Group 2 :

Large-Scale Beamforming for Massive MIMO via Randomized Sketching

- Speaker : Hayoung Choi (AORC Group 2)
- Abstract : Massive MIMO system yields significant improvements in spectral and energy efficiency for future wireless communication systems. The regularized zero-forcing (RZF) beamforming is able to provide good performance with the capability of achieving numerical stability and robustness to the channel uncertainty. However, in massive MIMO systems, the matrix inversion operation in RZF beamforming becomes computationally expensive. To address this computational issue, we shall propose a novel randomized sketching-based RZF beamforming approach with low computational complexity. This is achieved by solving a linear system via randomized sketching based on the preconditioned Richard iteration, which guarantees high-quality approximations to the optimal solution. We theoretically prove that the sequence of approximations obtained iteratively converges to the exact RZF beamforming matrix linearly fast as the number of iterations increases. Also, it turns out that the system sum-rate for such a sequence of approximations converges to the exact one at a linear convergence rate. Our simulation results verify our theoretical findings.

AORC Monthly Seminar

Jan. 28 (Fri), 2022 @ AORC (Online)

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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 :
    - Nhan Phu Chung (Committee Chair, Principal professor)
    - Bumtle Kang (Group 1), Juyoung Jeong (Group 2), Myunghyun Jung (Group 3)

Program

- 2:00 - 2:50 pm : Jaeseong Oh (AORC Group 1) & discussion
- 3:00 - 3:50 pm : Kyung seung Lee (AORC Group 3) & discussion
- 4:00 - 4:50 pm : Hayoung Choi (AORC Group 2) & discussion

Abstracts

Group 1 :

Identities for Macdonald polynomials

- Speaker : Jaeseong Oh (AORC Group 1)
- Abstract : In this talk, I will propose various conjectures concerning Macdonald polynomials and explain their relationship. I will prove one of the conjectures named 'stretching symmetry' for a one-row partition in three ways: using LLT polynomials, using the coinvariant ring and using (dual) Pieri formula. This is based on two joint works with Seung Jin Lee and Brendon Rhoades and with Donghyun Kim and Seung Jin Lee.

Group 3 :

Basis for the Minus Space of Weakly Holomorphic Modular Forms in Certain Level Cases

- Speaker : Kyung Seung Lee (AORC Group 3)
- Abstract : Modular forms appear in many ways in number theory and they are presently at the center of an immense amount of research activity. Among them, the set of weakly holomorphic modular forms is known as an infinite dimensional vector space. However, there are few studies which focus on the basis of weakly holomorphic modular form spaces. Our aim is to find the basis of the weakly holomorphic modular form spaces $M_k^!(\Gamma_0(p))$ and to improve our understanding of the modular form by calculating the basis explicitly. Works by Chang Heon Kim and SoYoung Choi (2013) gave us the basis of the space $M_k^!(\Gamma_0^+(p))$ when p is a prime number for which the genus of $\Gamma_0^+(p)$ is zero. We extended this result by defining the "minus space $M_k^{!-}(\Gamma_0(p))$" which is a subspace of $M_k^!(\Gamma_0(p))$ such that $M_k^!(\Gamma_0(p)) = M_k^!(\Gamma_0^+(p)) \oplus M_k^{!-}(\Gamma_0(p))$, and finding the canonical basis of $M_k^{!-}(\Gamma_0(p))$. As a result, we get the basis of $M_k^!(\Gamma_0(p))$, when the genus of $\Gamma_0^+(p)$ is 0. Furthermore we have investigated arithmetic properties of weakly holomorphic modular form spaces.