Docket #: S21-119

Augmenting High-dimensional Nonlinear Optimization with Conditional GANs

Stanford researchers have developed a method to use conditional generative adversarial networks (C-GANs) for solving highly complex optimization problems, e.g., with 10^{50} to 10^{80} dimensions. The C-GAN learns the underlying distribution of solutions found by an optimization algorithm, then generates further optimized solutions. Adversarial training enables the C-GAN model to learn the distribution of solutions and to generate more optimized solutions in a shorter time than that needed to run the original optimization algorithm. This regression-based method yields solutions with desired labels rather than a random set of optimization solutions. This method is specifically effective in augmenting heuristic optimization algorithms, which get stuck at local solutions, for solving high-dimensional and complex mathematical optimizations.

Photo description: Overview of the proposed algorithm for using a C-GAN to complement an optimization algorithm on a high-dimensional nonlinear optimization. Credit: Kalehbasti et al. arXiv (2021)

Stage of Research

- Software package

Applications

- Improve optimization for high-dimensional and complex problems
- Multivariate multiple regression

- Mathematical optimization

Advantages

- Trains on results of classic optimization methods and generates more optimized solutions
- Due to adversarial training, has much shorter runtime than classic optimization algorithms

Publications

- Kalehbasti et al. arXiv (2021) Augmenting High-dimensional Nonlinear Optimization with Conditional GANs
- Kalehbasti et al. GECCO (2021) Augmenting High-dimensional Nonlinear Optimization with Conditional GANs

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