RELOADING THE GLOBAL TREASURE OF HUMAN EXPERIENCES THROUGH ARTIFICIAL INTELLIGENCE

STATEMENT OF RESEARCH PROJECT

Societies have always used their heritage (i.e., the treasure of human experiences) to remain resilient and to express their cultural identities. Now, it seems that the rapid development of our society is endangering this spontaneous cultural process of adaptation to change. Part of this social adaptation is enabled by the human knowledge and values that we transmit from one generation to the next. In the past, this transmission is passed down through artefacts, oral traditions, social rituals, and cultural practices. But given the increasing pace of technological development of our times, many traditional modes of knowledge and value transmission have become obsolete or at risk of vanishing. Today, technology alone seems to be unequal to the task, as it has always been.

In human sciences the dreaming about a Robot Scientist—similar to Adam, the one created in the United Kingdom for Genomics by an interdisciplinary research team of computer scientist and biologists to identify "genes encoding orphan enzymes in Saccharomyces cerevisiae" (King, Rowland, Oliver, Young, Aubrey, Byrne, Liakata, Markham, Pir, Soldatova, Sparkes, Whelan & Clare, The Automation of Science, 2009)—dissolves and changes gradually into a series of reflections. Indeed automation for human sciences has its peculiarities. However, the discourse on formalisation through ontology and language can be instructive because the creation of learning algorithms needs conceptual solutions. In 2015 the computer scientist Pedro Domingos justified his use, with poetic license, of the term master algorithm in the Prologue to the homonymous book and explained it in the context of the advancement of learning (Domingos, The Master Algorithm, 2009, xviii-xix): "If it exists, the Master Algorithm can drive all knowledge in the world-past, present, and future-from data. Inventing it would be one of the greatest advances in the history of science... What it requires is stepping back from the mathematical arcana to see the overarching pattern of learning phenomena... Once we have the conceptual solution, we can fill in the mathematical details... convinced that learning is the key to solving AI... nothing could have more impact than teaching computers to learn".

Based on the above reflections, to access "automatic programming and artificial intelligence" (Holland, Automata Theory, 1959, 21), human sciences need a formal system (which in logic and metamathematics "consists of four parts: a set of primitives, a definition of what constitutes a term or well-formed formula, a set of rules, and a set of axioms") to be able to run simulations: "In automata theory, one always has some set of complex systems in mind, and the axioms are chosen so that upon interpretation they become true statements about important or characteristic properties of the system" (Ibidem, 8).

SCOPE OF WORK FOR SELECTED PHD STUDENT

From human sciences perspectives, there is "an inventory of human knowledge, which might provide the material for the art of combination" that can assist Artificial Intelligence specialists in the exploration of the origins of their field and open new horizons to machine learning algorithms (see Eco, Perfect Language: 275-7). At the very origins of modern science, where AI can find the roots of its field of studies as well: Ramon Llull's Ars Magna Combinatoria manuscript work dated 1305. Llull elaborated his ars, a universal logic, able to discover and demonstrate the truth starting from simple terms and mathematically combining them. His combinatorial logic and his memory techniques had vast influence until the 17th century: Giambattista Della Porta Bernardino Telesio, Giordano Bruno,
Tommaso Campanella, Francis Bacon, and Gottfried Wilhelm Leibniz (see Selected Works of Ramon Llull, Princeton 1985).

From a computer science and engineering perspective, we are at a very early stage in the construction of robust and sustainable automation tools and processes for the human sciences. The structure of graph databases can facilitate or prevent access to information across languages, because using English as an inter- and cross-cultural lingua franca, natural language processing (NLP) algorithms cope with a serial multilingual translation process via all sorts of interpretations expressed in different languages, which continuously modify, subtract, and add meaning to words and objects across time and space.

Gottfried Wilhelm von Leibniz (1646-1716)—who in his Dissertatio de Arte Combinatoria (1666, Dissertation on the Art of Combinations) "had long wondered what would be the best way of providing a list of primitives and, consequently, of an alphabet of thoughts or of an encyclopedia"—in his Initia et Specimina Scientiae Generalis de nova ratione instaurationis et augmento scientiarum, ita ut exiguo tempore et negotio si modo velint homines, magna praestari possint ad felicitatis humanae incrementum (1679, Beginnings and Specimens of General Science, a new concept of establishment and increasing of sciences, so that within a little time and effort, who is willing to do it, with high hopes can perform the increasing of human happiness) "described an encyclopaedia as an inventory of human knowledge which might provide the material for the art of combination". At that time he had aspired after "an alphabet of human thoughts" such that "from the combination of the letters of this alphabet, and from the analysis of the vocables formed by these letters, things might be discovered and judged" (Eco, Perfect Language: 275).

The scope of the work for the selected PhD student will be to investigate the theoretical framework of a machine-readable common language for the human sciences and test it into a practicum to be decided in due course of the graduate candidature.

Recently, IEEE Spectrum issued part one of a six-part series on the history of Natural Language Processing (NLP) that goes back to the middle ages (Arab, Latin, Greek). It is interesting. However, it does not deal with the precise understanding of the motivations and the methods. It is what the PhD candidate will do. The PhD student will start from the knowledge of today's NLP to extract theories, methods, and visions. Based on such a scheme, the candidate will parse the primary authors' works that dealt with the art of combination in the past and search for patterns and best practices. This information will be collected in a relational database, or any other suitable content management system.

The research will focus on visual knowledge aggregation, which was one of the main achievements of the "Ars Magna" that dealt with combinatory sciences before Alan Turing. The data would be gathered using English as a lingua franca, philological tools, and semiotic methods. The essential author will be Umberto Eco (Perfect language; From the Tree to the Labyrinth).