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This dissertation provides a detailed derivation of recent central limit theorems along with a new theorem for an integral Markov process which arises in the approximation of stochastic differential equations. This dissertation also investigated the noise-induced wave propagation through a chain of saddle node bifurcation on limit cycle using Voltage Control Oscillator Neuron Model described as $\dot{\theta}$-neural network. We have shown asymptotic convergence results for $\dot{\theta}$- neural network. This dissertation investigated continuous analog of a discrete Voltage Controlled Oscillator Neuron model ($\dot{\theta}$-neural network) of transmission line in neural networks. This dissertation propose a new approach to the numerical solution of a Fredholm integro–differential equations modelling neural networks. A solution strategy is based on the use of Gaussian quadrature rules for the infinite interval of integration and interpolation to a uniformly distributed grid on bounded subinterval. The effectiveness of the approach is illustrated by numerical experiments. This dissertation also extend the results of synaptically generated wave propagation through a network of connected excitatory neurons to a continuous model, defined by a new Fredholm Volterra integro-differential equation, which includes memory effects of the past in the propagation. Stochastic approximation and numerical simulations are discussed.