Evaluation of pedestrian crossing accidents using Artificial Neural Network

Bertha Santos[1], Jorge Gonçalves[2], Shohel Amin[3], Sandra Vieira[4] and Carlos Lopes[5]

[1] University of Beira Interior, GeoBioTec and CERIS, Covilhã 6200-358, Portugal
bsantos@ubi.pt
[2] University of Beira Interior, GeoBioTec and CITTA, Covilhã 6200-358, Portugal
jorge@ubi.pt
[3] Coventry University, Coventry CV1 5FB, United Kingdom
s.amin15@aston.ac.uk
[4] National Laboratory for Civil Engineering, Lisboa 1700-066, Portugal
sandravieira@lnec.pt
[5] National Road Safety Authority, Barcarena 2734-507, Portugal
carlos.lopes@ansr.pt

Abstract.

Most of European cities face increasing problems caused by excessive traffic of conventional fuel-based transport modes. To reverse this situation, sustainable urban mobility policies have been promoting soft modes of transport, such as walking. Despite the advantages of walking in reducing traffic congestion and pollution, cities have not always evolved to accommodate the needs of pedestrians. According to the European Commission, in 2020, 20% of road fatalities in the European Union (EU) and 21% in Portugal were pedestrian. Pedestrian fatality rates per million population was 9.7 for all EU countries and 13.1 for Portugal. In European and Portuguese urban areas, 36% and 27% of the fatalities were pedestrians' and 49% and 56% of all pedestrian fatalities were elderly's (respectively). In pedestrian infrastructures, crossings are considered the most critical element due to conflicts between vehicles and pedestrians. It is then essential to identify and minimize risk factors that increase the probability of accidents in these locations. The proposed work intends to assess this challenge by using Artificial Neural Network (ANN) to create pedestrian severity prediction models and identify road and pedestrian risk factors for accident occurred in or near urban crossings. The official Portuguese database on run over pedestrian accidents occurred between 2017-2021 was analyzed with ANN considering two scenarios: pre-Covid-19 and during Covid-19 period. Results obtained demonstrate that the use of ANN can promote a proactive infrastructure management, suggesting that crossings traffic lights operation, lighting, shoulders and pavement conditions, high speed limits (51-90 km/h) and pedestrians moving in soft modes are critical factors.

Keywords: Road Safety, Pedestrian Accidents at Urban Crossings; Artificial Neural Network (ANN); Severity Predictive Model; Risk Factors.