

Abstract

The aim of this doctoral dissertation was to develop an innovative method for insurance premium tariffing and quoting based on telemetry data and artificial intelligence (AI) algorithms. Traditional tariffing methods in the motor insurance sector rely primarily on static and historical data, which often leads to inaccurate risk assessment. In response to these challenges, a modern solution was proposed, leveraging the Internet of Things (IoT) technology and advanced AI models, enabling dynamic and precise risk evaluation.

The dissertation is divided into five main chapters. Chapter I presents the theoretical foundations of the insurance premium tariffing and quoting process, identifying key problems in traditional approaches. Chapter II discusses modern remote communication technologies, particularly IoT and AI, which have the potential to enhance the tariffing process.

Chapter III focuses on the methodology of the conducted research, detailing the applied research methods, including the use of Design Science Research (DSR) and analytical tools based on AI and IoT, to examine the effectiveness of the developed tariffing method.

Chapter IV introduced the developed method for insurance premium tariffing and quoting, based on collecting real telemetry data from vehicles and analyzing it using AI algorithms, such as Random Forest, Deep Neural Networks, k-means clustering, and k-Nearest Neighbors (k-NN), to process the data and create accurate risk profiles for drivers.

Chapter V presented the results of experiments conducted in the Krakchemia S.A. company. The studies involving a fleet of vehicles confirmed that the proposed method enables a more accurate risk assessment, resulting in a 20% reduction in insurance premiums. One of the most significant outcomes was the development of a crash detection algorithm, which allows for automatic detection of road incidents and proactive insurer response within assistance services.

The conducted research confirmed that the main objective of the dissertation was achieved, and the proposed method for insurance premium tariffing and quoting significantly improves the risk assessment process, enabling a more dynamic and precise tariffing approach. The dissertation made a significant contribution to the field of risk management in motor insurance by practically combining advanced remote communication technologies with AI.

The limitations of the study included the limited scale of the experiment (a fleet of 20 vehicles) and the need to simulate certain road conditions. Future research should focus on extending the study to a larger scale and integrating additional data sources, such as weather forecasts or geolocation analyses, to further enhance the precision of risk assessment.