Hypercontractive inequalities and their extensions

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Hypercontractive inequalities are a class of functional inequalities that strengthen the well-known Hölder inequalities. These inequalities have found many applications in functional analysis, probability theory, discrete Fourier analysis, theoretical computer science, etc., especially in dealing with extremal problems in the geometry of high-dimensional spaces. In this talk, we will introduce hypercontractive inequalities and their extensions, including the information-theoretic characterization of hypercontractive inequalities, a non-linear strengthening of hypercontractive inequalities, and the opposite version of hypercontractive inequalities, called anti-contractive inequalities. This talk is largely based on the works [1–3].

References

[1] Lei Yu, Venkat Anantharam, and Jun Chen. Graphs of Joint Types, Noninteractive Simulation, and Stronger Hypercontractivity. *IEEE Transactions on Information Theory* **70** (2024) 2287 - 2308.

[2] Lei Yu, Strong Brascamp-Lieb Inequalities. *arXiv preprint arXiv:2102.06935* (2021).

[3] Lei Yu, Rényi Resolvability, Noise Stability, and Anti-contractivity. *arXiv preprint arXiv:2402.07660* (2024).