

data science in context

Data Science in Context: Understanding Its Role and Impact

data science in context is a phrase that invites us to look beyond algorithms and code, urging a deeper understanding of how data science fits into real-world scenarios. It's not just about crunching numbers or building models; it's about interpreting data in a way that drives meaningful decisions and innovation across various fields. By placing data science within the framework of its application, we gain a clearer picture of its true value and transformative potential.

Why Context Matters in Data Science

Data science isn't a one-size-fits-all discipline. The effectiveness of data-driven insights depends heavily on the context in which they are applied. Think about it: a machine learning model that predicts customer churn in the telecom industry requires different data inputs, assumptions, and evaluation criteria compared to one designed for diagnosing diseases in healthcare.

Context shapes every stage of the data science pipeline—from data collection and cleaning to modeling and interpretation. Without it, even the most sophisticated algorithms can produce misleading or irrelevant results. Understanding the specific business environment, user needs, and external factors allows data scientists to tailor their approaches, ensuring outcomes are actionable and accurate.

The Role of Domain Knowledge

One of the biggest challenges in data science is bridging the gap between technical expertise and domain knowledge. Successful projects often hinge on collaboration between data scientists and subject matter experts who provide insights about industry nuances, regulatory constraints, and customer behavior.

For example, in finance, knowing the regulatory landscape can influence how data is handled and which predictive models are appropriate. Similarly, in marketing, understanding consumer psychology helps interpret patterns that raw data alone might not reveal. This blend of skills enriches analysis and helps avoid pitfalls like confirmation bias or overfitting.

Applications of Data Science in Different Contexts

The versatility of data science is best seen through its diverse applications across industries. By examining these examples, we can appreciate how context drives not only what data is used but also how it's analyzed and acted upon.

Healthcare: Improving Patient Outcomes

In healthcare, data science plays a crucial role in predicting patient risks, personalizing treatments, and managing hospital resources. Here, context involves understanding medical terminologies, patient histories, and ethical considerations such as privacy and consent.

Predictive analytics can identify patients at high risk of chronic diseases, allowing for early intervention. Yet, building such models requires careful attention to biases in datasets that might disproportionately affect certain demographics. Contextual awareness ensures that data science contributes to fair and effective healthcare solutions.

Retail and E-Commerce: Enhancing Customer Experience

Retailers leverage data science to optimize inventory, forecast demand, and personalize marketing campaigns. The context of consumer behavior, seasonality, and supply chain dynamics informs the types of data collected and the algorithms employed.

For example, recommendation systems use purchase history and browsing patterns to suggest products, but understanding cultural differences or regional preferences can drastically improve their relevance. By situating data science within the retail context, businesses can foster stronger customer loyalty and increase sales.

Environmental Science: Tackling Climate Change

Environmental applications of data science involve analyzing sensor data, satellite imagery, and climate models to address global challenges. The context here includes geographical variables, ecosystem interactions, and long-term trends that require specialized knowledge.

Data-driven insights help in predicting weather patterns, monitoring deforestation, and assessing the impact of human activity on biodiversity. Contextualizing data science in this field underscores the importance of interdisciplinary collaboration between data experts, ecologists, and policymakers.

Challenges in Applying Data Science in Context

While the promise of data science is immense, working within real-world contexts presents several challenges that practitioners must navigate.

Data Quality and Availability

Contextual complexities often translate to messy, incomplete, or biased data. For instance, historical data might not reflect recent changes in market conditions or consumer preferences. Data scientists must employ robust cleaning and validation techniques to ensure integrity.

Moreover, some industries face strict data privacy regulations that limit access to critical datasets. Understanding these constraints is vital to designing compliant and effective data strategies.

Interpreting Results Meaningfully

A common pitfall is treating data science outputs as absolute truths without considering the broader context. Models can be affected by hidden variables, confounding factors, or simply flawed assumptions.

Communicating results in a way that stakeholders can understand and trust requires more than technical accuracy; it demands storytelling skills and an ability to link insights back to business or societal goals.

Keeping Up with Rapid Changes

Contexts evolve rapidly—new technologies emerge, consumer behaviors shift, regulations change. Data science solutions must be adaptable to remain relevant. This often involves continuous monitoring, retraining models, and revisiting assumptions.

Building flexibility into data pipelines and fostering a culture of ongoing learning are essential strategies to address this challenge.

Tips for Integrating Data Science Effectively in Any Context

Understanding how to weave data science seamlessly into your domain can significantly boost the impact of your initiatives. Here are some practical tips:

- **Engage Stakeholders Early:** Collaborate with domain experts and end-users from the beginning to frame the right questions and identify relevant data sources.
- **Focus on Data Quality:** Prioritize data cleaning and validation to avoid garbage-in-garbage-out scenarios.
- **Prioritize Interpretability:** Use models and visualizations that stakeholders can easily understand and trust.
- **Consider Ethical Implications:** Be mindful of privacy, bias, and fairness, especially when dealing with sensitive data.
- **Stay Agile:** Regularly update models and processes to reflect changes in the environment and business needs.

Future Perspectives: The Growing Importance of Context in Data Science

As data science continues to mature, the emphasis on context will only intensify. Emerging technologies like explainable AI and automated machine learning seek to make data-driven insights more transparent and accessible, but their success depends on grounding these tools in real-world understanding.

Moreover, the explosion of data from IoT devices, social media, and other sources increases both opportunities and complexities. Navigating this landscape requires a holistic approach that balances technical innovation with contextual awareness.

In essence, the future of data science lies in its ability to connect the dots—transforming raw data into meaningful narratives that resonate within their unique environments and drive tangible progress.

Data science in context is more than a catchphrase; it's a call to embrace the richness and diversity of the world in which data operates. By appreciating this, data scientists and organizations alike can harness the full power of data to solve problems, uncover opportunities, and create value that truly matters.

Frequently Asked Questions

What does 'data science in context' mean?

'Data science in context' refers to the practice of applying data science techniques while considering the specific environment, domain, and real-world factors that influence the data and its interpretation. It emphasizes understanding the background and situational nuances to make more accurate and relevant insights.

Why is context important in data science?

Context is crucial in data science because it provides the necessary background to interpret data correctly, avoid misleading conclusions, and tailor models and analyses to the specific domain or problem. Without context, data may be misinterpreted or models may fail to generalize.

How can incorporating context improve data science models?

Incorporating context can improve data science models by allowing them to account for domain-specific variables, temporal or spatial factors, and external influences, which leads to more accurate predictions, better feature selection, and more meaningful insights.

What are common challenges when applying data science in different contexts?

Common challenges include data heterogeneity, varying data quality, domain-specific jargon or variables, ethical considerations unique to the context, and the need for domain expertise to correctly interpret results and build relevant models.

How does understanding context affect data preprocessing?

Understanding context affects data preprocessing by guiding decisions on cleaning, normalization, feature engineering, and handling missing values in ways that respect the domain-specific meaning and importance of data attributes, ensuring the processed data is suitable for analysis.

Can data science in context help in ethical decision-making?

Yes, data science in context helps ethical decision-making by recognizing the societal, cultural, and legal implications of data use within a particular domain, ensuring that analyses and models do not perpetuate biases or harm and align with ethical standards relevant to the context.

Additional Resources

Data Science in Context: Navigating the Complexity of Modern Analytics

data science in context is a phrase that encapsulates the growing necessity to understand data science not as an isolated discipline but as one deeply embedded within specific industries, societal needs, and technological environments. As organizations increasingly rely on data-driven decision-making, placing data science within its appropriate context becomes critical to harnessing its full potential and avoiding misapplications.

Understanding data science requires more than just knowledge of algorithms or statistical methods; it demands an appreciation of the data sources, industry-specific challenges, and the broader ecosystem where insights are generated and applied. This article delves into the multifaceted nature of data science in context, exploring how contextual factors influence the methodologies, deployment, and impact of data science initiatives.

The Evolving Landscape of Data Science

Data science has evolved from a niche specialization to a cornerstone of modern enterprise strategy. The surge in big data technologies, machine learning frameworks, and cloud computing has democratized access to powerful analytical tools. However, this evolution also accentuates the importance of context – without it, data science risks becoming a generic exercise disconnected from real-world utility.

For instance, consider the healthcare sector versus retail. Both leverage data science but with vastly different objectives, constraints, and ethical

considerations. Healthcare data science prioritizes patient privacy, regulatory compliance, and the need for interpretability in predictive models. In contrast, retail analytics often emphasize consumer behavior, supply chain optimization, and dynamic pricing strategies. Recognizing these distinctions is pivotal for developing effective models that reflect domain-specific realities.

Industry-Specific Contexts and Their Impact

The application of data science is inherently shaped by the industry context, which affects everything from data availability and quality to the choice of analytical techniques.

- **Finance:** Data science in finance often focuses on fraud detection, risk assessment, and algorithmic trading. The volatile and high-stakes nature of financial markets demands real-time analytics and robust model validation to prevent costly errors.
- **Manufacturing:** Predictive maintenance and quality control are primary use cases. Here, sensor data and Internet of Things (IoT) devices generate massive volumes of structured and unstructured data, necessitating specialized time-series analysis and anomaly detection methods.
- **Marketing:** Customer segmentation, sentiment analysis, and campaign optimization dominate. Marketers require insights that are actionable and interpretable to tailor strategies effectively.

Each domain's unique data infrastructure, regulatory environment, and business objectives compel data scientists to adapt their approaches accordingly, reinforcing the axiom that data science is most valuable when contextualized.

Challenges of Contextualizing Data Science

Despite its importance, embedding data science within the correct context presents several challenges. One major hurdle is the diversity and complexity of data sources. Data scientists must often integrate heterogeneous datasets, ranging from structured databases to streaming social media feeds. Without domain expertise, the risk of misinterpreting data or overlooking critical variables increases significantly.

Another challenge lies in ethical considerations. The context of data science projects often governs the ethical frameworks that must be applied. For example, algorithmic bias in criminal justice applications can have life-altering consequences, necessitating rigorous fairness assessments and transparency in model development. Conversely, less regulated contexts might prioritize efficiency, potentially at the expense of privacy or equity.

The Role of Domain Knowledge and Collaboration

One recurring theme in successful data science projects is the integration of domain knowledge. Data scientists working alongside subject matter experts tend to produce more relevant and actionable insights. This interdisciplinary collaboration bridges the gap between technical prowess and contextual understanding.

Organizations are increasingly adopting cross-functional teams where data scientists, engineers, analysts, and domain specialists co-create solutions. This approach mitigates the risk of “black box” models by ensuring that outputs are interpretable and aligned with business goals.

Technological Considerations in Contextual Data Science

The tools and platforms chosen for data science projects also reflect contextual demands. Cloud-based services such as AWS, Google Cloud, and Azure offer scalable infrastructure but require careful selection based on factors like data sovereignty, latency requirements, and integration with existing systems.

Moreover, the choice between open-source frameworks (e.g., TensorFlow, PyTorch) and proprietary solutions often depends on organizational context, including budget constraints, talent availability, and the need for customization.

Data Governance and Security

In regulated industries, contextual awareness extends to data governance policies. Ensuring compliance with standards such as GDPR, HIPAA, or CCPA is non-negotiable. Data lineage, access controls, and audit trails become critical features of the data science pipeline. Failure to incorporate governance considerations can undermine both the credibility and legality of data science initiatives.

The Future of Data Science in Context

Looking ahead, the interplay between data science and its context will become even more pronounced. As artificial intelligence systems grow more autonomous, embedding contextual understanding within algorithms will be essential to maintaining relevance and trustworthiness.

Emerging trends such as explainable AI (XAI) and responsible AI frameworks highlight the need for transparency tailored to specific user groups and regulatory environments. Additionally, the rise of edge computing introduces new contextual challenges related to data processing at the source, impacting latency and privacy considerations.

In summary, data science in context is not merely about applying statistical models to datasets but about comprehensively understanding the environment in

which data exists, how it is generated, and for what purpose it is used. Recognizing this complexity enables organizations to deploy data science more effectively, ethically, and strategically, ultimately driving better outcomes across industries.

Data Science In Context

data science in context: Data Science in Context Alfred Z. Spector, Peter Norvig, Chris Wiggins, Jeannette M. Wing, 2022-10-20 Data science is the foundation of our modern world. It underlies applications used by billions of people every day, providing new tools, forms of entertainment, economic growth, and potential solutions to difficult, complex problems. These opportunities come with significant societal consequences, raising fundamental questions about issues such as data quality, fairness, privacy, and causation. In this book, four leading experts convey the excitement and promise of data science and examine the major challenges in gaining its benefits and mitigating its harms. They offer frameworks for critically evaluating the ingredients and the ethical considerations needed to apply data science productively, illustrated by extensive application examples. The authors' far-ranging exploration of these complex issues will stimulate data science practitioners and students, as well as humanists, social scientists, scientists, and policy makers, to study and debate how data science can be used more effectively and more ethically to better our world.

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data science in context: The Real Work of Data Science Ron S. Kenett, Thomas C. Redman, 2019-05-06 The essential guide for data scientists and for leaders who must get more from their data science teams The Economist boldly claims that data are now the world's most valuable resource. But, as Kenett and Redman so richly describe, unlocking that value requires far more than technical excellence. The Real Work of Data Science explores understanding the problems, dealing with quality issues, building trust with decision makers, putting data science teams in the right organizational spots, and helping companies become data-driven. This is the work that spells the difference between a good data scientist and a great one, between a team that makes marginal contributions and one that drives the business, between a company that gains some value from its data and one in which data truly is the most valuable resource. These two authors are world-class experts on analytics, data management, and data quality; they've forgotten more about these topics than most of us will ever know. Their book is pragmatic, understandable, and focused on what really counts. If you want to do data science in any capacity, you need to read it. —Thomas H. Davenport, Distinguished Professor, Babson College and Fellow, MIT Initiative on the Digital Economy I like your book. The chapters address problems that have faced statisticians for generations, updated to reflect today's issues, such as computational Big Data. —Sir David Cox, Warden of Nuffield College and Professor of Statistics, Oxford University Data science is critical for competitiveness, for good government, for correct decisions. But what is data science? Kenett and Redman give, by far, the best introduction to the subject I have seen anywhere. They address the critical questions of formulating the right problem, collecting the right data, doing the right analyses, making the right

decisions, and measuring the actual impact of the decisions. This book should become required reading in statistics and computer science departments, business schools, analytics institutes and, most importantly, by all business managers. —A. Blanton Godfrey, Joseph D. Moore Distinguished University Professor, Wilson College of Textiles, North Carolina State University

data science in context: Managing Your Data Science Projects Robert de Graaf, 2019-06-07 At first glance, the skills required to work in the data science field appear to be self-explanatory. Do not be fooled. Impactful data science demands an interdisciplinary knowledge of business philosophy, project management, salesmanship, presentation, and more. In *Managing Your Data Science Projects*, author Robert de Graaf explores important concepts that are frequently overlooked in much of the instructional literature that is available to data scientists new to the field. If your completed models are to be used and maintained most effectively, you must be able to present and sell them within your organization in a compelling way. The value of data science within an organization cannot be overstated. Thus, it is vital that strategies and communication between teams are dexterously managed. Three main ways that data science strategy is used in a company is to research its customers, assess risk analytics, and log operational measurements. These all require different managerial instincts, backgrounds, and experiences, and de Graaf cogently breaks down the unique reasons behind each. They must align seamlessly to eventually be adopted as dynamic models. Data science is a relatively new discipline, and as such, internal processes for it are not as well-developed within an operational business as others. With *Managing Your Data Science Projects*, you will learn how to create products that solve important problems for your customers and ensure that the initial success is sustained throughout the product's intended life. Your users will trust you and your models, and most importantly, you will be a more well-rounded and effectual data scientist throughout your career. Who This Book Is For Early-career data scientists, managers of data scientists, and those interested in entering the field of data science

data science in context: Applied Data Science Martin Braschler, Thilo Stadelmann, Kurt Stockinger, 2019-06-13 This book has two main goals: to define data science through the work of data scientists and their results, namely data products, while simultaneously providing the reader with relevant lessons learned from applied data science projects at the intersection of academia and industry. As such, it is not a replacement for a classical textbook (i.e., it does not elaborate on fundamentals of methods and principles described elsewhere), but systematically highlights the connection between theory, on the one hand, and its application in specific use cases, on the other. With these goals in mind, the book is divided into three parts: Part I pays tribute to the interdisciplinary nature of data science and provides a common understanding of data science terminology for readers with different backgrounds. These six chapters are geared towards drawing a consistent picture of data science and were predominantly written by the editors themselves. Part II then broadens the spectrum by presenting views and insights from diverse authors – some from academia and some from industry, ranging from financial to health and from manufacturing to e-commerce. Each of these chapters describes a fundamental principle, method or tool in data science by analyzing specific use cases and drawing concrete conclusions from them. The case studies presented, and the methods and tools applied, represent the nuts and bolts of data science. Finally, Part III was again written from the perspective of the editors and summarizes the lessons learned that have been distilled from the case studies in Part II. The section can be viewed as a meta-study on data science across a broad range of domains, viewpoints and fields. Moreover, it provides answers to the question of what the mission-critical factors for success in different data science undertakings are. The book targets professionals as well as students of data science: first, practicing data scientists in industry and academia who want to broaden their scope and expand their knowledge by drawing on the authors' combined experience. Second, decision makers in businesses who face the challenge of creating or implementing a data-driven strategy and who want to learn from success stories spanning a range of industries. Third, students of data science who want to understand both the theoretical and practical aspects of data science, vetted by real-world case studies at the intersection of academia and industry.

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data science in context: *DevOps for Data Science* Alex Gold, 2024-06-19 Data Scientists are experts at analyzing, modelling and visualizing data but, at one point or another, have all encountered difficulties in collaborating with or delivering their work to the people and systems that matter. Born out of the agile software movement, DevOps is a set of practices, principles and tools that help software engineers reliably deploy work to production. This book takes the lessons of DevOps and applies them to creating and delivering production-grade data science projects in Python and R. This book's first section explores how to build data science projects that deploy to production with no frills or fuss. Its second section covers the rudiments of administering a server, including Linux, application, and network administration before concluding with a demystification of the concerns of enterprise IT/Administration in its final section, making it possible for data scientists to communicate and collaborate with their organization's security, networking, and administration teams. Key Features: • Start-to-finish labs take readers through creating projects that meet DevOps best practices and creating a server-based environment to work on and deploy them. • Provides an appendix of cheatsheets so that readers will never be without the reference they need to remember a Git, Docker, or Command Line command. • Distills what a data scientist needs to know about Docker, APIs, CI/CD, Linux, DNS, SSL, HTTP, Auth, and more. • Written specifically to address the concern of a data scientist who wants to take their Python or R work to production. There are countless books on creating data science work that is correct. This book, on the otherhand, aims to go beyond this, targeted at data scientists who want their work to be than merely accurate and deliver work that matters.

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learning algorithms to gain insights from dataBook Description Data Science Projects with Python is designed to give you practical guidance on industry-standard data analysis and machine learning tools, by applying them to realistic data problems. You will learn how to use pandas and Matplotlib to critically examine datasets with summary statistics and graphs, and extract the insights you seek to derive. You will build your knowledge as you prepare data using the scikit-learn package and feed it to machine learning algorithms such as regularized logistic regression and random forest. You'll discover how to tune algorithms to provide the most accurate predictions on new and unseen data. As you progress, you'll gain insights into the working and output of these algorithms, building your understanding of both the predictive capabilities of the models and why they make these predictions. By then end of this book, you will have the necessary skills to confidently use machine learning algorithms to perform detailed data analysis and extract meaningful insights from unstructured data. What you will learnInstall the required packages to set up a data science coding environmentLoad data into a Jupyter notebook running PythonUse Matplotlib to create data visualizationsFit machine learning models using scikit-learnUse lasso and ridge regression to regularize your modelsCompare performance between models to find the best outcomesUse k-fold cross-validation to select model hyperparametersWho this book is for If you are a data analyst, data scientist, or business analyst who wants to get started using Python and machine learning techniques to analyze data and predict outcomes, this book is for you. Basic knowledge of Python and data analytics will help you get the most from this book. Familiarity with mathematical concepts such as algebra and basic statistics will also be useful.

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implementing information management projects. It sets out, in a clear and structured way, the fundamentals of ethics, and provides practical and pragmatic methods for organizations to embed ethical principles and practices into their management and governance of information. Written by global experts in the field, Ethical Data and Information Management is an important book addressing a topic high on the information management agenda. Key coverage includes how to build ethical checks and balances into data governance decision making; using quality management methods to assess and evaluate the ethical nature of processing during design; change methods to communicate ethical values; how to avoid common problems that affect ethical action; and how to make the business case for ethical behaviours.

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data science in context: The Dictionary of Artificial Intelligence Utku Taşova, 2023-11-03 Unveiling the Future: Your Portal to Artificial Intelligence Proficiency In the epoch of digital metamorphosis, Artificial Intelligence (AI) stands as the vanguard of a new dawn, a nexus where human ingenuity intertwines with machine precision. As we delve deeper into this uncharted realm, the boundary between the conceivable and the fantastical continually blurs, heralding a new era of endless possibilities. The Dictionary of Artificial Intelligence, embracing a compendium of 3,300 meticulously curated titles, endeavors to be the torchbearer in this journey of discovery, offering a wellspring of knowledge to both the uninitiated and the adept. Embarking on the pages of this dictionary is akin to embarking on a voyage through the vast and often turbulent seas of AI. Each entry serves as a beacon, illuminating complex terminologies, core principles, and the avant-garde advancements that characterize this dynamic domain. The dictionary is more than a mere compilation of terms; it's a labyrinth of understanding waiting to be traversed. The Dictionary of Artificial Intelligence is an endeavor to demystify the arcane, to foster a shared lexicon that enhances collaboration, innovation, and comprehension across the AI community. It's a mission to bridge the chasm between ignorance and insight, to unravel the intricacies of AI that often seem enigmatic to the outsiders. This profound reference material transcends being a passive repository of terms; it's an engagement with the multifaceted domain of artificial intelligence. Each title encapsulated within these pages is a testament to the audacity of human curiosity and the unyielding quest for advancement that propels the AI domain forward. The Dictionary of Artificial Intelligence is an invitation to delve deeper, to grapple with the lexicon of a field that stands at the cusp of redefining the very fabric of society. It's a conduit through which the curious become enlightened, the proficient become masters, and the innovators find inspiration. As you traverse through the entries of The Dictionary of Artificial Intelligence, you are embarking on a journey of discovery. A journey that not only augments your understanding but also ignites the spark of curiosity and the drive for innovation that are quintessential in navigating the realms of AI. We beckon you to commence this educational expedition, to explore the breadth and depth of AI lexicon, and to emerge with a boundless understanding and an unyielding resolve to contribute to the ever-evolving narrative of artificial intelligence. Through The Dictionary of Artificial Intelligence, may your quest for knowledge be as boundless and exhilarating as the domain it explores.

data science in context: *Proceedings of the 23rd European Conference on Research Methodology for Business and Management Studies* Dr Ana Isabel Azevedo, 2024-07-04 These proceedings represent the work of contributors to the 23rd European Conference on Research Methodology (ECRM 2024), hosted by ISCAP in Porto, Portugal on 4-5 July 2024. The Conference Co-Chairs are Dr Ana Isabel Azevedo and Dr José Manuel Azevedo, both from ISCAP Portugal. ECRM is a well-established event on the academic research calendar and now in its 23rd year and remains an opportunity for participants to share ideas and meet. The aims and scope of this conference is to bring together researchers from a range of disciplines and sectors to share expertise and novel approaches in business and management research methods. ECRM is interested in contributions on the subject of research methods used in business and management research. The papers tend to either focus directly on creating and implementing innovative methodologies or research papers which highlight an interesting use of methodologies in their study. The opening keynote presentation is given by Marta Agostinho, Executive Director of EU-LIFE with the title Excellent Scientific Research: What Does it Mean and Why Should we Care About it? On the second day, Professor Susanne Tietze from The University of Sheffield Hallam, UK will give a talk on the subject Cross-Language Research Methods: Translation and Linguistic Reflexivity. With an initial submission of 90 abstracts, after the double blind, peer review process there are 30 Academic research papers, 1 PhD research paper, 1 Masters Research paper and 1 work-in-progress paper published in these Conference Proceedings. These papers represent research from India, Australia, Brazil, Canada, China, Czech Republic, Estonia, Germany, India, Ireland, Italy, Latvia, Morocco, Norway, Oman, Poland, Portugal, Slovakia, South Africa, Sweden, UK and the USA.

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demonstrates how to develop the services needed in the right place and at the right time, and how to properly adapt to user needs, making necessary interventions to ensure the safety of the transportation process. Further, it describes the main ways to increase the autonomy and efficiency of user-vehicle interaction and shows how Information and Communications Technology (ICT) structural support for current and past situations in AI-based systems can help to anticipate future developments in freight transportation.

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