Technological Sustainability and Artificial Intelligence Algor-ethics

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Since 2018, a new terminology has been developed, called Algor-ethics, indicating the necessity for a dedicated study concerning the evaluation of an ethics applied to technology, to Algorithms and to Artificial Intelligence (AI). At the same time, since 1987, when the concept of sustainability was introduced, the discussion on this issue has become increasingly lively and has now spread to every area of life. An application of the concept of sustainability to technological processes and in particular to the elaboration of AI systems, for the construction of an ethics that could confer meaning, motivations and impetus in using new technologies and Artificial Intelligence is proposed here. Researchers first try to build an ethical framework, here called Dynamical Techno-Algor-Ethical Composition, to define the interaction between the most important ethical ingredients involving the human person in relation to technology, taking a person-centered approach. Out of this it will emerge a possible structure and definition of Technological Sustainability. The second step consist of evaluating the process for the elaboration of an AI algorithm as a concrete application of the previously analyzed framework, to set ethical contents composing what researchers might call a good and sustainable algorithm.

Keywords: algor-ethics ; technological sustainability ; artificial intelligence ; justice ; power of service ; freedom-creativity ; anthropology ; responsibility ; eschatology ; completion ; pacification ; meekness/minority ; poor big data ; relationality

1. Introduction

Researchers first introduce the possible basis of attempting to set a motivational and operational framework for a wise interpretation of technological development, in order to orient it to the service of the human person and therefore to his good. It will then be possible to propose a definition of Technological Sustainability in the context of an adequate ethical person-centered reference, and to explore its application in the development of a consequent sustainable Algor-ethics applied to AI.

2. Social and Transcendental Coordinates of Technology

In the context of a Technology strictly connected with Anthropology, that is:

$$Anthropology \leftrightarrow Technology \leftrightarrow Person\ Centered$$

researchers first pose two important and precious pillars to structure these relations:

- the horizontal ethical coordinates: responsibility, justice and power, that define the *Social Ethics of Technology*;
- the vertical coordinates, that represent a sort of fermentation and dynamic development ground, such as: anthropology, freedom and creativity and finally teleology and eschatology, collected as the *Transcendental Motives for AI and Technology* [1].

The latter inscribe, in researchers' context, an orientation of meaning, giving the necessary breath to the Social Ethics of Technology, which otherwise would remain prisoners of a freedom without a source. These coordinates are not static but are strictly interconnected in the dynamism of human life so that the ethical attitude could emerge as a result of their synergy.

Social Ethics of Technology:

- *Responsibility:* in researchers' point of view, it is a direct consequence of the person-centered approach emphasizing, first of all, that it does not arise in itself (as post-modernity seems to support, whereby it becomes ephemeral and changing depending on the subjective emotions), but is a response as a consequence of a ‘calling’, that can come from multiple interconnected levels. Every possibility, which emerges in the panorama of history and progress, poses in fact

a question to human beings and their consciences - which consequently need to be trained to recognize their solicitations - to be answered with ethical choices. In addition, the relationships in which man is involved stimulate him to respond ethically and responsibly. Researchers therefore have a fourfold level of responsibility, which shows the flowering of this ethical pillar in the vitality of the human person:

$$Responsibility = Calling \Rightarrow Answer \rightarrow \begin{cases} to\ God \\ to\ Knowledge \\ to\ History \\ to\ Relations \end{cases}$$

- *Orientation towards Justice:* this is a very important issue, primarily considering justice to people as persons [2]. In this sense, the reference both to the good of the single person and to the common good of society and humanity is immediate:

$$Justice \Rightarrow Good \rightarrow \begin{cases} of\ the\ Person \\ Common \end{cases}$$

  Justice is the way through which the ethical commitment of charity takes substance, which is in turn embodied precisely in Justice, without, however, identifying itself with it; in fact: “Charity . . . has its first expression in Justice, which . . . informed by charity, participates in the theological and salvific tension” [3]. It is in this sense that charity prevents justice from objectifying itself, that is, from remaining static and arid, just as, without justice, charity would be abstract and unproductive: “Justice gives charity a realistic incarnational character” [3].

- *Power:* this is a particularly critical experience for humans, that needs to be ‘dimensioned’ in an ethical sense, also in reference to technology and its use, due to their fragility. The problem of power emerges in the relationship between technology, man and society. It can be said that “Technology is Power: technology is a powerful and determining factor” [1] and that “Technique is a realization, a fulfillment and an increase in the spirit of power that leads to a polarization of man on power” [4]. Power must therefore be analyzed carefully, as, on the one hand, it has to do with a sort of ‘form’ of the contemporary world, due to the involvement of man, who uses it more and more; on the other hand, man entrusts himself to it by delegating the custody of his own history, if not even the ‘guide’ of it. The question of power linked to technology then involves man who, in his weakness, is called in turn to recognize the preciousness of his dignity and his potentialities, which are precisely given. These latter two polarities (weakness and potentiality) are to be inscribed in the context of an order to be discovered rather than defined: this is the order of the Cosmos, which already contains in itself every stimulus for the realization, fulfilment and increasing of man’s dignity along the search for the truth. In this wide context, power should be experienced within the unitary dynamism that involves the Cosmos, the person and society:

$$Power \Rightarrow Confidence \rightarrow \begin{cases} Cosmos \\ Human\ Person \\ Society \end{cases}$$

Transcendental Motives for Technology:

Could be considered as three dynamic ‘engines’ that could orient technology itself in a fermentation process that, on one side evaluates human’s potentialities, and on the other maintains a look to human dignity and its fulfillment:

- *Anthropology:* which characterizes the preciousness of man as an integral person: “we speak of man as a person, and we mean both his endowment with the spirit, which goes beyond materiality and physicality, and the independence and freedom that is founded in it” [1];
- *Freedom and Creativity:* which shine as gifts and opportunities received and given, and only in this context they both can be expressed to make the person flourish toward the good, according to the logic of an ordered complexity, in a historical horizon rich in meaning, because it is not self-made;
- *Teleology – Eschatology:* which support the whole system because they enlarge the horizon and keep the ‘skies’ open, that is, they enlighten the real possibility of a significant, substantial and oriented progress: it “is about the completion of the individual as well as the completion of the whole creation” [1]. These orientation elements confer the dimension of finality onto the human activity, deriving from the intrinsic value of the human person, which is therefore called not only to be, but also to flourish.

3. Technological Sustainability: The Dynamical Techno-Algor-ethical Composition. First Step

Receiving as “inputs” the *Social Ethics of Technology* (*responsibility*, *justice* and *power*) on the one hand and on the other the *Transcendental Motives for Technology* (*anthropology*, *freedom-creativity* and *eschatology*), researchers now propose a specific composition in order to appropriately structure them in a dynamic, operational and propulsive relationship: *dynamic*, because all the individual elements of such a system should be continually interconnected in an active dialogue, capable of wisely facing the complexity of reality and the challenges it poses; *operational*, as the integral relationships between the components should be able to descend to the level of implementation, and therefore have strong roots and luminous foundations; *propulsive*, because an organic reading, such as the one researchers are proposing, in addition to offering a solid elasticity, should finally be able to push towards a fullness of meaning and choices regarding the good of the human person.

With these premises, researchers now come to introduce two elements that researchers believe are decisive for guaranteeing the right glue and the necessary elasticity to all the analyzed elements, the horizontal and the vertical ones, in order to structure bonds with the characteristics described above: the *Service of Love* or *Power of Service* (first element), which is able to harmonize the structure researchers propose, precisely in the horizon of meaning that calls the human person to his *Fullness* (second element).

This is to obtain what researchers call the **Dynamical Techno-Algor-Ethical Composition**, which constitutes the ethical environment in which to develop specific traits and operational provisions in the individual technological and/or algorithmic design applications (**Figure 1**).

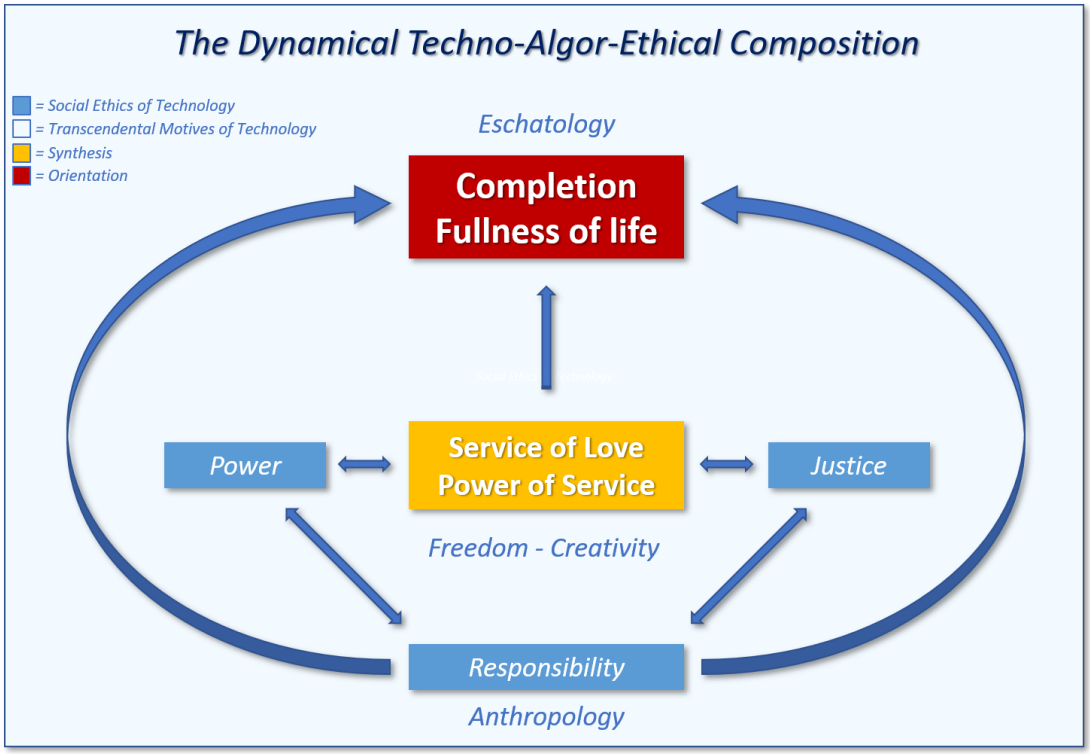

Figure 1. The Dynamical Techno-Algor-Ethical Composition.

1. **The Service of Love** or **Power of Service**, is a decisive element towards which, on the one hand, the forces of *power* and *justice* should converge in order to be enriched in meaning with respect to the human person, which represents the center, and on the other hand, freedom and creativity could be significantly expressed within this context in which Love is manifested as the most precious gift received that asks to be donated (service). *Power* needs to be anchored on an original value (love) and cannot be left alone at the mercy of itself; but, at the same time, it needs a specification (service) that could qualify its horizon. In the same way, *justice* must be placed in a position in which could orient itself (service) and also be founded (love). The result is the two-way link that power and justice have with responsibility, which in turn is solidly built on a consistent anthropology. *Responsibility*, gradually nourished in the discernment of a formed and listening conscience, thus allows the integral person to learn and to manage power and justice in a wise way. *Power* therefore becomes service (having in mind that ’to serve is to reign‘), and the *justice*, that derives from it, is a constitutive existential/relational condition and an opportunity for continuous progress and creative flowering to be expressed. *Justice*, in fact, if it is oriented towards service and love, rediscovers its roots. The *Service of Love* and the *Power of Service* thus offer a clear identity to the expression of *freedom* and *creativity*, typical of the technological

innovation, and they become possible, abundant, luminous and capable of fully and reasonably renewing themselves in the horizon of the truth that is now colored with charity. The *Service of Love* assumes the role of 'semantic and pulsating glue', because it confers meaning and vital order, with an almost cardiac rhythm, onto the three pillars of the *Social Ethics of Technology*. These coordinates are expanded on two levels of the *Transcendental Motives*: the *anthropological* one, which forms the basis for responsibility, and the *freedom-creativity* one, which expands its operations. *Justice*, *power* and *responsibility* are nourished, therefore, by dynamic relationships, which indicate their interdependence, and above all the vital link with the dimension of the *Service of Love*, moving in a real virtuous and multi-dimensional hermeneutic circle. The latter expresses itself in a *systolic beat*, concerning the progressive discernment and research for an ethical value (**Figure 2**a), and in a *diastolic beat*, which allows its colorful and lively expression precisely in the ever-new context of a person-centered technology (**Figure 2**b). The *Service of Love* is therefore the element of synthesis of researchers' composition.

2. The orientation is represented by the **Fulfillment** and **Fullness of Life**, because the above seen this first virtuous and multi-dimensional hermeneutic circle is constantly projecting and orienting itself towards completion, at each 'beat' of the *Service of Love*, according to the structural calling researchers have previously highlighted. The *eschatological* dimension in fact confers the consistency of the end (in the sense of finality not of finiteness), to which every human dynamism tends: precisely the *fullness of life*. In a person-centered perspective, technology should therefore receive and participate in this intimate human movement because it has to be rediscovered as 'person moved'. Not only the beats of the virtuous multi-dimensional hermeneutic circle, supplied by the *Service of Love*, but also the breath of *responsibility*, must point to *completion*. In this case researchers no longer have a 'cardiac dynamism', i.e., systolic and diastolic, but a constant flow, as a tension of convergence, a continuously oriented passage to the limit, finely tuned with ever greater precision and awareness. The *fulfillment* is thus the element of orientation in researchers' composition (**Figure 2**c).

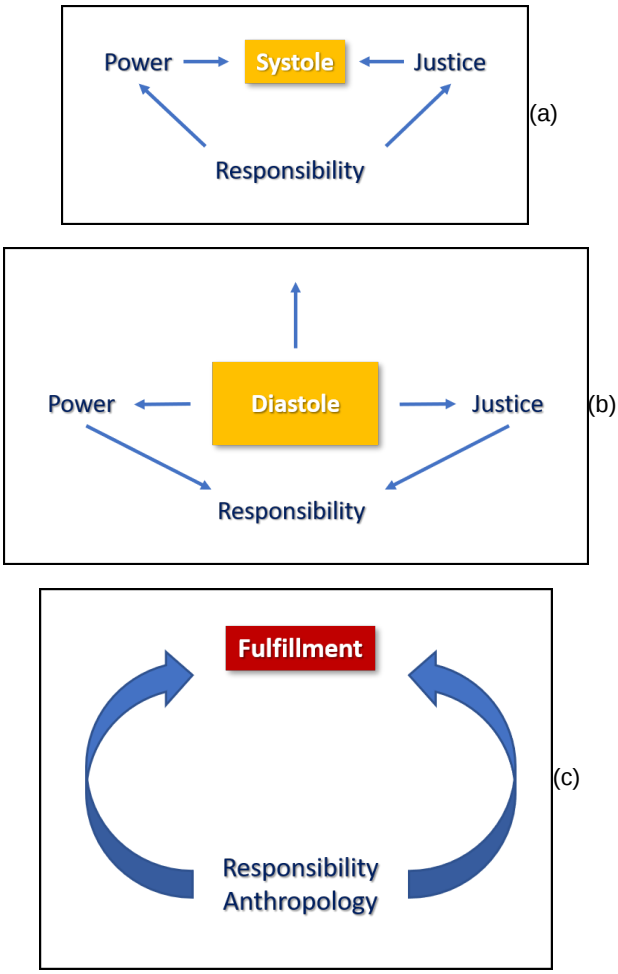

Figure 2. (**a**). Systolic beat of Service of Love. (**b**). Diastolic beat of Service of Love. (**c**). Breath of Responsibility.

In this way the *Social Ethics of Technology* and the *Transcendental Motives of Technology* are dynamically connected and receive, as a living and enlarged heart, the *Service of Love*, which constitutes their 'beating' synthetic core, and also the *Completion*, which represents in turn their propulsive orientation term: all this defines the *Dynamical Techno-Algor-Ethical Composition* or Ethical Framework for technology finally composed with all these macro-ingredients:

$$Social\ Ethics\ of\ Technology \rightarrow \begin{cases} Responsibility \\ Justice \\ Power \end{cases}$$

$$Transcendental\ Motives\ for\ Technology \rightarrow \begin{cases} Anthropology \\ Freedom - Creativity \\ Eschatology \end{cases}$$

$$Multi - Dimensional\ Dynamism \rightarrow \begin{cases} Service\ of\ Love \\ Fulfillment \end{cases}$$

This dynamic composition acts as an ethical reference for technology and AI, which should be inserted within it, and in this way could lead to the construction of a Sustainable Technology and Algor-ethics.

At this point researchers can summarize **Technological Sustainability**, offering this definition:

"Technological Sustainability is the opportunity to develop an authentic human progress according to an ethically consistent interaction with the technique, considered as a person-centered dynamical service. Technology, in this context, assumes its own role to sustain mankind's freedom and creativity in order to respect human dignity and to facilitate, embracing with responsibility all humanity in the service of love, the expression of its common good in a diachronic path toward fulfillment".

4. A Possible Algor-ethics Structure of AI And Its Sustainability: Second Step

In this section researchers propose a specific application of the ethical framework that researchers have presented, to Artificial Intelligence. The *Dynamical Techno-Algor-Ethical Composition* could be in fact, in researchers' proposal, the framework in which a researcher may move to build and structure a sustainable technology or *Good Algorithm*, being disposed in an ethically consistent perspective. For this purpose, researchers choose to split an AI project into 5 subsystems, following the different steps that realize its development:

1. Data setting;
2. Model evaluation;
3. Learning process;
4. Validation process;
5. Reporting–Presentation interface.

An Algor-ethical monitoring in fact, should not be developed simply starting from the inputs and outputs, but should proceed by analyzing all the phases of the algorithmic process, thus entering the technological and algorithmic box to evaluate all the elaboration chain from the inside.

The aim of each following paragraph is to answer to the question: "which ethical trait could emerge from each single algorithmic step drawing on from the Dynamical Techno-Algor-Ethical Composition?".

Data Ethics: Poverty of Spirit

The data represent a numerical sampling, therefore a translation into digital numbers of quantities associated with the dynamic and continuous life of a person, or with natural phenomena. It is the very first step that collects a sort of digitalization of man and reality, a form of sampling to provide an adequate and sufficient virtual image, which will then be artificially processed or elaborated.

It therefore seems appropriate to combine this precious moment of compiling and using an algorithm with the attitude of the '*poverty of spirit*'. This provision, on the one hand, should always be maintained throughout the evolution of the technological process (design, construction and use); on the other hand it allows researchers to interface with Big Data in an ethically sustainable way. In researchers' context the '*poverty of spirit*' consists in fact of a disposal that guides researchers to consider the data for what they really are, 'respecting them' within the poverty/totality polarity:

a. although they may be very accurate, they are, however, an expression of a poverty of content compared to reality, a poverty certainly useful and usable also for great results, but this poverty represents an 'existential datum' of the Big Data, which researchers then could rename as '*Poor Big Data*'. Recognizing the structural poverty of data is not a mere ethical exercise, but disposes an operational attitude that can qualify not only man in the approach to technology, but also technology itself, that could, in this way, increasingly be valued because it is inserted in its own horizon as a work

of human hands and dedicated to his service (this is the diaconal dimension of technology). ‘Respect the data’ means not to give them a disproportionate power and therefore evaluate the human person in his dignity, to enhance reality in its multi-level depth and to enhance the technology in its service;

b. *Poor Big Data*, therefore, once recognized as such, can be correctly contextualized as part of a totality. Considering reality in a multi-level perspective, even technology cannot presume to travel alone, but must be placed in a wider context. Poor Big Data are thus part of a dynamic and profound ‘totality’, of which they represent a very small and static fraction, as a partial perspective and a mono-level reduction.

Model Ethics: Meekness and Minority

Faced with the importance and diffusion of models, researchers then propose to combine the attitude of ‘*meekness*’ at this stage of technological development. *Meekness* could be the disposition with which man builds the model, freeing it from the presumption of being in the likeness of man. At the same time, man could confer to the model the traits of *meekness*, as long as it remains in the ‘*minority*’ with respect to the reality.

The ‘*meekness of the model*’ is then its ‘*technological minority*’, a minority that does not mortify its power and subtlety, but which instead gives it back its strength at least in two directions: that of its increasingly advanced potential and that of the reference and return to man not only as an author, but also as a decision maker, evaluator and measurer.

Learning Ethics: Hunger and Thirst for the Truth

Machine Learning defines and tunes numerical parameters, structured in a more or less complex network of interconnections. These are numerical parameters which, as they are derived in an algorithmic way from *Poor Big Data*, in turn should be considered in the same way as *Poor Parameters*. The sequence is therefore as follows:

$$Poor\ Big\ Data \rightarrow Model \rightarrow Poor\ Parameters \rightarrow Learnings$$

These parameters, which define an artificial learning model, always carry with them a more or less evident component of error, partly due to the quality of the data themselves and partly to the inevitable limitations of the model. Machine Learning also lacks, with respect to human learning, the dimensions of relationality and creativity, of conscience, emotions, feelings, judgments and previous lived experience, freedom, neural conformation and the uniqueness of the Person, in his unrepeatable unity. So, researchers could summarize by saying: “when faced with Machine Learning, ‘remember to learn’”, as an opportunity to feel always ‘hungry and thirsty’ for human learning and therefore for knowledge and truth. In fact, in the case of technology, knowledge tents to be always and only technical, reaching further data, while in the human case knowledge is always oriented towards the relationship:

$$Artificial\ Intelligence \rightarrow Data$$

$$Human\ Learning \rightarrow Relation \rightarrow Person$$

Validation Ethics: Pacification

In this part of the journey in the technological algorithm, researchers recognize the greater need for ‘peace’ between the various competing fronts: the expectations of the designers; the quality of the input data; the quality of the model; the error of the results (standard deviation); the expectations and satisfaction of users.

This type of ‘peace operation’ can be defined as fine tuning; it is in fact a question of tuning different parameters, different processing qualities and different weights that can also conflict with each other, requiring design compromises.

Researchers then see the validation of the data as a real peace-making process, where the most essential pacification is that between what is typical of human evaluation and what is numerical evaluation. In fact, human evaluation contains elements which, even if they may not always lead to absolute certainty, refer to an integral experience that cannot be reproduced and cannot be codified.

The pacification researchers are talking about therefore refers precisely to this ethical dimension of evaluation, which cannot in any way be attributed to the machine and algorithm, which are lacking of the essential components of the evaluating process. In the artificial chain of evaluation there is no imagination, intellectual intuition or judgment, which in the artificial does not have a predicative function (as for the Human Person) but of classification. It does not in fact reach being, but it reaches a statistical, numerical, qualitative, distributive, organizational and precisely classificative content. It is a more or less complex manipulation of data, not a knowledge or a judgment.

The first ‘pacification’ consists therefore of not speaking of Artificial Intelligence but of *Artificial Processing* or *Elaboration*, and the second in not referring to Machine Sapiens but always to *Homo Sapiens* also if enhanced with the aid of artificial instruments. The machine can never be wise, while the human person partakes of a personal wisdom. The synergistic and ethically balanced complex of human and artificial can instead be wisely considered by virtue of the human component alone:

$$\underbrace{Artificial\ Intelligence}_{Not\ Pacified} \mapsto \underbrace{Artificial\ Elaboration}_{Pacified}$$

$$\underbrace{Machine\ Sapience}_{Not\ Pacified} \mapsto \underbrace{(Human - Artificial)\ Sapience}_{Pacified}$$

Pacifying the moment of evaluation is therefore an essential step, because it places the truth of relationships and differences, restoring the dignity of knowledge to the human person. From this pacification derives the ethical evaluation of the interaction (not relationship!) with the machine and with the results it can produce.

Presentation Ethics: Purity of Heart

The final dimension of researchers' algorithmic process consists in the phase of data presentation, that is, the interface with the user. It is a very important system as it involves the dialogic-communicative aspect. The impact of ‘presentation’, in this digital age has strong resonances on the inside of the persons. In fact, very deep chords of the human person are touched, precisely in his interiority and spirituality, and it is therefore important that the Algor-ethics appeals to a ‘pure’ disposition of the person who designs, and that defines the ‘dialogic’ dimension man-machine. This could be a fruitful and sincere way to present a great expression of human intelligence, which is technology, by placing it in its appropriate context of service to humanity and also of strengthening its faculties. The results presented with the attitude of the ‘pure of heart’ will then offer the user the opportunity to see the person and not just the machine, and even himself, perceiving the expansion to the mystery that, in the humble and non-imposing attitude of technology, directs him to open the doors of his interiority and spirituality, to become more and more himself, not remaining just in the technological level. In this way, technology could really serve the integral human person and enhance his faculties, allowing the gifts that characterize him to dare where humanity alone could not reach.

The set of these five ethical relationships, that now researchers resume as:

$$Data\ Ethics \rightarrow Poor\ Big\ Data$$

$$Model\ Ethics \rightarrow Minority\ and\ Meekness$$

$$Learning\ Ethics \rightarrow Personal\ Relationality$$

$$Validation\ Ethics \rightarrow Pacification$$

$$Presentation\ Ethics \rightarrow Purity\ of\ Heart$$

provides a paradigm that is not only exploratory but declarative of a process of re-reading technology in an ethical key, primarily involving the human person in the rediscovery of his dignity and his transcendence not available for reductionism.

Poverty, *minority* and *meekness*, *relationality*, *pacification* and *purity of heart*, are characteristics of the *Service of Love* emerging from an AI system designed within the *Dynamical Techno-Algor-Ethical Composition*. In fact, in these characteristics converge the ethical tensions typical of technology, such as *power*, *justice* and *responsibility* (*Social Ethics of Technology*), which are always lurking as risks and at the same time are always available as opportunities for growth along the entire path of a technology oriented towards the common good and *fulfillment* (*Transcendental Motives of Technology*). These features agree with the definition of Technological Sustainability and therefore define a sustainable Algor-ethics for AI.

In this way, both the technological process and, above all, the researcher are involved in an attractive and challenging dynamism:

- **poverty**, conceived in its relationship with the totality of reality and with its complexity, stimulates the expression of human wealth and of the ordered creativity of the project;
- **minority and meekness** highlight the dual attitude of man to keep supervision and to maintain a principle of reality that can never be reduced to technique or simulation;

- the typical **relationality** of knowing and learning spurs the Person to keep alive the communal sense of acting, also scientific, constantly re-proposing the hunger and thirst for truth, sometimes forgotten;
- the **pacification** along the validation process serves to maintain the balance between the parts, with the wisdom of the rainbow, which relates distances, illuminating the colors of diversity, without compromises;
- the **purity of heart** of the researcher allows the development of a technology and an AI capable of putting the relational dimension, purely human, in the foreground, both in the planning phase and in the implementation phase, recognizing the technological function of transparency and service with respect to the human person.

5. Conclusions

The difficulties in applying this approach, which is based, as researchers have seen, on a multi-dimensional and dynamic ethical composition, for the various technological processes, allowing concrete ethical paths to emerge, mainly reside in the required change of mentality. On the one hand, the latter is in some way imposed by the conspicuous overcoming of mechanistic determinism; on the other, however, in the face of ‘quantity’ and ‘speed’ (two characteristic traits of the post-modern technological era) it risks being practically forgotten due to lack of time and therefore attention. This change of mentality introduces an ethical horizon as well as a transcendent horizon, as not only necessary but also propulsive resources.

Who knows if a new scientific beatitude will not be born from this!

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