

September 25, 2023

# Enhancing Construction Operations with Artificial Intelligence (AI)



# Agenda

- Introduction & Session Objectives
- What is AI
- AI Across Industries
- Why AI in Construction
- Latest Trends
- AI in Industries / Capabilities
- Real-world Examples
- Tools
- Benefits and Challenges
- Q & A



# MEET YOUR PRESENTERS

Withum



# Sherry Goode

Senior Manager, Emerging Technologies

## About Me

I grow my own food and have way too many house plants! I enjoy cooking, and a good laugh.. I have an extensive sneaker collection. I am married, and I have three fur kids (Hugo, Bella and Enzo) who often join meetings and sometimes entertain clients. Oh yeah, and my hair is red now...

## About My Career

I started in a construction firm as an IT support analyst before joining the consulting world. I lived in the world of SharePoint before becoming a Scrum Master who helps teams to tap into their growth mindsets to unlock their true team potential to deliver quality software. I am also co-chair for the Technology Peer Group for the DC Metro chapter of Associated Builders and Contractors.



# Val Orekhov

Partner, Emerging Technologies

## About Me

- 20+ years of experience in software development and IT consulting.
- Sets the overall technical strategy and providing oversight for Withum's projects.
- Directs tax and audit modernization efforts internally and for his clients.

# Session Objectives



# Learning Objectives

01

Identify the latest trends in Artificial Intelligence

02

Understand how AI can improve and enhance construction operations

03

Observe real-world AI examples to boost operational efficiencies

# What is AI



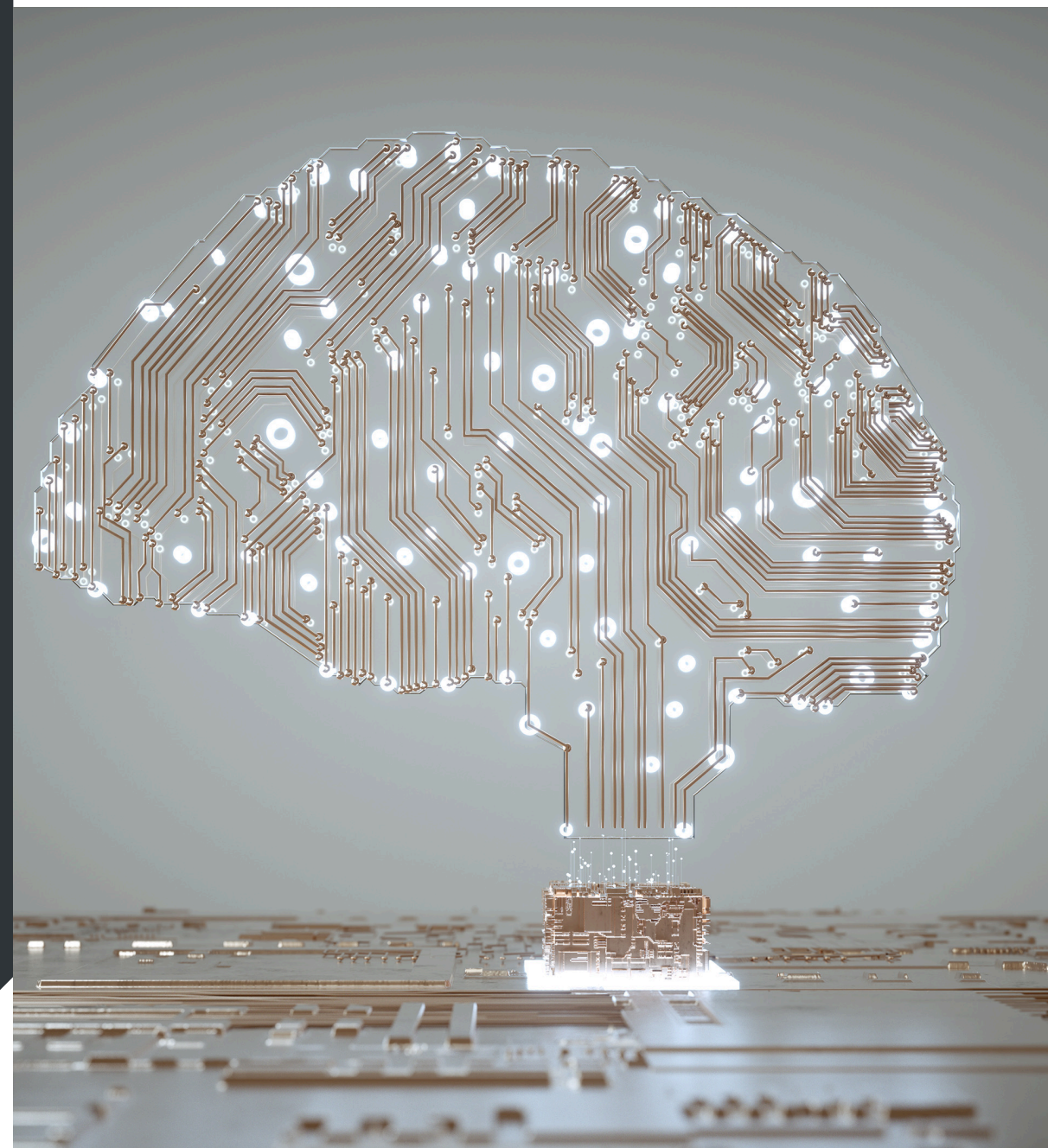


# What is AI

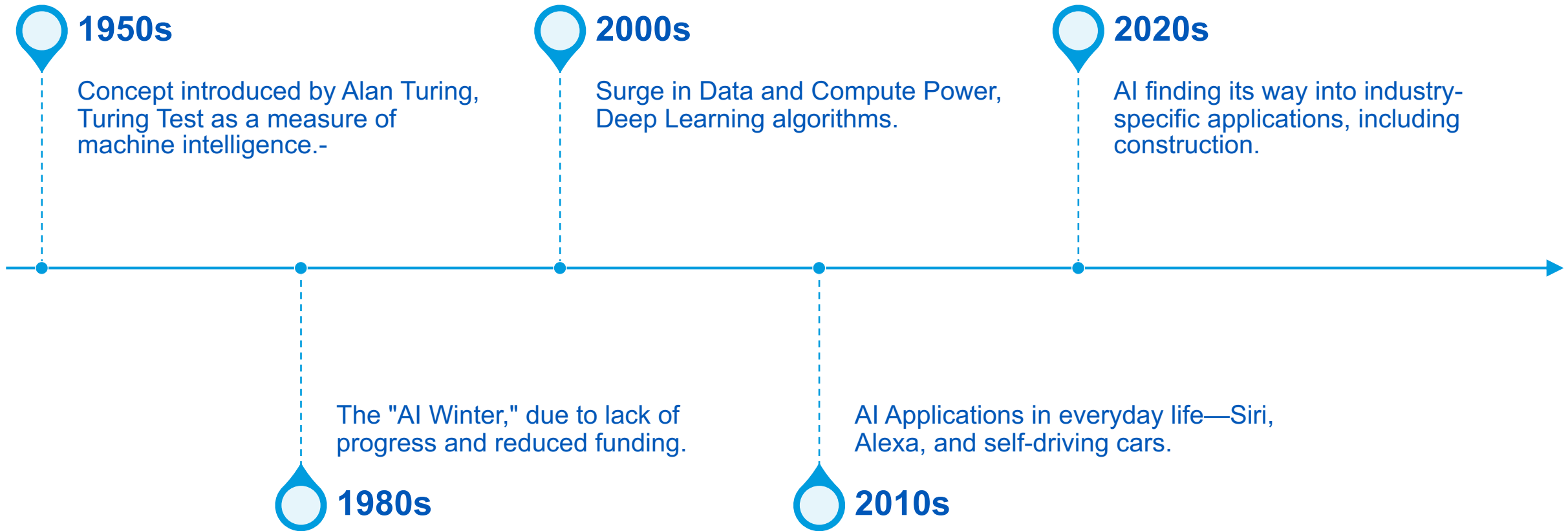
**Definition:** Artificial Intelligence (AI) refers to the simulation of human intelligence in machines programmed to think, learn, and make decisions

**Components:** Includes Machine Learning, Natural Language Processing, and Robotics

**Why it Matters:** Automation and data analysis capabilities can massively improve efficiency and decision-making



# What is AI – Brief History



# Latest Trends in AI



# AI Topics

- **Explainable AI (XAI):** Growing emphasis on understanding and interpreting ML models' decisions, especially in critical applications like healthcare and finance.
- **AI for Edge Devices:** AI models optimized for edge computing, enabling real-time decision-making on IoT devices.
- **AI Ethics and Bias Mitigation:** Increased focus on ethical AI, fairness, and bias reduction in ML algorithms.
- **Generative AIs:** Text, image & sound generation developments of 2022 & 2023

# Robotics

- **Collaborative Robots (Cobots):** Robots designed to work alongside humans in shared workspaces, enhancing productivity and safety.
- **Autonomous Vehicles:** Advancements in AI-powered self-driving cars for transportation and logistics.
- **Swarm Robotics:** Use of multiple small robots working together for tasks like agriculture and search-and-rescue operations.
- **AI in Healthcare Robotics:** Robotic surgery, patient care, and diagnostics benefiting from AI-powered automation.

# Natural Language Processing

- **Conversational AI:** Advancements in chatbots and virtual assistants for more natural and context-aware interactions.
- **Generative AI:** Computers understanding instruction and generating text content in the "Extractive" and "Abstractive" fashion.
- **Multilingual NLP:** Development of models capable of understanding and generating content in multiple languages.
- **Domain-Specific NLP:** Customized NLP solutions for specific industries, such as construction and legal.

# AI Across Industries and in Construction



# AI Across Industries



Healthcare



Retail



Finance

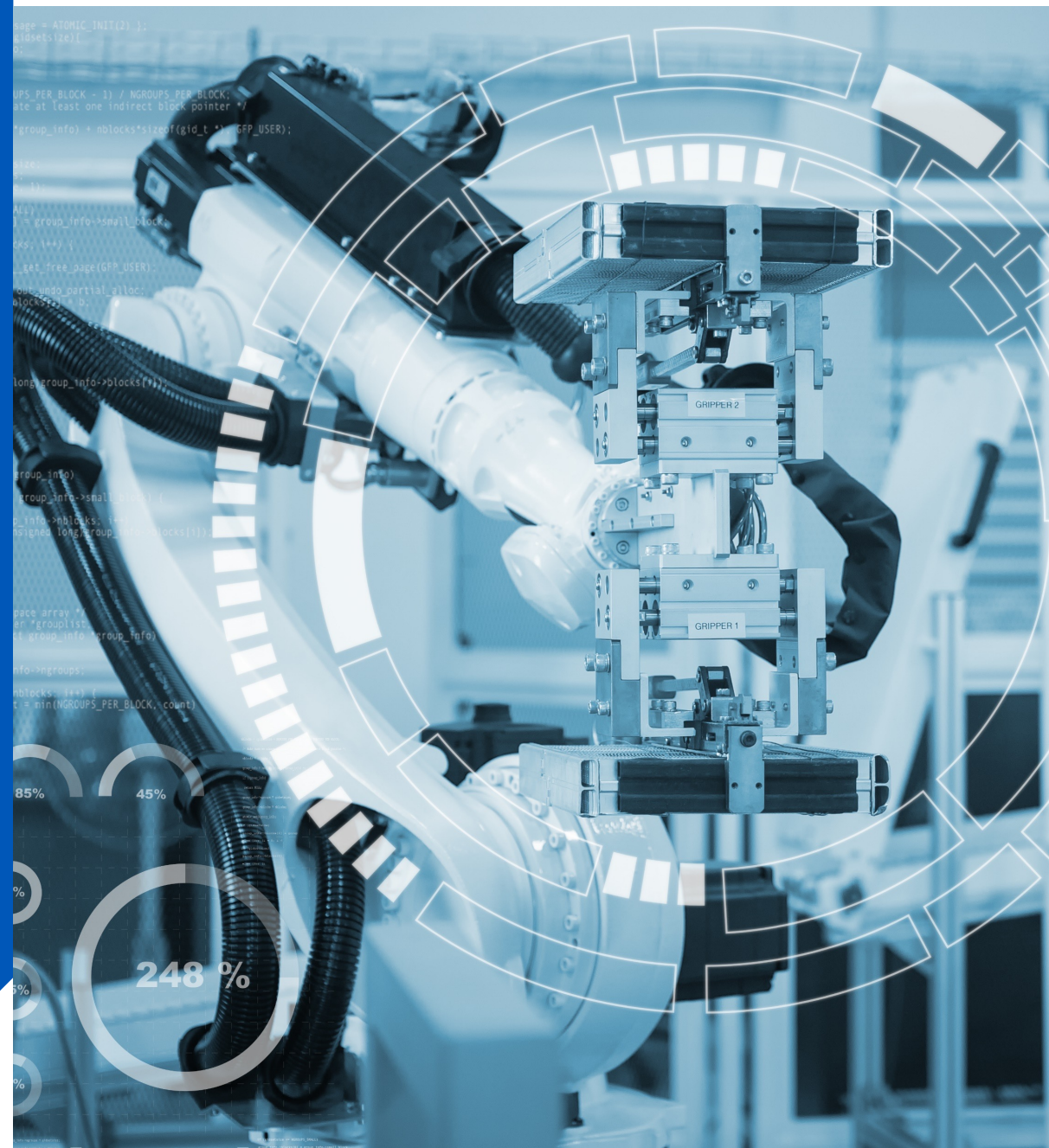


Transportation



# Healthcare

- ❑ Diagnosis using image recognition
- ❑ Predictive analysis for patient care
- ❑ Personalized treatment plans
- ❑ Robot-assisted surgeries



# Retail

- ❑ Customer insights & personalization
- ❑ Chatbots for customer service
- ❑ Inventory management & demand forecasting
- ❑ Virtual fitting rooms



# Finance

- ❑ Fraud detection & prevention
- ❑ Algorithmic trading
- ❑ Personalized banking & robo-advisors
- ❑ Credit & risk assessment



# Transportation

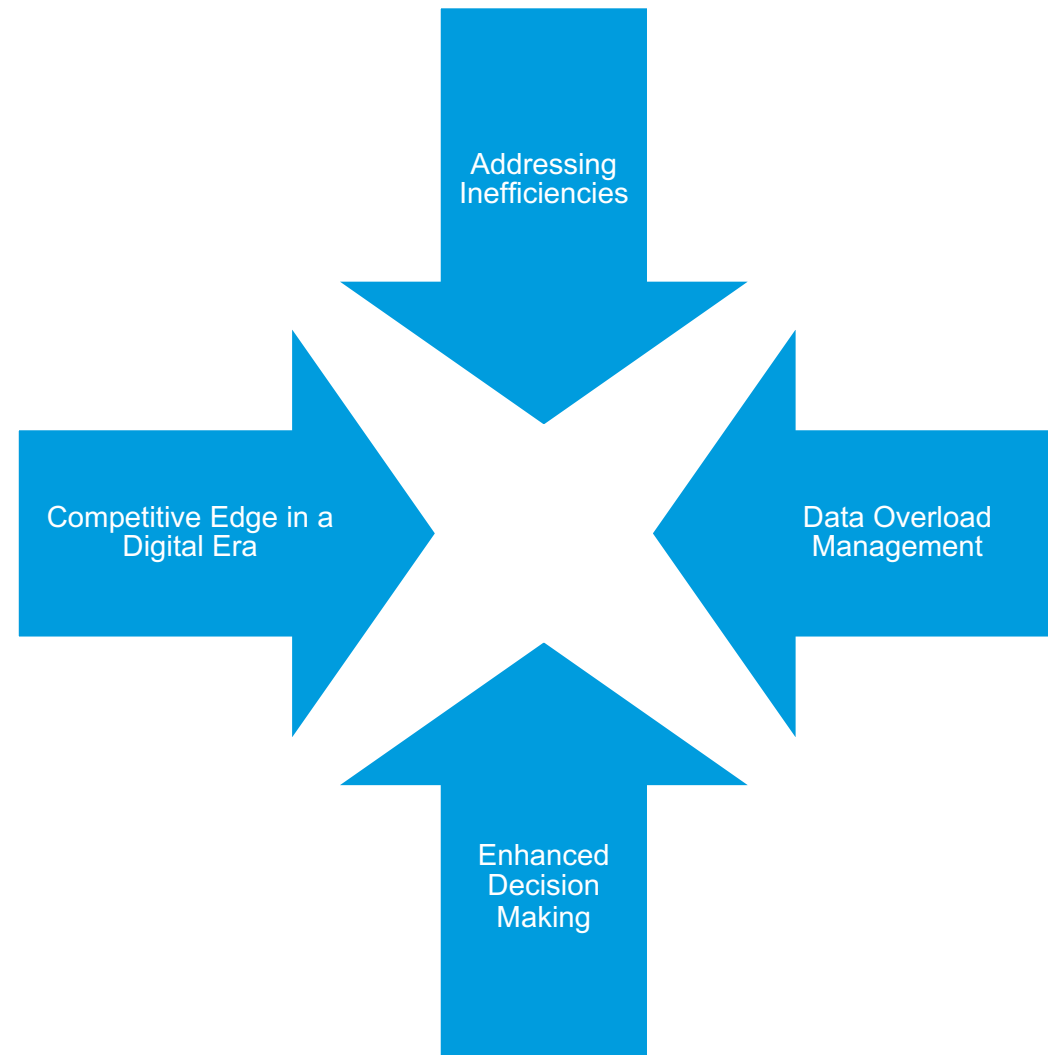
- ❑ Autonomous vehicles & drones
- ❑ Smart traffic management & prediction
- ❑ Predictive maintenance for vehicles & infrastructure
- ❑ Enhanced logistics & route optimization



# AI in Construction Operations



# Why AI in Construction



# AI in Construction Planning

- Predictive Analysis for Enhanced Scheduling
- Resource Allocation and Optimization
- Risk Identification and Mitigation
- Collaborative and Dynamic Planning

# AI in Design and Modeling

- Automated Design Assistance
- Enhanced Building Information Modeling (BIM)
- AI-Driven Simulations and Prototyping
- Sustainable and Efficient Design Solutions



# AI in Contract Management

- Automated Contract Analysis
  - Identify terms / key clauses, risks, and obligation
  - Predict potential disputes
- Contract Creation & Negotiation
  - Generate contracts from project specifics
  - Utilize negotiation bots

# AI in Procurement

- Predictive Analytics
  - Optimal material purchase timing
  - Quantity recommendations
- Supplier Evaluation
  - Performance Analysis
  - Cost-effectiveness assessment
- Order Automation
  - Automated order placements
  - Real-time order tracking

# AI in Invoicing

- Automated Invoice Scanning
  - Error detection
  - Duplicate or mismatch identification
- Predictive Payment Analysis
  - Optimal payment timings
  - Cash flow management
- Integration with Financial Software
  - Reduced manual data entry
  - Synchronized financial data

# AI: Real World Examples - Demo



Which AI Applications will be most useful in the Construction Industry?



# AI Applications that can be useful in the Construction Industry

- **Project Scheduling:** AI algorithms can optimize schedules, taking into account multiple variables that are hard to juggle manually.
- **Resource Allocation:** AI can optimize the use of labor, materials, and machinery, reducing waste and improving efficiency.
- **Predictive Maintenance:** Machine learning models can predict when equipment is likely to fail, so you can fix problems before they happen.
- **Safety Monitoring:** Computer vision can monitor job sites to ensure that safety protocols are being followed.
- **Cost Estimation:** AI can analyze past projects to provide more accurate cost estimates for future ones.
- **Quality Control:** AI systems can analyze images and data to spot defects or deviations in real-time.
- **Contract Management:** Natural language processing can be used to auto-generate or analyze legal documents, saving time on paperwork.
- **Supply Chain Optimization:** AI can predict material needs and order them automatically.
- **Site Selection:** AI algorithms can analyze geographic, economic, and environmental data to help select the best site for construction.
- **Waste Reduction:** AI can identify inefficiencies and suggest ways to reduce waste, be it in materials, time, or human resources.

# Off-the-Shelf Construction Applications with AI

- Project Scheduling and Management - Procore
- Design Optimization - Autodesk Generative Design
- Safety and Risk Management - Smartvid.io
- Quality Control - Plumbob
- Cost Estimating and Budgeting - Candela AI
- Supply Chain Management - BrilliantTS
- Document Management - PlanGrid (now part of Autodesk)

- Energy Efficiency - Building Management Systems (BMS)
- Drones and Robotics - Skycatch and Brick-laying Robotics
- Equipment Maintenance - Caterpillar
- Environmental Sustainability - Ecovative Design
- Communication and Collaboration - BIM 360 (by Autodesk)

# Benefits and Challenges





# AI in Construction: Pros and Cons

- Increased Efficiency & Productivity
- Cost Savings & Budget Optimization
- Enhanced Safety Measures & Protocols
- Improved Decision Making & Forecasting
- Sustainability & Environmental Impact

- Initial High Costs & Integration Challenges
- Learning Curve
- Job Displacement Concerns
- Data Privacy & Security
- Over-reliance on Technology

# How to Get Started



Assessment & Goal Setting

Understand current challenges  
Define clear objectives



Data Collection & Organization

Gather historical data  
Structure data for analysis



Choose the Right Tools & Software

AI platforms tailored for construction  
Scalable solutions for future growth



Training & Skill Development

Up-skill employees  
Onboard AI specialist or consultants



Pilot & Scale

Begin a pilot program  
Scale AI adoption based on results

# Questions



# Thank You & Contact Information

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