# Chapter 9 - ML Algorithms - A Partial Taxonomy

## A short survey

### 9.1 - Introduction

New machine learning algorithms used to be introduced at a breathtaking pace. However, these more recent algorithms were typically built off the core existing algorithms, tweaking certain aspects to mitigate known issues. The tweaks made the application area of these algorithms narrower, making it harder for researchers and engineers to pick the correct algorithm for the right problem. This issue was resolved partially when neural networks once again became the sweetheart algorithm of AI. This time though, advances in hardware and software meant they truly started outperforming their conventional counterparts. More importantly, they offered a more general-purpose machine learning algorithm: a one-size-fits-all, accelerating their application to many different real-world domains. As stated above, this did come with a price: neural networks are inherently complex, and therefore it will be harder to grasp how they accomplish their high performance. The mapping of the algorithmic objective (see the previous chapter) and class/type of algorithm is not necessarily one-to-one. For example, there are many regression methods, ranging from linear regression to deep belief neural networks. Below is a very non-exhaustive list of the most common machine learning algorithms and the primary algorithmic objectives we typically use them for.

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| 9.2 - Regression Algorithms | |
| Linear Regression | Chart  Description automatically generated |
| Polynomial Regression |
| Support Vector Machine Regression |
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| 9.3 - Classification Algorithms | |
| Logistic Regression | Icon  Description automatically generated |
| K-nearest Neighbors |
| Ridge Regression |
| Elastic Nets / Lasso |
| Support Vector Machine Classification |
| Fisher Discriminant Analysis |
| Decision Trees |

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| 9.4 - Ensemble Methods | |
| Random Forests | Icon  Description automatically generated |
| Gradient Boosting |
| Ada Boost |

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| 9.5 - Clustering Algorithms | |
| K-means/medians | Qr code  Description automatically generated |
| Gaussian Mixture Models |
| DBSCAN |
| Affinity Propagation |
| OPTICS |
| BIRCH |
| Agglomerative Clustering |

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| 9.6 - Dimensionality Reduction Algorithms | |
| PCA | A picture containing text, athletic game, sport  Description automatically generated |
| ICA |
| Factor Analysis |
| Autoencoders |
| Multidimensional Scaling |

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| 9.7 - Manifold Algorithms | |
| tSNE | A picture containing sky  Description automatically generated |
| Hessian Eigenmapping |
| Stochastic diffusion |

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| 9.8 - Natural Language Processing | |
| Latent Dirichlet Analysis | Logo  Description automatically generated |
| Hidden Markov Models |
| Word2Vec |
| Naive Bayes |

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| 9.9 - Graph Algorithms | |
| Girvan Newman Community Detection | Icon  Description automatically generated |
| Louvain Community Detection |
| Minimum Spanning Trees |
| Dijkstra Shortest Path |
| Random Walks |
| Page Rank |

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| 9.10 - Neural Networks | |
| Markov Chains | Icon  Description automatically generated |
| Kohonen Self-organizing Network |
| Recurrent Neural Nets |
| Deep Belief Neural Nets |
| Convolutional DB Neural Nets |
| Deconvolutional Neural Nets |
| Radial Basis Function Nets |
| General Adversarial Nets |

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| 9.11 - Niche Algorithms | |
| Evolutionary algorithms | Icon  Description automatically generated |
| Genetic algorithms |
| Swarm optimization |
| Quantum Algorithms |
| AlphaGo Zero |