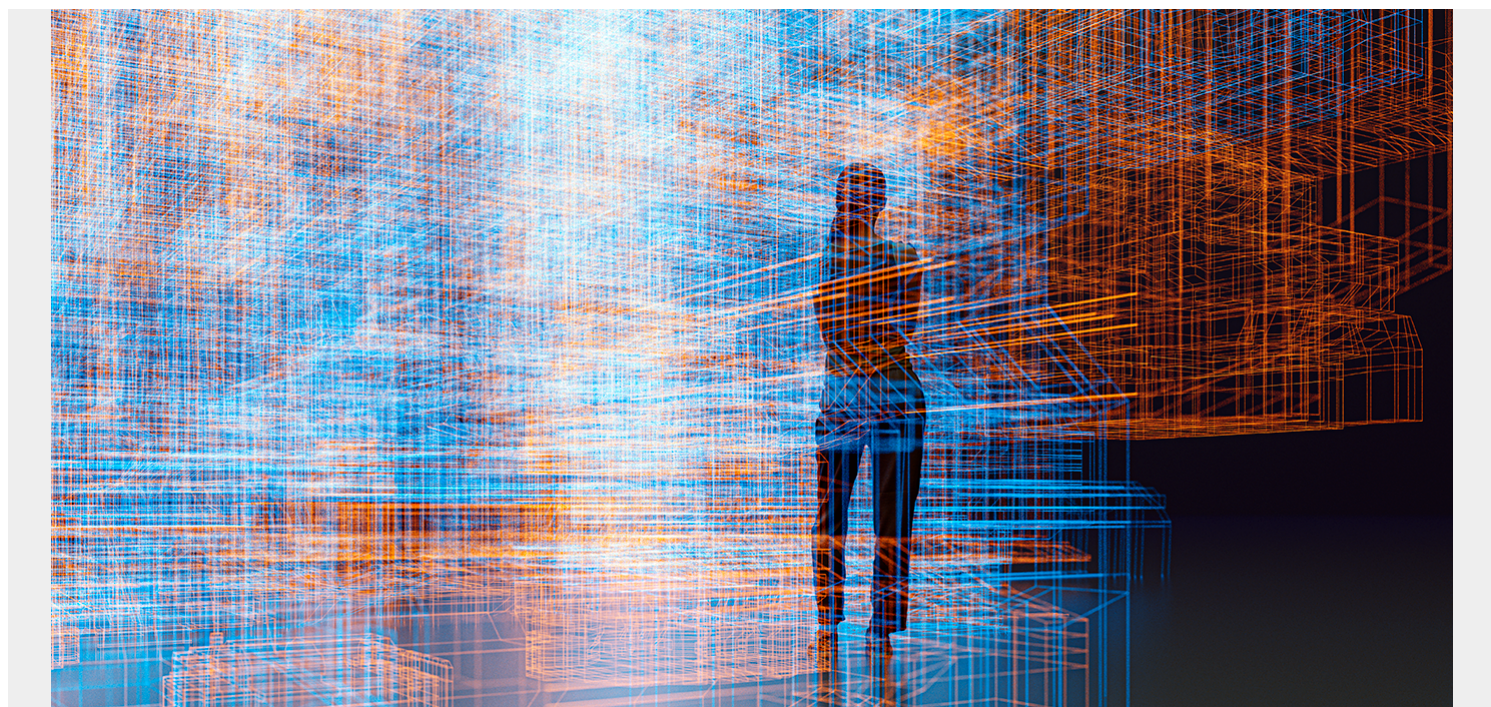# PREDICTIONS FOR 2025: TRANSFORMING MAINFRAMES WITH GENERATIVE AND HYBRID AI

The year 2025 is poised to be a pivotal one for artificial intelligence (AI). For decades, mainframes have been the backbone of critical systems that power industries like banking, finance services, insurance, healthcare, and government. These systems are indispensable, managing vast amounts of data and ensuring the reliability of business-critical operations. However, as organizations strive to innovate and stay competitive, they face a growing set of challenges: integrating mainframes with modern cloud platforms, simplifying the complexity of AI for IT operations (AIOps), addressing skills shortages as experienced professionals retire, and ensuring operational resilience in the face of increasing cyberthreats and regulatory demands.

Enter hybrid AI solutions, which combine rules-based systems, generative AI (GenAI), and machine learning (ML) to redefine the way mainframes are managed and transformed, creating an integrated approach that enhances problem solving in areas like AIOps, DevOps, and SecOps, enabling solutions that were previously out of reach. These advanced AI techniques promise solutions that address both technical and operational pain points. From enhancing operational resilience through proactive anomaly detection to simplifying the complexity of mainframe systems, AI will help organizations achieve greater efficiency and agility. By bridging the gap between core mainframe systems and modern IT environments, AI will solidify the mainframe's role as a dynamic enabler of innovation and digital transformation.

Our predictions for 2025 highlight how AI will tackle these challenges, ensuring that mainframes remain not just relevant but also central to the future of enterprise IT. Let's explore the innovations that will make this possible.

1. ## Hybrid AI powers mainframe operational resilience

   Hybrid AI will redefine mainframe operational resilience by combining rules-based systems, machine learning (ML), and GenAI to anticipate, prevent, and resolve disruptions. This integrated approach will enable real-time anomaly detection, root cause analysis, and predictive maintenance, ensuring uninterrupted performance of critical systems. By leveraging the strengths of multiple AI techniques, organizations will enhance their ability to meet stringent uptime requirements and adapt to evolving threats with unmatched precision and speed.

2. ## The rise of specialized language models (SLMs)

   SLMs will gain prominence as cost-effective, targeted language models trained for use in a specific area or domain. Unlike general-purpose large language models (LLMs), SLMs are lightweight and efficient, reducing costs and enhancing privacy by running on premises or at the edge, which gives industries like healthcare, finance, and manufacturing the flexibility to increase AI adoption and unlock precise SLM-driven innovations. Flexibility to integrate specialized and privately fine-tuned SLMs will be a key vendor selection criterion. GenAI platforms must offer open architectures to adapt to domain-specific needs, policy requirements, and custom optimizations.

3. ## Goal-oriented AI agents leveraging SLMs

   AI agents will emerge as goal-oriented workers powered by fine-tuned SLMs, working collaboratively to solve complex problems with precision and efficiency. This shift toward specialized, interconnected agents will propel us into the era of "agentics," where autonomous systems redefine problem-solving and decision-making across domains. These AI agents, seamlessly integrating with existing systems, will excel in dynamic environments like AIOps, DevOps, and SecOps, driving automation and innovation to new heights.

4. ## Autonomous AI and agentic AI for self-healing mainframe systems

   While the autonomous and agentic AI trend continues to evolve, it's clear that it has the potential to take operational efficiency to the next level by enabling self-healing mainframe systems. These systems will detect, diagnose, and resolve issues independently, minimizing human intervention. Routine optimizations and health monitoring will become automated, reducing operational risks and ensuring consistent uptime. This evolution will allow IT teams to focus on strategic initiatives rather than routine maintenance.

5. ## Intelligent AI voice assistants revolutionize mainframe transformation

   Intelligent AI voice assistants will transform mainframe operations by providing natural language conversational interfaces that simplify complex tasks and enhance productivity. These assistants will leverage GenAI and hybrid AI capabilities to offer real-time insights, explain code, and guide users through development and operational workflows. By bridging the gap between technical complexity and user accessibility, voice assistants will accelerate mainframe transformation, empowering teams to modernize with greater ease and efficiency.

6. ## Enhanced data analysis drives mainframe innovation

   Advanced AI and hybrid AI techniques will revolutionize data analysis on mainframe systems, unlocking deeper insights from complex datasets. These capabilities will enable predictive analytics, anomaly detection, and real-time decision-making, enhancing operational efficiency and business agility and stability. By leveraging enhanced data analysis, organizations will uncover new opportunities for growth while maintaining the performance and reliability of their core systems.

7. ## Responsible AI takes center stage

   Responsible AI will become a critical focus in mainframe transformation, ensuring transparency, fairness, and compliance across AI-driven workflows. Organizations will prioritize integrating ethical frameworks and explainable AI into mainframe systems to meet stringent regulatory requirements and build trust with stakeholders. This emphasis on accountability will drive the adoption of robust AI governance strategies, ensuring AI solutions align with business values and global standards.

Conclusion: The future of mainframe transformation with AI

As we move into 2025, the convergence of hybrid AI, SLMs, and goal-oriented AI agents marks a transformative era for mainframe operations. Hybrid AI's ability to integrate rules-based systems, ML, and GenAI ensures unprecedented operational resilience, enabling real-time anomaly detection and predictive maintenance to safeguard uptime. Meanwhile, the rise of SLMs provides a scalable, cost-effective foundation for domain-specific AI solutions that empower organizations to address unique challenges with precision.

These advancements are further amplified by goal-oriented AI agents, which redefine problem-solving through collaboration and specialization. By utilizing these agents, organizations can unlock faster access to intelligent documentation, preserving decades of enterprise tribal knowledge and distilling vast amounts of complex information into actionable insights. This means quicker and more accurate answers for developers and IT teams navigating mainframe transformation.

Autonomous, self-healing systems and intelligent voice assistants further simplify mainframe management by automating routine tasks and offering a seamless, more natural user experience. These innovations enable businesses to bridge technical expertise gaps, accelerate transformation initiatives, and focus on strategic goals and innovation. Together, these predictions illustrate a future where AI doesn't just transform the mainframe—it revolutionizes how businesses operate, innovate, and thrive in a rapidly evolving digital landscape.

Are you ready to embrace the future of AI-driven mainframe transformation?

Learn how GenAI is helping to build the mainframe of the future in the Modern Mainframe podcast, "The Role of Generative AI in Mainframe Transformation."