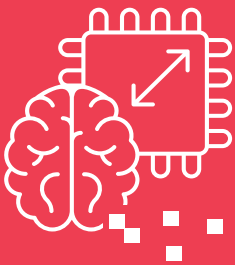


Intel AI Reference Kits

AI promises to transform every industry, but most decision makers have more questions than answers as they chart their course forward. The unbridled promise of AI to drive new business models, efficiencies and profitability is matched by its fast-growing complexity, and cost.



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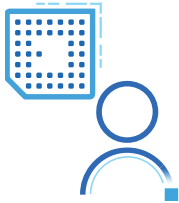




Accelerate Digital Transformation with Intel AI Reference Kits

AI promises to transform every industry, but most decision makers have more questions than answers as they chart their course forward.

Taking AI from concept to production is more difficult than many teams expect, and putting AI to work successfully can be fraught with challenges. The unbridled promise of AI to drive new business models, efficiencies and profitability is matched by its fast-growing complexity and cost.



Do you have the right skill sets on your team?



What tools and frameworks should you use?



How can you project and contain compute costs?

To help you address these challenges, Intel offers a series of trained AI reference kits that help enterprises innovate and accelerate their digital transformation journey. With these kits, Intel further builds upon the AI application tools it provides to data scientists and developers.

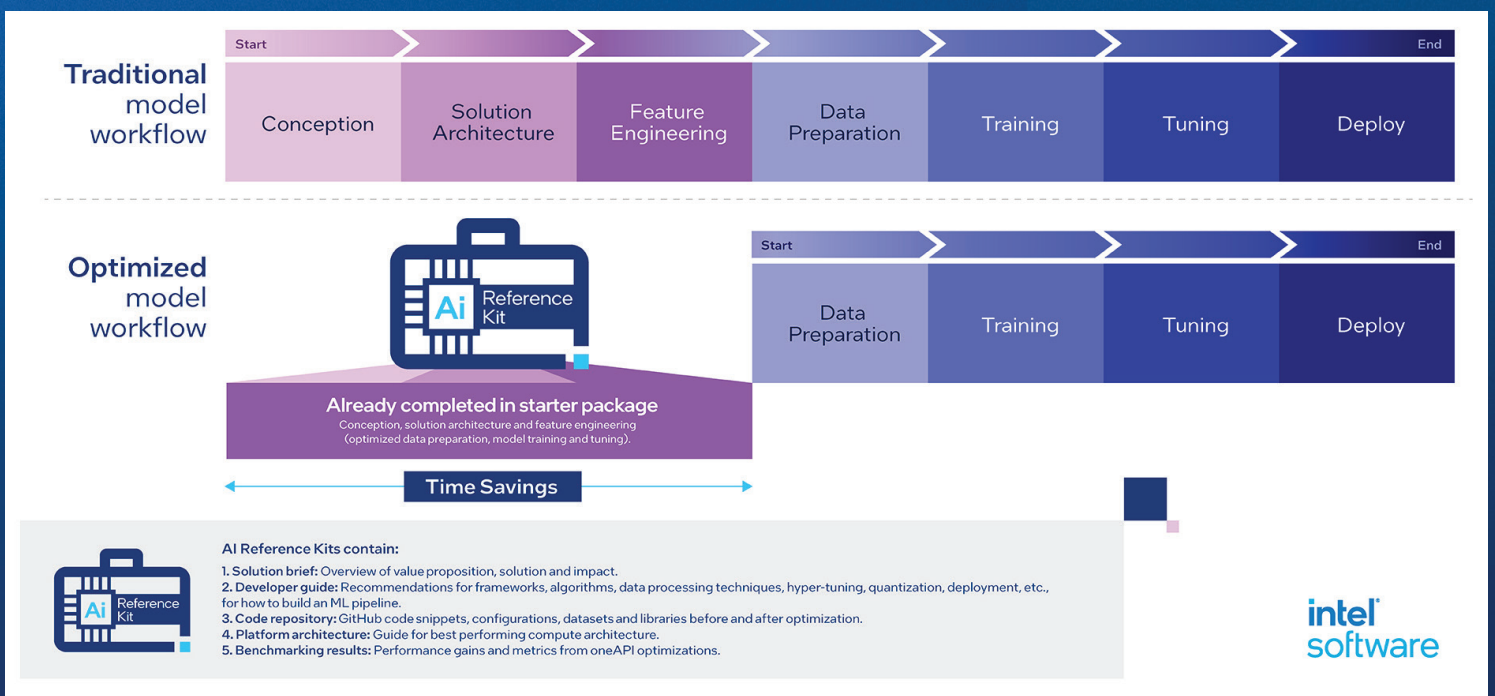


Fast path to success

The Intel AI Reference Kits provide an open path to innovation that streamlines your AI journey. Your team will benefit from the built-in domain expertise of the data scientists who developed them, and help avoid lengthy and costly experimentation and get to market faster.

Solutions built using the kits are based on popular AI frameworks and tools including PyTorch, TensorFlow, oneAPI, OpenVINO and many others, for a fast path to cost-effective, optimized performance on Intel hardware, from client to edge to data center and cloud.

Mix and match any combination of kits to meet the specific needs of your business. Adapt the pre-optimized and integrated solution components with your own data to transform critical processes. The kits provide a solid foundation to get models into production quickly, for solutions that are simple, flexible and performant.



Take advantage of domain expertise



Avoid lengthy and costly experimentation



How can you project and contain compute costs?

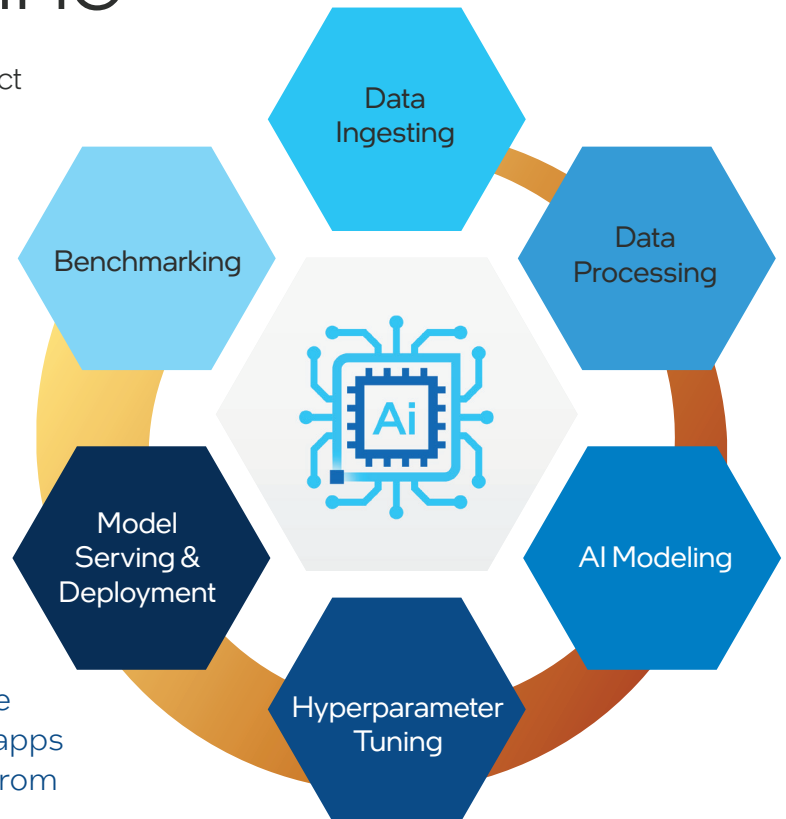


Designed and Optimized for the AI Pipeline

In developing these kits, Intel chose high impact problems to solve across multiple industries. Each kit includes an AI model developed to deliver accuracy, training and inference performance. Data scientists can customize and fine-tune models with their data.

Reference kit features

The models are built with popular open source frameworks and tools, optimized for Intel® architecture using Intel's AI software portfolio. Powered by oneAPI, the kits are offered as open source and include full documentation, as well as apps and source code, to cover the AI lifecycle from data ingestion to benchmarking.



intel hardware

4th Gen Intel Xeon Scalable Processor



Pick and Choose: A library of Intel® AI Reference Kits

The current library includes over 30 Intel® AI Reference Kits that power an extensible model of AI transformation for every vertical. While most incorporate industry-specific examples to illustrate their real-world implementations, they can all be applied to other industries by training with your own data.

Cross-Industry

- Personal Identifiable Information (PII) Data Protection
- AI Structured Data Generation
- Computational Fluid Dynamics
- Data Streaming Anomaly Detection
- Digitize Document Routing with Intelligent Indexing
- Enhance Enterprise Network Intrusion Detection
- Step Up Interactions with a Conversational AI Chatbot
- Structural Damage Assessment
- Text Data Generation
- Traffic Camera Object Detection
- Vertical Search Discovery
- Voice Data Generation

Consumer Products

- Automate Processing of Trade Promotion Deductions

Energy & Utilities

- A Better Way to Predict Utility Asset Health to Deliver Higher Service Reliability
- Extract Text from Engineering Documents for Utility Assets
- Identify Drone Landing Areas
- Improve Power Line Fault Detection

Health & Life Sciences

- Automate Visual Quality Control Inspections for Life Sciences
- Disease Prediction Using NLP
- Document Automation for Claims Processing Using NLP
- Faster Session Notes with Speech-to-Text AI for Healthcare Providers
- Image Data Generation
- Medical Imaging Diagnostics Using Computer Vision

Manufacturing

- Engineering Design Optimization
- Faster Digital Twin Insights

Financial Services

- Increase Mortgage Loan Default Risk Prediction Speed
- More Efficient Credit Card Fraud Risk Detection

Retail

- Efficiently Automate Retail Purchase Prediction
- Increase Demand Forecasting Efficiency
- Increase Retail Order to Delivery Time Forecasting
- Personalize Retail Experiences with Customer Segmentation
- Strengthen Customer Product Recommendations

Telecommunications

- Retail Customers with Better Churn Prediction

Each Intel AI Reference Kit has an open source GitHub repository.

[Explore the possibilities >](#)

Regardless of the industry where they are used, the AI kits provide a simplified path to production with step-by-step instructions that are tested to deliver optimized performance out of the box to solve business challenges.



Bringing the Kits to Life: Pharma Manufacturing

Here is an example of how the AI reference kits can be used together to transform a pharmaceutical manufacturing business.

Pharmaceutical Manufacturing Lifecycle



Demand Prediction >



Predictive
Maintenance >



Product QA/QC >



Customer Support >

Optimizing pharmaceutical manufacturing ensures that drugs are produced consistently, to the highest quality and regulatory standards. Faulty pharmaceuticals can have devastating consequences, from causing adverse effects to failing to treat the intended condition. For instance, a defective batch of drugs can lead to wrong dosage or worse, while a wrongly labeled drug can cause patients to take the wrong medication.

AI can play a significant role in optimizing pharmaceutical manufacturing business. By training large datasets and identifying patterns, AI can detect inefficiencies, reduce defects and improve product quality. This can help reduce manufacturing costs, improve production speed and ultimately lead to better patient outcomes.



Pharma Lifecycle Stage 1: Demand prediction



Demand Prediction >



Predictive Maintenance >



Product QA/QC >



Customer Support >

Demand Forecasting Kit

Overcome the negative cost impacts of demand variability

Reduce inventory
forecast errors

Reduce out-of-stock
sales losses

Reduce
inventories

Business Challenges

Supply chain managers say that one of their top challenges is forecasting production to manage supply inventory and minimize lost sales due to lack of inventory. Poor forecasting can also lead to over-production, which then leads to excess inventory, resulting in additional costs for the business and stock obsolescence.

Technology Solutions

This AI reference kit helps your enterprise increase its demand forecasting capability. Intel software products deliver added efficiency by training complex AI deep-learning models faster to help reduce inventory and forecasting error costs, while optimizing stock replenishment management.

Demand Forecasting Kit Building Blocks

Model	Time-series Prediction Modeling; CNN-LSTM
Output	Predict demand at the selected time for multiple products across multiple locations
Software	Intel® Optimization for TensorFlow*; oneAPI Deep Neural Network Library
Hardware	4th Gen Intel® Xeon® Scalable processors
More Information	www.intel.com/aireferencekit



Pharma Lifecycle Stage 2: Predictive maintenance



Predictive Maintenance Kit

Plan equipment maintenance based on real-world monitoring data

Increase Mean Time Between Failures (MTBF)

Improve Drug-Production Efficiency

Extend Asset Life & Reduce Maintenance Costs

Business Challenges

The success of a pharmaceutical company depends on the health and uninterrupted operation of its manufacturing resources. Optimizing maintenance cycles for manufacturing equipment helps keep manufacturing lines operational with minimal production interruptions.

Technology Solutions

This predictive analytics model draws on data including asset age, mechanical properties, geospatial data, inspections, the manufacturer, prior repair/maintenance history and outage records. It operates on a robotic arm used in the manufacturing process that retrieves defective pills from the line. The model continuously learns as new data is provided, including real-time monitoring in production.

Predictive asset maintenance kit building blocks	
Model	Predictive Maintenance; XGBoost Classifier
Output	Flag defining if the asset requires maintenance
Software	Intel® Extension for Scikit-Learn*; Intel® Optimization for XGBoost*, Intel® oneAPI Data Analytics Library for Python* API (daal4py)
Hardware	4th Gen Intel® Xeon® Scalable processors
More Information	www.intel.com/aireferencekit



Pharma Lifecycle Stage 3: Product QA/QC



Visual Anomaly Detection Kit

Digitize visual quality inspections on production lines

Increase Quality of Pills Produced

Lower Operating Costs for Manufacturing

Operate at Higher Capacity for Profitability

Business Challenges

Quality control (QC) is safety-critical for the pharmaceutical industry, but human visual inspection for quality assurance tends to be costly and ineffective. Pharma quality control accounts for an outsized portion of manufacturing costs in pharmaceuticals and other industries and can impact production volume.⁴

Technology Solutions

This reference kit uses computer vision techniques powered by AI and deep learning to digitize and automate visual inspection, helping improve product quality and lower operating costs. It enables quality inspection processes to scale up without an associated increase in labor.

Visual anomaly detection kit building blocks

Model	Binary Classification Computer Vision Model; VGG-16 or Padim
Output	Flag defining if the product passes or fails visual inspection
Software	OpenVINO™; Anomalib; Intel® Extension for PyTorch*; Hugging Face Transformers
Hardware	4th Gen Intel® Xeon® Scalable processors; Intel ARC GPUs
More Information	www.intel.com/aireferencekit



Pharma Lifecycle Stage 4: Customer Support



GenAI Chatbot Kit

Automate customer care

Reduce Support Operations Costs

Focus Agents on Complex Issues

Increase Customer Satisfaction & Retention

Business Challenges

Chatbots have become business-critical to streamline and improve support operations, but basic chatbots that match words to scripted responses are no longer enough to satisfy users' requirements. Conversational AI assistants can engage in human-like dialogue, capture the context of inquiries, and provide more accurate responses.

Technology Solutions

The generative AI chatbot component uses a quantized 6.7B parameter GPT4all-J LLM with Retrieval Augmented Generation (RAG) to respond to queries associated with fictitious robotic maintenance scenarios. In many cases, combining in-context learning techniques like RAG with custom data enables developers to increase model performance on domain-specific tasks without the need for training from scratch or fine-tuning.

GeAI kit building blocks

Model	Text Generation LLM with RAG; GPT4All-J v1.3-groovy
Output	Responses to user queries associated with fictitious robotic maintenance scenarios
Software	Intel® Optimization for PyTorch* 2.0; LangChain; Hugging Face Transformers
Hardware	4th Gen Intel® Xeon® Scalable processors
More Information	www.intel.com/aireferencekit





Take the Next Step

[Learn More](#) about the Reference Kits ›

[Download](#) the Reference Kits ›

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