Overcoming the curse of dimensionality through nonlinear stochastic algorithms

Fact Sheet

Project Information

**MONTECARLO**

Grant agreement ID: 101045811

DOI

[10.3030/101045811](10.3030/101045811)

Funded under

European Research Council (ERC)

Total cost

€ 1,351,528,00

EU contribution

€ 1,351,528,00

Coordinated by

UNIVERSITAT MUNSTER

Germany

Start date

1 July 2023

End date

30 June 2028

Project description

Nonlinear Monte Carlo type methods for high-dimensional approximation problems

In many relevant real-world problems it is of fundamental importance to approximately compute evaluations of high-dimensional functions. Standard deterministic approximation methods often suffer in this context from the so-called curse of dimensionality in the sense that the number of computational operations of the approximation method grows at least exponentially in the problem dimension. It is the key objective of the ERC-funded MONTECARLO project to employ multilevel Monte Carlo and stochastic gradient descent type methods to design and analyse algorithms which provably overcome the curse of dimensionality in the numerical approximation of several high-dimensional functions; these include solutions of
certain stochastic optimal control problems of some nonlinear partial differential equations and of certain supervised learning problems.

**Fields of science**

natural sciences > computer and information sciences > artificial intelligence > machine learning > supervised learning

natural sciences > mathematics > applied mathematics > statistics and probability

natural sciences > mathematics > pure mathematics > mathematical analysis > differential equations > partial differential equations

natural sciences > mathematics > applied mathematics > numerical analysis

**Keywords**

- information-based complexity
- IBC
- computational stochastics
- Monte Carlo method
- multilevel Monte Carlo method
- numerical analysis
- partial differential equation
- PDE
- backward stochastic differential equation
- BSDE
- stochastic optimal control
- stochastic partial differential equation
- SPDE
- stochastic gradient descent
- SGD
- machine learning
- artificial neural network
- ANN

**Programme(s)**

HORIZON.1.1 - European Research Council (ERC)  [MAIN PROGRAMME]

**Topic(s)**

ERC-2021-COG - ERC CONSOLIDATOR GRANTS

**Call for proposal**
ERC-2021-COG

See other projects for this call

Funding Scheme

HORIZON-ERC - HORIZON ERC Grants

Coordinator

UNIVERSITAT MUNSTER

Net EU contribution
€ 1 351 528,00

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Nordrhein-Westfalen > Münster > Münster, Kreisfreie Stadt

Links
Contact the organisation  Website  Participation in EU R&I programmes  HORIZON collaboration network

Other funding
€ 0,00

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