Analysis of traffic accident time series in the Karlovy Vary Region and prediction of their development

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Abstract

Road traffic accidents represent a long-term social issue influenced by various temporal, regional and behavioural factors. The aim of this study was to identify the trend and seasonal components of road traffic accidents in the Karlovy Vary Region in the period 2015–2024, to evaluate their development and to verify the possibilities of predicting future accident rates using a selected time series model. The study was based on secondary data on road traffic accidents processed through content analysis. Descriptive statistics and time series methods were applied to evaluate accident development, while the ARIMA model was used for short-term prediction. The results showed that the development of road traffic accidents in the Karlovy Vary Region cannot be described by a clear long-term increasing or decreasing trend, but rather by significant variability over time and recurring seasonal fluctuations. Furthermore, men were consistently more frequently involved in traffic accidents than women, although the development dynamics of both groups were similar. The predictive model achieved an acceptable level of accuracy for short-term forecasting and indicated a continuation of the existing development pattern without major structural changes. The main limitation of the study is the use of aggregated monthly data, which does not allow for a detailed assessment of accident causes or severity. Future research could focus on more detailed accident characteristics, regional comparisons or the application of alternative predictive models.

Keywords: Road traffic accidents, time series analysis, seasonal fluctuations, traffic accident forecasting, ARIMA model, Karlovy Vary Region

Introduction

Traffic accidents are a significant part of road traffic. In many cases, they can lead not only to damage to vehicles and property, but also to serious injuries or even death of road users. The prevalence of traffic accidents and related mortality in a given country is an important indicator of the sophistication of that country and its population (Andrejiova, 2024). Traffic accidents result in lost productivity and healthcare costs (Bertoli & Grembi, 2021). Safe traffic is an important part of sustainable transport. Traffic accidents cause a large number of casualties and property losses every year (Zeng et al., 2024). The development of road transport infrastructure is progressing rapidly in both developed and developing countries. However, the number of deaths caused by traffic accidents continues to rise (Hermawan et al., 2024). Traffic accident risk analysis and prediction are considered prerequisites for road safety management, which directly affects the accuracy and effectiveness of road safety decisions (Zhao et al., 2023).

Purkrábková et al. (2021) addressed the current issue of classifying traffic accident risks in urban environments. In connection with the increase in traffic in the Czech Republic, a higher probability of traffic excesses can be expected in the future. In the event of a traffic excess in a city, the goal is to propose a meaningful traffic management solution that minimizes social losses. Gorzelanczyk et al. (2024) argue that there has been a decline in the number of reported traffic accidents in the Czech Republic and worldwide each year. Although these figures have been affected by recent pandemic-related trends, the overall rate remains significant.

Real-time traffic accident prediction helps identify and prevent traffic accidents. For many years, various real-time traffic accident prediction models have been studied to provide effective information for proactive traffic management (Lei et al., 2021). The causes of traffic accidents vary, including weather, road conditions, road design, and psychological factors. With the development of information technology, large amounts of traffic accident data can be collected and analyzed more easily than before (Yang et al., 2024). Demographic factors such as age and gender significantly influence the causes of traffic accidents, which is essential for ensuring effective prevention and road safety (Reznicek & Kovac, 2025).

The aim of this study is to identify the trend and seasonal components of traffic accident development in the Karlovy Vary Region in the period 2015–2024, evaluate their development, and verify the possibilities of predicting future accident rates using a selected time series model. In connection with this aim, the following research questions are set:

The prices of selected commodities have a significant impact on the economy and the standard of living of the population. This research question allows for a better understanding of the development of these commodities over a longer period of time and an assessment of the main trends in their prices over the last seven years.

RQ1: What is the long-term trend in traffic accidents in the Karlovy Vary Region between 2015 and 2024?

The first research question focuses on determining the long-term trend in traffic accidents in the Karlovy Vary Region between 2015 and 2024. Its aim is to find out whether the number of accidents is showing an upward, downward, or stable trend, and thus to assess the overall development of road safety in the region.

RQ2: What are the differences in the involvement of men and women in traffic accidents in the Karlovy Vary Region in the period 2015–2024?

This research question focuses on analyzing the differences in the involvement of men and women in traffic accidents in the Karlovy Vary Region in the period 2015–2024. The aim is to quantify the proportions of each gender among traffic accident participants and monitor their development over time.

RQ3: How accurate is the prediction model in estimating future traffic accident trends in the region?

The third research question deals with the accuracy of the created prediction model in estimating future traffic accident trends. Its purpose is to verify the reliability of the selected time series model and assess its usability for predicting accident trends on a regional scale.

Literary research

Author Getahun (2021) focused on modeling trends in injury, fatal, and total traffic accidents based on monthly regional data, using ARIMA time series models to analyze and predict accident trends; The results indicated a continuing, unabated trend in traffic accidents in the predicted period and pointed to the need for systematic preventive measures. The importance of using time series in assessing accident trends is also confirmed by other studies that focus on a broader geographical and methodological context. Authors Khasawneh et al. (2022) focused on the development of predictive models of traffic accidents, injuries, and deaths in developing countries with the aim of supporting planning and improving road safety measures, with predictive models created using time series analysis broken down into trend, cyclical, seasonal, and irregular components; The results showed that this approach explained a significant part of the variability of the monitored variables, as evidenced by relatively acceptable values of the coefficient of determination (R^2). Similarly, time series analysis was also used to evaluate long-term trends in traffic accidents at the national level, identifying a downward trend in accidents and fatalities in the Slovak Republic between 2009 and 2022 based on the ETS exponential smoothing method (Andrejiova, 2024). Kovač et al. (2025) analyzed over 90,000 traffic accidents from the Czech national accident register (10/2022–10/2023) and confirmed a statistically significant increase in accident frequency during sunrise and sunset periods. Although the correlation between sunrise/sunset timing and accident frequency was weak, it remained statistically significant, indicating that sunlight glare represents a relevant risk factor for road safety.

The results of this study also confirmed the importance of the trend and seasonal components of the time series and enabled a five-year forecast of further developments. At the

macro level of traffic accident development, there are further studies that, in addition to time dynamics, also take into account the influence of selected explanatory factors, with a combination of correlation and regression analysis with the ARIMA time series model demonstrating a statistically significant influence of demographic and traffic characteristics on accident development (Cincikaite & Meidute-Kavaliauskiene, 2023)

The authors Sekadakis et al. (2021) focused on predicting the number of traffic accidents and related losses by combining the classic ARIMA time series model with a backpropagation neural network. The results showed that the hybrid ARIMA-BP model achieved a lower prediction error rate than the ARIMA model alone, but at the cost of higher methodological and computational complexity, which the authors identify as the main limitation of this approach. Using the same data set, the authors further evaluated the impact of extraordinary events on the development of traffic accidents by analyzing the impact of the COVID-19 pandemic on the development of traffic accidents, deaths, and injuries in Greece using monthly data for the period 2010–2020. Using the SARIMA seasonal time series model, they compared actual developments with a counterfactual prediction without the pandemic, with the results showing an overall decline in accidents but also a relative deterioration in road safety during the lockdown period due to the disproportion between traffic volume and the number of accidents. The use of time series models to predict traffic accidents at the national level is also followed up by studies focusing on the urban environment and a more detailed spatial context. The study focused on the development and frequency of traffic accidents on London's A-class roads with the aim of identifying factors influencing accident rates and creating a short-term estimate of their future development. Descriptive statistics and ARIMA and SARIMAX time series models were used to process the data. The results showed that the ARIMA model achieved higher predictive accuracy and enabled the identification of key factors influencing the frequency of traffic accidents (Balawi & Tenekeci, 2024).

The impact of pandemic measures on specific transport segments was examined by Islam et al. (2025), who focused on analyzing the effects of restrictions against the spread of COVID-19 on accident rates and mortality. To process the data series from 2016–2023, the authors used the ARIMA time series prediction model in combination with boxplot analysis, which allowed them to compare real data with the expected development. The results showed that while the first wave and lockdowns led to a significant decrease in accidents compared to the prediction, the third wave saw a sharp increase in all monitored variables, confirming the significant but time-varying impact of crisis measures on safety trends. The issue of interventions in the transport system is also addressed in studies focusing on targeted state interventions outside the pandemic context. Delavara et al. (2024) analyzed the impact of government interventions on road traffic fatalities and injuries, specifically the effects of two waves of fuel price increases and stricter penalties for traffic violations. They used a method of interrupted time series analysis to evaluate three specific intervention points. The results showed that although the overall accident rate (RTM) was declining, this decline was not uniform across all provinces. A key finding was that while both waves of fuel price increases correlated with a decline in accidents, the second wave had an impact in fewer provinces than the first, suggesting that repeated interventions of the same type lose their effectiveness.

Furthermore, it was shown that increasing fines was an effective tool only in a limited number of regions. In a geographically similar context, Tutka et al. (2025) analyzed the impact of stricter traffic laws and increased financial penalties in Poland in 2022. The aim of the study was to estimate the impact of these legislative changes on road safety. The authors chose interrupted time series analysis as their primary methodological tool and compared the results with data from neighboring countries. The model demonstrated a statistically significant impact of the reforms, with the authors estimating a decrease in the number of accidents by approximately 6–8% and a decrease in the number of deaths by up to 22% as a result of the measures introduced.

Billah et al. (2022) assumed that the frequency of traffic accidents, the severity of injuries, and driver behavior differ according to gender, and analyzed differences in accident rates between men and women based on ten years of data from a traffic accident database. The study focused on selected types of risky driver behavior, particularly inattentive driving, speeding, lane departure, and drunk driving, and their relationship to injury severity. The results showed that men were more often involved in accidents related to speeding, driving under the influence of alcohol, and lane departure, while women were more often involved in accidents caused by inattentive driving, with time and environmental factors also playing a significant role. Studies focusing exclusively on drunk driving provide a more detailed breakdown of gender differences in specific risk behaviors. Khasawneh et al. (2022) focused on analyzing traffic accidents related to drunk driving in order to identify differences in accident severity between men and women. Based on single-vehicle accident data, a logit model with random parameters was created, which allowed for separate assessment of factors influencing injury severity by gender, taking into account driver, vehicle, road condition, and environmental characteristics. The results showed significant gender differences in the severity of injuries in accidents caused by drunk driving and confirmed that the likelihood of serious injury increases significantly even at lower blood alcohol levels.

Authors Wang et al. (2023) analyzed risk factors affecting the severity of traffic accidents with regard to the responsibility of the perpetrator and the characteristics of the built environment. Based on traffic accident data from 2018–2020, they used the RF-SHAP method to identify key factors affecting accident severity, including the season, road type, mode of travel, driver age, and density of points of interest (POI) at the accident site. The results showed that the significance of individual risk factors varies depending on whether motor vehicle drivers or vulnerable road users are responsible for the accident, with seasonality and the nature of the built environment playing a significant role, especially in serious and fatal accidents.

The studies mentioned above show that research into traffic accidents in professional literature is most often based on quantitative processing of secondary data using descriptive statistics, time series analysis, and regression approaches. These methods make it possible to capture long-term accident trends, identify changes in trends, and assess the impact of selected factors such as extraordinary events, legislative interventions, or demographic characteristics of drivers.

Based on the literature review, content analysis will be used for data collection in this work. Descriptive statistics and time series methods will be used for data processing, which will allow us to describe the development of traffic accidents over time, assess changes in long-term trends, and create a short-term estimate of future developments using the ARIMA time series model. This approach builds on previous research, but is applied in the regional context of the Karlovy Vary Region and to a specific data set.

Data and methods

This chapter focuses on defining the data base and methodological procedure used in the application part of the thesis. Its aim is to present the data used, the analytical methods applied, and to describe the procedure used to obtain the results that serve to fulfill the objective of the thesis and answer the research questions set.

The data base of the thesis consists of secondary data on traffic accidents in the Karlovy Vary Region. The data was obtained from a publicly available database of traffic accidents administered by the Transport Research Centre of the Czech Republic via the internet portal nehody.cdv.cz. Content analysis of the data source was used for data collection, with the aim of selecting relevant indicators and verifying their consistency. The data used covers the period from January 2015 to December 2024, is processed on a monthly basis, and the unit of observation is one calendar month. The database includes the total number of traffic accidents in the Karlovy Vary Region and the number of participants in traffic accidents by gender.

Descriptive statistics and time series analysis methods were used to analyze the data. Descriptive statistics were used to provide a basic description of the database and a clear presentation of the development of traffic accidents over time. Time series analysis was used to capture the development of values on a monthly basis, identify fluctuations over time, and recurring seasonal fluctuations. These methods were applied in particular to answer research questions focused on the development of traffic accidents and differences in the involvement of men and women in traffic accidents.

An ARIMA (AutoRegressive Integrated Moving Average) time series model was used to predict future trends in traffic accidents. The ARIMA model combines an autoregressive component, an integration component, and a moving average and can be generally expressed by the equation (Box et al., 2015):

$$\phi(B)(1-B)^d y_t = \theta(B)\varepsilon_t$$

where:

- $y_t$represents the value of the time series at time
- t [number],
- B is the delay operator,
- d is the degree of differentiation,
- $\phi(B)$ is the autoregressive polynomial,

- $\theta(B)$ is the moving average polynomial
- ε_t is a random component of the model.

The prediction model was estimated using monthly data for the period from January 2015 to December 2023. To verify its predictive ability, validation was performed for the year 2024, when the predicted values were compared with the actual recorded values of traffic accidents. The accuracy of the model was evaluated using the standard error indicators MAE, RMSE, and MAPE.

The Mean Absolute Error (MAE) indicator is defined by the relationship (Hyndman and Athanasopoulos, 2021):

$$MAE = \frac{1}{n}\sum_{t=1}^{n} | y_t - \hat{y}_t |$$

where:

- y_t = represents the actual value of the time series at time
- t = [number],
- $\hat{y}_t$ = is the predicted value [number]
- n = is the number of observations.

The RMSE (Root Mean Squared Error) indicator is expressed by the following equation: (Hyndman and Athanasopoulos, 2021):

$$RMSE = \sqrt{\frac{1}{n}\sum_{t=1}^{n}(y_t - \hat{y}_t)^2}$$

where the individual variables have the same meaning as in the MAE indicator.

The relative accuracy of the prediction was evaluated using the MAPE (Mean Absolute Percentage Error) indicator, which is defined by the following equation (Hyndman and Athanasopoulos, 2021):

$$MAPE = \frac{100}{n}\sum_{t=1}^{n} | \frac{y_t - \hat{y}_t}{y_t} |$$

where MAPE expresses the average relative deviation of predicted values from reality in percent.

Basic data processing, descriptive statistics, and the creation of graphical outputs related to research questions VO1 and VO2 will be performed in Microsoft Excel. Statistical software R (RStudio) will be used for time series modeling, ARIMA prediction model estimation,

validation of its accuracy, and the creation of related graphical outputs within the framework of research question VO3.

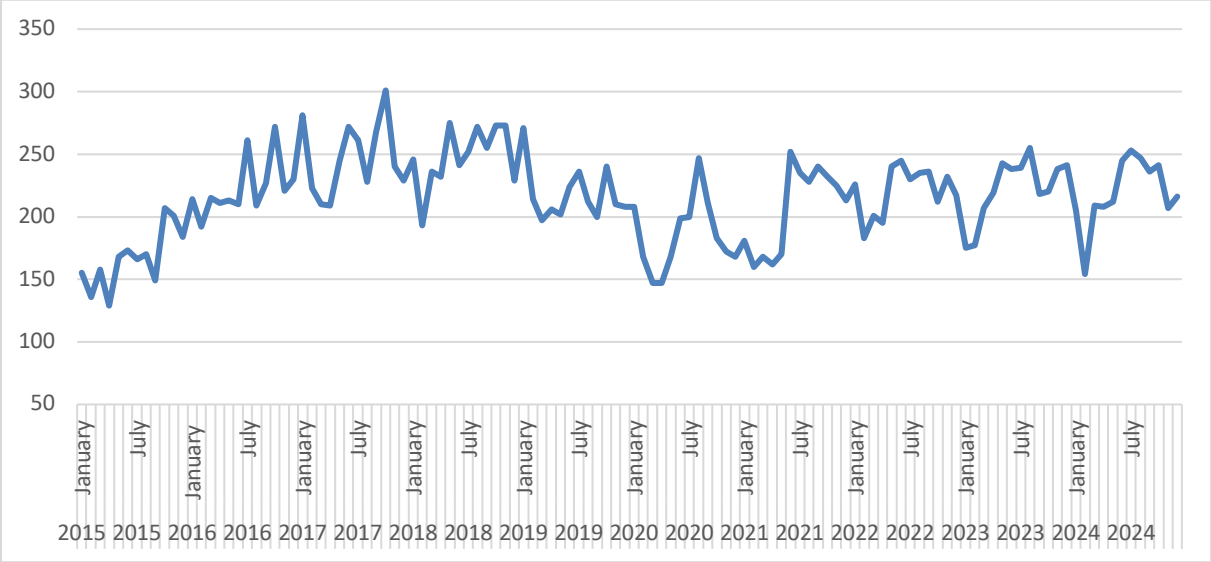
Based on the verified prediction model, a prediction of the development of traffic accidents in the Karlovy Vary Region for the period from January 2025 to December 2026 will then be created. The prediction will be processed on a monthly basis and supplemented with confidence intervals that will express the uncertainty of future developments and serve as a basis for interpreting the results in the following chapter of the thesis.

Results

This section presents the results of an analysis of the development of the total number of traffic accidents in the Karlovy Vary Region between January 2015 and December 2024. The results are based on monthly data on traffic accidents obtained from the database of the Transport Research Centre of the Czech Republic and were processed in accordance with the methodological procedure described in the previous chapter.

Chart 1 shows the development of the total number of traffic accidents in the Karlovy Vary Region on a monthly basis. The chart shows that the number of traffic accidents during the period under review fluctuates and shows recurring fluctuations over time. The values for individual months range from approximately 130 to 300 traffic accidents. The time series indicates the presence of regular seasonal fluctuations, with differences in the absolute accident rate between individual years.

Figure 1: Development of the total number of traffic accidents in the Karlovy Vary Region

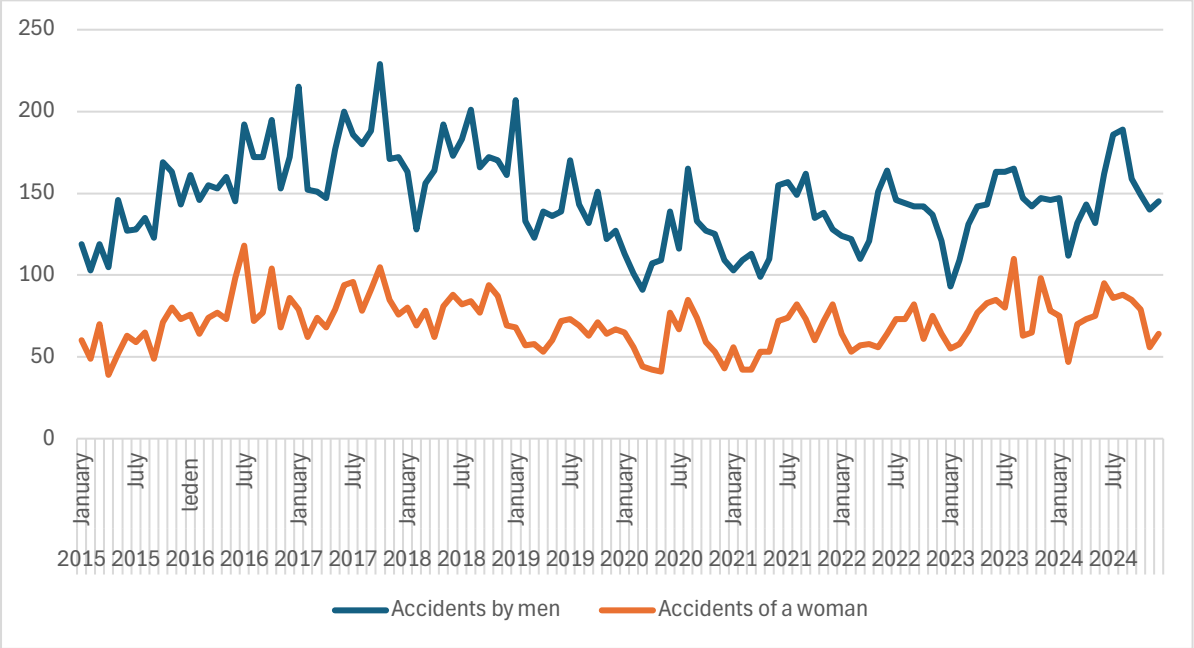


Source: Own processing based to nehoda.cdv.cz.

At Chart 2 shows the development of the number of participants in traffic accidents by gender in the Karlovy Vary Region in the period from January 2015 to December 2024. The graph shows that throughout the entire period under review, the number of men involved in traffic accidents exceeded the number of women. This difference is evident in all the years

under review and does not show any significant changes over time. The development of both time series shows similar dynamics, characterized by fluctuations over the years and recurring seasonal fluctuations. Higher and lower values for the number of traffic accident participants for both sexes occur in similar time periods. The absolute numbers of traffic accident participants for men range from approximately 100 to 180 persons in most months, while for women the values most often range from approximately 50 to 100 participants per month. The graph also shows that differences between the numbers of traffic accident participants by gender are evident throughout the period under review, with their magnitude varying slightly from month to month depending on the total number of recorded traffic accidents.

Figure 2: Development of the number of traffic accidents by gender in the Karlovy Vary Region (2015–2024)



Source: Own processing based to nehoda.cdv.cz.

To verify the accuracy of the prediction model, validation was performed on a known period. The ARIMA model was first estimated on monthly data for the period January 2015 to December 2023, followed by the creation of an annual prediction for the period January 2024 to December 2024. This prediction was compared with the actual values recorded in 2024. The accuracy of the model was evaluated using standard error indicators MAE, RMSE, and MAPE, which allow the deviation of the prediction to be expressed both in absolute values and relatively in percentages.

Table 1 - Error indicators of the ARIMA prediction model (verification for 2024)

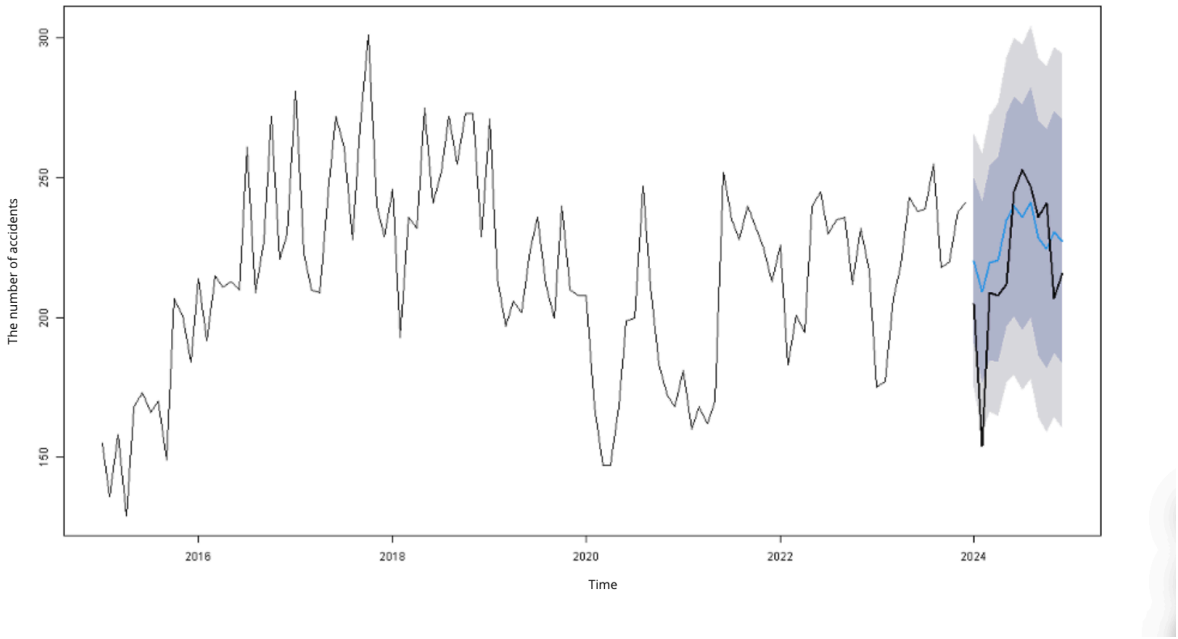
MAE	RMSE	MAPE
16,92	21,26	8,57 %

Source: Own processing based to nehoda.cdv.cz.

Table 1 shows the values of the error indicators of the ARIMA prediction model when verified for 2024. The MAE and RMSE indicators express the magnitude of the absolute deviation of the predicted values from reality, while MAPE expresses the relative deviation of the prediction in percent.

For a clear assessment of the estimated values, a visual comparison of the actual development and the prediction for 2024 was performed. Graph 3 shows the actual monthly values of the number of traffic accidents in the Karlovy Vary Region in 2024 and, at the same time, the values predicted by the ARIMA model created on the basis of historical time series. The display also includes prediction confidence intervals, which define the expected range of values at the selected probability level.

Figure 3: Actual and predicted total number of traffic accidents in the Karlovy Vary Region (ARIMA), 2024



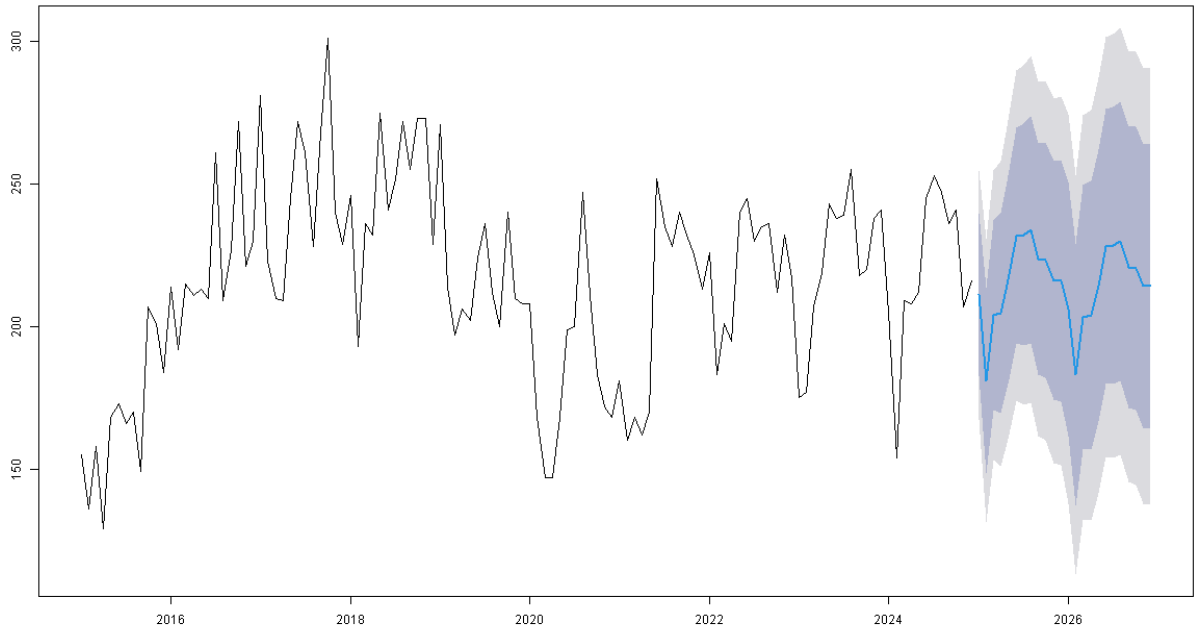
Source: Own processing based to nehoda.cdv.cz.

Chart 3 shows that the predicted time series captures the monthly development of the number of traffic accidents in 2024. The actual values for each month are close to the predicted trajectory. The confidence intervals shown define the range of values within which the actual values for each month lie, given the level of uncertainty of the model.

After verifying the predictive power of the model for 2024, the model was then applied to the entire available time series for the period from January 2015 to December 2024. Based on this model, a prediction of traffic accidents in the Karlovy Vary Region for the period from January 2025 to December 2026 was created. Graph 4 shows the historical development of the

number of traffic accidents and the corresponding point prediction supplemented by confidence intervals.

Figure 4: Prediction of the monthly number of traffic accidents in the Karlovy Vary Region for 2025–2026 (ARIMA model)



Source: Own processing based to nehoda.cdv.cz.

Chart 4 shows that the model provides a prediction of future traffic accident trends on a monthly basis and also illustrates the uncertainty of the estimate through confidence intervals. The point prediction represents the mean estimate of future trends, while the confidence intervals define the lower and upper limits of expected values at the selected probability level. The prediction is processed on a monthly basis with a frequency of 12, which corresponds to the nature of the input database.

The specific numerical values of the point prediction and confidence intervals for individual months of 2025 and 2026 are listed in the appendix to this work.

Discussion of results

RQ1: What is the long-term trend in traffic accidents in the Karlovy Vary Region between 2015 and 2024?

The observed trend in traffic accidents in the Karlovy Vary Region indicates that the long-term trend cannot be characterized as clearly increasing or decreasing, but rather as variable with significant seasonal fluctuations. This may be due to a combination of several factors, including fluctuations in traffic intensity throughout the year, the influence of weather

conditions, and the specifics of the regional transport infrastructure. The marked seasonality suggests that traffic accident rates are strongly influenced by short-term changes in traffic behavior and external conditions rather than by a stable long-term trend.

The conclusions of this study are consistent with the study by Getahun (2021), who, using ARIMA time series models, pointed out the unstable nature of traffic accident trends and emphasized the importance of the trend and seasonal components of the time series. At the same time, however, the results suggest differences from the conclusions of Andrejiová (2024), who identified a long-term downward trend in traffic accidents at the national level. This difference can be interpreted as meaning that aggregated national data may obscure regional specifics and local fluctuations, which are more pronounced at the level of individual regions. From an interpretative point of view, it can therefore be assumed that regional analysis provides a more detailed view of the development of traffic accidents and allows us to capture dynamics that may not be reflected in national averages. The results thus support the hypothesis that conclusions based on national-level analyses cannot be automatically transferred to the level of individual regions without further generalization.

RQ2: What are the differences in the involvement of men and women in traffic accidents in the Karlovy Vary Region in the period 2015–2024?

The differences found in the involvement of men and women in traffic accidents in the Karlovy Vary Region indicate a long-term stable imbalance between the sexes, with men systematically more frequently involved in traffic accidents than women. The stability of this difference over time may indicate that it is a structural characteristic of traffic accidents rather than a short-term or random phenomenon. The fact that the development of male and female participation shows similar temporal dynamics also suggests that both groups respond to the same seasonal and temporal factors affecting overall accident rates. This result is consistent with the conclusions of the professional literature, which has long pointed to the existence of gender differences in traffic accidents. Billah et al. (2022) link the higher representation of men among traffic accident participants primarily to different patterns of traffic behavior and a higher degree of risky behavior. Although this work does not directly assess the causes of traffic accidents or their severity, the results support the general assumption that gender is a significant factor in the differentiation of participation in traffic accidents.

From an interpretative point of view, however, it is necessary to emphasize that the data used reflect participation in traffic accidents, not responsibility for their occurrence. The differences found cannot therefore be interpreted as differences in the degree of fault between men and women, but rather as differences in their exposure to traffic and in the way they are involved in the transport system. This view is consistent with approaches in the professional literature, which points to the need to distinguish between participation, behavior, and responsibility when assessing the gender aspects of traffic accidents.

RQ3: How accurate is the prediction model in estimating future traffic accident trends in the region?

The prediction of traffic accident trends in the Karlovy Vary Region for the period 2025–2026 suggests that future trends are likely to continue along the same lines as before, with no significant changes in the trend. It can therefore be assumed that the short-term development of traffic accidents will continue in a similar pattern to that observed in previous years. Confidence intervals express the natural uncertainty of the prediction and show the possible range of future values, not the exact scenario of development.

Verification of the prediction model over a known period showed that the selected model provides sufficiently reliable estimates for the short-term outlook. From a practical point of view, it can be said that the ARIMA model is able to capture basic development trends and recurring seasonal fluctuations in traffic accident data well. This confirms its usefulness, especially at the regional level, where the goal is to provide an indicative estimate of future developments rather than an accurate prediction of individual values.

The findings of this work correspond to the conclusions of the professional literature, which considers ARIMA models to be a suitable tool for short-term prediction of traffic accidents when working with monthly time series. Getahun (2021) and Khasawneh et al. (2022) point out that these models are able to capture the basic structure of accident development and provide a meaningful estimate of future developments. Compared to more methodologically complex approaches, such as hybrid models combining ARIMA with neural networks (Sekadakis et al., 2021), the chosen approach has the advantage of simpler interpretation of results.

In the context of this work, the ARIMA model can therefore be considered a suitable compromise between accuracy and simplicity. This approach allows for a clear description of the expected development of traffic accidents and provides a clear basis for basic orientation in future developments at the regional level.

Conclusion

The aim of the study was to identify trend and seasonal components in the development of traffic accidents in the Karlovy Vary Region in the period 2015–2024, to evaluate their development, and to verify the possibilities of predicting future accident rates using a selected time series model. This objective was achieved within the scope of the study.

Based on the synthesis of the results and their discussion, it can be stated that the development of traffic accidents in the Karlovy Vary Region is characterized by significant temporal variability and regularly recurring seasonal fluctuations. These fluctuations point to the fact that traffic accident rates are strongly influenced by short-term factors such as changes in traffic intensity, climatic conditions, or the seasonal behavior of road users. At the same time, the results suggest that at the regional level, accident trends cannot be clearly interpreted through a simple long-term trend, which confirms the importance of regionally focused analyses in assessing traffic safety.

Another important finding of the study is that the differences in the involvement of men and women in traffic accidents in the Karlovy Vary Region have remained stable over the long term. During the period under review, men were systematically more frequently involved in traffic accidents than women, with both groups showing similar trends over time. This suggests that gender differences in accident rates are more structural in nature and are not the result of short-term fluctuations. The findings are consistent with the conclusions of the professional literature and support the view that gender is an important aspect that should be taken into account when interpreting traffic accident data.

The study also included verification of the possibilities for predicting future trends in traffic accident rates at the regional level. Discussion of the results showed that short-term predictions based on historical trends make it possible to create realistic and comprehensible estimates of future accident dynamics. The predictive approach thus appropriately complements the view focused on past developments and provides a framework for considering future developments in traffic safety in the region. The significance of prediction lies not in the accurate estimation of individual values, but primarily in the identification of the expected direction of development and its possible variability.

The main limitations of the study include the use of aggregated monthly data, which does not allow for a detailed assessment of the causes of traffic accidents, their severity, or the responsibility of individual participants. The prediction is also based on the assumption of continuity of current developments and does not take into account possible future changes in transport infrastructure, legislative measures, or the occurrence of extraordinary events. Further research could therefore focus on working with more detailed data, extending the analysis to include causal factors, or comparing the results with other regions of the Czech Republic. The findings could serve as a basis for further specialist research and contribute to a deeper understanding of the development of traffic accidents at the regional level.

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Attachments

Appendix 1 - Point prediction of traffic accident trends

Date	Point prediction	Lower limit of 80%	Upper limit 80%	Lower limit of 95%	Upper limit of 95%
01/2025	211	183	240	168	255
02/2025	181	149	213	131	231
03/2025	204	171	237	153	255
04/2025	205	170	240	151	258
05/2025	216	180	253	161	272
06/2025	232	194	270	174	290
07/2025	232	193	271	173	292
08/2025	234	194	274	173	295
09/2025	224	183	264	162	286
10/2025	223	182	264	160	286
11/2025	216	174	258	152	280
12/2025	216	174	258	151	281
01/2026	206	162	251	138	275
02/2026	183	137	229	113	253
03/2026	203	157	250	132	274
04/2026	204	157	251	132	276
05/2026	214	167	262	141	287
06/2026	228	180	276	154	302
07/2026	228	180	277	154	303
08/2026	230	181	279	155	305
09/2026	221	172	270	145	296
10/2026	220	171	270	145	296
11/2026	214	164	264	138	290

12/2026	214	164	264	138	291

Source: Own processing based to nehoda.cdv.cz.

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