数値解析・機械学習（今倉 暁）
Numerical analysis & machine learning (IMAKURA Akira)

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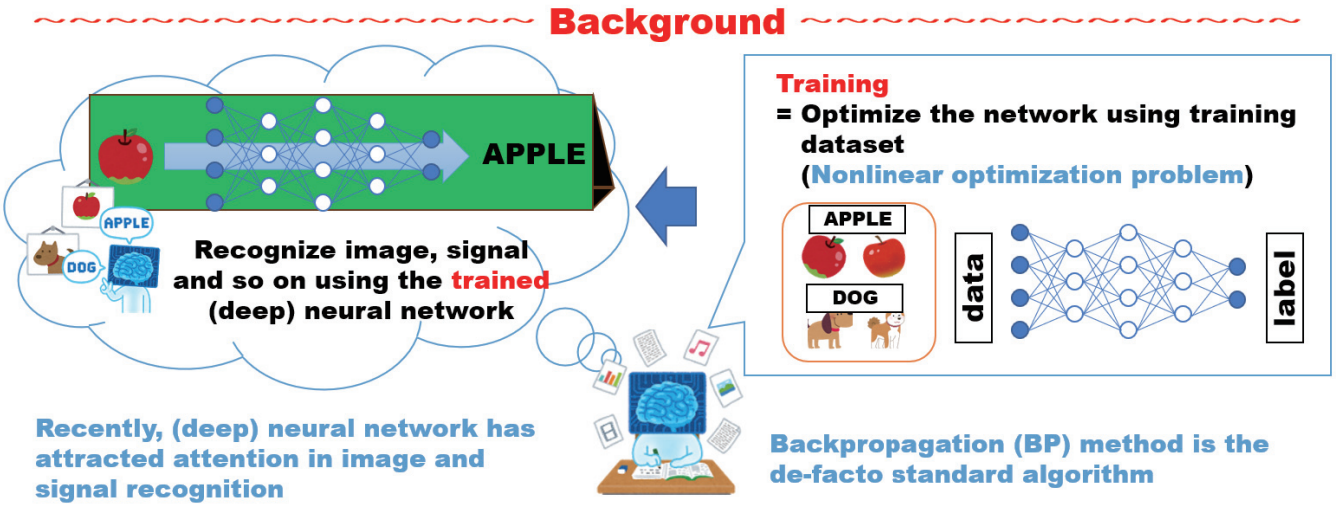
数値解析および行列計算を基盤とした機械学習アルゴリズムの開発

我々の研究グループでは、数値解析および行列計算を基盤とした機械学習アルゴリズムの開発を進めています。線形方程式や固有値問題などの基本的な行列計算は大規模数値シミュレーションの基盤として重要な役割を果たします。我々のグループではこれらの大規模行列計算に対する並列数値計算法の開発を行ってきました。これらの高性能行列計算法のノウハウを活かし、新しい機械学習・ディープラーニングアルゴリズムや複数機関が分散保持するデータに対する「データコラボレーション解析」を独自開発しており、医療データなど様々なデータ解析への応用を進めています。

Numerical analysis & machine learning based on matrix computations

Our research group has been developing numerical analysis and machine learning algorithms based on matrix computations. Matrix computation including linear systems and eigenvalue problems play an important role for large-scale numerical simulations. We have been investigating efficient and parallel numerical algorithms for computing such large-scale matrix computations. Recently, utilizing the know-how of these high-performance matrix computation techniques, we have originally developed new machine learning / deep learning algorithms and data analysis method called "Data Collaboration Analysis" for the data owned by multiple institutions in distributed manner. We also apply these methods for some real-world problems including medical data.



Achievements

- **We have been developing a new algorithm based on Non-negative Matrix Factorization (NMF) for optimizing the deep neural network.**
- **Compared with BP method, our NMF-based algorithm achieves**
  -- competitive recognition performance for benchmark problems.
  -- higher parallel efficiency.

[JST/ACT-I, Information and future] 2016.12-2018.3 and 2018.4-2020.3 (Acceleration Phase)
Development of a nonlinear nonnegative matrix factorization-based algorithm for deep neural networks