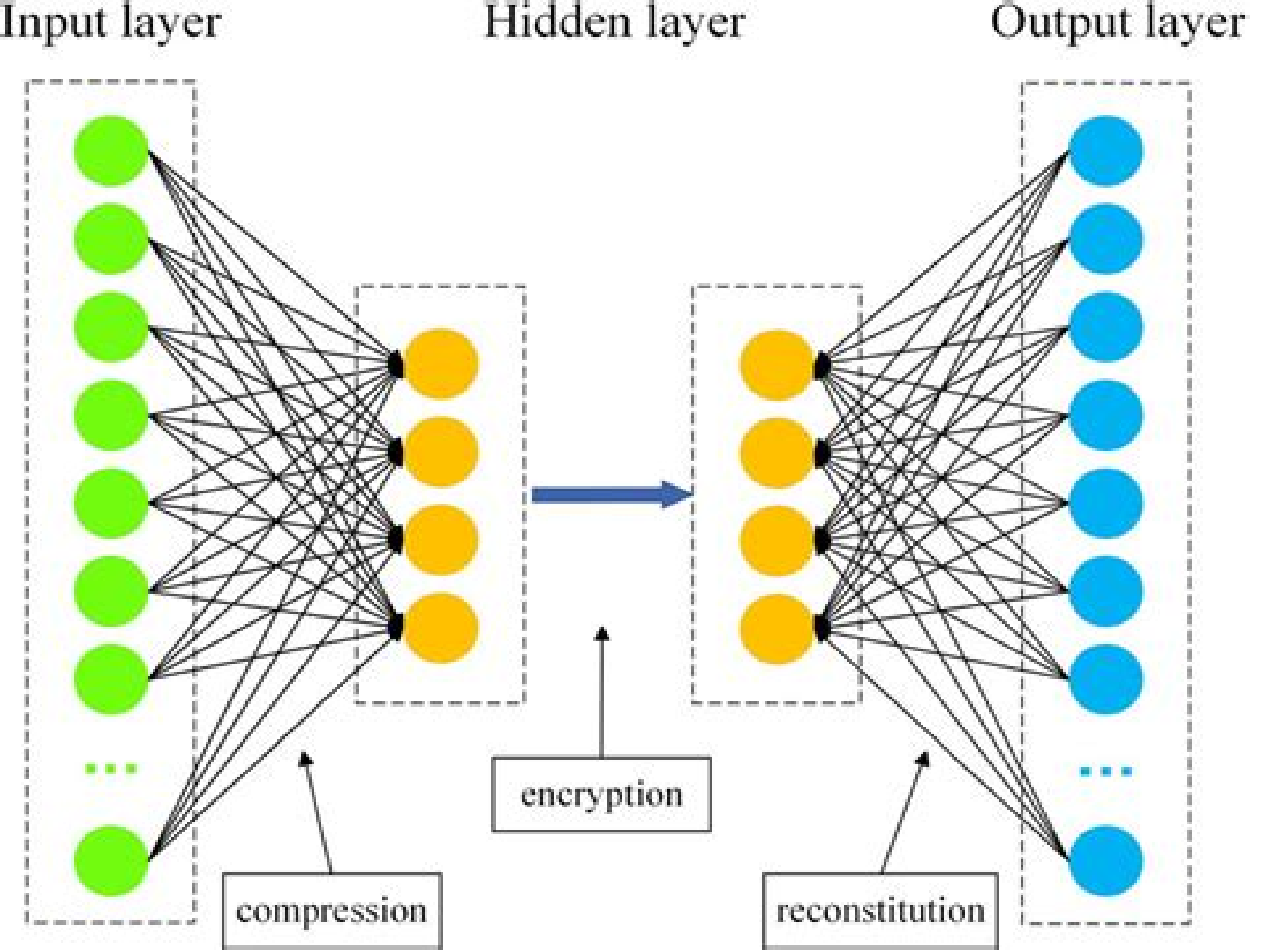
Input layer
Hidden layer
Output layer
encryption
compression
reconstitution

Image Compression Neural Network Matlab Code Thesis

Wui Pin Lee

Image Compression Neural Network Matlab Code Thesis:

Image Compression Using Cascaded Neural Networks Chigozie Obiegbu,2003 Images are forming an increasingly large part of modern communications bringing the need for efficient and effective compression Many techniques developed for this purpose include transform coding vector quantization and neural networks In this thesis a new neural network method is used to achieve image compression This work extends the use of 2 layer neural networks to a combination of cascaded networks with one node in the hidden layer A redistribution of the gray levels in the training phase is implemented in a random fashion to make the minimization of the mean square error applicable to a broad range of images The computational complexity of this approach is analyzed in terms of overall number of weights and overall convergence Image quality is measured objectively using peak signal to noise ratio and subjectively using perception The effects of different image contents and compression ratios are assessed Results show the performance superiority of cascaded neural networks compared to that of fixed architecture training paradigms especially at high compression ratios The proposed new method is implemented in MATLAB The results obtained such as compression ratio and computing time of the compressed images are presented *Dissertation Abstracts International* ,1998 *Government Reports Announcements & Index* ,1996-08

Index to Theses with Abstracts Accepted for Higher Degrees by the Universities of Great Britain and Ireland and the Council for National Academic Awards ,2006 Theses on any subject submitted by the academic libraries in the UK and Ireland **Artificial Neural Networks Models for Image Data Compression [microform]** Hazem M. Abbas,1993 **Image and Video Compression** Madhuri A. Joshi,Mehul S. Raval,Yogesh H. Dandawate,Kalyani R. Joshi,Shilpa P. Metkar,2014-11-17 Image and video signals require large transmission bandwidth and storage leading to high costs The data must be compressed without a loss or with a small loss of quality Thus efficient image and video compression algorithms play a significant role in the storage and transmission of data Image and Video Compression Fundamentals Techniques and **Image Compression Using a Neural Network Implementation of the Discrete Cosine Transform** Brian A. Gavin,1995 *Theoretical Results for Applying Neural Networks to Lossless Image Compression* National University of Singapore. Dept. of Information Systems and Computer Science,Steve G. Romaniuk,1994 Abstract The ability to employ neural networks to the task of image compression has been pointed out in recent research The pre dominant approach to image compression is centered around the backpropagation algorithm to train on overlapping frames of the original picture Several deficiencies can be identified with this approach First no potential time bounds are provided for compressing images Second utilizing backpropagation is difficult due to its computational complexity To overcome these shortcomings we propose a different approach by concentrating on a general class of 3 layer neural networks of 2 N 1 hidden units It will be shown that the class N can uniquely represent a large number of images in fact growth of this class is larger than exponential Instead of training a network it is automatically constructed The construction process can be accomplished

in O subscript worst n n4 n2 time where n is the image size Obtainable compression rates lossless exceed 97% for square images of size 256 **Data Compression Using Artificial Neural Networks** Bruce E. Watkins,Murali Tummala,1991 **Lossless Image Compression Using Neural Network** Heng Ee Chin,1993 **Comparison of Lossless Image Compression Techniques based on Context Modeling** Mohammad El-Ghoboushi,2015-03-31 Master s Thesis from the year 2014 in the subject Computer Science Software course Image Processing language English abstract In this thesis various methods for lossless compression of source image data are analyzed and discussed The main focus in this work is lossless compression algorithms based on context modeling using tree structure We are going to compare CALIC GCT I algorithms to the JPEG2000 standard algorithm which will be considered the reference of comparison This work includes research on how to modify CALIC algorithm in continuous tone mode by truncating tails of the error histogram which may lead to improve CALIC compression performance Also we are going to propose a modification to CALIC in binary mode by eliminating error feedback mechanism As when any pixel to be encoded has a different grey level than any of the neighboring pixels CALIC triggers an escape sequence that switches the algorithm from binary mode to continuous tone mode Which means in this case the pixel will be treated as if it was in continuous tone region This minor modification should improve CALIC performance in binary images Finally we are going to discuss the GCT I on medical images and compare results to the JPEG2000 standard *Image Compression and Signal Classification by Neural Networks and Projection Pursuits* M. Fardanesh,Okan K. Ersoy,1996 **Image Compression Using Artificial Neural Network** Yang Xiong,1996 Codebook Image Compression with Neural Networks Richard Dansereau (University of Manitoba student),1995 Image Compression Using Sum-product Networks Tejas K. Jayashankar,2022 An estimated 79 zettabytes 1021 bytes of data was generated worldwide in 2021 with even more data expected to be produced in the future The effective storage and communication of such large amounts of data is an important problem Data compression lies at the heart of the solution to this issue The two aspect of data compression data modeling and coding are typically jointly designed As a result it is difficult to evolve compression standards without a complete modification of the entire architecture Recently a model code separation architecture for compression was proposed with a model free encoder and model adaptive decoder The architecture uses a data independent encoder and it employs a probabilistic graphical model PGM to model the source structure in the decoder Decoding is performed by running belief propagation over the graphical models representing the modeling and coding aspects of compression In practical settings where we deal with naturally occurring data e g CIFAR 10 images the PGM underlying the source data is unknown Existing structure learning algorithms for PGMs are inefficient for learning from large datasets and place additional constraints on the graphical model structure that diminishes a PGM s representational power Due to the difficulty of inference and learning in complex PGMs the current model code separation architecture is limited in its use for many real world applications In this thesis we develop a new separation architecture based on recently proposed

sum product networks SPNs a class of tractable probabilistic generative models to model the source distribution Our architecture strikes a balance between efficient learning of source structure and fast lossless decoding We show that SPNs admit efficient parameter learning via gradient descent to learn statistical structure in synthetic and naturally occurring images Furthermore through modifications to the SPN architecture we describe a procedure to assimilate external beliefs about the source and compute the marginal probabilities of all the source nodes in a single forward and backward pass of the SPN architecture By using an SPN source model in place of a PGM we obtain a new model code separation architecture for compression Throughout this thesis we focus on the efficient implementation of our compression architecture We take advantage of modern deep learning frameworks and GPUs to implement our entire architecture using parallelized tensor operations As a result we are able to bridge the gap between traditional statistical inference algorithms and modern deep learning models by carefully developing the SPN source code belief propagation algorithm for source decoding The resulting algorithm can decode grayscale sources in under 0 04 seconds This work applies the proposed architecture for the lossless compression of binary and grayscale images We compare our architecture against some of the most commonly used compression systems of today and theoretical limits We show that our architecture achieves a 1 7x gain in compression rate over the state of the art JBIG2 compressor on the binarized MNIST dataset Furthermore our architecture does not incur a performance penalty on grayscale sources and is still able to achieve a 1 4x gain in compression rate on the grayscale CIFAR 10 and the Fashion MNIST datasets as compared against some of the best universal compressors Extensive analysis on synthetic binary sources show that our architecture can achieve near theoretical limits of compression and match the performance of baseline separation architectures with known PGM structure **Neural Networks for Fast Image Compression** Mu Li,1998 *A Comparison of Image Compression Techniques Using Neural Networks and Principal Component Analysis* Jaenam Choi,1992 *Image Compression and Channel Error Correction Using Neurally Inspired Network Models* Yijing Watkins,2018 Everyday an enormous amount of information is stored processed and transmitted digitally around the world Neurally inspired compression models have been rapidly developed and researched as a solution to image processing tasks and channel error correction control This dissertation presents a deep neural network DNN for gray high resolution image compression and a fault tolerant transmission system with channel error correction capabilities A feed forward DNN implemented with the Levenberg Marguardt learning algorithm is proposed and implemented for image compression I demonstrate experimentally that the DNN not only provides better quality reconstructed images but also requires less computational capacity as compared to DCT Zonal coding DCT Threshold coding Set Partitioning in Hierarchical Trees SPIHT and Gaussian Pyramid An artificial neural network ANN with improved channel error correction rate is also proposed The experimental results indicate that the implemented artificial neural network provides a superior error correction ability by transmitting binary images over the noisy channel using Hamming and Repeat Accumulate coding

Meanwhile the network s storage requirement is 64 times less than the Hamming coding and 62 times less than the Repeat Accumulate coding Thumbnail images contain higher frequencies and much less redundancy which makes them more difficult to compress compared to high resolution images Bottleneck autoencoders have been actively researched as a solution to image compression tasks However I observed that thumbnail images compressed at a 2 1 ratio through bottleneck autoencoders often exhibit subjectively low visual quality In this dissertation I compared bottleneck autoencoders with two sparse coding approaches Either 50% of the pixels are randomly removed or every other pixel is removed each achieving a 2 1 compression ratio In the subsequent decompression step a sparse inference algorithm is used to in paint the missing the pixel values Compared to bottleneck autoencoders I observed that sparse coding with a random dropout mask yields decompressed images that are superior based on subjective human perception yet inferior according to pixel wise metrics of reconstruction quality such as PSNR and SSIM With a regular checkerboard mask decompressed images were superior as assessed by both subjective and pixel wise measures I hypothesized that alternative feature based measures of reconstruction quality would better support my subjective observations To test this hypothesis I fed thumbnail images processed using either bottleneck autoencoder or sparse coding using either checkerboard or random masks into a Deep Convolutional Neural Network DCNN classifier Consistent with my subjective observations I discovered that sparse coding with checkerboard and random masks support on average 2 7% and 1 6% higher classification accuracy and 18 06% and 3 74% lower feature perceptual loss compared to bottleneck autoencoders implying that sparse coding preserves more feature based information The optic nerve transmits visual information to the brain as trains of discrete events a low power low bandwidth communication channel also exploited by silicon retina cameras Extracting high fidelity visual input from retinal event trains is thus a key challenge for both computational neuroscience and neuromorphic engineering % Here we investigate whether sparse coding can enable the reconstruction of high fidelity images and video from retinal event trains Our approach is analogous to compressive sensing in which only a random subset of pixels are transmitted and the missing information is estimated via inference We employed a variant of the Locally Competitive Algorithm to infer sparse representations from retinal event trains using a dictionary of convolutional features optimized via stochastic gradient descent and trained in an unsupervised manner using a local Hebbian learning rule with momentum Static images drawn from the CIFAR10 dataset were passed to the input layer of an anatomically realistic retinal model and encoded as arrays of output spike trains arising from separate layers of integrate and fire neurons representing ON and OFF retinal ganglion cells The spikes from each model ganglion cell were summed over a 32 msec time window yielding a noisy rate coded image Analogous to how the primary visual cortex is postulated to infer features from noisy spike trains in the optic nerve we inferred a higher fidelity sparse reconstruction from the noisy rate coded image using a convolutional dictionary trained on the original CIFAR10 database Using a similar approach we analyzed the asynchronous event trains from a silicon retina

camera produced by self motion through a laboratory environment By training a dictionary of convolutional spatiotemporal features for simultaneously reconstructing differences of video frames recorded at 22HZ and 5 56Hz as well as discrete events generated by the silicon retina binned at 484Hz and 278Hz we were able to estimate high frame rate video from a low power low bandwidth silicon retina camera *Wavelet-based Image/video Compression with Application to Coding of Underwater Imagery* David F. Hoag,1996 Image Compression Using Neural Network Based Vector Quantization Wui Pin Lee,1997

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