasi municipality after a major seismic event, by using the REvaSim software and assessing the importance of three important bridges found on Bahlui river. Study of the information effect on the population evacuation process;
- Improving of the REvaSim software by adding new options, which lead to more realistic results following the population evacuation simulation.

