Group 2 :

Some log and weak majorization inequalities in Euclidean Jordan algebras

- Speaker : Juyoung Jeong (AORC Group 2)

- Abstract : Motivated by Horn's log-majorization (singular value) inequality $s(AB) \underset{log}{\prec} s(A) * s(B)$ and the related weak-majorization inequality $s(AB) \underset{w}{\prec} s(A) * s(B)$ for square complex matrices, we consider their Hermitian analogs $\lambda(\sqrt{A}B\sqrt{A}) \underset{log}{\prec} \lambda(A) * \lambda(B)$ for positive semidefinite matrices and $\lambda(|A \circ B|) \underset{w}{\prec} \lambda(|A|) * \lambda(|B|)$ for general (Hermitian) matrices, where $A \circ B$ denotes the Jordan product of A and B and $*$ denotes the componentwise product in $\mathcal{R}^n$. In this talk, we extended these inequalities to the setting of Euclidean Jordan algebras in the form $\lambda\big(P_{\sqrt{a}}(b)\big) \underset{log}{\prec} \lambda(a) * \lambda(b)$ for $a, b \geq 0$ and $\lambda\big(|a \circ b|\big) \underset{w}{\prec} \lambda(|a|) * \lambda(|b|)$ for all a and b, where P_u and $\lambda(u)$ denote, respectively, the quadratic representation and the eigenvalue vector of an element u. In the form of applications, we prove the generalized Hölder type inequality $||a \circ b||_p \leq ||a||_r \, ||b||_s$, where $||x||_p := ||\lambda(x)||_p$ denotes the spectral p-norm of x and $p, q, r \in [1, \infty]$ with $\frac{1}{p} = \frac{1}{r} + \frac{1}{s}$.

Group 3 :

From Partial Differential Equations involving the energy to Control theory and Optimization

- Speaker : Woocheol Choi (AORC Group 3)

- Abstract : In this talk, I will introduce my research topics, which have been extended to Control theory and Optimization from PDES involving the energy. In the first part I will deliver a brief introduction on these topics and explain the mathematical structures that these topics share. In the second part I will introduce my current research projects on these topics with applications in Engineering.

AORC Monthly Seminar

June 25 (Thu), 2020 @ Zoom Meeting

SRC Funded by NRF of Korea

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 :
  - Soonhak Kwon (Committee Chair, Principal professor)
  - Bumtle Kang (Group 1), Muralitharan Krishnan (Group 2), Kyoungmin Kim (Group 3)

Program

- 2:00 - 2:40 pm : Sun Kim (AORC Group 1) & discussion
- 2:50 - 3:30 pm : Minho Song (AORC Group 1) & discussion
- 3:40 - 4:20 pm : Juyoung Jeong (AORC Group 2) & discussion
- 4:30 - 5:10 pm : Woocheol Choi (AORC Group 3) & discussion
- 5:30 - 7:00 pm : Dinner (Aboce restaurant)

Abstracts

Group 1 :

Bressoud's Conjecture

- Speaker : Sun Kim (AORC Group 1)
- Abstract : In 1980, D. M. Bressoud obtained an analytic generalization of the Rogers-Ramanujan-Gordon identities. He then tried to establish a combinatorial interpretation of his identity, which specializes to many well-known Rogers-Ramanujan type identities. He proved that a certain partition identity follows from his identity in a very restrictive case and conjectured that the partition identity holds true in general. In this paper, we prove Bressoud's conjecture for the general case by providing bijective proofs.

Group 1 :

Geometric graphs and Riordan group theory

- Speaker : Minho Song (AORC Group 1)
- Abstract : A Riordan matrix $(g(z), f(z))$ is an infinite lower triangular array determined by a pair of formal power series $g, f \in \mathbb{R}[[z]]$ in which its kth column has the generating function $g(z)f(z)^k$ where $k \in \mathbb{N}_0$, $g(0) \neq 0$, $f(0) = 0$ and $f'(0) \neq 0$. A geometric graph on a finite set $\mathcal{S} \subset \mathbb{R}^2$ of points is a graph with vertex set $\mathcal{S}$ whose edges are straight-line segments with endpoints in $\mathcal{S}$. In this talk, we introduce various geometric graphs and show how to count them via Riordan group thoery. After that, an open problem of finding production matrices for bipartite graphs with point sets in convex position will be presented.
