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Deep learning is a branch of machine learning that uses multi-layered artificial neural networks to automatically learn patterns and representations from data. Instead of relying on hand-crafted features, deep models discover useful structures directly from raw inputs like images, text, or audio by stacking many transformation layers. Early layers often learn simple patterns (edges, shapes, or word co-occurrences), while deeper layers capture more abstract concepts (objects, semantics, or intent). This hierarchical representation learning has enabled breakthroughs in computer vision, natural language processing, speech recognition, and many other fields. However, deep learning also comes with challenges, including large data and computation requirements, sensitivity to data quality and bias, and difficulties in interpretability and reliability—motivating ongoing research into more efficient, robust, and trustworthy models.

Deep learning is a powerful technique where computers learn to make decisions by passing data through many layers of artificial neurons. Each layer transforms the input a little bit, gradually turning raw data—such as pixels, sound waves, or sensor readings—into meaningful features like shapes, words, or actions. By training on large datasets, deep networks can recognize objects in images, translate between languages, drive cars, or even generate realistic text and images. Unlike traditional methods that require manual feature engineering, deep learning automates this process, often achieving superior performance. At the same time, it raises important questions about transparency, fairness, and robustness, which are now central topics in modern AI research.