# **Differences between AI, ML, DL, DS**

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| AI | ML | DL | DS |
| FULL FORM | | | |
| Artificial Intelligence | Machine Learning | Deep Learning | Data Science |
| **2.First Used In** | | | |
| Computer scientist **John McCarthy** in 1955. | In 1959 by Arthur Samuel. | In 2000s by Igor Aizenberg. | Data science as a distinct field emerged in the early **2000s**. |
| **3.Basic Purpose** | | | |
| To mimic human behaviors | To enable machines learn like humans | To design algorithms ,inspired by structure & functioning of human brain | To manipulate data using various techniques to get as much result-oriented information as possible |
| 4. Division | | | |
| Broadest concept | Subset of AI | Subset of ML | Interdisciplinary field |
| **5. Primary focus** | | | |
|  Encompasses various approaches like robotics, natural language processing, and machine learning.  Focuses on achieving human-like capabilities. |  Relies on algorithms that improve with experience.  No explicit programming for every task; learns patterns from data |  Uses artificial neural networks with multiple layers to process complex data.  Particularly effective for tasks like image recognition and speech translation. |  Utilizes various techniques, including ML and DL, but may also involve statistics and visualization.  Focuses on understanding data and solving problems through its analysis. |
| **6. Techniques** | | | |
| Logic programming, expert systems, symbolic reasoning. | Supervised learning, unsupervised learning, reinforcement learning, Regression, classification, clustering, decision trees | Convolutional Neural Networks (CNNs), Recurrent Neural Networks (RNNs) | Data cleaning, data wrangling, data visualization, statistical analysis, data mining,. |
| **7. Applications** | | | |
| Self-driving cars, robotic surgery, game playing. | Spam filtering, product recommendations, credit card fraud detection. | Facial recognition, medical image analysis, natural language processing. | Market research, customer segmentation, risk management, scientific discovery. |
| **8. Roles** | | | |
| AI Engineer Designs and implements intelligent systems. | Machine Learning Engineer Develops and applies machine learning algorithms.. | Deep Learning Engineer Builds and trains complex neural networks. | Data Scientist Cleans, analyzes, and interprets data to extract insights |
| **9. Data Dependence** | | | |
| Can function without data | Requires labeled or unlabeled data for training | Requires large amounts of labeled data | Relies on high-quality and relevant data |
| 10. Complexity | | | |
| Ranges from simple to highly complex | Generally complex algorithms | Extremely complex algorithms inspired by the brain | Requires strong analytical and problem-solving skills |
| **11. Current State** | | | |
| Still under development | Widely used across various industries | Rapidly evolving with promising results | Evolving field with high demand for skilled professionals |
| **12. Learning Style** | | | |
| Not directly applicable | Learning from data through algorithms | Learning from patterns in large datasets | Learning from data to extract meaningful information |
| **13. Interpretability** | | | |
| Models can be difficult to interpret | Models can be somewhat interpretable | Models can be difficult to interpret | Interpretability can be high depending on the technique |
| **14. Skillset** | | | |
| Requires knowledge of AI algorithms, logic, and robotics | Requires knowledge of math, statistics, and programming | Requires expertise in deep learning frameworks and algorithms | Requires knowledge of statistics, data analysis tools, and programming languages |
| **15. Tools & Technologies** | | | |
| Symbolic AI systems, logic programming languages | Machine learning libraries (TensorFlow, PyTorch) | Deep learning frameworks (Keras, PyTorch)) | Programming languages (Python, R), data analysis tools (Tableau |

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