

DESIGN AND DEVELOPMENT OF AN INFORMATION SYSTEM WITH A DATABASE FOR A TRANSPORT COMPANY

Vinnitsia National Technical University

Анотація

Доповідь присвячена використанню методів машинного навчання у сфері аналізу загроз та управління ризиками. Враховано актуальні технічні підходи та алгоритми, що дає змогу ефективно ідентифікувати потенційні небезпеки та вдосконалювати процеси прийняття рішень у рамках управління ризиками.

Ключові слова: машинне навчання (МН), штучний інтелект (ШІ), аналіз загроз, управління ризиками, великі дані, алгоритми.

Abstract

The report focuses on the application of machine learning methods in the field of threat analysis and risk management. It considers current technical approaches and algorithms that enable effective identification of potential threats and support improved decision-making processes within risk management frameworks.

Keywords: machine learning (ML), artificial intelligence (AI), threat analysis, risk management, big data, algorithms.

Introduction

In the modern economy, logistics and freight transportation are critical components. Effective management of a transport company is impossible without a reliable information system that provides quick access to data on the fleet, orders, clients, and finances. The relevance of this work is driven by the need to optimize business processes, minimize paper documentation, and reduce the risk of human error. The goal of the project is to create a unified information space for managers and logisticians to perform CRUD operations and analyse key performance indicators (KPIs).

Research results

The primary outcome of this research is the design and development of a comprehensive information system tailored for automating the workflow of a transport and logistics enterprise. The foundation of the system is a relational database model, which was rigorously normalized to the Third Normal Form to ensure data integrity, eliminate redundancy, and prevent update anomalies [2]. The resulting schema comprises ten interconnected entities, including Clients, Employees, Vehicles, and Payments, revolving around the central Deliveries table which links all logistical data. To maintain logical consistency within the database, the system enforces strict constraints and utilizes foreign keys to establish one-to-many relationships, such as linking multiple delivery orders to a single client or driver.

Regarding the technical implementation, the software was built using a modern and efficient technology stack chosen for its flexibility. SQLite was selected as the database management system due to its serverless architecture and seamless integration with Python, which makes the system lightweight and easily portable between different environments [3]. The server-side logic was implemented using the Flask microframework, allowing for a modular application structure without the overhead associated with heavier frameworks [1, 4]. For the user interface, the project utilized HTML5 and CSS3 alongside the Bootstrap 5 framework, ensuring that the application provides a responsive experience across various devices [6], while the Jinja2 engine handled the dynamic rendering of content.

A significant result of the research is the development of an analytical module that processes raw data into actionable business insights. Unlike standard solutions that rely heavily on Object-Relational Mapping, this project utilizes optimized raw SQL queries to maximize performance and control over data retrieval. The system implements complex algorithms involving aggregation functions and multi-table joins to solve specific management tasks, such as calculating monthly revenue trends to identify seasonal patterns in demand.

Additionally, the system analyzes driver workload by counting active deliveries to ensure balanced task distribution and monitors financial risks by identifying orders where payments do not match the service price. These analytical insights are further enhanced through data visualization using the ApexCharts.js library [5], which renders dynamic graphs for financial monitoring. Comprehensive testing of the system confirmed that all data management operations function correctly via the web interface and that input validation mechanisms effectively preserve database integrity.

REFERENCES

1. Grinberg, M. Flask Web Development. Kyiv, 2019. 280 p.
2. Date, C. J. An Introduction to Database Systems. 8th ed. Kyiv: Williams, 2005. 1328 p.
3. SQLite Documentation. URL: <https://www.sqlite.org/docs.html> (accessed: 25.11.2025).
4. Flask Web Framework Official Documentation. URL: <https://flask.palletsprojects.com/> (accessed: 26.11.2025).
5. ApexCharts.js Visualization Library Documentation. URL: <https://apexcharts.com/docs/> (accessed: 28.11.2025).
6. Bootstrap Framework Documentation. URL: <https://getbootstrap.com/docs/5.0/> (accessed: 20.11.2025).

Borymskyi Yevhenii Volodymyrovych – student of the SA-24b group, Faculty of Intelligent Information Technologies and Automation, Vinnytsia National Technical University, Vinnytsia, email: zenia.zt2006@gmail.com.

Melekh Anna Vasylivna – English language instructor at the Department of Foreign Languages, Vinnytsia National Technical University, email: a.melekh@vntu.edu.ua.

Боримський Євгеній Володимирович – студент групи СА-24б, Факультет інтелектуальних інформаційних технологій та автоматизації, Вінницький національний технічний університет, м. Вінниця, email: zenia.zt2006@gmail.com.

Мелех Анна Васиївна – викладач англійської мови, кафедра іноземних мов, Вінницький національний технічний університет, email: a.melekh@vntu.edu.ua.