



"سخنرانی‌های علمی"

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کامپیوتر

Learning Models in Scientific Computing

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Abstract

Scientific computing is a broad, multidisciplinary area that encompasses mathematics, computer science, and applications in science and engineering. This area makes use of the techniques of applied mathematics and computer science for the solution of scientific and engineering problems which are modeled by some differential equations. More recently, solving differential equations via learning methods emerged as a potentially new sub-field under the name of Scientific Machine Learning (SciML). This work advocates a fruitful synergy between machine learning and classical computational physics that has the potential to enrich both fields and lead to high-impact developments.

In this talk, we review some learning method such as support vector machines and neural networks that lead to have some numerical learning approaches. The support vector machine model for classification tasks can be modified for the regression problems. The least squares support vector machine is a modification of support vector machine model and we discuss about it for function estimation, known as LS-SVR, deals with regression problems. Neural networks as well as deep networks can also be used to efficiently approximate a function, derived from the universal approximation theorems. We introduce physics-informed neural networks, a new class of universal function approximators that is capable of solving two main classes of problems: data-driven solution and data-driven discovery of differential equations. Furthermore, a new approach which creates a bridge among machine learning models, spectral methods, and orthogonal polynomials to solve different mathematical models is presented and addressed on some problems.

Biography

Fatemeh Baharifard is a postdoc researcher at Institute for Research in Fundamental Sciences (IPM). She received her PhD in Computer Science from the School of Computer Science, IPM in 2018. Her research interests focus on learning methods for scientific computing, approximation algorithms and algorithmic graph theory.

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