

Special Issue

New developments in functional electronics triggered by artificial intelligence (AI)

Foreword

The present collection of papers is intended to mirror the developments triggered, at the level of electronic engineering, by the new AI emerged after the last “AI winter” just ended approximately one decade ago. Besides the high level theoretical investigations at one end, and the big industrial developments at the other end, there are major evolutions at the level of electronics and information technologies ready to support the revival of the AI domain.

The action of Moore’s law allows only to grow the size of the digital system. We are unable to follow the growth of size with a corresponding increase of complexity. Therefore, the first stage in the process of increasing the competence of our systems was to build big programmable and, as much as possible, modular systems. Thus, the programmability helped us to increase the complexity & competence of our too fast increasing digital systems. But, this way for providing solutions starts to be exhausted. There are big complexities, in the reality we intend to approach, which do not get caught in explicitly expressed rules. Here we receive the help from the self-organizing processes supposed by the new neural networks-based AI.

The **second stage** of the process of increasing the competence of our intelligent systems is to use Machine Learning techniques for “programming” our big modular systems. The “program”, i.e., the matrices of weights, generated by learning will have the biggest complexity we can now consider. Thus, the gap between size and complexity (competence), in our informational systems, will start to narrow. The Moore’s law will start also to act shy, in the beginning, but convincing at the level of functional complexity of our systems.

“Cellular hardware activated through Machine Learning” is the new slogan. The papers we present are related with real applications (Eduard Frani, et al.: Voice Based Emotion Recognition with Convolutional Neural Networks for Companion Robots), the present stage of an expanding domain (Alexandru Caranica, et al.: Survey on Multilingual Spoken Term Detection), new theoretical issues (Monica Dascălu and Silvia Branea: Applying Communication Sciences in Artificial Societies), and technological support (David Mihăiță and Gheorghe M. Ștefan: Hybrid Accelerator with MapReduce Architecture for Convolutional Neural Networks) for the emerging domain of parallel embedded systems fed with complexity and competence though AI techniques.