Group 1 :

Deep learning algorithm with the aid of numerical methods

- Speaker : Youngjoon Hong (Sungkyunkwan University)
- Abstract : Deep learning is a process by which machines learn to perform tasks based upon data. The exponential growth of machine learning models and the extreme success of deep learning have seen application across a multitude of disciplines. In this talk, a background of the neural network is described, and data-driven numerical methods are introduced. In many physical systems, the governing equations are known with high confidence, but direct numerical solution is prohibitively expensive. Often this situation is alleviated by writing effective equations to approximate dynamics below the grid scale. This process is often impossible to perform analytically and is often ad hoc. In this regard, we propose data-driven numerical approaches, a method that uses machine learning to systematically derive discretizations for continuous physical systems. If time permits, a robust neural network inspired by numerical methods is introduced to handle adversarial examples.

AORC Monthly Seminar

Jun. 25 (Fri), 2021 @ AORC (Online)

AORC 응용대수 및 최적화 연구센터
Applied Algebra & Optimization Research Center

AORC Monthly Seminar

- Object : Active collaboration within and between groups, fitting the aim of SRC

- Plan : Newly-joined researchers take pivotal roles.

- Operations Committee :

    - Jang Soo Kim (Committee Chair, Principal professor)
    - Bumtle Kang (Group 1), Juyoung Jeong (Group 2), Myunghyun Jung (Group 3)

Program

- 2:00 - 2:50 pm : Seonjeong Park (Jeonju University) & discussion

- 3:00 - 3:50 pm : Yeong-Wook Kwon (AORC Group 3) & discussion

- 4:00 - 4:50 pm : Youngjoon Hong (Sungkyunkwan University) & discussion

Abstracts

Group 1 :

Toric Richardson varieties of Catalan type

- Speaker : Seonjeong Park (AORC Group 1)
- Abstract : In this talk, we associate a complete non-singular fan with a polygon triangulation. Then the toric variety arising from a polygon triangulation is called of Catalan type. Toric varieties of Catalan type are Fano Bott manifolds, and they appear in toric Richardson varieties. We show that toric varieties of Catalan type are classified up to isomorphism in terms of unordered binary trees. This talk is based on joint work with Eunjeong Lee and Mikiya Masuda.

Group 3 :

Bounds for coefficients of cusp forms and extremal modular lattices

- Speaker : Yeong-Wook Kwon (AORC Group 3)
- Abstract : A lattice is a finitely generated $\mathbb{Z}$-submodule of full rank in Euclidean space $(\mathbb{R}^d, (\, , \,))$. An even unimodular lattice L is called extremal if the theta function of L is equal to the extremal modular form of weight $d/2$. When d is a multiple of 24, extremal lattices provide sphere packings with high packing density.

On the other hand, Jenkins and Rouse derived bounds for Fourier coefficients of cusp forms of level 1. As an application, they computed an upper bound for the largest possible dimension of an extremal lattice.

One generalization of even unimodular lattice is the notion of modular lattice. It is known that the theta function of a modular lattice of norm ℓ is a modular form for $\Gamma_0^+(\ell)$. Moreover, for $\ell = 2, 3, 4, 6, 7, 11, 14, 15, 23$, the concept of extemal lattice can be generalized to modular lattices of norm ℓ. But very little is known for extremal modular lattices. For example, we don't know the largest possible dimension of an extremal modular lattices. In this talk, we discuss one approach to this problem.