MCKNIGHT CONSULTING GROUP

2025 Trends in Analytics Architecture

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TOP VOICE ★ 2024 ★ thinkers 360 OVERALL

I'VE BEEN FEATURED IN THE 2024 dataIQ™ 100 USA THE MOST INFLUENTIAL PEOPLE IN DATA

Partial Client List

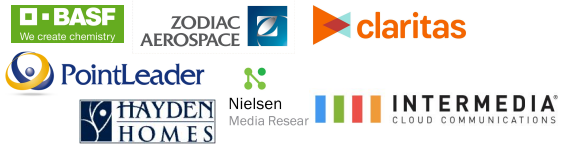
CONSUMER PRODUCTS/RETAIL

FINANCIAL

INSURANCE/HEALTHCARE

PUBLISHING

OTHER



GOVERNMENT AND UTILITIES

EDUCATION

PHARMACEUTICAL

TELECOMMUNICATIONS

Technology Set

Big/Analytic/Vector/Mixed Data Management

Data Movement and APIs

Data Management

Operational/Transactional Data Management

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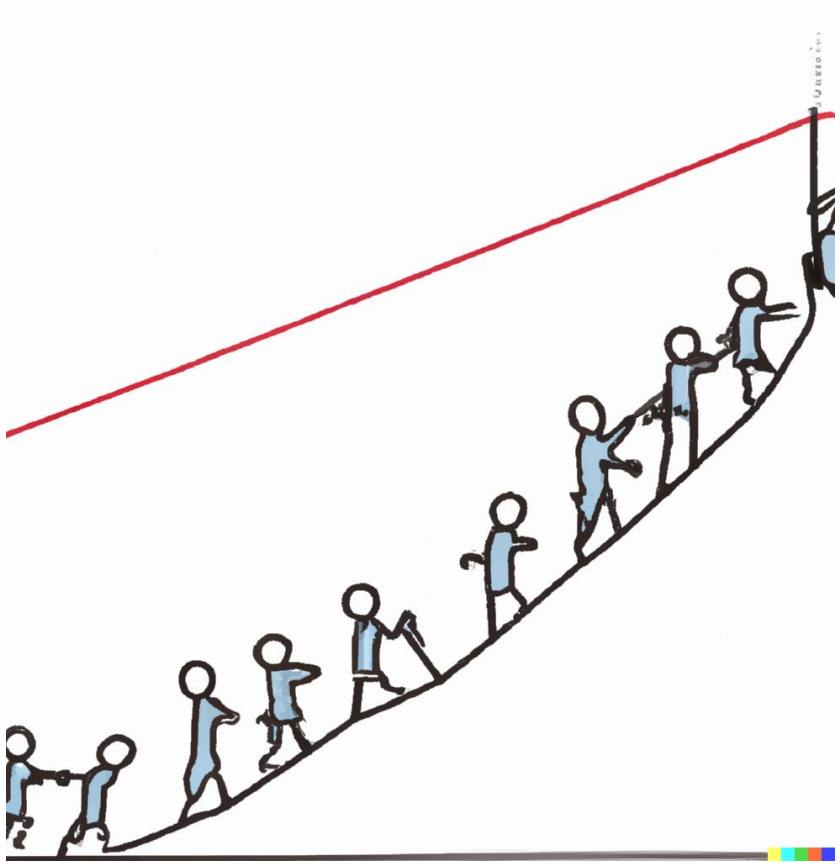
Why Are Trends Important?

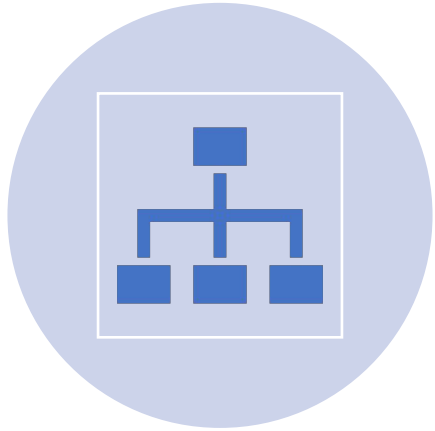
- It is imperative to see trends that affect your business to know how to respond
- Plan for and deal with change
- Better to be at the beginning of the trend rather than the end
- Wants, needs, and tastes of your customer changes
- Make you a leader, not a follower
- Grow your business ideas
- Give you ideas what to improve in your business



Information Management Leaders

INFORMATION MANAGEMENT LEADERS OF TOMORROW CAN ADVANCE MATURITY WHILE ALSO SOLVING BUSINESS ISSUES

THERE'S NO BUDGET FOR "STAYING ON TRENDS"



INFORMATION MANAGEMENT LEADERS MUST PICK THEIR WINNING (I.E., MULTI-YEAR SUSTAINABLE) APPROACHES AND GET ON BOARD

Last Year's Trends that Hit

- Focus on efficiency and accuracy in machine learning modeling (AI Trend #6)
- Success in generative AI and LLMs (AI Trend #1)
- Simplified data architecture to improve efficiency and adaptability (Information Management Trend #1)
- Continued dominance of cloud-native approaches (Broader Environment Trend #1)
- Shift towards MLOps (AI Trend #8)
- Significant AI impact on healthcare (AI Trend #12)
- Overall impact of AI on all industries (AI Trend #14)
- Data FinOps becoming crucial (Information Management Trend #4)
- Increased adoption of data mesh (Information Management Trend #2)
- Data governance augmented by AI governance (Information Management Trend #6)
- Integration of data and AI governance (Information Management Trend #7)
- Emergence of multimodal LLMs (AI Trend #3)
- Advancements in AI hardware (AI Trend #5)
- Continued dialogue on ESG and AI ethics (AI Trend #7)
- Observability gaining traction (Broader Environment Trend #3)
- Increased focus on organizational change management (OCM) (Broader Environment Trend #5)
- Unstructured data reaching parity with structured data (Information Management Trend #3)

Last Year's Trends that Didn't Hit

- Increased use of Langchain (AI Trend #4)
- Rise of AI agents as personalized assistants (AI Trend #9)
- Data engineering becoming the most valuable profession (Broader Environment Trend #6)
- Growth of AI companions (AI Trend #10)
- Integration of data and AI governance (Information Management Trend #7)
- Solutions to the "hallucination" problem in GenAI (AI Trend #2)

2025 Trends in Analytics Architecture

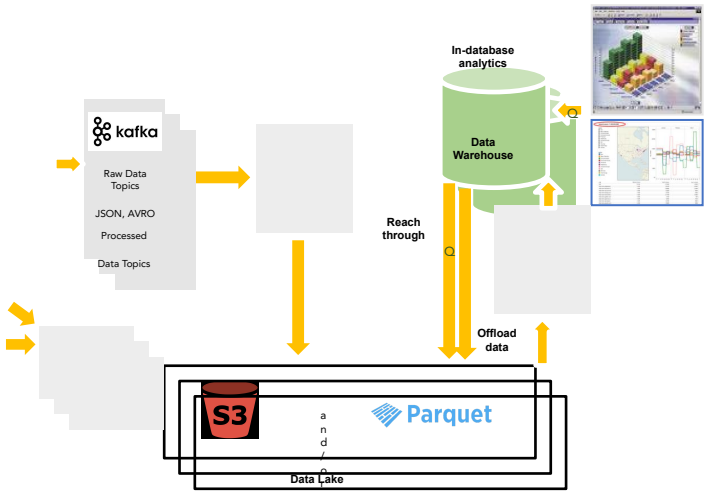
Information Management

Companies Seek a Simplified Data Architecture

- Consolidation drives down costs while instilling architectural discipline, allowing focus on specific domains
- Rationalization of data environments continues
- Data products are a way to streamline data sharing
- Consolidating tools allows for context sharing and greater efficiency, making consolidation a key strategy for businesses
- AI Agents package a combination of data, models, and software that enable them to perform specific tasks or provide particular services

Simplification of Data Governance and Security Through Data Mesh

- Data Mesh emphasizes self-service analytics, domain-driven data ownership, data-as-a-product, and federated governance
- In 2025, data mesh will become a significant trend, focusing on distributed data management
- IT will play a crucial role in creating and distributing **data products** throughout the enterprise
- Data mesh initiatives are being driven from line-of-business units and business leaders, rather than central IT teams



Unstructured Data at Parity with Structured Data

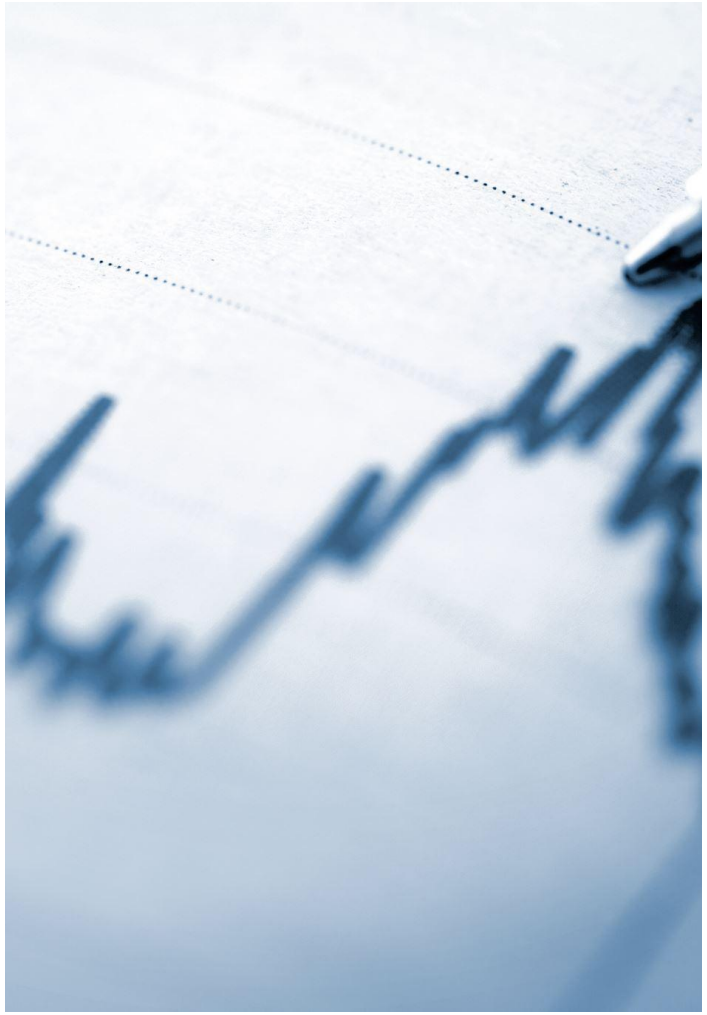
- The **data lakehouse** is expected to become the primary architecture for data analytics, surpassing cloud data warehouses in popularity
- Data Warehouses – best for modeled data, structured data, reporting
- Data Lakes – price-performance advantages for big data, unstructured data, data engineering/science, cold data
- With **open data formats** like Apache Iceberg, Delta, and Apache Hudi, the data lakes start to resemble data warehouses
- The development of **multimodal** models will continue, allowing a single model to handle various tasks, such as text, images, and audio

Open Table Formats Are Transforming Data Management

- Open table formats, such as Apache Iceberg, are ushering in a new era in data management by enabling full SQL capabilities directly on the data lake
- They offer freedom, flexibility, and control over data, while eliminating the limitations of vendor-specific formats
- Apache Iceberg is rapidly gaining popularity due to its performance, interoperability, and broad open-source and commercial support

Data FinOps

- Businesses are facing a significant challenge in managing cloud data expenses, which are escalating unsustainably
- By analyzing usage patterns, optimizing storage solutions, and adopting FinOps principles, businesses can balance cost savings and operational efficacy, with a rise in FinOps dashboards in 2025
- To maintain high-quality service and competitive performance, businesses must analyze cloud expenses, identify inefficiencies, and consider cost-effective storage options
- Regular monitoring, forecasting, and implementing financial best practices in cloud management can help organizations balance cost savings and operational efficacy
- In 2025, FinOps dashboards will be increasingly used to manage cloud data charges



Data products become the standard for data exchange within companies

- Curated, well-defined datasets or services
- Packaged product offerings for internal or external consumers
- Delivered in a user-friendly, accessible, and consistent manner
    - Oftentimes as an Application Programming Interface or API
- Enables seamless data integration and consumption

Data Privacy Affects Business Operations

Data Governance and Regulation

- European AI Act affect
- Digital resilience is becoming a crucial aspect of economic output, with regulators enacting strict governance and compliance frameworks to ensure businesses can prepare for adverse events
- Minimum standards for incident response plans, data security, supply chain diversification, risk assessment, disaster recovery plans, cyber hygiene practices, and reporting protocols
- Governments will offer tax breaks or subsidies to companies that invest in building and demonstrating strong resilience capabilities
- Cyber insurance mandates

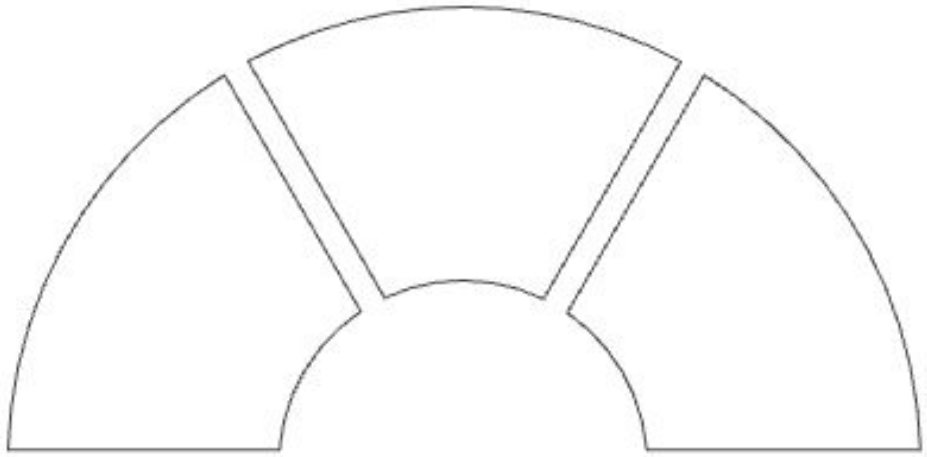
Data Privacy and Ethical Considerations

Stringent Regulations

Emphasizes the need for stricter regulations like GDPR and CCPA to protect consumer data.

Growing Importance

Highlights the increasing criticality of data privacy and ethical considerations due to expanding data volumes.

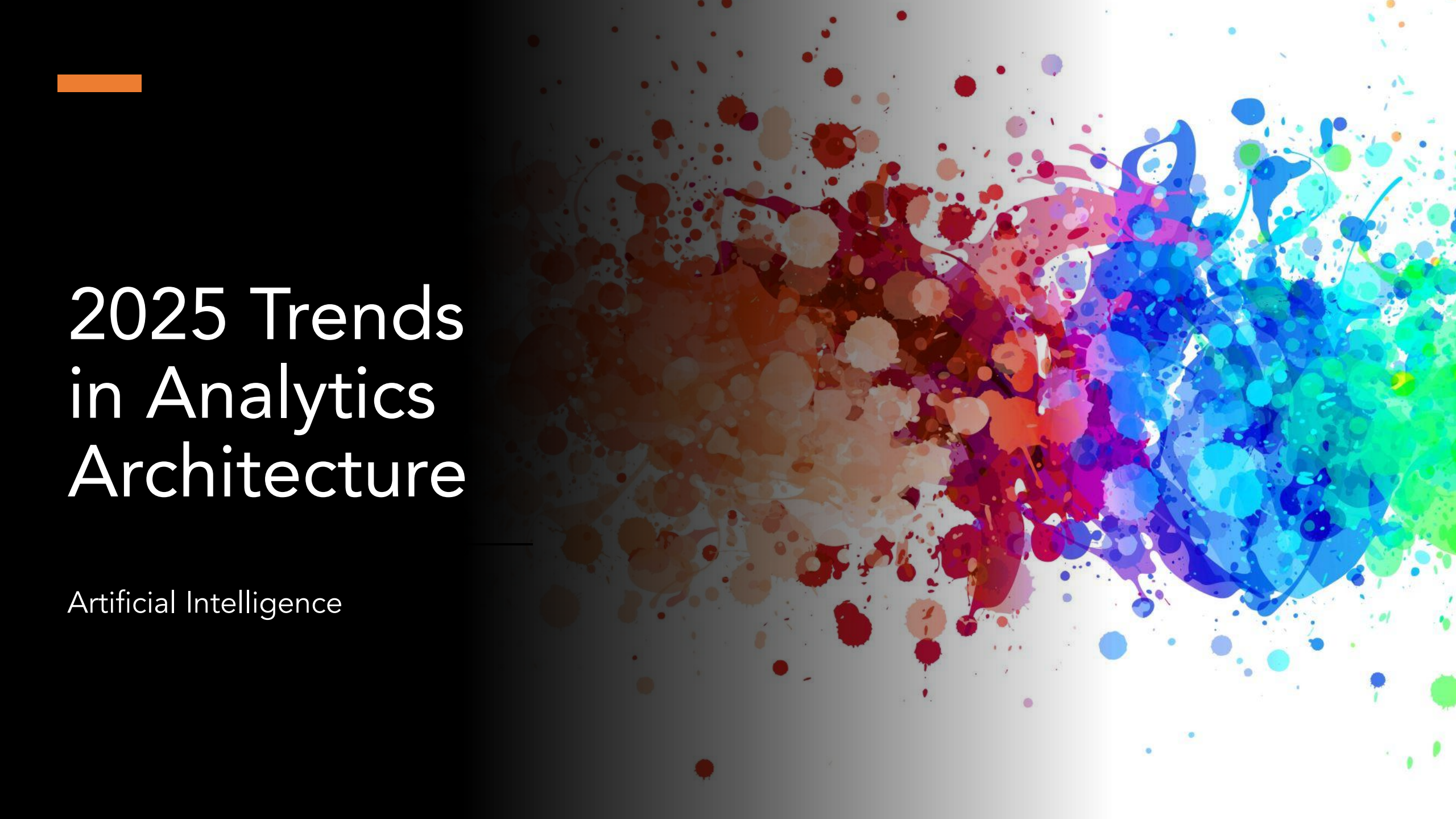


Trust and Compliance

Focuses on the necessity for organizations to ensure data governance and transparency to maintain user trust.

2025 Trends in Analytics Architecture

Artificial Intelligence



2025: The Year of AI Agents

•Pervasive Adoption: AI agents become ubiquitous in daily life, revolutionizing industries like healthcare, finance, and education.

•Conversational Interfaces: AI-powered chatbots and voice assistants become the primary means of human-computer interaction.

•Autonomous Decision-Making: AI agents begin making decisions autonomously, freeing humans from mundane tasks and enabling focus on strategic and creative work.

•Hyper-Personalization: AI agents provide tailored experiences, anticipating and meeting individual needs in real-time.

•Rise of Hybrid Intelligence: Human-AI collaboration becomes the norm, leveraging the strengths of both humans and machines to drive innovation and productivity.

Gen AI and LLM Success

- Organizations will successfully implement GenAI and large language models without facing knockout challenges related to data quality, governance, ethical compliance, and cost management
- Generative AI apps, like chatbots, will become commonplace in daily tasks, with large language models being a powerful and user-friendly form of AI
- Small Language Models Fine-tuned AI models will emerge for specific industries and use cases

AI Hardware Advancements

- Hardware that fine-tunes itself over time could lead to more efficient and intelligent machines
- Neuromorphic chips: Mimicking the human brain's architecture, these chips promise massive leaps in efficiency and adaptability for specific AI tasks
- Optical computing: Using light instead of electrons could lead to faster data processing and communication for complex AI models
- Increased investment in AI hardware startups: Venture capitalists and major tech companies are recognizing the potential of disruptive hardware innovations
- Government initiatives: Several countries are launching programs to fund and develop cutting-edge AI hardware technologies

Focus on Efficiency in ML Modeling

- Traditional AI solutions (Pre-trained models, AutoML, SageMaker) can be costly and ineffective
- New technologies focus on efficient model deployment and workload optimization
- Innovative neural network architectures reduce training time and resource consumption
- Automated hyperparameter optimization tools streamline development

From ML to MLOps

- Companies struggle to realize the full potential of machine learning (ML) due to difficulties in putting models into production, inefficient processes, and complexity overload, resulting in untapped value and hindered scalability
- Few businesses have been successful in putting the majority of their ML models into production, leaving a sizable amount of value untapped
- Machine learning operations, also known as MLOps, are a set of standards, tools, and frameworks that are used to scale ML to reach its full potential

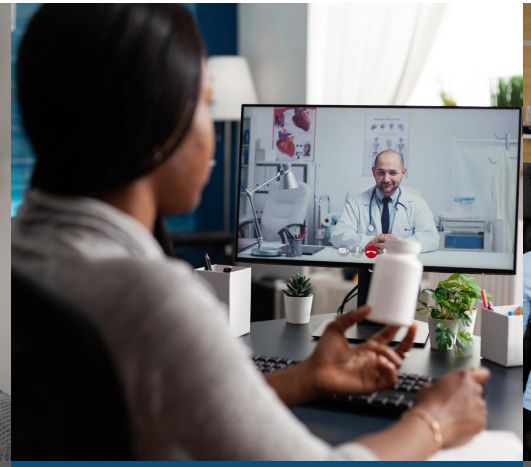
AI Companions

- Natural Language Processing (NLP): Improved NLP capabilities will allow AI companions to hold more natural and engaging conversations, fostering closer connections
- Multimodal Sensing: Integration of vision, audio, and other sensor data will enable AI companions to better understand context and respond proactively
- Personalization and Adaptability: AI companions will learn user preferences and adjust their behavior, accordingly, creating a more personalized experience
- Changing Social Landscape

Major Healthcare Advancements Driven by AI

Genomic Medicine

Virtual Visits



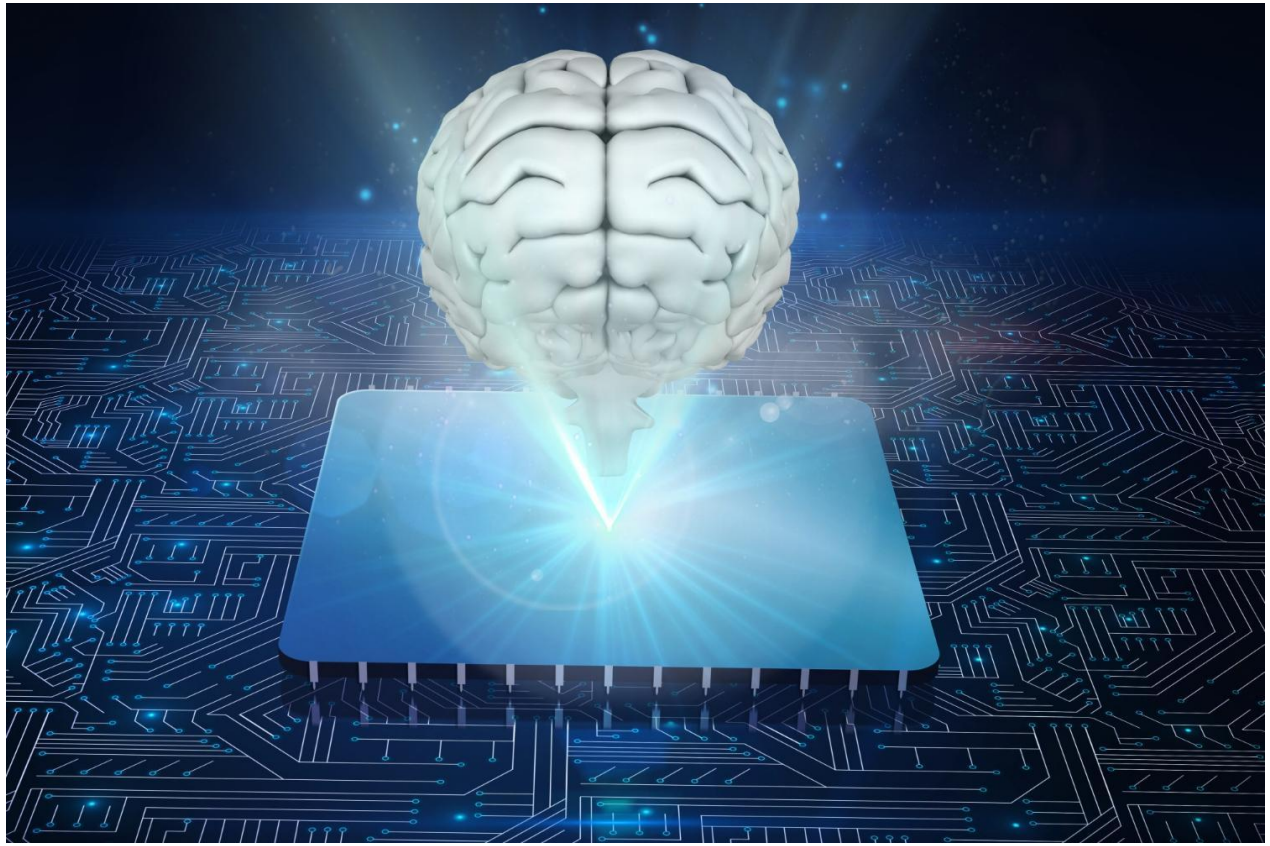
Tele-health and AI Triage

Personalized Medicine

Automating Lab Testing

Major Education Advancements Driven by AI

- Personalized Education
- Stimulating Learning Environments
- Global Lens



AI Challenges Remain

•Technical Challenges

- Data Quality and Availability: GenAI models require high-quality, diverse, and relevant data to learn and generate accurate results
- Explainability: GenAI models can be difficult to interpret, making it challenging to understand the decision-making process
- Scalability and Performance: GenAI models can be computationally intensive, requiring significant resources to deploy and maintain

- Ethical Challenges
  - Bias and Fairness: Ensure training data is representative and bias-free to prevent perpetuating social inequalities
  - Transparency and Security: Implement model interpretability, explainability, data protection, and robust security measures
  - Accountability: Establish human oversight, clear responsibilities, and accountability for GenAI-driven decisions and model development

AI Organizational Challenges Remain

- Process Challenges
  - Align AI with business goals
  - Know what you're building – program or project
  - Need MLOps
- Organizational Readiness
  - Internal Resistance
  - Emerging Roles
    - Prompt Engineer
    - AI Trainer
    - AI Auditor
    - AI Ethicist/Ethics Expert
    - Cybersecurity Analyst
    - AI Business Strategist
    - Data Broker
  - Skills Gap

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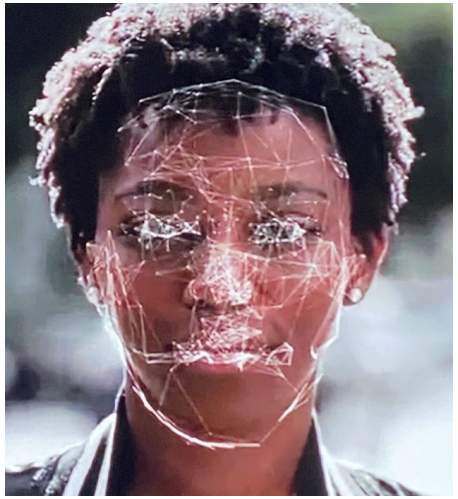
Population Underestimating the Transformative Impact of AI



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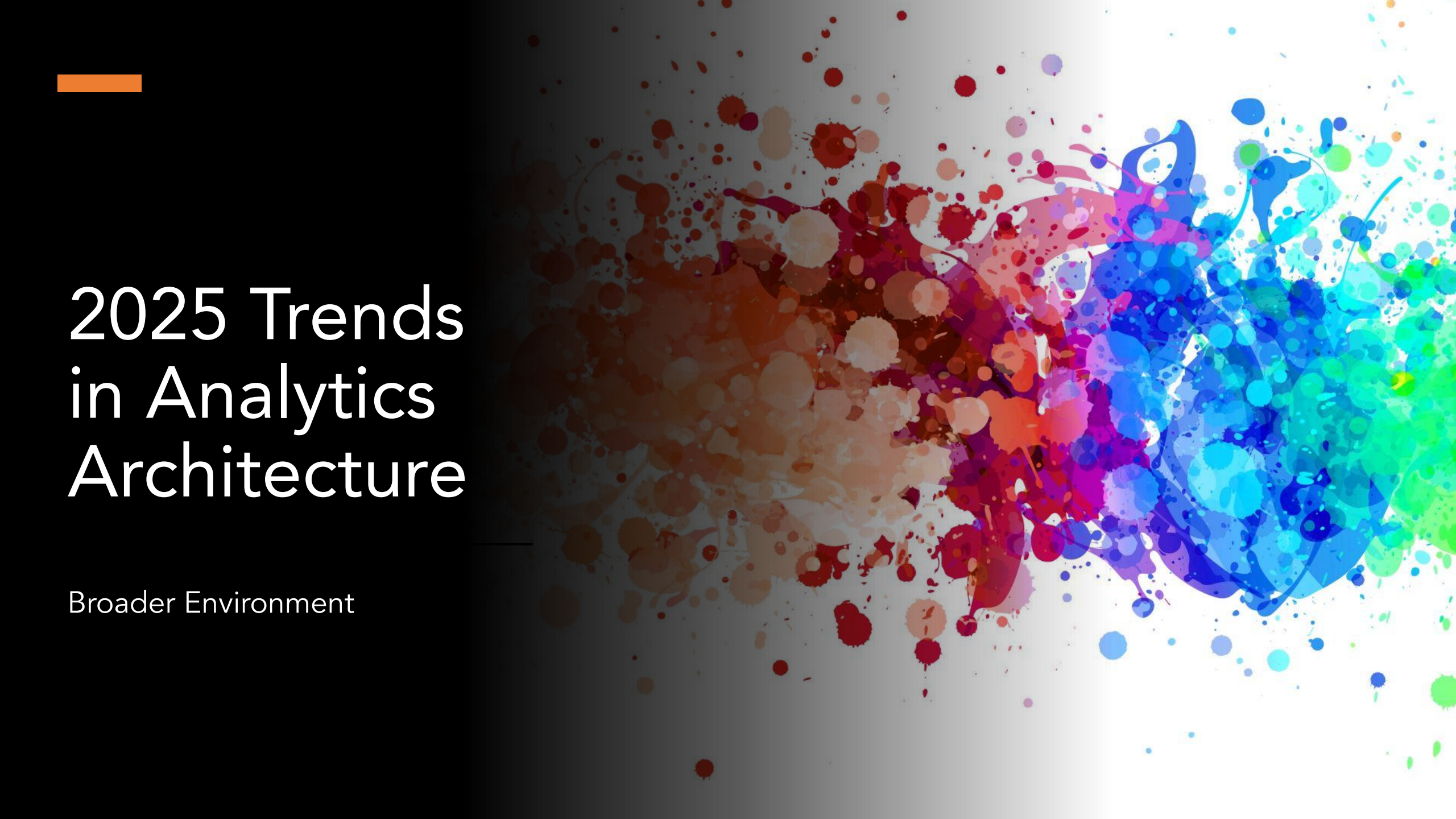
Broader Environment



Cloud Native Approaches

- Microservices Architecture
- Containers
- Elasticity
- ContinuousDelivery with DevOps
- Infrastructure as Code (IaC)
- With Observability Added

The Year of Data Observability

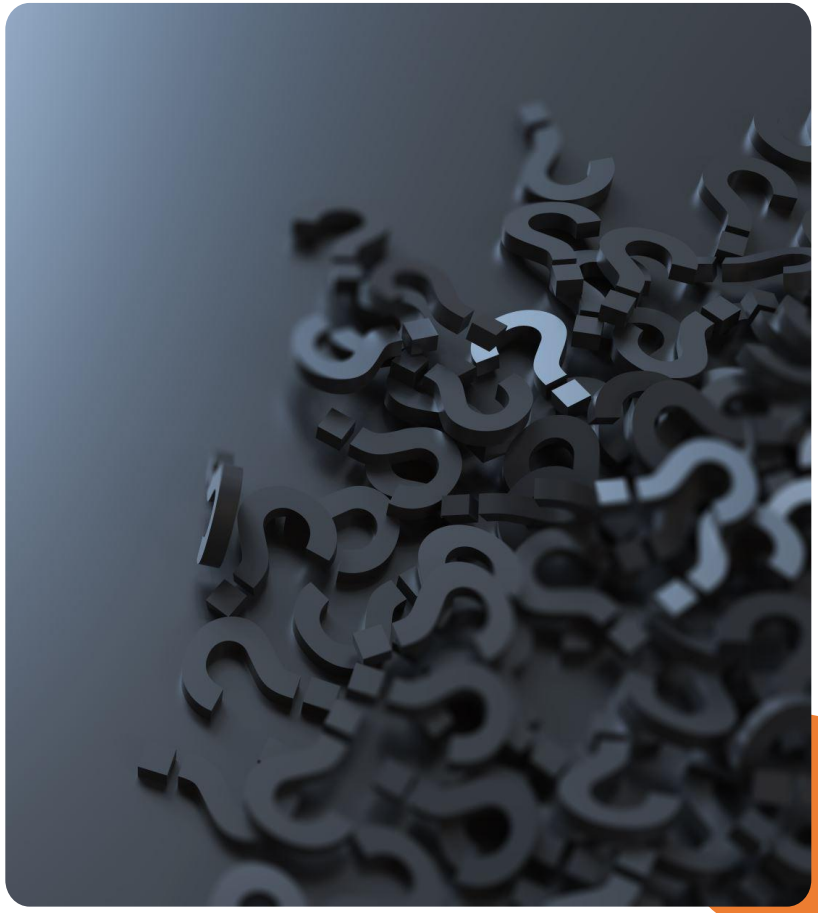
- Rise of Unified Observability Platforms
- Focus on Contextual Intelligence
- Collaboration & Shared Visibility
- Shift from MTTR to Proactive Prevention
- Democratization of Observability
- Openness and Interoperability

Hybrid Quantum Computing

- Hybrid systems combine the power of quantum processors with the flexibility and scalability of classical computers, tackling problems both sides struggle with alone
- This technology shows promise for various medical and other applications
- Hybrid algorithms could revolutionize areas like logistics, finance, and materials science by finding optimal solutions for complex problems much faster
- Quantum-assisted machine learning models could learn from vast datasets and uncover hidden patterns more effectively, leading to breakthroughs in areas like medical diagnosis and fraud detection
- Hybrid systems could provide unprecedented insights into complex systems like molecules and quantum fields, opening doors in chemistry, physics, and materials science

Data Engineering Becomes the Highest Value Profession

- Data Engineer's knowledge of data will be more important than before, albeit in novel and inventive ways
- Data engineers will need to comprehend the value that generative AI brings in order to stay up to date with the changing scenario
- For companies looking to unlock value, the data pipelines constructed and overseen by data engineers may be the initial point of contact with language models
- The people who know how to use a model and plug it into a data pipeline in order to automate value extraction are the data engineers
- They will also be expected to supervise and comprehend the tasks related to AI



Summary

- Data Lakehouses Defacto
- Data Mesh Decentralized Architectures
- Data Formatted in Open Data Formats
- Data Exchange of Data Products
- Gen AI Success
- AI Agents Emerge
- Regulation around Privacy and AI
- The Year of Data Observability

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