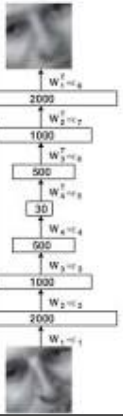
Chapter 3: The Deep Revival

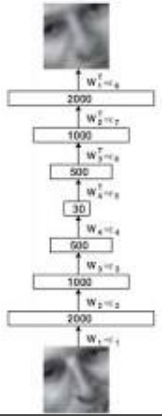
Unsupervised Pre-Training

Hinton and Salakhutdinov described an effective way of initializing the weights that allows deep autoencoder networks to learn a low-dimensional representation of data. [1]



Unsupervised Pre-Training

The idea of unsupervised pre-training actually dates back to 1991-1993 (J. Schmidhuber) when it was used to train a "Very Deep Learner"



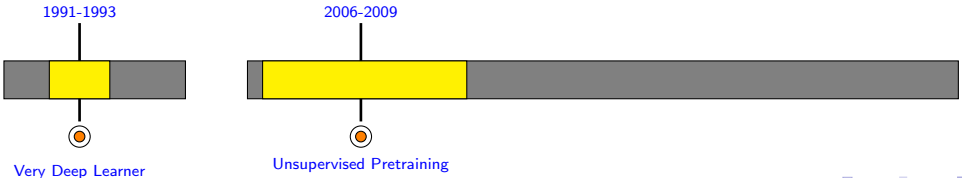
More insights (2007-2009)

Further Investigations into the effectiveness of Unsupervised Pre-training

Greedy Layer-Wise Training of Deep Networks

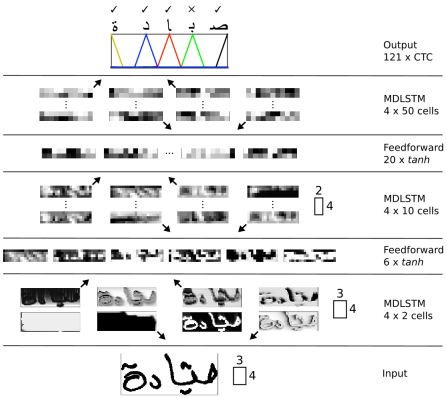
Why Does Unsupervised Pre-training Help Deep Learning?

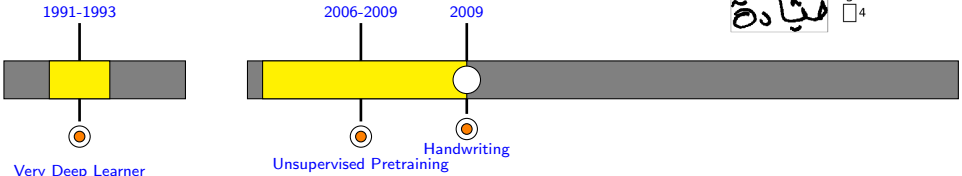
Exploring Strategies for Training Deep Neural Networks



Success in Handwriting Recognition

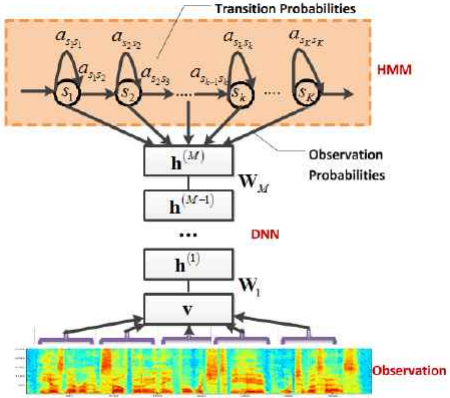
Graves et. al. outperformed all entries in an international Arabic handwriting recognition competition [2]

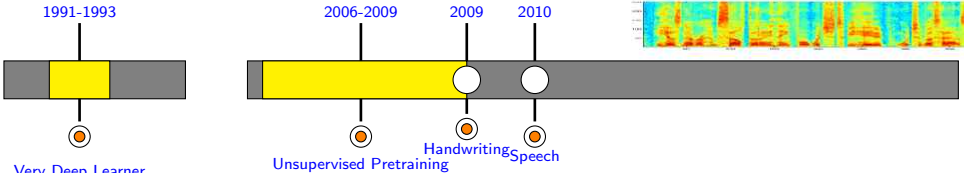




Success in Speech Recognition

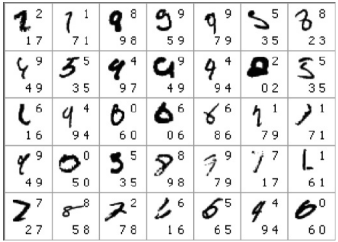
Dahl et. al. showed relative error reduction of 16.0% and 23.2% over a state of the art system [3]

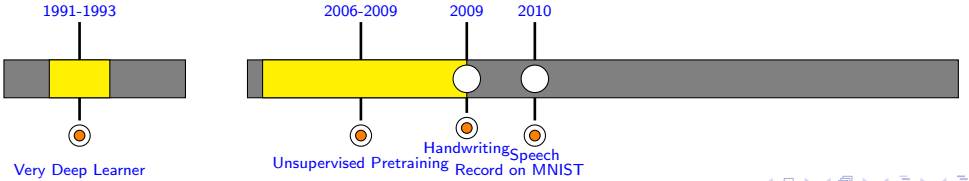




New record on MNIST

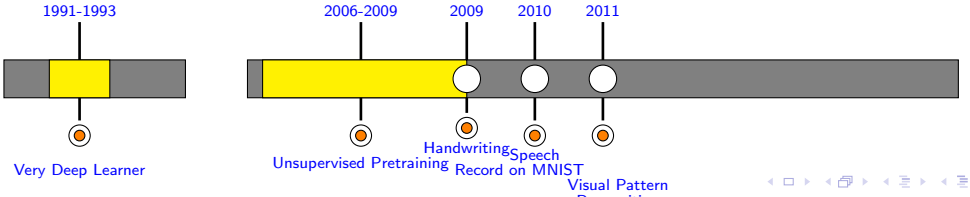
Ciresan et. al. set a new record on the MNIST dataset using good old backpropagation on GPUs (GPUs enter the scene) [4]





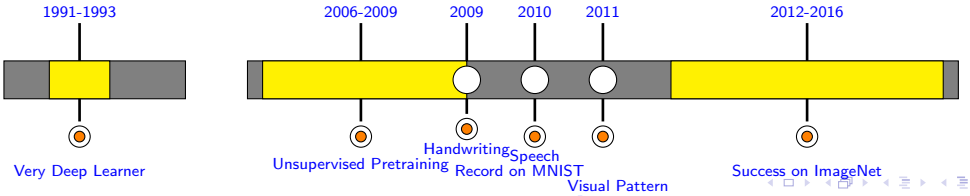
First Superhuman Visual Pattern Recognition

D. C. Ciresan et. al. achieved 0.56% error rate in the IJCNN Traffic Sign Recognition Competition [5]



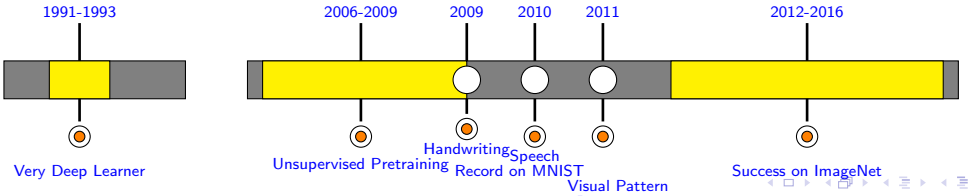
Winning more visual recognition challenges

Network	Error	Layers
AlexNet [6]	16.0%	8



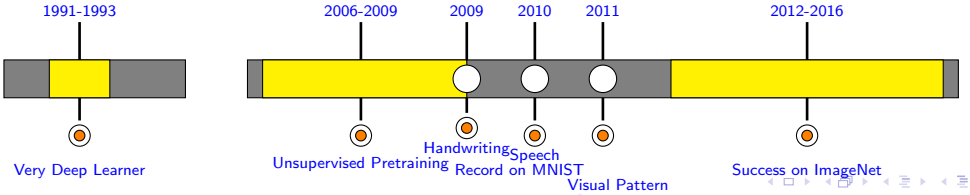
Winning more visual recognition challenges

Network	Error	Layers
AlexNet [6]	16.0%	8
ZFNet [7]	11.2%	8



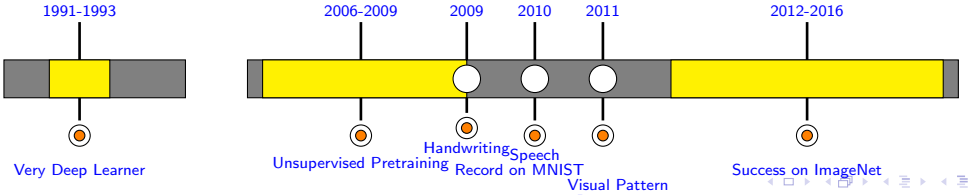
Winning more visual recognition challenges

Network	Error	Layers
AlexNet [6]	16.0%	8
ZFNet [7]	11.2%	8
VGGNet [8]	7.3%	19



Winning more visual recognition challenges

Network	Error	Layers
AlexNet [6]	16.0%	8
ZFNet [7]	11.2%	8
VGGNet [8]	7.3%	19
GoogLeNet [9]	6.7%	22



Winning more visual recognition challenges

Network	Error	Layers
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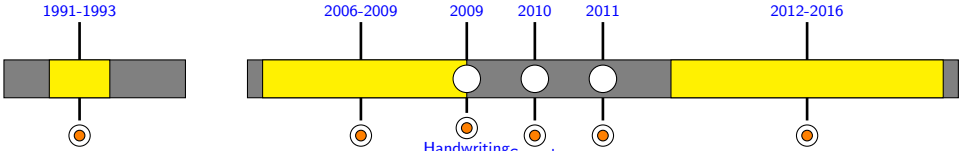
VGGNet [8]	7.3%	19
GoogLeNet [9]	6.7%	22
MS ResNet [10]	3.6%	152!!



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