



Technology Opportunity



JPL's

Analog Artificial Neural Network

On-chip learning using an analog approach to capacitor and refresh training

Marketing Summary

Artificial neural networks—computational models inspired by the brain—offer a special computing paradigm that is ideal for machine learning. This is particularly useful for learning tasks such as pattern recognition and regression, which are widely used in a variety of industries. Software implementations of neural networks are often inconveniently slow and can require vast computing resources, and existing hybrid implementations are impractical for large-scale neural networks. Innovators at JPL have developed an analog artificial neural network to address these shortcomings.

Technology

An analog neural network can be implemented such that a training network and a validation network are distinct but share the same synaptic weights, which can be stored as charge on one or more capacitors. The training network computes the changes in synaptic weights, updates these weights in real time, and learns new and incomplete training patterns. At the same time, the validation network validates the cross-validation or test data set and checks for the overlearning state without interrupting the training network. Cascade Back Propagation, a gradient descent technique for supervised learning, is well-suited for this particular hardware learning implementation because hidden neurons can be added when the learning rate falls below a threshold level.

Benefits

- Simultaneous training and validation activities
- Flexible architecture allows for network expansion

Applications

- Robotics and machine learning
- Data processing
- Pattern recognition

Technology Status

- Patent Pending
- U.S. Patent (US 6,513,023)
- Copyrighted
- Available to license
- Available for no-cost transfer
- Seeking industry partner for further co-development

If your company is interested in licensing or joint development opportunities associated with this technology, or if you would like additional information on partnering with NASA, please contact:

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