

Glossary

actant designates any particular human or nonhuman entity. The notion was developed by semiotician Algirdas Julien Greimas before being taken up by Bruno Latour (2005) to expand agency to nonhuman actors and ground his sociological theory, often labeled “actor-network theory.”

algorithm is what this book tries to define in an action-oriented way. In view of the inquiry’s empirical results, algorithms may be considered, but certainly not reduced to, uncertain products of ground-truthing, programming, and formulating activities.

algorithmic drama refers to the impasse threatening critical studies of algorithms. By mainly considering algorithms from a distance and in terms of their effects, these studies take the risk of being stuck in a dramatic loop: Algorithms are powerful because they are inscrutable, because they are powerful, because they are inscrutable, and so on. The term “algorithmic drama” was initially proposed by Malte Ziewitz (2016).

association refers to a connection, or a link, made between at least two actants. An association is an event from which emanates a difference that a text can, sometimes, partially account for.

BRL is the acronym of *Ballistic Research Laboratory*, a now-dismantled center dedicated to ballistics research for the US Army that was located at Aberdeen Proving Ground, Maryland. The BRL played an important role in the history of electronic computing because the ENIAC project was initially launched to accelerate the analysis of ballistic trajectories carried out within the BRL’s premises—in collaboration with the Moore School of Electrical Engineering at the University of Pennsylvania.

CCD and **CMOS** are acronyms for *charge-coupled device* and *complementary metal-oxide semiconductor*, respectively. Through the translation of electromagnetic photons into electron charges as well as their amplification and digitalization, these devices enable the production of digital images constituted of discrete square elements called pixels. Organized according to a coordinate system allowing the identification of their locations within a grid, these discrete pixels—to which are typically assigned eight-bit red, green, and blue values in the case of color images—allow computers equipped

with dedicated programs to process them. Both CCD and CMOS are central parts of digital cameras. Although they are still the subject of many research efforts, they are now industrially produced and supported by many norms and standards.

chain of reference is a notion initially developed by Bruno Latour and Steve Woolgar (1986) to address the construction of scientific facts. Closely linked with the notion of inscription, a chain of reference allows the maintenance of constants, thus sometimes providing access to that which is distant. Making chains of reference visible, for example, by describing scientific instrumentations in laboratories allows appreciation of the materiality required to produce certified information about remote entities.

cognition is an equivocal term, etymologically linked with the notion of knowledge as it derives from the Latin verb *cognōscere* (get to know). To deflate this notion, which has become hegemonic largely for political reasons, this inquiry—in the wake of the work of Simon Penny (2017)—prefers to attribute to it the more general process of *making sense*.

cognitivism is a specific way to consider cognition. For contingent historical reasons, the general process of making sense has progressively been affiliated with the process of gaining knowledge about remote entities without taking into account the instrumentation enabling this gain. The metaphysical division between a knowing subject and a known object is a direct consequence of this nonconsideration of the material infrastructure involved in the production of knowledge. This, in turn, has forced cognitivism to amalgamate knowledge and reality, thus making the *adaequatio rei et intellectus* the unique, though nonrealistic, yardstick of valid statements and behaviors.

collective world is the immanent process of what is happening. It is close to Wittgenstein's definition of the world as "everything that is the case" (Wittgenstein 1922). The adjective "collective" seeks to underlie the multiplicity of entities involved in this generative process.

Command Window is a space within the Matlab *integrated development environment* (IDE) that allows programmers to see the results of their programming actions on their computer terminal.

composition is the focus of this inquiry; that in which it is trying, at its own level, to participate. Close to compromise, composition expresses a desire for commonality without ignoring the creative readjustments such a desire constantly requires. Composition is an alternative to modernity in that its desire for universality is based on comparative anthropology, thus avoiding—at least potentially—the traps of ethnocentrism.

computationalism is a type of cognitivist metaphysics for which perceptual inputs take the shape of nervous pulses processed by mental models that, in turn, output

a different numerical value to the nervous system. According to computationalism, agency is considered the output of both perception and cognition processes and takes the form of bodily movements instructed by nervous pulses. This conception of cognition is closely related to the *computational metaphor of the mind* that establishes an identity relationship between the human mind and (programmed) computers.

constitution refers to both a process and a document. The notion is here preferred to the more traditional one of *construction* because it preserves a fundamental tension of sociological ventures: to describe and contest. The term “constitution” reminds us that a reality comes into being to the detriment of another.

course of action is an accountable sequence of gestures, looks, speeches, movements, and interactions between human and nonhuman actants whose articulations sometimes end up producing *something* (a piece of steel, a plank, a court decision, an algorithm, etc.). Following the seminal work of Jacques Theureau, courses of action are the building blocks of this inquiry. The notion is closely linked to that of *activity* that, in this book, is understood as a set of intertwining courses of actions sharing common finalities. The three parts of this book are all adventurous attempts to present activities taking part in the formation of algorithms; hence their respective gerund titles: *ground-truthing*, *programming*, *formulating*.

CSF is the acronym of *Computer Science Faculty*. It is the department to which the Lab belongs. The CSF is part of what I call, for reasons of anonymity, the *European technical institute* (ETI).

digital signal is, in its technical understanding, represented by n number of dimensions depending on the independent variables used to describe the signal. A sampled digital sound is, for example, typically described as a one-dimensional signal whose dependent variables—amplitudes—vary according to time (t); a digital image is typically described as a two-dimensional signal whose dependent variables—intensities—vary according to two axes (x , y) while audiovisual content will be described as a three-dimensional signal with independent variables (x , y , t).

Editor is a space within the Matlab *integrated development environment* (IDE) allowing a programmer to inscribe characters capable of triggering—with the help of an interpreter—electric pulses to compute digital data in desired ways. It is part of the large family of *source-code editors* that can be stand-alone applications or functionalities built into larger software environments.

EDVAC is the acronym of *Electronic Discrete Variable Automatic Computer*. This classified project was launched in August 1944 as the direct continuation of the ENIAC project at the Moore School of Electrical Engineering. The EDVAC played an important role in the history of electronic computing because it was the subject of an influential report written by John von Neumann in 1945. This unfinished report, entitled *First Draft of a Report on the EDVAC*, laid the foundations for what would later be called the *von Neumann architecture*.

ENIAC is the acronym of *Electronic Numerical Integrator and Computer*. This classified project was launched in April 1943 under the direction of John Mauchly and John Presper Eckert at the Moore School of Electrical Engineering. It initially aimed to accelerate the production of firing tables required for long-distance weapons by solving large iterative equations at electronic speed. Although innovative in many ways, the limitations of ENIAC prompted Mauchly, Eckert, and later von Neumann to launch another electronic computing project: the EDVAC.

flat laboratory is a figure of style aiming to address the physical locations in which mathematicians work to produce certified statements. Compared with, for example, laboratories of molecular biology or high-energy physics, the instrumentation of mathematical laboratories tends to take up less space. It is important here not to confuse flatness with the mathematical concept of dimensionality often used to capture and qualify the experience of flatness (or bulkiness). According to the point of view adopted in this book, dimensionality should be considered a product of the relative flatness of mathematical laboratories' equipment.

formula is a mathematical operation expressed in a generic scriptural form. The practical process of enrolling a formula to establish antecedence and posteriority among sets of data is here called *formulating*.

ground truth is an artifact that typically takes the shape of a digital database. Its main function is to relate sets of input-data—images, text, audio—to sets of output-targets—labeled images, labeled text, labeled audio. As ground truths institute problems that not-yet-designed algorithms will have to solve, they also establish their veracity. As this book indicates, many ground truths do not preexist and thus need to be constructed. The collective processes leading to the design and shaping of ground truths heavily impact the nature of the algorithms they help constitute, evaluate, and compare.

image processing is a subfield of computer science that aims to develop and publish computerized methods of calculation capable of processing CDD- and CMOS-derived pixels in meaningful ways. Because digital images can be described as two-dimensional signals whose dependent variables—intensities—vary according to two axes (x, y), image processing is also sometimes called “two-dimensional signal processing.” When it focuses on recognition tasks, it is generally called “image recognition.”

inscription is a special category of actant that is *durable* (it lives on beyond the here and now of its instantiation), *mobile* (it can move from one place to another without being too much altered), and *re-presentable* (it can—together with suitable infrastructures—carry, transport, and display properties that are not only its own). Due to these capacities, inscriptions greatly participate in shaping the collective world.

INT is the abbreviation for *interpreter*, a complex computer program that translates inscriptions written in high-level programming language into an abstract syntax tree

before establishing communication with the computer's hardware. Whenever an interpreter cannot complete its translation, the high-level program cannot perform fully.

Lab stands for the computer science academic *laboratory* that is the field site of the present ethnographic inquiry. The Lab specializes in digital image processing, and its members—PhD students, postdocs, invited researchers, professors—spend a significant amount of their time trying to shape new algorithms and publish them in peer-reviewed journals and conferences.

laboratory study is an STS-inspired genre of ethnographic work that consists in accounting for the mundane work of scientists and technologists. Borrowing from anthropology, it implies staying within an academic or industrial laboratory for a relatively long period of time, collaborating with its members, becoming somewhat competent, and taking a lot of notes on what is going on. At some point, eventually, it also implies leaving the laboratory—at least temporarily—to further compile and analyze the data before submitting, finally, a research report on the scrutinized activity.

machine learning is not only a class of statistical methods but also, and perhaps above all, a lived experience consisting of automating parts of formulating activities. However, this algorithmic delegation for algorithmic design relies on increasing, and often invisibilized, ground-truthing and programming efforts.

mathematics is, in this book, considered integral part of scientific activity. It thus typically consists of producing certified facts about objects shaped or discovered with the help of instruments and devices within (flat) laboratories.

Matlab is a privately held mathematical software for numerical computing built around its own interpreted high-level programming language. Because of its agility in designing problems of linear algebra, Matlab is widely used for research and industrial purposes in computer science, electrical engineering, and economics. Yet as Matlab works mainly with an interpreted programming language, its programs have to be translated by an *interpreter* (INT) before interacting with the hardware. This interpretative step makes it less efficient for processing heavy matrices than, for example, programs directly written in compiled languages such as C or C++.

model is a term that is close to an algorithm. In this book, the distinction between an algorithm and a model can only be retrospective: If what is called a “model” derives from, at least, ground-truthing, programming, and formulating activities, it is considered an algorithm.

problematization is, in this book, the collective process of establishing the terms of a problem. Building on *Science and Technology Studies*, analyzing problematization implies describing the way questions are framed, organized, and progressively transformed into issues for which solutions can be proposed.

process thought is an ontological position supported by a wide and heterogeneous body of philosophical works that share similar sensibilities toward associations—sometimes also called relations. For process thinkers, what things are is what they become in association to other entities, the association itself being part of the process. The emphasis is put on the “how” rather than the “what”: instead of asking what *is* something, process thinkers would rather ask *how* something *becomes*. This ontology is about continuous performances instead of binary states.

PROG specifically refers, in this book, to a Matlab computer program aiming to create matrices whose pixel-values correspond to the number of rectangles drawn by human crowdworkers on pixels of digital images.

program is a document whose structure and content, when adequately articulated, makes computers compute data. The practical process of writing a computer program is called *programming*.

re-presentation is the presentation of something *again*. Inscriptions are common re-presentations in that they display properties of other entities over. Re-presentations, in this book, should not be confused with *representations* (without the hyphen), a term that refers to the solution found by cognitivist authors to overcome the distinction between extended things (*res extensa*) and thinking things (*res cogitans*).

saliency detection is a subfield of image processing that aims to detect what attracts people’s attention within digital images. Because the topic of these detection efforts is extremely equivocal, saliency detection is a field of research that shows dynamics that may go unnoticed in more traditional subfields such as facial or object recognition.

scenario refers to a narrative operating a triple shifting out toward another place, another time, and other actants while having a hold on its enunciator. As performative narrative resources, scenarios are of crucial importance for programming activities because they institute horizons on which programmers can hold—while being held by them—and establish, in turn, the boundaries of computer programming episodes.

Science and Technology Studies (STS) are a subfield of social science and sociology that aims to document the co-construction of science, technology, and the collective world. What loosely connects the practitioners of this heterogeneous research community is the conviction that science is not just the expression of a logical empiricism, that knowledge of the world does not preexist, and that scientific and technological truths are dependent on collective arrangements, instrumentations, and dynamics.

script commonly refers to a small computer program. Many interlinking scripts and programs calling on each other typically form a *software*. The notion should not be confused with Madeleine Akrich’s (1989) “scripts” that, in this book, are close to the notion of *scenario*.

sociology is, in this book, the activity of describing associations (*socius*) by means of specialized texts (*logos*). It aims to help understand what is going on in the collective world and better compose with the heterogeneous entities that populate/shape it. In this book, sociology is differentiated from *social science* that is considered the scientific study of an a priori postulated aggregate, generally called the social (or society).

technical detour is a furtive and difficult-to-record experience that takes the form of a zigzag: Thanks to unpredictable detours, a priori distant entities become the missing pieces in the realization of a project. Technical detours—as conceptualized by Bruno Latour (2013)—involve a form of delegation to newly enrolled entities. They also imply forgetting their brief passages once the new composition has been established.

translation is a work by which actants modify, move, reduce, transform, and articulate other actants to align them with their concerns. This is a specific type of association that produces differences that can, with an appropriate methodology, be reflected in a text. The notion was initially developed by Michel Serres (1974) before being taken up by Madeleine Akrich, Michel Callon, and Bruno Latour to ground their *sociologie de la traduction*, which I call sociology here.

trial is a testing event whose outcome has a strong impact on the becoming of an actant. If the trial is overcome, the actant may manage to associate with other actants, with this new association becoming, in turn, more resistant. If the trial is not overcome, the actant will lose some of its properties, sometimes to point of disappearing.

visibility/invisibility are relative states of work practices. These variable states are products of visibilization, or invisibilization, processes. If complete invisibility of work practices is not desirable, complete visibility is not either. In this book, I have chosen public controversies as indicators of negative invisibilities, suggesting in turn the launching of visibilization processes by means of, for example, sociological inquiries.

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Ground-Truthing, Programming, Formulating

By: Florian Jatón

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