TORCH.AI™

Cutting Through the Noise: How to Evaluate Industrial-grade Artificial Intelligence

A concise discussion of artificial intelligence at Torch.AI

Every day, more and more vendors claim to leverage artificial intelligence. Buzzwords and hyperbole paint a dense wall of promises that can be difficult to verify. Without specialized understanding, how can you ensure that their solution employs genuine intelligence and not just a fancy computation?

To evaluate artificial intelligence solutions, cut through the marketing noise and ask the tough questions. These questions include:

- ✔ How is artificial intelligence applied in the product?
- ✔ How does is the intelligence trained?
- ✔ How does it improve over time?

This document describes, in concise terms, how Torch.AI approaches artificial intelligence. It directly addresses these questions...without the marketing hype.

How does Torch.AI use artificial intelligence?

In a nutshell, we use artificial intelligence to create meaning and context across disparate, multi-modal data. Our **intelligence extraction** technology reads and understands data from a connected data source without precognition. It extracts domain-specific objects, concepts, and relationships from the data. Our **knowledge graph** technology establishes a clear view of the enterprise data landscape—without removing or duplicating data from the authoritative source. This approach facilitates auditability and validation, a fundamental requirement of industrial-grade artificial intelligence.

How do Torch.AI machines actually learn?

Intelligence Extraction

Our intelligence extraction technology uses self-supervised learning to train models that extract knowledge from structured, semi-structured, and unstructured data. Our approach incorporates transformer-based machine learning models which consider three aspects of information interchange: raw textual content, the layout and imagery of the content, and the hierarchy of the information expressed in the content. We train a baseline model using the self-supervised machine learning methodology on a broad corpus of document types. Ontologies provide context and meaning to the data. The model is further tuned using a set of training data optimized for the customer's business case. Our models improve over time by capturing domain-specific knowledge of the enterprise through a proprietary data annotation solution. Torch.AI has extensive experience safeguarding customer data and never shares or re-uses customer data in any way.

The following table describes the different types of AI applied in our intelligence extraction technology.

Transfer Learning	Enables us to reuse large models and fine-tune them on the domain instead of training them from scratch
Contextualized Embeddings	Enables us to build models with a deep semantic understanding
Deep Neural Networks	Enables us to build models that can extract and distill knowledge from any unstructured data source
Weakly Supervised Learning	The weak supervision approach enables us to create high-quality training sets quickly and with less effort

Table 1: AI Techniques in Intelligence Extraction

Enterprise Knowledge Graph

Torch.AI leverages knowledge graphs to provide a contextual overlay across an organization's entire data landscape. Training adheres to the representational learning methodology, which is a class of machine learning that discovers the representations required for feature detection or classification from raw data. Our approach considers the many unique characteristics of graph data, which do not lend themselves to typical linear encoding algorithms. To accommodate the graph data structure, baseline training includes random walks on the configured node types to create sets of node pairs representing positive correlation. Training also generates a negative set of node pairs by randomly selecting nodes from the graph. Walks can be configured using either depth-first search (DFS) or breadth-first search (BFS) algorithms.

Learning occurs by iterating through the walk chains. Each iteration passes node features, edge features, and graph structure through an encoder. A classifier predicts the inclusivity of node embeddings and determines whether the prediction was correct. The predictions underpin the inductive nature of the learning process. Unseen nodes and node features can be evaluated without a comprehensive retraining of the model.

Once trained, the model processes graph data and produces embedded representations that preserve node and edge feature information. The advantage to this approach is that the embedded representations can be used in downstream machine processes, such as node classification, link prediction, and named entity disambiguation.

As the organization's data infrastructure continues to grow and evolve, so too must the knowledge graph. Torch.AI monitors the knowledge graph and, with every 10% increase in nodes, automatically recomputes all embedding values.

How is the artificial intelligence monitored and adjusted?

True artificial intelligence learns from experience and improves over time. Torch.AI continuously monitors and adjusts models in production using a proprietary set of technologies that incorporate both automated and human-in-the-loop mechanisms.

We have designed a proprietary data annotation solution for harvesting human expertise, assessing model accuracy, and improving data operation models. Our intuitive web-based interface captures domain-specific knowledge for ongoing model training purposes. It also records audit trails for non-repudiation and historical purposes. This interface is incorporated into the user's workflow and has been proven to reduce cognitive burden in their day-to-day tasks.

Our patented *Combinatorial machine-learning analysis of data in flight* (PATENT ID 20210279401) technology enables real-time automation of the inductive learning process. This technology bypasses replicated data in the data ecosystem, analyzes data from its authoritative source, and transforms data in flight. It absolves an enterprise from the fundamental flaws of data replication, which creates unnecessary infrastructure costs and undermines speed, reliability, and even compliance. As new, domain-specific enterprise data becomes available, Torch.AI initiates an automated process to train and validate new models.

Conclusion

When evaluating artificial intelligence solutions, dispense with the marketing hype and obtain a clear picture of their approach. Ask the tough questions to uncover the truth. How is the intelligence applied? How does it learn? How is it monitored and refined over time? This document directly addresses these questions for Torch.AI. We are **The Data Infrastructure AI Pioneers**™, and our software brings the power of artificial intelligence to everyone in an enterprise.