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ON DEEP LEARNING FOR OPTION PRICING IN LOCAL VOLATILITY MODELS

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Existence of exact closed-form formula for the price of derivative is a rather rare event in derivative pricing, therefore, to determine the price of derivative, one has to apply various numerical methods, including finite difference methods, binomial trees and Monte Carlo simulations. Alternatively, derivative prices can be approximated with deep neural networks.

We study pricing of European call and put options with deep neural networks under assumption that the volatility is a function of underlying asset price and time (option pricing in local volatility model). We apply recently introduced deep learning algorithm for solving partial differential equations (DGM algorithm) and investigate its performance when pricing options in local volatility models with known exact closed-form solutions.

We introduce enhancements to the commonly used neural network architecture and loss function of the option pricing problem to improve the accuracy of approximation and to ensure convergence of the neural network training. We consider enhanced deep learning algorithm for pricing options and its implementation with TensorFlow framework. Option pricing with deep neural networks and hardware-accelerated TensorFlow framework on macOS operating system is also discussed. Native hardware acceleration is based on Apple's ML Compute framework capabilities.

Summary

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