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**Section** Artificial Intelligence  
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## Section **Artificial Intelligence Circuits and Systems**

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### Section Information

The Artificial Intelligence Circuits and Systems section is focused on publications that are related to circuits and systems for artificial intelligence. The section covers topics of interest within hardware-based deep learning AI and algorithmic deep learning AI using machine learning. It is dedicated to the publication of articles not only from the listed areas but also from similar or related areas. We encourage the submission of original contributions derived from theoretical and/or application-oriented research studies.

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## Selected Papers

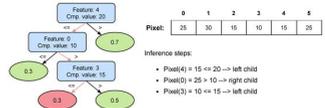
DOI: 10.3390/electronics10030314

### FPGA Accelerator for Gradient Boosting Decision Trees

Authors: Adrián Alcolea and Javier Resano



Abstract: A decision tree is a well-known machine learning technique. Recently their popularity has increased due to the powerful Gradient Boosting ensemble method that allows to gradually increasing accuracy at the cost of executing a large number of decision trees. In this paper we present an accelerator designed to optimize the execution of these trees while reducing the energy consumption. We have implemented it in an FPGA for embedded systems, and we have tested it with a relevant case-study: pixel classification of hyperspectral images. In our experiments with different images our accelerator can process the hyperspectral images at the same speed at which they are generated by the hyperspectral sensors. Compared to a high-performance processor running optimized software, on average our design is twice as fast and consumes 72 times less energy. Compared to an embedded processor, it is 30 times faster and consumes 23 times less energy.



DOI: 10.3390/electronics10020182

### Design and Implementation of Deep Learning Based Contactless Authentication System Using Hand Gestures

Authors: Aveen Dayal, Naveen Paluru, Linga Reddy Cenkeramaddi, Soumya J. and Phaneendra K. Yalavarthy



Abstract: Hand gestures based sign language digits have several contactless applications. Applications include communication for impaired people, such as elderly and disabled people, health-care applications, automotive user interfaces, and security and surveillance. This work presents the design and implementation of a complete end-to-end deep learning based edge computing system that can verify a user contactlessly using 'authentication code'. The 'authentication code' is an 'n' digit numeric code and the digits are hand gestures of sign language digits. We propose a memory-efficient deep learning model to classify the hand gestures of the sign language digits. The proposed deep learning model is based on the bottleneck module which is inspired by the deep residual networks. The model achieves classification accuracy of 99.1% on the publicly available sign language digits dataset. The model is deployed on a Raspberry pi 4 Model B edge computing system to serve as an edge device for user verification. The edge computing system consists of two steps, it first takes input from the camera attached to it in real-time and stores it in the buffer. In the second step, the model classifies the digit with the inference rate of 280 ms, by taking the first image in the buffer as input.





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### **Energy-Efficient Processors, Systems, and Their Applications**

Guest Editors: Iakovos Mavroidis, Sotiris Ioannidis and Konstantinos Georgopoulos

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### **Advances in Electrical Capacitance Tomography System**

Guest Editors: Waldemar Smolik and Jacek Kryszyn

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### **Advanced Analog Circuits for Emerging Applications**

Guest Editors: Shiwei Wang and Shuang Song

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### **Deep Learning Algorithm Generalization for Complex Industrial Systems**

Guest Editors: Aboul Ella Hassanien and Ahmad Taher Azar

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### **Advancements in Electromagnetic Compatibility (EMC) Techniques for Electronic Systems**

Guest Editors: Georgios Fotis and Vasiliki Vita

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## SI Book

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### **Artificial Intelligence and Ambient Intelligence**

Guest Editors: **Matjaz Gams** and **Martin Gjoreski**

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