Alexa's Conversational AI: Amazon pioneered always-listening voice interfaces using deep neural networks for wake word detection, speech recognition, natural language understanding, and text-to-speech synthesis. Their approach combines on-device processing with cloud-based models for real-time responses.

Recommendation Systems at Scale: Amazon's recommendation engine processes billions of customer interactions using deep learning to predict purchases, suggest products, and personalize the shopping experience. They've developed novel collaborative filtering techniques that work across their massive product catalog.

Supply Chain Optimization: Amazon uses deep reinforcement learning for inventory management, demand forecasting, and logistics optimization. Their systems predict what products to stock in which warehouses and optimize delivery routes in real-time.

Amazon Go's Computer Vision: Their cashier-less stores use deep learning for object detection, tracking, and activity recognition to automatically charge customers. This combines multiple camera angles with weight sensors and advanced computer vision models.

AWS AI Services: Amazon democratizes deep learning through pre-trained models for image recognition (Rekognition), natural language processing (Comprehend), and speech services (Polly/Transcribe), making these capabilities accessible to businesses without AI expertise.

Fraud Detection: Amazon applies deep learning to detect fraudulent transactions, fake reviews, and suspicious seller behavior across their marketplace, processing millions of transactions in real-time.

SageMaker Platform: AWS's flagship ML service provides end-to-end machine learning workflows - from data preparation to model deployment. It offers pre-built algorithms, managed Jupyter notebooks, and one-click model training and deployment.

Convolutional Neural Networks (CNNs):

- Amazon Go stores use CNNs for object detection and customer tracking
- Rekognition uses CNN variants (ResNet, EfficientNet) for image classification and facial recognition
- Product image search and visual similarity matching

Recurrent Neural Networks (RNNs/LSTMs):

- Alexa's speech recognition pipeline uses bidirectional LSTMs
- Time-series forecasting for inventory management and demand prediction
- Sequential pattern recognition in customer behavior analysis

Transformer Networks:

- Alexa's natural language understanding uses BERT-like transformer models
- AWS Comprehend employs transformers for sentiment analysis and entity extraction
- CodeWhisperer (AWS's coding assistant) uses transformer-based large language models

Deep Reinforcement Learning:

- Supply chain optimization uses Deep Q-Networks (DQNs)
- Dynamic pricing algorithms employ actor-critic networks
- Warehouse robot navigation and task allocation

Generative Adversarial Networks (GANs):

- Product image enhancement and synthetic training data generation
- Fraud detection through anomaly detection using adversarial training

Autoencoder Networks:

- Recommendation systems use variational autoencoders for collaborative filtering
- Anomaly detection in AWS security services
- Data compression for efficient storage and transmission

Graph Neural Networks:

- Social commerce recommendations analyzing user-product-category relationships
- Supply chain network optimization
- Fraud detection through transaction network analysis

Attention Mechanisms:

- Multi-head attention in Alexa's wake word detection
- Visual attention for Amazon Go's customer tracking systems

Amazon doesn't just use these architectures individually—they often combine multiple types in ensemble systems for robust, production-scale applications.