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| **Title:** Large Scale Evolution of Convolutional Neural  Networks Using Volunteer Computing  **Main author:** Travis Desell  **Year:** 2017  **Link:** https://arxiv.org/pdf/1703.05422 |
| **Conference:**  [GECCO '17](http://gecco-2017.sigevo.org/) Proceedings of the Genetic and Evolutionary Computation Conference Companion  **Citations:** 23  **Pages:** 17 |
| **Structure of the paper**   1. Abstract 2. Introduction 3. Evolutionary Exploration of Augmenting Convolutional Topologies  * Population Initialization * Mutation Operations * Crossover * Epigenetic Weight Initialization  1. EXACT on Volunteered Hosts  * Validation * Check pointing   **5**.Backpropagation Implementation  **6**. Results   * Benchmark Networks * Evolved Neural Networks   **7.** Discussion and Future Work |
| **Detail of figures and plots**   1. **Regarding Neural networks**     1. Benchmark Architectures for neural networks. 2. **Regarding Training evaluations**    1. Graphs depicting performance of proposed CNN in the basis on weight initialization, epochs and inheritance 3. **Regarding Genome Efficiency**    1. Evaluation of genomes passed-on based on training errors |
| **Experimental setup and experimentation**  The focus of this work was to demonstrate the effectiveness of EXACT as an evolution strategy for the structure of convolutional neural networks, and due to the fact that the EXACT algorithm can allow for the use of any neural network training strategy.  **Experiment-1:** Single layer neural network where the 28x28 input node feeds 784 weights (one per pixel) into each of the ten output nodes in a softmax layer.   * + **Outputs:** Error rates.   + **Output structure:** Tabular and plots   **Experiment-2:** a two-layer neural network adds feeds the 28x28 input node feeds 784 weights (one per pixel) into each of 10 nodes in the hidden layer, which are fully connected to the ten output nodes in a final softmax layer.   * + **Outputs:** Error rates   + **Output structure:** Tabular and plots |
| **A brief summary of the proposed work [one paragraph]**  The EXACT method is a very good way to optimize CNN architectures in a way that in no way does this technique depend on the existing CNN topology which as to be optimized. This method basically generates a population of CNNs given a baseline and evolves them to get the best results for an image dataset as possible. This method also integrates an asynchronous evolution strategy which helps efficiently utilize the run-time of the systems evaluating and training CNNs without waiting time. |
| **Critical review** |
| **Any idea to upgrade the concept** |
| **Name five papers from references, you’d like to read next**   1. F. Gomez, J. Schmidhuber, and R. Miikkulainen. Accelerated neural evolution through cooperatively coevolved synapses. Journal of Machine Learning Research. 2. K. He, X. Zhang, S. Ren, and J. Sun. Delving deep into rectiers: Surpassing human-level performance on imagenet classication. In Proceedings of the IEEE international conference on computer vision. 3. K. He, X. Zhang, S. Ren, and J. Sun. Deep residual learning for image recognition. In Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition. 4. G. Hinton, S. Osindero, and Y.-W. Teh. A fast learning algorithm for deep belief nets. Neural computation. 5. E. M. Heien, Y. Takata, K. Hagihara, and A. Kornafeld. Pymw-a python module for desktop grid and volunteer computing. In Parallel & Distributed Processing, 2009. IPDPS 2009. IEEE International Symposium. |
| **Name five papers from citations, you’d like to read next** |