

Bachelor-/Masterthesis

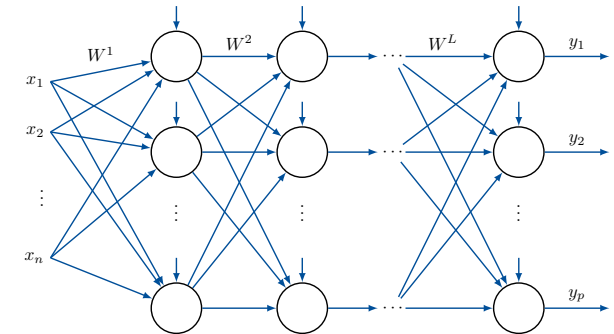
Feedforward Neural Network Training via Systems and Control Strategies

Feedforward Neural Networks (FNNs) are a fundamental class of artificial neural networks characterized by a simple, layered structure consisting of input layer, hidden layers with nonlinear activation functions, and output layers. Owing to the use of nonlinear activation functions, FNNs are well-known as universal function approximators. This property also makes FNNs a core block in more complex neural network architectures, e.g., convolutional neural networks and ChatGPT.

In practice, FNNs are most commonly trained using the backpropagation algorithm with first-order optimization methods, such as gradient descent (GD), mini-batch gradient descent, and adaptive methods like Adam. Despite their practical success, these methods still lack strong theoretical guarantees with respect to convergence and generalization. However, applications in systems and control engineering typically require a high degree of predictability and safety.

Related Bachelor-/Masterthesis topics include comparison of moving horizon estimation (MHE)-based training method with traditional backpropagation approaches, the development of MHE-based FNN training method with reduced computational complexity, and the improvement of the convergence speed for MHE-based FNN training method.

Requirements: knowledge on optimization and neural networks.



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