Chameleon
Smarter World

Artificial Intelligence & Data Science Glossary of Terms

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INTRODUCTION

PURPOSE

This document forms part of a collection of artefacts and documents for the handover of knowledge to students enrolled in the School of Information Technology (IT) two Capstone units run by Deakin Universities Faculty of Science, Engineering and Built Environment (SEBE). Specifically, this document has been authored for students assigned to the Chameleon virtual company established by the SEBE IT Capstone program.

AUDIENCE

The Chameleon virtual company includes both undergraduate and postgraduate students from a variety of IT disciplines, many of whom may be unfamiliar with specific technical terms commonly used in Artificial Intelligence and Data Science. As such, this document has been prepared to assist these new Chameleon company students become familiar AI and DS specific technology and as a reference for those familiar with the domain and searching for either an informative or normative reference.

ATTRIBUTION & REFERENCES

It should be noted that this glossary of terms is a collection of definitions from a variety of informative and normative references from across the internet. Copyright in the wording of each definition is credited to the original author from which the definition was sourced.

References to each source can be found listed underneath each term.

All content in this introduction section, all synonyms, and terms with no reference or source provided are the original work of the document author.

GLOSSARY OF TERMS

ACCOUNTABILITY

Those responsible for the different phases of the AI system lifecycle should be identifiable and accountable for the outcomes of the AI systems, and human oversight of AI systems should be enabled.
This principle aims to acknowledge the relevant organisations' and individuals' responsibility for the outcomes of the AI systems that they design, develop, deploy and operate. The application of legal principles regarding accountability for AI systems is still developing.
Mechanisms should be put in place to ensure responsibility and accountability for AI systems and their outcomes. This includes both before and after their design, development, deployment and operation. The organisation and individual accountable for the decision should be identifiable as necessary. They must consider the appropriate level of human control or oversight for the particular AI system or use case.
AI systems that have a significant impact on an individual's rights should be accountable to external review, this includes providing timely, accurate, and complete information for the purposes of independent oversight bodies.

Source/s: Australian Government AI Ethics Framework

ACTION RECOGNITION

Activity recognition aims to recognize the actions and goals of one or more agents from a series of observations on the agents' actions and the environmental conditions. Since the 1980s, this research field has captured the attention of several computer science communities due to its strength in providing personalized support for many different applications and its connection to many different fields of study such as medicine, human-computer interaction, or sociology.

Synonym/s: activity recognition

Source/s: https://en.wikipedia.org/wiki/Activity_recognition

ACTIVE LEARNING

A training approach in which the algorithm chooses some of the data it learns from. Active learning is particularly valuable when labeled examples are scarce or expensive to obtain. Instead of blindly seeking a diverse range of labeled examples, an active learning algorithm selectively seeks the particular range of examples it needs for learning.

Source/s: Google Machine Learning Glossary

ADAPTIVE LEARNING

Adaptive learning, also known as adaptive teaching, is an educational method which uses computer algorithms as well as artificial intelligence to orchestrate the interaction with the learner and deliver customized resources and learning activities to address the unique needs of each learner.
Adaptive learning has been partially driven by a realization that tailored learning cannot be achieved on a large-scale using traditional, non-adaptive approaches. Adaptive learning systems endeavor to transform the learner from passive receptor of information to collaborator in the educational process. Adaptive learning systems' primary application is in education, but another popular application is business training. They have been designed as desktop computer applications, web applications, and are now being introduced into overall curricula.

Source/s: https://en.wikipedia.org/wiki/Adaptive_learning

ADVERSARIAL MACHINE LEARNING

Adversarial machine learning is a machine learning technique that attempts to fool models by supplying deceptive input. The most common reason is to cause a malfunction in a machine learning model.
Most machine learning techniques were designed to work on specific problem sets in which the training and test data are generated from the same statistical distribution. When those models are applied to the real world, adversaries may supply data that violates that statistical assumption. This data may be arranged to exploit specific vulnerabilities and compromise the results.

Source/s: https://en.wikipedia.org/wiki/Adversarial_machine_learning

AGENT-BASED MODEL (ABM)

An agent-based model (ABM) is a computational model for simulating the actions and interactions of autonomous agents (both individual or collective entities such as organizations or groups) in order to understand the behavior of a system and what governs its outcomes. It combines elements of game theory, complex systems, emergence, computational sociology, multi-agent systems, and evolutionary programming.

Source/s: https://en.wikipedia.org/wiki/Agent-based_model

AI ETHICS

AI ethics is a growing discipline concerned with building frameworks and norms to ensure the ethical use of AI in society. Establishing trust in AI through adherence to an ethical framework should be a focus for all organisations implementing AI technology. AI ethical principle aims to ensure that AI systems are aligned with human values.
Ethical use of AI should ensure accountability, explainability, fairness, privacy, safety, security, and transparency.

AI SERVICES

AI services refers to any infrastructure, software, and platform (e.g., cognitive computing, ML frameworks, bots, and virtual assistants, etc.) provided as (serverless) services or applications, possibly in the cloud, which are available off the shelf and executed on demand, reducing the management of complex infrastructures.

Source/s: EU AI HLEG, 2019

ALGORITHM

Finite suite of formal rules (logical operations, instructions) allowing to obtain a result from input elements. This suite can be the object of an automated execution process and rely on models designed through machine learning.

Source/s: Council Of Europe - AI Glossary

ANALYTICS

The discovery, interpretation, and communication of meaningful patterns in data.

Source/s: Wikipedia Glossary of AI

ANALYTICS

Analytics is the systematic computational analysis of data or statistics. It is used for the discovery, interpretation, and communication of meaningful patterns in data. It also entails applying data patterns towards effective decision-making. It can be valuable in areas rich with recorded information; analytics relies on the simultaneous application of statistics, computer programming and operations research to quantify performance.
Organizations may apply analytics to business data to describe, predict, and improve business performance. Specifically, areas within analytics include predictive analytics, prescriptive analytics, enterprise decision management, descriptive analytics, cognitive analytics, Big Data Analytics, retail analytics, supply chain analytics, store assortment and stock-keeping unit optimization, marketing optimization and marketing mix modeling, web analytics, call analytics, speech analytics, sales force sizing and optimization, price and promotion modeling, predictive science, graph analytics, credit risk analysis, and fraud analytics. Since analytics can require extensive computation (see big data), the algorithms and software used for analytics harness the most current methods in computer science, statistics, and mathematics.

Synonym/s: Data Analytics

Source/s: https://en.wikipedia.org/wiki/Analytics

ANALYTICS PLATFORM

Technology platform for analytics.

ANOMALY DETECTION

The process of identifying outliers. For example, if the mean for a certain feature is 100 with a standard deviation of 10, then anomaly detection should flag a value of 200 as suspicious.

Source/s: Google Machine Learning Glossary

ARTIFICIAL GENERAL INTELLIGENCE (AGI)

Artificial General Intelligence (AGI) or “Strong” AI refers to machines that exhibit human intelligence. In other words, AGI aims to perform any intellectual task that a human being can. AGI is often illustrated in science fiction movies with situations where humans interact with machines that are conscious, sentient, and driven by emotion and self-awareness. AGI demonstrates a broad range of problem solving, creativity, and adaptability. For example, a program demonstrating artificial general intelligence could translate text, compose symphonies, and excel at games that have not yet been invented.

Synonym/s: Strong AI

ARTIFICIAL INTELLIGENCE (AI)

A set of sciences, theories and techniques whose purpose is to reproduce by a machine the cognitive abilities of a human being. Current developments aim, for instance, to be able to entrust a machine with complex tasks previously delegated to a human.
Artificial intelligence (AI) systems are systems designed by humans that, given a complex goal, act in the physical or digital dimension by perceiving their environment through data acquisition, interpreting the collected structured or unstructured data, reasoning on the knowledge, or processing the information, derived from this data and deciding the best action(s) to take to achieve the given goal. AI systems can either use symbolic rules or learn a numeric model, and they can also adapt their behaviour by analysing how the environment is affected by their previous actions.

Source/s: EU AI HLEG, 2019

Artificial Narrow Intelligence (ANI)

Artificial intelligence that can match or exceed human capability on specific tasks is called Artificial Narrow Intelligence (ANI) or "Weak AI". ANI is considered less than human intelligence although it may exceed our capabilities in specific areas.

Synonym/s: Narrow AI

Artificial neural network (ANN)

Any computing system vaguely inspired by the biological neural networks that constitute animal brains.

Synonym/s: Connectionist System

Source/s: Wikipedia Glossary of AI

Artificial Super Intelligence (ASI)

Artificial Superintelligence (ASI) is defined as "any intellect that greatly exceeds the cognitive performance of humans in virtually all domains of interest" (Bostrom 2016). ASI is supposed to surpass human intelligence in all aspects — such as creativity, general wisdom, and problem-solving. ASI is supposed to be capable of exhibiting intelligence that we have not seen in the brightest thinkers amongst us. Many thinkers are worried about ASI.

Audio Processing

Audio processing refers to AI systems allowing the perception or generation (synthesis) of audio signals, including speech, but also other sound material (e.g., environmental sounds, music). Speech recognition and generation as well as Speech Emotion recognition are included in this sub-field.

Source/s: EU AI HLEG, 2019

Automated machine learning (AutoML)

Automated machine learning (AutoML) is the process of automating the tasks of applying machine learning to real-world problems. AutoML covers the complete pipeline from the raw dataset to the deployable machine learning model. AutoML was proposed as an artificial intelligence-based solution to the ever-growing challenge of applying machine learning. The high degree of automation in AutoML allows non-experts to make use of machine learning models and techniques without requiring them to become experts in machine learning. Automating the process of applying machine learning end-to-end additionally offers the advantages of producing simpler solutions, faster creation of those solutions, and models that often outperform hand-designed models. AutoML has been used to compare the relative importance of each factor in a prediction model.

Source/s: https://en.wikipedia.org/wiki/Automated_machine_learning

Autonomous system

A system which can perform desired tasks in unstructured environments without continuous human guidance.

BAG OF WORDS

A representation of the words in a phrase or passage, irrespective of order. For example, bag of words represents the following three phrases identically:
• the dog jumps
• jumps the dog
• dog jumps the
Each word is mapped to an index in a sparse vector, where the vector has an index for every word in the vocabulary. For example, the phrase the dog jumps is mapped into a feature vector with non-zero values at the three indices corresponding to the words the, dog, and jumps. The non-zero value can be any of the following:
A 1 to indicate the presence of a word.
A count of the number of times a word appears in the bag. For example, if the phrase were the maroon dog is a dog with maroon fur, then both maroon and dog would be represented as 2, while the other words would be represented as 1.
Some other value, such as the logarithm of the count of the number of times a word appears in the bag.

Synonym/s: bagging

Source/s: Google Machine Learning Glossary

BAYESIAN INFERENCE

Bayesian inference is a method of statistical inference in which Bayes' theorem is used to update the probability for a hypothesis as more evidence or information becomes available. Bayesian inference is an important technique in statistics, and especially in mathematical statistics. Bayesian updating is particularly important in the dynamic analysis of a sequence of data. Bayesian inference has found application in a wide range of activities, including science, engineering, philosophy, medicine, sport, and law. In the philosophy of decision theory, Bayesian inference is closely related to subjective probability, often called "Bayesian probability".

Synonym/s: Bayesian modeling

Source/s: https://en.wikipedia.org/wiki/Bayesian_inference

BAYESIAN NEURAL NETWORK

A probabilistic neural network that accounts for uncertainty in weights and outputs. A standard neural network regression model typically predicts a scalar value; for example, a model predicts a house price of 853,000. By contrast, a Bayesian neural network predicts a distribution of values; for example, a model predicts a house price of 853,000 with a standard deviation of 67,200. A Bayesian neural network relies on Bayes' Theorem to calculate uncertainties in weights and predictions. A Bayesian neural network can be useful when it is important to quantify uncertainty, such as in models related to pharmaceuticals. Bayesian neural networks can also help prevent overfitting.

Source/s: Google Machine Learning Glossary

BAYESIAN OPTIMISATION

A probabilistic regression model technique for optimizing computationally expensive objective functions by instead optimizing a surrogate that quantifies the uncertainty via a Bayesian learning technique. Since Bayesian optimization is itself very expensive, it is usually used to optimize expensive-to-evaluate tasks that have a small number of parameters, such as selecting hyperparameters.

Source/s: Google Machine Learning Glossary

BIAS (ETHICS/FAIRNESS)

1. Stereotyping, prejudice or favoritism towards some things, people, or groups over others. These biases can affect collection and interpretation of data, the design of a system, and how users interact with a system. Forms of this type of bias include:
• automation bias
• confirmation bias
• experimenter's bias
• group attribution bias
• implicit bias
• in-group bias
• out-group homogeneity bias
2. Systematic error introduced by a sampling or reporting procedure. Forms of this type of bias include:
• coverage bias
• non-response bias
• participation bias
• reporting bias
• sampling bias
• selection bias
Not to be confused with the bias term in machine learning models or prediction bias.

Source/s: Google Machine Learning Glossary

BIAS (MATH)

An intercept or offset from an origin. Bias (also known as the bias term) is referred to as b or w0 in machine learning models.

Source/s: Google Machine Learning Glossary

BIG DATA

The term "big data" refers to a large heterogeneous data set (open data, proprietary data, commercially purchased data).

Source/s: Council Of Europe - AI Glossary

BINARY CLASSIFICATION

A type of classification task that outputs one of two mutually exclusive classes. For example, a machine learning model that evaluates email messages and outputs either "spam" or "not spam" is a binary classifier.

Source/s: Google Machine Learning Glossary

BINNING

Converting a (usually continuous) feature into multiple binary features called buckets or bins, typically based on value range. For example, instead of representing temperature as a single continuous floating-point feature, you could chop ranges of temperatures into discrete bins. Given temperature data sensitive to a tenth of a degree, all temperatures between 0.0 and 15.0 degrees could be put into one bin, 15.1 to 30.0 degrees could be a second bin, and 30.1 to 50.0 degrees could be a third bin.

Synonym/s: Bucketing

Source/s: Google Machine Learning Glossary

BOOSTING

A machine learning technique that iteratively combines a set of simple and not very accurate classifiers (referred to as "weak" classifiers) into a classifier with high accuracy (a "strong" classifier) by upweighting the examples that the model is currently misclassifying.

Source/s: Google Machine Learning Glossary

BOT

Bot is the generic term for a piece of software that provides automated responses to user input. The bot is typically hosted in the cloud and is highly available. A bot is meant to be written once and run anywhere across different channels.
An example of a bot is a weather bot that can be used with Watson Assistant to determine weather forecasts and guide users about the weather. This bot can be exposed to run in different channels, such as the web, Facebook messenger, Twitter DM, or Slack.
A bot is specialized for a domain, such as retail or support, and uses natural language understanding to interact with users. A bot understands the user's intent and the entities that are referred to and answers users' questions and requests. A bot can also integrate one or more back-end applications.

Synonym/s: ChatBot

Source/s: IBM AI Glossary

BUSINESS INTELLIGENCE (BI)

Business intelligence (BI) comprises the strategies and technologies used by enterprises for the data analysis of business information. BI technologies provide historical, current, and predictive views of business operations.
Common functions of business intelligence technologies include reporting, online analytical processing, analytics, dashboard development, data mining, process mining, complex event processing, business performance management, benchmarking, text mining, predictive analytics, and prescriptive analytics.

Source/s: https://en.wikipedia.org/wiki/Business_intelligence

CASE-BASED REASONING (CBR)

Broadly construed, the process of solving new problems based on the solutions of similar past problems.

Source/s: Wikipedia Glossary of AI

CAUSAL INFERENCE

Causal inference is the process of determining the independent, actual effect of a particular phenomenon that is a component of a larger system. The main difference between causal inference and inference of association is that causal inference analyzes the response of an effect variable when a cause of the effect variable is changed. The science of why things occur is called etiology. Causal inference is said to provide the evidence of causality theorized by causal reasoning.

Source/s: https://en.wikipedia.org/wiki/Causal_inference

CAUSAL MODEL

In the philosophy of science, a causal model (or structural causal model) is a conceptual model that describes the causal mechanisms of a system. Causal models can improve study designs by providing clear rules for deciding which independent variables need to be included/controlled for.
Causal models have found applications in signal processing, epidemiology and machine learning.
Any causal model can be implemented as a Bayesian network. Bayesian networks can be used to provide the inverse probability of an event (given an outcome, what are the probabilities of a specific cause). This requires preparation of a conditional probability table, showing all possible inputs and outcomes with their associated probabilities.

Source/s: https://en.wikipedia.org/wiki/Causal_model

CHATBOT

Conversational agent that dialogues with its user (for example: empathic robots available to patients, or automated conversation services in customer relations).

Synonym/s: Conversational Agent, Bot, talkbot, chatterbot, smartbot, interactive agent, conversational interface

Source/s: Council Of Europe - AI Glossary

CLASSIFICATION MODEL

A type of machine learning model for distinguishing among two or more discrete classes. For example, a natural language processing classification model could determine whether an input sentence was in French, Spanish, or Italian. Compare with regression model.

Source/s: Google Machine Learning Glossary

CLUSTERING

Grouping related examples, particularly during unsupervised learning. Once all the examples are grouped, a human can optionally supply meaning to each cluster.
Many clustering algorithms exist. For example, the k-means algorithm clusters examples based on their proximity to a centroid.

Source/s: Google Machine Learning Glossary

COGNITION

Often associated with humans, cognition is the process of acquiring, learning, and understanding through various senses of human perceptions: thought, experience, sense, sight, and speech. An AI system exhibits one or more of those traits. The traits can be accomplished by involving techniques such as machine learning, natural language processing, and deep learning.

Source/s: IBM AI Glossary

COGNITIVE SCIENCE

The interdisciplinary scientific study of the mind and its processes

Source/s: Wikipedia Glossary of AI

COGNITIVE SYSTEM

See Artificial Intelligence (AI)

COLLABORATIVE FILTERING

Making predictions about the interests of one user based on the interests of many other users. Collaborative filtering is often used in recommendation systems.

Source/s: Google Machine Learning Glossary

COMMON-SENSE REASONING

A branch of artificial intelligence concerned with simulating the human ability to make presumptions about the type and essence of ordinary situations they encounter every day.

Source/s: Wikipedia Glossary of AI

COMPUTATIONAL CREATIVITY

A multidisciplinary endeavour that includes the fields of artificial intelligence, cognitive psychology, philosophy, and the arts.

Synonym/s: artificial creativity, mechanical creativity, creative computing, creative computation

Source/s: Wikipedia Glossary of AI

COMPUTATIONAL LINGUISTICS

An interdisciplinary field concerned with the statistical or rule-based modeling of natural language from a computational perspective, as well as the study of appropriate computational approaches to linguistic questions.

Source/s: Wikipedia Glossary of AI

COMPUTATIONAL NEUROSCIENCE

A branch of neuroscience which employs mathematical models, theoretical analysis and abstractions of the brain to understand the principles that govern the development, structure, physiology, and cognitive abilities of the nervous system.

Synonym/s: theoretical neuroscience, mathematical neuroscience

Source/s: Wikipedia Glossary of AI

COMPUTER VISION (CV)

An interdisciplinary scientific field that deals with how computers can be made to gain high-level understanding from digital images or videos. From the perspective of engineering, it seeks to automate tasks that the human visual system can do.
Computer vision (CV) can refer to activities that identify human faces and objects in digital images, as part of object-class detection. It is usually referred to as image pattern recognition for specific tasks, or as in a broader sense as machine vision, with applications on face and body recognition, video content recognition and 3D model reconstruction.

Source/s: EU AI HLEG, 2019

CONSTRAINT SATISFACTION

In artificial intelligence and operations research, constraint satisfaction is the process of finding a solution to a set of constraints that impose conditions that the variables must satisfy.[1] A solution is therefore a set of values for the variables that satisfies all constraints—that is, a point in the feasible region.

Source/s: https://en.wikipedia.org/wiki/Constraint_satisfaction

CONTENT-BASED FILTERING

A common approach when designing recommender systems is content-based filtering. Content-based filtering methods are based on a description of the item and a profile of the user's preferences. These methods are best suited to situations where there is known data on an item (name, location, description, etc.), but not on the user. Content-based recommenders treat recommendation as a user-specific classification problem and learn a classifier for the user's likes and dislikes based on an item's features.

Source/s: https://en.wikipedia.org/wiki/Recommender_system#Content-based_filtering

CONTESTABILITY

When an AI system significantly impacts a person, community, group or environment, there should be a timely process to allow people to challenge the use or outcomes of the AI system.
This principle aims to ensure the provision of efficient, accessible mechanisms that allow people to challenge the use or output of an AI system, when that AI system significantly impacts a person, community, group or environment. The definition of the threshold for 'significant impact' will depend on the context, impact and application of the AI system in question.
Knowing that redress for harm is possible, when things go wrong, is key to ensuring public trust in AI. Particular attention should be paid to vulnerable persons or groups.
There should be sufficient access to the information available to the algorithm, and inferences drawn, to make contestability effective. In the case of decisions significantly affecting rights, there should be an effective system of oversight, which makes appropriate use of human judgment.

Source/s: Australian Government AI Ethics Framework

CONTROL THEORY

In control systems engineering is a subfield of mathematics that deals with the control of continuously operating dynamical systems in engineered processes and machines. The objective is to develop a control model for controlling such systems using a control action in an optimum manner without delay or overshoot and ensuring control stability.

Source/s: Wikipedia Glossary of AI

CONVOLUTIONAL NEURAL NETWORK (CNN)

A neural network in which at least one layer is a convolutional layer. A typical convolutional neural network consists of some combination of the following layers:
• convolutional layers
• pooling layers
• dense layers
Convolutional neural networks have had great success in certain kinds of problems, such as image recognition.

Source/s: Google Machine Learning Glossary

CORPUS

A corpus is a large collection of trusted texts. It is a body of written material, spoken material, images, or video that a linguistic or AI analysis is based on.

Source/s: IBM AI Glossary

CRASH BLOSSOM

A sentence or phrase with an ambiguous meaning. Crash blossoms present a significant problem in natural language understanding. For example, the headline Red Tape Holds Up Skyscraper is a crash blossom because an NLU model could interpret the headline literally or figuratively.

Source/s: Google Machine Learning Glossary

DATA MINING

Data mining makes it possible to analyze a large volume of data and bring out models, correlations and trends.

Source/s: Council Of Europe - AI Glossary

DATA SCIENCE

A broad grouping of mathematics, statistics, probability, computing, data visualization to extract knowledge from a heterogeneous set of data (images, sound, text, genomic data, social network links, physical measurements, etc.).
The methods and tools derived from artificial intelligence are part of this family.

Source/s: Council Of Europe - AI Glossary

DEEP LEARNING (DL)

Deep Learning (DL) is a subfield of Machine Learning and AI and uses an algorithmic model that emulates the neurons in our brain. Deep learning models can include thousands of artificial neurons in a deep neural network to perform complex tasks such as image classification, speech recognition or natural language processing.
The terms AI or ML often replace DL, especially in the popular media.

DEEP MODEL

A type of neural network containing multiple hidden layers.
Contrast with wide model.

Synonym/s: Deep neural network

Source/s: Google Machine Learning Glossary

DISTRIBUTED ARTIFICIAL INTELLIGENCE (DAI)

Distributed Artificial Intelligence (DAI) also called Decentralized Artificial Intelligence is a subfield of artificial intelligence research dedicated to the development of distributed solutions for problems. DAI is closely related to and a predecessor of the field of multi-agent systems.
Distributed Artificial Intelligence (DAI) is an approach to solving complex learning, planning, and decision making problems. It is embarrassingly parallel, thus able to exploit large scale computation and spatial distribution of computing resources. These properties allow it to solve problems that require the processing of very large data sets. DAI systems consist of autonomous learning processing nodes (agents), that are distributed, often at a very large scale. DAI nodes can act independently and partial solutions are integrated by communication between nodes, often asynchronously. By virtue of their scale, DAI systems are robust and elastic, and by necessity, loosely coupled. Furthermore, DAI systems are built to be adaptive to changes in the problem definition or underlying data sets due to the scale and difficulty in redeployment.
DAI systems do not require all the relevant data to be aggregated in a single location, in contrast to monolithic or centralized Artificial Intelligence systems which have tightly coupled and geographically close processing nodes. Therefore, DAI systems often operate on sub-samples or hashed impressions of very large datasets. In addition, the source dataset may change or be updated during the course of the execution of a DAI system.

Source/s: https://en.wikipedia.org/wiki/Distributed_artificial_intelligence

ENSEMBLE

A merger of the predictions of multiple models. You can create an ensemble via one or more of the following:
• different initializations
• different hyperparameters
• different overall structure
Deep and wide models are a kind of ensemble.

Synonym/s: Ensemble method

Source/s: Google Machine Learning Glossary

EVOLUTIONARY ALGORITHM

A subset of evolutionary computation, a generic population-based metaheuristic optimization algorithm. An EA uses mechanisms inspired by biological evolution, such as reproduction, mutation, recombination, and selection. Candidate solutions to the optimization problem play the role of individuals in a population, and the fitness function determines the quality of the solutions (see also loss function). Evolution of the population then takes place after the repeated application of the above operators.

Source/s: Wikipedia Glossary of AI

EXPERT SYSTEM

A computer system that emulates the decision-making ability of a human expert. Expert systems are designed to solve complex problems by reasoning through bodies of knowledge, represented mainly as if–then rules rather than through conventional procedural code.

Source/s: Wikipedia Glossary of AI

FACIAL RECOGNITION SYSTEM

A facial recognition system is a technology capable of matching a human face from a digital image or a video frame against a database of faces, typically employed to authenticate users through ID verification services, works by pinpointing and measuring facial features from a given image.
Since their inception, facial recognition systems have seen wider uses in recent times on smartphones and in other forms of technology, such as robotics. Because computerized facial recognition involves the measurement of a human's physiological characteristics, facial recognition systems are categorized as biometrics. Although the accuracy of facial recognition systems as a biometric technology is lower than iris recognition and fingerprint recognition, it is widely adopted due to its contactless process. Facial recognition systems have been deployed in advanced human-computer interaction, video surveillance and automatic indexing of images.
Facial recognition systems are employed throughout the world today by governments and private companies. Their effectiveness varies, and some systems have previously been scrapped because of their ineffectiveness. The use of facial recognition systems has also raised controversy, with claims that the systems violate citizens' privacy, commonly make incorrect identifications, encourage gender norms and racial profiling, and do not protect important biometric data. These claims have led to the ban of facial recognition systems in several cities in the United States.

Synonym/s: Face Recognition

Source/s: https://en.wikipedia.org/wiki/Facial_recognition_system

FAIRNESS

Throughout their lifecycle, AI systems should be inclusive and accessible, and should not involve or result in unfair discrimination against individuals, communities or groups.
This principle aims to ensure that AI systems are fair and that they enable inclusion throughout their entire lifecycle. AI systems should be user-centric and designed in a way that allows all people interacting with it to access the related products or services. This includes both appropriate consultation with stakeholders, who may be affected by the AI system throughout its lifecycle, and ensuring people receive equitable access and treatment.
This is particularly important given concerns about the potential for AI to perpetuate societal injustices and have a disparate impact on vulnerable and underrepresented groups including, but not limited to, groups relating to age, disability, race, sex, intersex status, gender identity and sexual orientation. Measures should be taken to ensure the AI produced decisions are compliant with anti-discrimination laws.

Source/s: Australian Government AI Ethics Framework

FEATURE ENGINEERING

The process of determining which features might be useful in training a model, and then converting raw data from log files and other sources into said features.
Feature engineering is sometimes called feature extraction.

Synonym/s: Feature extraction

Source/s: Google Machine Learning Glossary

FEATURE EXTRACTION

Overloaded term having either of the following definitions:
Retrieving intermediate feature representations calculated by an unsupervised or pretrained model (for example, hidden layer values in a neural network) for use in another model as input.
Synonym for feature engineering.

Synonym/s: Feature engineering

Source/s: Google Machine Learning Glossary

FEDERATED LEARNING

A distributed machine learning approach that trains machine learning models using decentralized examples residing on devices such as smartphones. In federated learning, a subset of devices downloads the current model from a central coordinating server. The devices use the examples stored on the devices to make improvements to the model. The devices then upload the model improvements (but not the training examples) to the coordinating server, where they are aggregated with other updates to yield an improved global model. After the aggregation, the model updates computed by devices are no longer needed, and can be discarded.
Since the training examples are never uploaded, federated learning follows the privacy principles of focused data collection and data minimization.

Source/s: Google Machine Learning Glossary

FEEDFORWARD NEURAL NETWORK (FFN)

A neural network without cyclic or recursive connections. For example, traditional deep neural networks are feedforward neural networks. Contrast with recurrent neural networks, which are cyclic.

Source/s: Google Machine Learning Glossary

FUZZY LOGIC

A simple form for the many-valued logic, in which the truth values of variables may have any degree of "Truthfulness" that can be represented by any real number in the range between 0 (as in Completely False) and 1 (as in Completely True) inclusive. Consequently, It is employed to handle the concept of partial truth, where the truth value may range between completely true and completely false. In contrast to Boolean logic, where the truth values of variables may have the integer values 0 or 1 only.

Source/s: Wikipedia Glossary of AI

GAME THEORY

The study of mathematical models of strategic interaction between rational decision-makers.

Source/s: Wikipedia Glossary of AI

GENERATIVE ADVERSARIAL NETWORK (GAN)

A system to create new data in which a generator creates data and a discriminator determines whether that created data is valid or invalid.

Source/s: Google Machine Learning Glossary

GENERATIVE MODEL

Practically speaking, a model that does either of the following:
• Creates (generates) new examples from the training dataset. For example, a generative model could create poetry after training on a dataset of poems. The generator part of a generative adversarial network falls into this category.
• Determines the probability that a new example comes from the training set, or was created from the same mechanism that created the training set. For example, after training on a dataset consisting of English sentences, a generative model could determine the probability that new input is a valid English sentence.
A generative model can theoretically discern the distribution of examples or particular features in a dataset.
Unsupervised learning models are generative.
Contrast with discriminative models.

Source/s: Google Machine Learning Glossary

GENETIC ALGORITHM (GA)

A metaheuristic inspired by the process of natural selection that belongs to the larger class of evolutionary algorithms (EA). Genetic algorithms are commonly used to generate high-quality solutions to optimization and search problems by relying on bio-inspired operators such as mutation, crossover and selection.

Source/s: Wikipedia Glossary of AI

GESTURE RECOGNITION

Gesture recognition is a topic in computer science and language technology with the goal of interpreting human gestures via mathematical algorithms. It is a subdiscipline of computer vision. Gestures can originate from any bodily motion or state but commonly originate from the face or hand. Users can use simple gestures to control or interact with devices without physically touching them. Many approaches have been made using cameras and computer vision algorithms to interpret sign language. However, the identification and recognition of posture, gait, proxemics, and human behaviors is also the subject of gesture recognition techniques. Gesture recognition can be seen as a way for computers to begin to understand human body language, thus building a richer bridge between machines and humans than primitive text user interfaces or even GUIs (graphical user interfaces), which still limit the majority of input to keyboard and mouse and interact naturally without any mechanical devices.

Source/s: https://en.wikipedia.org/wiki/Gesture_recognition

GRADIENT DESCENT

A technique to minimize loss by computing the gradients of loss with respect to the model's parameters, conditioned on training data. Informally, gradient descent iteratively adjusts parameters, gradually finding the best combination of weights and bias to minimize loss.

Source/s: Google Machine Learning Glossary

GRAPHICAL MODEL

A graphical model or probabilistic graphical model (PGM) or structured probabilistic model is a probabilistic model for which a graph expresses the conditional dependence structure between random variables. They are commonly used in probability theory, statistics—particularly Bayesian statistics—and machine learning.

Source/s: https://en.wikipedia.org/wiki/Graphical_model

HEURISTIC

A technique designed for solving a problem more quickly when classic methods are too slow, or for finding an approximate solution when classic methods fail to find any exact solution. This is achieved by trading optimality, completeness, accuracy, or precision for speed. In a way, it can be considered a shortcut. A heuristic function, also called simply a heuristic, is a function that ranks alternatives in search algorithms at each branching step based on available information to decide which branch to follow. For example, it may approximate the exact solution.

Source/s: Wikipedia Glossary of AI

HUMAN, SOCIAL AND ENVIRONMENTAL WELLBEING

Throughout their lifecycle, AI systems should benefit individuals, society and the environment.
This principle aims to clearly indicate from the outset that AI systems should be used for beneficial outcomes for individuals, society and the environment. AI system objectives should be clearly identified and justified. AI systems that help address areas of global concern should be encouraged, like the United Nation's Sustainable Development Goals. Ideally, AI systems should be used to benefit all human beings, including future generations.
AI systems designed for legitimate internal business purposes, like increasing efficiency, can have broader impacts on individual, social and environmental wellbeing. Those impacts, both positive and negative, should be accounted for throughout the AI system's lifecycle, including impacts outside the organisation.

Source/s: Australian Government AI Ethics Framework

HUMAN-AI COLLABORATION

Human-AI collaboration is the study of how humans and artificial intelligence (AI) agents work together to accomplish a shared goal. AI systems can aid humans in everything from decision making tasks to art creation. Examples of collaboration include medical decision making aids, hate speech detection, and music generation. As AI systems are able to tackle more complex tasks, studies are exploring how different models and explanation techniques can improve human-AI collaboration.

Source/s: https://en.wikipedia.org/wiki/Human%E2%80%93artificial_intelligence_collaboration

HUMAN-AI INTERACTION

The study of how humans and artificial intelligence (AI) agents interact.

HUMAN-CENTERED VALUES

Throughout their lifecycle, AI systems should respect human rights, diversity, and the autonomy of individuals.
This principle aims to ensure that AI systems are aligned with human values. Machines should serve humans, and not the other way around. AI systems should enable an equitable and democratic society by respecting, protecting and promoting human rights, enabling diversity, respecting human freedom and the autonomy of individuals, and protecting the environment.
Human rights risks need to be carefully considered, as AI systems can equally enable and hamper such fundamental rights. It's permissible to interfere with certain human rights where it's reasonable, necessary and proportionate.
All people interacting with AI systems should be able to keep full and effective control over themselves. AI systems should not undermine the democratic process, and should not undertake actions that threaten individual autonomy, like deception, unfair manipulation, unjustified surveillance, and failing to maintain alignment between a disclosed purpose and true action.
AI systems should be designed to augment, complement and empower human cognitive, social and cultural skills. Organisations designing, developing, deploying or operating AI systems should ideally hire staff from diverse backgrounds, cultures and disciplines to ensure a wide range of perspectives, and to minimise the risk of missing important considerations only noticeable by some stakeholders.

Synonym/s: Human aligned values

Source/s: Australian Government AI Ethics Framework

IMAGE RECOGNITION

A process that classifies object(s), pattern(s), or concept(s) in an image.

Synonym/s: Image classification

Source/s: Google Machine Learning Glossary

INDUCTIVE PROGRAMMING

Inductive programming (IP) is a special area of automatic programming, covering research from artificial intelligence and programming, which addresses learning of typically declarative (logic or functional) and often recursive programs from incomplete specifications, such as input/output examples or constraints.
Depending on the programming language used, there are several kinds of inductive programming. Inductive functional programming, which uses functional programming languages such as Lisp or Haskell, and most especially inductive logic programming, which uses logic programming languages such as Prolog and other logical representations such as description logics, have been more prominent, but other (programming) language paradigms have also been used, such as constraint programming or probabilistic programming.

Source/s: https://en.wikipedia.org/wiki/Inductive_programming

INTELLIGENT AGENT (IA)

An autonomous entity which acts, directing its activity towards achieving goals (i.e. it is an agent), upon an environment using observation through sensors and consequent actuators (i.e. it is intelligent). Intelligent agents may also learn or use knowledge to achieve their goals. They may be very simple or very complex.

Source/s: Wikipedia Glossary of AI

INTELLIGENT CONTROL

A class of control techniques that use various artificial intelligence computing approaches like neural networks, Bayesian probability, fuzzy logic, machine learning, reinforcement learning, evolutionary computation and genetic algorithms.

Source/s: Wikipedia Glossary of AI

INTELLIGENT CONTROL

ntelligent control is a class of control techniques that use various artificial intelligence computing approaches like neural networks, Bayesian probability, fuzzy logic, machine learning, reinforcement learning, evolutionary computation and genetic algorithms.

Source/s: https://en.wikipedia.org/wiki/Intelligent_control

INTELLIGENT USER INTERFACE

An intelligent user interface (Intelligent UI, IUI, or sometimes Interface Agent) is a user interface (UI) that involves some aspect of artificial intelligence (AI or computational intelligence). There are many modern examples of IUIs, the most famous (or infamous) being the Microsoft Office Assistant, whose most recognizable agentive representation was called "Clippy".
Generally, an IUI involves the computer-side having sophisticated knowledge of the domain and/or a model of the user. These allow the interface to better understand the user's needs and personalize or guide the interaction.

Source/s: https://en.wikipedia.org/wiki/Intelligent_user_interface

INTERPRETABILITY

The ability to explain or to present an ML model's reasoning in understandable terms to a human.

Synonym/s: Explainability

Source/s: Google Machine Learning Glossary

KNOWLEDGE REPRESENTATION AND REASONING (KR2 OR KR&R)

The field of artificial intelligence dedicated to representing information about the world in a form that a computer system can utilize to solve complex tasks such as diagnosing a medical condition or having a dialog in a natural language. Knowledge representation incorporates findings from psychology[204] about how humans solve problems and represent knowledge in order to design formalisms that will make complex systems easier to design and build. Knowledge representation and reasoning also incorporates findings from logic to automate various kinds of reasoning, such as the application of rules or the relations of sets and subsets.[205] Examples of knowledge representation formalisms include semantic nets, systems architecture, frames, rules, and ontologies. Examples of automated reasoning engines include inference engines, theorem provers, and classifiers.

Source/s: Wikipedia Glossary of AI

LABEL

In supervised learning, the "answer" or "result" portion of an example. Each example in a labeled dataset consists of one or more features and a label. For instance, in a housing dataset, the features might include the number of bedrooms, the number of bathrooms, and the age of the house, while the label might be the house's price. In a spam detection dataset, the features might include the subject line, the sender, and the email message itself, while the label would probably be either "spam" or "not spam."

Source/s: Google Machine Learning Glossary

LANGUAGE MODEL

A model that estimates the probability of a token or sequence of tokens occurring in a longer sequence of tokens.
Though counterintuitive, many models that evaluate text are not language models. For example, text classification models and sentiment analysis models are not language models.

Source/s: Google Machine Learning Glossary

MACHINE LEARNING

Machine learning (ML) is an AI subfield and the scientific study of algorithms that computer systems use to learn through experience or by determining patterns in data. ML algorithms build a model based on sample data, known as "training data", to make predictions or decisions without being explicitly programmed to do so.
Machine learning is different to classical computer programming since the rules are not embedded into the logic of the program but rather adapt to new data or experiences.

MACHINE TRANSLATION

Machine translation, sometimes referred to by the abbreviation MT (not to be confused with computer-aided translation, machine-aided human translation or interactive translation), is a sub-field of computational linguistics that investigates the use of software to translate text or speech from one language to another.

Source/s: https://en.wikipedia.org/wiki/Machine_translation

METADATA

Data used to define, contextualize or characterize other data.

Source/s: Council Of Europe - AI Glossary

META-LEARNING

A subset of machine learning that discovers or improves a learning algorithm. A meta-learning system can also aim to train a model to quickly learn a new task from a small amount of data or from experience gained in previous tasks. Meta-learning algorithms generally try to achieve the following:
• Improve/learn hand-engineered features (such as an initializer or an optimizer).
• Be more data-efficient and compute-efficient.
• Improve generalization.
Meta-learning is related to few-shot learning.

Synonym/s: Few-shot learning

Source/s: Google Machine Learning Glossary

MODEL

The representation of what a machine learning system has learned from the training data.

Synonym/s: Machine Learning Model

Source/s: Google Machine Learning Glossary

MULTI-AGENT SYSTEMS

Multi-agent systems (MASs) is an area in the field of distributed artificial intelligence (DAI), as well as in the mainstream computer science. These systems are composed of relatively autonomous and intelligent parts, called agents that may exhibit autonomy, social ability (interaction with other agents or humans), reactivity (perception of their environment) and pro-activeness (exhibit goal-directed behaviour).
Agents may be as large as an expert system and as small as the part of an application interface. Agents can be static (permanently located in some computer) or mobile (moving across the computer network, such as the Internet).

Source/s: EU AI HLEG, 2019

MULTI-CLASS CLASSIFICATION

Classification problems that distinguish among more than two classes. For example, there are approximately 128 species of maple trees, so a model that categorized maple tree species would be multi-class. Conversely, a model that divided emails into only two categories (spam and not spam) would be a binary classification model.

Source/s: Google Machine Learning Glossary

MULTI-MODAL MODEL

A model whose inputs and/or outputs include more than one modality. For example, consider a model that takes both an image and a text caption (two modalities) as features, and outputs a score indicating how appropriate the text caption is for the image. So, this model's inputs are multimodal and the output is unimodal.

Source/s: Google Machine Learning Glossary

MULTI-TASK LEARNING

Multi-task learning (MTL) is a subfield of machine learning in which multiple learning tasks are solved at the same time, while exploiting commonalities and differences across tasks. This can result in improved learning efficiency and prediction accuracy for the task-specific models, when compared to training the models separately. Early versions of MTL were called "hints".

Source/s: https://en.wikipedia.org/wiki/Multi-task_learning

NATURAL LANGUAGE GENERATION (NLG)

A software process that transforms structured data into plain-English content. It can be used to produce long-form content for organizations to automate custom reports, as well as produce custom content for a web or mobile application. It can also be used to generate short blurbs of text in interactive conversations (a chatbot) which might even be read out loud by a text-to-speech system.

Source/s: Wikipedia Glossary of AI

Natural Language Processing (NLP)

A subfield of AI focused on the understanding of human language. NLP often uses machine learning algorithms and allows computers to understand the hierarchical structure of language and how components of a sentence relate to each other.
NLP lets computers understand the complexities of human language that influence the meaning of a sentence. The advent of NLP has led to a wide range of practical applications, such as chatbots, converting speech to text, correcting grammar, the ability to identify the sentiment of a string of text, and much more.

Source/s: EU AI HLEG, 2019

Natural language understanding (NLU)

Determining a user's intentions based on what the user typed or said. For example, a search engine uses natural language understanding to determine what the user is searching for based on what the user typed or said.

Source/s: Google Machine Learning Glossary

Neural network

A model that, taking inspiration from the brain, is composed of layers (at least one of which is hidden) consisting of simple connected units or neurons followed by nonlinearities.

Source/s: Google Machine Learning Glossary

Open Data

The term refers to the public availability, by download, of structured databases. These data may be re-used in a non-monetary way under the conditions of a specific licence, which may in particular specify or prohibit certain purposes of re-use.
Open data is not to be confused with unitary public information available on Internet sites, the entire database of which cannot be downloaded (for example case law databases). It does not replace the mandatory publication of certain administrative or judicial measures or decisions already enacted by certain laws or regulations.
Finally, confusion is sometimes created between the data (open data strictly speaking) and their means of processing (machine learning, data science) for different purposes (search engines, assistance in drafting acts, analysis of jurisprudential trends, anticipation of court decisions).

Source/s: Council Of Europe - AI Glossary

OpenAI

A project that aims to build an open-source artificial intelligence framework. OpenCog Prime is an architecture for robot and virtual embodied cognition that defines a set of interacting components designed to give rise to human-equivalent artificial general intelligence (AGI) as an emergent phenomenon of the whole system.

Source/s: Wikipedia Glossary of AI

OUTLIERS

Values distant from most other values. In machine learning, any of the following are outliers:
• Weights with high absolute values.
• Predicted values relatively far away from the actual values.
• Input data whose values are more than roughly 3 standard deviations from the mean.
Outliers often cause problems in model training. Clipping is one way of managing outliers.

Source/s: Google Machine Learning Glossary

PATTERN RECOGNITION

Concerned with the automatic discovery of regularities in data through the use of computer algorithms and with the use of these regularities to take actions such as classifying the data into different categories.

Source/s: Wikipedia Glossary of AI

PERCEPTION

Perception refers to systems' ability to become aware of their environment through the senses: vision, hearing, manipulation. etc., being vision and hearing the most developed areas in AI.

Source/s: EU AI HLEG, 2019

PERCEPTRON

A system (either hardware or software) that takes in one or more input values, runs a function on the weighted sum of the inputs, and computes a single output value. In machine learning, the function is typically nonlinear, such as ReLU, sigmoid, or tanh.
Perceptrons are the (nodes) in deep neural networks. That is, a deep neural network consists of multiple connected perceptrons, plus a backpropagation algorithm to introduce feedback.

Source/s: Google Machine Learning Glossary

PLANNING

Automated planning concerns the design and execution of strategies (e.g., an organised set of actions) to carry out some activity, and typically performed by intelligent agents, autonomous robots, and unmanned vehicles. Unlike classical control and classification problems, the solutions are complex and must be discovered and optimised in the multidimensional space.

Synonym/s: Automated Planning

Source/s: EU AI HLEG, 2019

PRIVACY PROTECTION & SECURITY

Throughout their lifecycle, AI systems should respect and uphold privacy rights and data protection, and ensure the security of data.
This principle aims to ensure respect for privacy and data protection when using AI systems. This includes ensuring proper data governance, and management, for all data used and generated by the AI system throughout its lifecycle. For example, maintaining privacy through appropriate data anonymisation where used by AI systems. Further, the connection between data, and inferences drawn from that data by AI systems, should be sound and assessed in an ongoing manner.
This principle also aims to ensure appropriate data and AI system security measures are in place. This includes the identification of potential security vulnerabilities, and assurance of resilience to adversarial attacks. Security measures should account for unintended applications of AI systems, and potential abuse risks, with appropriate mitigation measures.

Synonym/s: Privacy

Source/s: Australian Government AI Ethics Framework

PROBABILISTIC MODEL

See Statistical Model

PROBABILISTIC PROGRAMMING (PP)

A programming paradigm in which probabilistic models are specified and inference for these models is performed automatically. It represents an attempt to unify probabilistic modeling and traditional general-purpose programming in order to make the former easier and more widely applicable. It can be used to create systems that help make decisions in the face of uncertainty. Programming languages used for probabilistic programming are referred to as "Probabilistic programming languages" (PPLs).

Source/s: Wikipedia Glossary of AI

Q-LEARNING

In reinforcement learning, an algorithm that allows an agent to learn the optimal Q-function of a Markov decision process by applying the Bellman equation. The Markov decision process models an environment.

Source/s: Google Machine Learning Glossary

QUANTUM COMPUTING

The use of quantum-mechanical phenomena such as superposition and entanglement to perform computation. A quantum computer is used to perform such computation, which can be implemented theoretically or physically.

Source/s: Wikipedia Glossary of AI

REASONING

Reasoning tackles the way machines transform data into knowledge or infer facts from data. This includes the process of justifying (reasoning) the available data and information, providing solutions and representing them efficiently, based on a set of symbolic rules.

Source/s: EU AI HLEG, 2019

Recommendation System

A system that selects for each user a relatively small set of desirable items from a large corpus. For example, a video recommendation system might recommend two videos from a corpus of 100,000 videos, selecting Casablanca and The Philadelphia Story for one user, and Wonder Woman and Black Panther for another. A video recommendation system might base its recommendations on factors such as:
• Movies that similar users have rated or watched.
• Genre, directors, actors, target demographic...

Synonym/s: Recommender system

Source/s: Google Machine Learning Glossary

Recurrent neural network (RNN)

A neural network that is intentionally run multiple times, where parts of each run feed into the next run. Specifically, hidden layers from the previous run provide part of the input to the same hidden layer in the next run. Recurrent neural networks are particularly useful for evaluating sequences, so that the hidden layers can learn from previous runs of the neural network on earlier parts of the sequence.

Source/s: Google Machine Learning Glossary

Recursive neural network (RvNNs)

A recursive neural network is a kind of deep neural network created by applying the same set of weights recursively over a structured input, to produce a structured prediction over variable-size input structures, or a scalar prediction on it, by traversing a given structure in topological order. Recursive neural networks, sometimes abbreviated as RvNNs, have been successful, for instance, in learning sequence and tree structures in natural language processing, mainly phrase and sentence continuous representations based on word embedding. RvNNs have first been introduced to learn distributed representations of structure, such as logical terms. Models and general frameworks have been developed in further works since the 1990s.

Source/s: https://en.wikipedia.org/wiki/Recursive_neural_network

Regression Model

A type of model that outputs continuous (typically, floating-point) values. Compare with classification models, which output discrete values, such as "day lily" or "tiger lily."

Source/s: Google Machine Learning Glossary

Reinforcement Learning (RL)

Reinforcement learning models problems where a software agent must learn how to behave in an environment and learning is achieved through reward or punishment to that agent. For example, a robotic vacuum cleaner learning the geography of a household and the most efficient way to traverse it is an example of reinforcement learning.
Reinforcement learning (RL) is also useful for optimize sequential decisions. RL is interesting because it mimics how we, as humans, learn. We are instinctively capable of learning strategies that help us master complex tasks like riding a bike or taking a mathematics exam. RL attempts to copy this process by interacting with the environment to learn strategies.

Reliability & Safety

Throughout their lifecycle, AI systems should reliably operate in accordance with their intended purpose.
This principle aims to ensure that AI systems reliably operate in accordance with their intended purpose throughout their lifecycle. This includes ensuring AI systems are reliable, accurate and reproducible as appropriate.
AI systems should not pose unreasonable safety risks, and should adopt safety measures that are proportionate to the magnitude of potential risks. AI systems should be monitored and tested to ensure they continue to meet their intended purpose, and any identified problems should be addressed with ongoing risk management as appropriate. Responsibility should be clearly and appropriately identified, for ensuring that an AI system is robust and safe.

Synonym/s: Reliability

Source/s: Australian Government AI Ethics Framework

Robotics

An interdisciplinary branch of science and engineering that includes mechanical engineering, electronic engineering, information engineering, computer science, and others. Robotics deals with the design, construction, operation, and use of robots, as well as computer systems for their control, sensory feedback, and information processing.

Source/s: Wikipedia Glossary of AI

Rule Based System

In computer science, a rule-based system is used to store and manipulate knowledge to interpret information in a useful way. It is often used in artificial intelligence applications and research. Normally, the term rule-based system is applied to systems involving human-crafted or curated rule sets. Rule-based systems constructed using automatic rule inference, such as rule-based machine learning, are normally excluded from this system type.

Source/s: Wikipedia Glossary of AI

Safety

See Reliability & Safety

Security

See Privacy Protection & Security

Self-Supervised Learning

A family of techniques for converting an unsupervised machine learning problem into a supervised machine learning problem by creating surrogate labels from unlabeled examples.
Some Transformer-based models such as BERT use self-supervised learning.
Self-supervised training is a semi-supervised learning approach.

Source/s: Google Machine Learning Glossary

SEMANTIC WEB

The Semantic Web (widely known as Web 3.0) is an extension of the World Wide Web through standards set by the World Wide Web Consortium (W3C). The goal of the Semantic Web is to make Internet data machine-readable.
The term was coined by Tim Berners-Lee for a web of data (or data web) that can be processed by machines—that is, one in which much of the meaning is machine-readable. While its critics have questioned its feasibility, proponents argue that applications in library and information science, industry, biology and human sciences research have already proven the validity of the original concept.

Source/s: https://en.wikipedia.org/wiki/Semantic_Web

SEMI-SUPERVISED LEARNING

Training a model on data where some of the training examples have labels but others don't. One technique for semi-supervised learning is to infer labels for the unlabeled examples, and then to train on the inferred labels to create a new model. Semi-supervised learning can be useful if labels are expensive to obtain but unlabeled examples are plentiful.
For example, end customer data containing a small subset with assigned (labelled) demographic segments can be used to assign that same demographic segment to other (unlabelled) customers who are considered similar based on cluster analysis where all customers are grouped using various characteristics.

SENTIMENT ANALYSIS

Using statistical or machine learning algorithms to determine a group's overall attitude—positive or negative—toward a service, product, organization, or topic. For example, using natural language understanding, an algorithm could perform sentiment analysis on the textual feedback from a university course to determine the degree to which students generally liked or disliked the course.

Source/s: Google Machine Learning Glossary

SIMILARITY LEARNING

An area of supervised machine learning in artificial intelligence. It is closely related to regression and classification, but the goal is to learn from a similarity function that measures how similar or related two objects are. It has applications in ranking, in recommendation systems, visual identity tracking, face verification, and speaker verification.

Source/s: Wikipedia Glossary of AI

SPEECH RECOGNITION

An interdisciplinary subfield of computational linguistics that develops methodologies and technologies that enables the recognition and translation of spoken language into text by computers. It is also known as automatic speech recognition (ASR), computer speech recognition or speech to text (STT). It incorporates knowledge and research in the linguistics, computer science, and electrical engineering fields.

Source/s: Wikipedia Glossary of AI

SPIKING NEURAL NETWORK (SNN)

An artificial neural network that more closely mimics a natural neural network. In addition to neuronal and synaptic state, SNNs incorporate the concept of time into their Operating Model.

Source/s: Wikipedia Glossary of AI

STATISTICAL LEARNING

The application of statistical techniques using Machine Learning methods.

STATISTICAL MODEL

A statistical model is a mathematical model that embodies a set of statistical assumptions concerning the generation of sample data (and similar data from a larger population). A statistical model represents, often in considerably idealized form, the data-generating process.
A statistical model is usually specified as a mathematical relationship between one or more random variables and other non-random variables. As such, a statistical model is "a formal representation of a theory" (Herman Adèr quoting Kenneth Bollen).
All statistical hypothesis tests and all statistical estimators are derived via statistical models. More generally, statistical models are part of the foundation of statistical inference.

Source/s: https://en.wikipedia.org/wiki/Statistical_model

STOCHASTIC GRADIENT DESCENT (SGD)

A gradient descent algorithm in which the batch size is one. In other words, SGD relies on a single example chosen uniformly at random from a dataset to calculate an estimate of the gradient at each step.

Source/s: Google Machine Learning Glossary

STOCHASTIC OPTIMISATION

Any optimization method that generates and uses random variables. For stochastic problems, the random variables appear in the formulation of the optimization problem itself, which involves random objective functions or random constraints. Stochastic optimization methods also include methods with random iterates. Some stochastic optimization methods use random iterates to solve stochastic problems, combining both meanings of stochastic optimization.[294] Stochastic optimization methods generalize deterministic methods for deterministic problems.

Source/s: Wikipedia Glossary of AI

STRONG AI

See Artificial General Intelligence (AGI)

Synonym/s: AGI

SUPERINTELLIGENCE

A hypothetical agent that possesses intelligence far surpassing that of the brightest and most gifted human minds. Superintelligence may also refer to a property of problem-solving systems (e.g., superintelligent language translators or engineering assistants) whether or not these high-level intellectual competencies are embodied in agents that act within the physical world. A superintelligence may or may not be created by an intelligence explosion and be associated with a technological singularity.

Source/s: Wikipedia Glossary of AI

SUPERVISED LEARNING

Supervised Learning uses labelled data, data with answers attached to the raw input, to train and test predictive models. Supervised learning is most often used for classification and regression (quantitative prediction). For example, we can train a supervised learning model to recognise the picture of a cat by providing it hundreds of photos of cats and other animals. These images train the model to learn to identify which photos are cats or not. Once the model is trained a new image can be fed into the model which will attempt to predict whether it is a Cat or other animal.

SWARM INTELLIGENCE (SI)

The collective behavior of decentralized, self-organized systems, either natural or artificial. The expression was introduced in the context of cellular robotic systems.

Source/s: Wikipedia Glossary of AI

SYNTHETIC INTELLIGENCE (SI)

An alternative term for artificial intelligence which emphasizes that the intelligence of machines need not be an imitation or in any way artificial; it can be a genuine form of intelligence.

Source/s: Wikipedia Glossary of AI

TECHNOLOGICAL SINGULARITY

A hypothetical point in the future when technological growth becomes uncontrollable and irreversible, resulting in unfathomable changes to human civilization.

Synonym/s: the singularity

Source/s: Wikipedia Glossary of AI

TEXT MINING

Text mining, also referred to as text data mining, similar to text analytics, is the process of deriving high-quality information from text.
Typical text mining tasks include text categorization, text clustering, concept/entity extraction, production of granular taxonomies, sentiment analysis, document summarization, and entity relation modeling (i.e., learning relations between named entities).
Text analysis involves information retrieval, lexical analysis to study word frequency distributions, pattern recognition, tagging/annotation, information extraction, data mining techniques including link and association analysis, visualization, and predictive analytics. The overarching goal is, essentially, to turn text into data for analysis, via application of natural language processing (NLP), different types of algorithms and analytical methods. An important phase of this process is the interpretation of the gathered information.
A typical application is to scan a set of documents written in a natural language and either model the document set for predictive classification purposes or populate a database or search index with the information extracted. The document is the basic element while starting with text mining. Here, we define a document as a unit of textual data, which normally exists in many types of collections.

Source/s: https://en.wikipedia.org/wiki/Text_mining

TIME SERIES ANALYSIS

A subfield of machine learning and statistics that analyzes temporal data. Many types of machine learning problems require time series analysis, including classification, clustering, forecasting, and anomaly detection. For example, you could use time series analysis to forecast the future sales of winter coats by month based on historical sales data.

Source/s: Google Machine Learning Glossary

TRANSFER LEARNING

Transferring information from one machine learning task to another. For example, in multi-task learning, a single model solves multiple tasks, such as a deep model that has different output nodes for different tasks. Transfer learning might involve transferring knowledge from the solution of a simpler task to a more complex one, or involve transferring knowledge from a task where there is more data to one where there is less data.
Most machine learning systems solve a single task. Transfer learning is a baby step towards artificial general intelligence in which a single program can solve multiple tasks.

Source/s: Google Machine Learning Glossary

TRANSPARENCY AND EXPLAINABILITY

There should be transparency and responsible disclosure so people can understand when they are being significantly impacted by AI, and can find out when an AI system is engaging with them.
This principle aims to ensure responsible disclosure when an AI system is significantly impacting on a person's life. The definition of the threshold for 'significant impact' will depend on the context, impact and application of the AI system in question.
Achieving transparency in AI systems through responsible disclosure is important to each stakeholder group for the following reasons [1]:
• for users, what the system is doing and why
• for creators, including those undertaking the validation and certification of AI, the systems' processes and input data
• for those deploying and operating the system, to understand processes and input data
• for an accident investigator, if accidents occur
• for regulators in the context of investigations
• for those in the legal process, to inform evidence and decision-making
• for the public, to build confidence in the technology
Responsible disclosures should be provided in a timely manner, and provide reasonable justifications for AI systems outcomes. This includes information that helps people understand outcomes, like key factors used in decision making. This principle also aims to ensure people have the ability to find out when an AI system is engaging with them (regardless of the level of impact), and are able to obtain a reasonable disclosure regarding the AI system.

Synonym/s: Explainability

Source/s: Australian Government AI Ethics Framework

Turing Test

A test of a machine's ability to exhibit intelligent behaviour equivalent to, or indistinguishable from, that of a human, developed by Alan Turing in 1950. Turing proposed that a human evaluator would judge natural language conversations between a human and a machine designed to generate human-like responses. The evaluator would be aware that one of the two partners in conversation is a machine, and all participants would be separated from one another. The conversation would be limited to a text-only channel such as a computer keyboard and screen so the result would not depend on the machine's ability to render words as speech. If the evaluator cannot reliably tell the machine from the human, the machine is said to have passed the test. The test results do not depend on the machine's ability to give correct answers to questions, only how closely its answers resemble those a human would give.

Source/s: Wikipedia Glossary of AI

Unstructured Data

Unstructured data (or unstructured information) is information that either does not have a pre-defined data model or is not organized in a pre-defined manner. Unstructured information is typically text-heavy, but may contain data such as dates, numbers, and facts as well. This results in irregularities and ambiguities that make it difficult to understand using traditional programs as compared to data stored in fielded form in databases or annotated (semantically tagged) in documents.

Source/s: https://en.wikipedia.org/wiki/Unstructured_data

Unsupervised Learning

Training a model to find patterns in a dataset, typically an unlabeled dataset.
The most common use of unsupervised machine learning is to cluster data into groups of similar examples. For example, an unsupervised machine learning algorithm can cluster songs together based on various properties of the music. The resulting clusters can become an input to other machine learning algorithms (for example, to a music recommendation service). Clustering can be helpful in domains where true labels are hard to obtain. For example, in domains such as anti-abuse and fraud, clusters can help humans better understand the data.
Another example of unsupervised machine learning is principal component analysis (PCA). For example, applying PCA on a dataset containing the contents of millions of shopping carts might reveal that shopping carts containing lemons frequently also contain antacids.
Identifying customer segments(groups) based on purchasing behaviour or demographics is an example of Clustering.

Source/s: Google Machine Learning Glossary

Weak AI

See Artificial Narrow Intelligence (ANI)

Synonym/s: ANI