Glossary

Here you will find an alphabetical list of terms common to computer vision and evolutionary computing.

Accuracy  The degree of conformity to a standard, or the degree of perfection attained in a measurement. Accuracy relates to the quality of a result, and is different from precision, which relates to the quality of the operation by which the result is obtained.

Adaptation  In biology, adaptation is a trait with a current functional role in the life history of an organism that is maintained and evolved by means of natural selection. Adaptation refers to both the current state of being adapted and to the dynamic evolutionary process that leads to the adaptation. Adaptations contribute to the fitness and survival of individuals.

Algorithm  A precise rule (or set of rules) specifying how to solve some problem. An algorithm is an effective method expressed as a finite list of well-defined instructions for calculating a function. It starts from an initial state and with an initial input (perhaps empty); then, the instructions describe a computation that, when executed, will proceed through a finite number of well-defined successive states, eventually producing “output” and terminating in a final ending state. The transition from one state to the next is not necessarily deterministic; some algorithms, known as randomized algorithms, incorporate random input.

Apparent  That which is clearly revealed to the mind, or to the senses, or to judgment. In fact, terms like apparent design or spontaneous emergence should be used with care since they refer to the absence of a mind acting under a global plan; nevertheless, they do not exclude the idea of planning or organizing the components towards a goal.

Artificial  Humanly contrived, often on a natural model.

Camera  A device that records images (within the visible or some other parts of the electromagnetic spectrum), consisting of an enclosed hollow chamber with an opening (aperture) at one end for light to enter, and a recording or viewing surface for capturing the light at the other end. A majority of cameras have a lens positioned in front of the camera’s opening to gather the incoming light and focus all or part of the image on the recording surface. The term camera comes from the word camera obscura (Latin for “dark chamber”), an early mechanism for projecting images.
**Computation**  The procedure of calculating or determining something by mathematical or logical methods.

**Complex Systems**  A system composed of interconnected parts that as a whole exhibit one or more properties (behavior being among the possible properties) not obvious from the properties of the individual parts. In general, self-organization and emergent behavior are considered properties of complex systems. For example, stigmergy is a mechanism of indirect coordination between agents and actions by which the trace left in the environment by an action stimulates the performance of a next action, by the same or a different agent. In that way, actions tend to reinforce and build on each other, leading to the emergence of coherent and systematic activity.

**Computer**  A general purpose device that can be programmed to carry out a finite set of arithmetic or logical operations. Conventionally, a computer consists of at least one processing element, typically a central processing unit (CPU), some form of memory, and peripheral devices.

**Design**  To conceive and plan out in the mind. To create, fashion, execute, or construct according to a plan. To have a purpose. To devise for a specific function or end. To make a drawing, pattern, or sketch. Synonyms are “devise” and “contrive”. Note that according to Aristotle and Darwin a design does not necessarily need a mind to exist.

**Emergence**  In philosophy, systems theory, science, and art, emergence is the way complex systems and patterns arise out of a multiplicity of relatively simple interactions. Emergence is central to the theories of integrative levels and complex systems.

**Error**  The difference between an observed or computed value of a quantity and the ideal or true value of that quantity.

**Evolution**  In biology, evolution is the change in the inherited characteristics of biological populations over successive generations. Evolutionary processes give rise to diversity at every level of biological organization, including species, individual organisms and molecules such as those of DNA and proteins. In general, evolution is a process in which something passes by degrees to a different stage (especially a more advanced or mature stage).

**Formula**  A group of symbols that make a mathematical statement. A standard procedure for solving a class of mathematical problems.

**Function**  In biology, a function is the reason some object or process occurred in a system that evolved through a process of selection or natural selection. Thus, function refers forward from the object or process, along some chain of causation, to the goal or success. In mathematics, a function is a relation between a set of inputs and a set of permissible outputs with the property that each input is related to exactly one output. In computer science, a function or subroutine is a sequence of program instructions that perform a specific task, packaged as a unit.
Geometry  A branch of mathematics concerned with questions of shape, size, relative position of figures, and the properties of space. A mathematician who works in the field of geometry is called a geometer.

Genetics  A discipline of biology, genetics is the science of genes, heredity, and variation in living organisms.

Intelligence  This term has been defined in many different ways including, but not limited to, abstract thought, understanding, self-awareness, communication, reasoning, learning, having emotional knowledge, retaining, planning, and problem solving. Intelligence is most widely studied in humans, but has also been observed in animals and in plants. Artificial intelligence is the simulation of intelligence in machines.

Learning  The process of acquiring new, or modifying existing, knowledge, behaviors, skills, values, or preferences; it may involve synthesizing different types of information. The ability to learn is possessed by humans, animals and some machines. Learning is based on experience and it produces changes that are relatively permanent.

Life  The characteristic that distinguishes objects that have signaling and self-sustaining processes from those that do not, either because such functions have ceased (death), or else because they lack such functions and are classified as inanimate. Biology is the science concerned with the study of life.

Optimization  The act of rendering something optimal. In mathematics, optimization is the selection of a best element (with regard to some criteria) from some set of available alternatives.

Optimum  The amount or degree of something that is most favorable to some end. In other words, the greatest degree attained or attainable under implied or specified conditions. The adjective “optimal” refers to the most desirable or satisfactory.

Ontology  The metaphysical study of the nature of being and existence. In computer science, it is understood as a rigorous and exhaustive organization of some knowledge domain that is usually hierarchical and contains all the relevant entities and their relations.

Perception  This term refers to the organization, identification, and interpretation of sensory information in order to represent and understand the environment.

Planning  The term refers to the process of thinking about and organizing the activities required to achieve a desired goal. Planning involves the creation and maintenance of a plan. As such, planning is a fundamental property of intelligent behavior. This thought process is essential to the creation and refinement of a plan, or integration of it with other plans; that is, it combines forecasting of developments with the preparation of scenarios of how to react to them.

Precision  A quality associated with the refinement of instruments and measurements, indicated by the degree of uniformity or identity of repeated measurements.
In a somewhat narrower sense, the term refers to the spread of the observations, or some measure of it, whether or not the mean value around which the spread is measured approximates the true value. Contrast with accuracy.

**Projection** In geometry, the extension of lines or planes to intersect a given surface; the transfer of a point from any surface to a corresponding position on another surface, by graphical or analytical methods.

**Problem** This is an obstacle, impediment, difficulty or challenge, or any situation that invites resolution, the resolution of which is recognized as a solution of or contribution toward a known purpose or goal.

**Self-organization** A process where some form of global order or coordination arises out of the local interactions among the components of an initially disordered system. This process is spontaneous: it is not directed or controlled by any agent or subsystem inside or outside the system; however, the laws followed by the process and its initial conditions may have been chosen or caused by an agent. It is often triggered by random fluctuations that are amplified by positive feedback. The resulting organization is wholly decentralized or distributed over all the components of the system. As such it is typically very robust and able to survive and self-repair substantial damage or perturbations.

**Teleology** A teleology is any philosophical account that holds that final causes exist in nature, meaning that design and purpose analogous to that found in human actions are inherent also in the rest of nature. The adjective “teleological” has broader usage, for example in discussions where particular ethical theories or types of computer programs are sometimes described as teleological because they involve aiming toward goals.

**Vision** The act or power of seeing. The special sense by which the qualities of an object (such as color, luminosity, shape, and size) constituting its appearance are perceived through a process in which light rays entering the eye are transformed by the retina into electrical signals that are transmitted to the brain via the optic nerve.
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