

Introduction

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I am very pleased to present this volume that brings together 13 papers by young Italian researchers operating in the wide field of Cognitive Sciences. It witnesses that a community of young cognitive scientists has been firmly established in Italy. Almost all authors are members of the AISC (the Italian Association for the Cognitive Sciences) and in particular of the special subgroup called AISC-Junior. This is an initiative that the Steering Committee of AISC (and modestly myself) contributed to foster, with the aim of enhancing the contribution of young researchers to cognitive science and to provide them the opportunity of creating a network for cooperation. The majority of papers in this book are the result of work done as part of doctoral programs and as such have been reviewed by Ph.D. committees. They constitute evidence of a variety of interests and of a truly multidisciplinary approach.

Several streams of topics are represented in this book. The first concerns one of the most classical cognitive processes, categorisation. Cesare Bianchi discusses analogical reasoning and proposes new hypotheses about how analogy promotes learning. The most traditional account, in psychology and machine learning, is aimed at explain cases where analogy is used to allow the discovery of new concepts by the transfer of already acquired knowledge from similar and well known concepts. The account proposed by Bianchi, instead, applies to cases where analogy is used to help learning of different concepts simultaneously, and none of them is really well known. In these cases, similarities among examples can be

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exploited in order to save cognitive resources. The traditional theory would predict that new categories are best learned when they are easily discriminable. Bianchi shows the results of some psychological experiments and a computational model, that support a partial learning, that proceeds by successive steps, where initial hypotheses are subsequently refined and previously discarded alternatives may also be re-used.

Francesco Gagliardi also investigates categorisation and proposes a classification algorithm to be used in machine learning that aims to have a psychological plausibility as well. In machine learning two alternative classifying systems have been proposed: one is based on the construction of a single representative instance for each class (prototype); the other one is based on memory of learned instances (exemplars) and computes the similarity of new cases matching them to the entire set of cases. The classification system here proposed is “hybrid” because it uses both classification systems, using prototypes when there are typicalities to be exploited, but storing as exemplars the most atypical instances. As learning proceeds, this system can reconsider previously atypical or misclassified instances and, for example, abstract new prototypes from them. The author’s endeavour is to suggest a possible way for overcoming one age-old controversy between different theories of categorisation (prototype versus exemplars).

Another topic in the book concerns the relation between sensory activity and emotion. Nicholas Caporusso is concerned with music. His idea is very simple (but its realisation might currently be complicated): given that there is evidence that music acts not only on emotions but on all mental and bodily processes, why not use it with diagnostic and therapeutic purposes in psycho-physical diseases? He proposes the original idea of analysing music-induced effects by the use of some non-intrusive and portable devices that can give feedback about various nonverbal reactions. This new sort of human-computer interaction would require much technology and also much psychology.

Francesco Parisi also is interested in some relationships between aesthetic experience and cognition. When we look at a photograph, we tend to consider it more real and objective than a painting, but in fact, from the emotional and empathic point of view, there is no difference considering the aspect that also a photograph conveys a particular perspective of the photographer. Parisi speculates on different (psychological, social, neural) aspects that contribute to acquire a meaning from aesthetic experiences.

The paper by Marco Elio Tabacchi is devoted to a more classic perceptual problem, that is symmetry detection. This detection is rather biased in humans, that show a better performance in detecting vertical symmetries. Tabacchi presents a computational algorithm for symmetry detection that is based on a physical model but simulates human performance.

Economy is one of disciplines that were not originally included in the classical “cognitive hexagon” but that today most profit from the cognitive multidisciplinary perspective. As an example, it can draw new tools from evolutionary theories. In her paper, Chiara Chelini analyses the emergence of behaviour that is beneficial for group and that cannot be explained by the traditional view, according to which “homo oeconomicus” is rather individualistic. This behaviour fits better with a different view: having a theory of mind and taking other people’s needs into account are facts that also bring evolutionary advantages. Diego Ponte, on his part, proposes a method to analyze organisational sensemaking dynamics in their “symbolic” and “political” levels. By these labels the author denotes respectively representations of reality and interests to be preserved. This method is based on case studies “on the field” inside a real organisation, using classic qualitative methods like observation or interviews.

Language is obviously another big stream where cognitive sciences are deeply involved. And meaning is one of the core concepts in this stream, one of the most classical and most studied. According to a trend that becomes more and more consolidated, meaning cannot be studied only considering linguistic or psycholinguistic factors and ignoring contextual, extra-linguistic aspects, that take part in its use. Marco Cruciani argues that the intended meaning of an utterance should be determined by pragmatic factors, mainly by interest (“a state of affairs preferred by an agent because it implies his/her goal”). Cruciani exemplifies his thesis by some real-life cases where there is a controversy in linguistic interpretation, which in fact is expression of a conflict of interests. In most cases, a unique intended meaning cannot be fixed unless the extra-semantic conflict is settled.

Another paper on linguistic matter is the one by Francesca Delogu, who investigates how is non-factual knowledge (e.g. concerning goals, desires, beliefs, etc.) represented in discourse comprehension. Since extensional referents are hard or impossible to be found for such knowledge, building a coherent representation may be difficult in some cases. This happens in texts where a sentence, implying an explicit reference to an existing entity, anaphorically refers to a previous sentence where such entity was only an

indefinite argument of a non-factual expression. For example: “John wanted to write a book. Its ending was very much appreciated”, which can only be understood using some supplementary inference, that the book was actually written and so on. Experiments are reported that show longer response times in these cases.

The paper by Daniele Porello illustrates the use of logic for dealing with problems arising inside social choice theory. For example, when preferences of different agents are transitive or circular as in the famous Condorcet paradox, nobody could win if one would try to simply aggregate individual preferences. Porello claims that expressing preferences as judgments in a logical language may help in reaching an agreement on a shared outcome.

One current buzzword in cognitive science is “embodiment”, where this often means “no more mind and more body to overcome the Cartesian dichotomy”. In this sense, body is clearly a biological entity. Giulia Selmi in her paper starts considering theories of an anthropologist (Mary Douglas) and of a philosopher (Michel Foucault) that consider human body not as part of the natural world but as the product of a sociocultural construction. Her aim is to extend such a shift from biology to culture also to body considered by the gender perspective (i.e. to differences between male and female bodies). The paper’s proposal is to adopt a phenomenological approach in order to overcome the consideration of body as an object by connecting it to some subjective dimension.

Connected to the embodiment issue is another current catch phrase: “mirror neurons”: as it is widely known, this is a common group of neurons that fires both when we act and we observe an action. The paper by Nicola Simonetti recalls the discovery of these neurons by the celebrated team of neurologists in Parma, and its main psychological implications, i.e. allowing imitation and understanding of other’s intentions and emotions, therefore being a ground for empathy. According to the author, this discovery has also some philosophical implications, namely it would support a reductive theory of mind like the one asserted by the philosopher Kim. The fact that perceptual and cognitive processes have the same physical (neural) implementation than motor action would entail that antecedents for behaviour (causes) could only be considered at the physical level. Mental causation would be a hopeless concept because mental (higher-order) properties would be dependent (or supervenient) on their realisation at the neural level.

Artificial intelligence and ergonomics could not be missing in a cognitive science book, and the paper by Fabio Tango fills both the gaps at once. It describes an intelligent driving simulator, implemented using statistical learning techniques and artificial neural networks, that learns from human drivers (playing a simulation game) behaviour to classify what they do, and to infer their intentions during driving manoeuvres like following a car or lane changing. Results can be applied to traffic safety and driver assistance.

Altogether, contributions in this volume are a good sample of multidisciplinary research. But life for multidisciplinary research is not easy, in Italy perhaps more than in the rest of the world. Academic structures more and more bureaucratic tend to pigeonhole and to frame knowledge into small, well-delimited and well-coded sections. Disciplinary interests have to be defended and prevail in a context where curricular requirements for university courses and job positions in universities are defined and planned inside Faculties. Research funding is also strictly linked to disciplinary areas.

All such factors give rise to problems for young people. The first concerns education: as students they tend to be limited and prevented from acquiring multidisciplinary competencies and a wide-minded and broadly-oriented scientific thinking. Despite all this, there are (now and then) some brilliant students that understand that scientific research must be cross-fertilized among different disciplines, and that this is particularly true when studying human mind or social phenomena.

But life is hard for those guys that would like to start multidisciplinary research, not only for the fore mentioned general reasons, but also because they personally risk to be penalized in their individual career. Indeed they will find more difficult to publish the results of their work because there are less multidisciplinary than disciplinary journals. And, above all, multidisciplinary papers are often less appreciated from the scientific point of view (more precisely: for academic career), because they usually don’t go much deep into technical details, but are more focused on general questions that don’t exactly match with the expected questions.

So, notwithstanding all this, the fact that there is an Italian community of young cognitive scientists, that produces innovative and good quality work, is a proof of the vitality of the cognitive science approach in Italy, and it is a hope for the future. New advancements will certainly come from these young researchers.