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	authors: Beatriz Salvador; Cornelis W. Oosterlee; Remco van der Meer **title**: Financial option valuation by unsupervised learning with artificial neural networks **publication_date**: 2020-05-25 12:05:36+00:00 **source**: SupportedSources.ARXIV **journal**: None **volume**: **doi**: **urls**: http://arxiv.org/pdf/2005.12059v1; http://arxiv.org/abs/2005.12059v1; http://arxiv.org/pdf/2005.12059v1 **id**: id-2560106934351702222 **abstract**: Artificial neural networks (ANNs) have recently also been applied to solve partial differential equations (PDEs). In this work, the classical problem of pricing European and American financial options, based on the corresponding PDE formulations, is studied. Instead of using numerical techniques based on finite element or difference methods, we address the problem using ANNs in the context of unsupervised learning. As a result, the ANN learns the option values for all possible underlying stock values at future time points, based on the minimization of a suitable loss function. For the European option, we solve the linear Black-Scholes equation, whereas for the American option, we solve the linear complementarity problem formulation. Two-asset exotic option values are also computed, since ANNs enable the accurate valuation of high-dimensional options. The resulting errors of the ANN approach are assessed by comparing to the analytic option values or to numerical reference solutions (for American options, computed by finite elements). **versions**:	**authors**: Meer, Remco van der; Oosterlee, Cornelis W.; Salvador, Beatriz **title**: Financial Option Valuation by Unsupervised Learning with Artificial Neural Networks **publication_date**: 2020-05-25 00:00:00 **source**: SupportedSources.CORE **journal**: Mathematics **volume**: **doi**: 10.3390/math9010046 **urls**: https://core.ac.uk/download/389430717.pdf **id**: id-4120261404320921985 **abstract**: [Abstract] Artificial neural networks (ANNs) have recently also been applied to solve partial differential equations (PDEs). The classical problem of pricing European and American financial options, based on the corresponding PDE formulations, is studied here. Instead of using numerical techniques based on finite element or difference methods, we address the problem using ANNs in the context of unsupervised learning. As a result, the ANN learns the option values for all possible underlying stock values at future time points, based on the minimization of a suitable loss function. For the European option, we solve the linear Blackâ€“Scholes equation, whereas for the American option we solve the linear complementarity problem formulation. Two-asset exotic option values are also computed, since ANNs enable the accurate valuation of high-dimensional options. The resulting errors of the ANN approach are assessed by comparing to the analytic option values or to numerical reference solutions (for American options, computed by finite elements). In the short note, previously published, a brief introduction to this work was given, where some ideas to price vanilla options by ANNs were presented, and only European options were addressed. In the current work, the methodology is introduced in much more detail **versions**:	DUPLICATES	277