

Math 595-Banach spaces

Instructor/time: Marius Junge, MWF 11-11.50am

Prerequisites: Real Analysis 540

Text: Jameson, G. J. O. Summing and nuclear norms in Banach space theory. London Mathematical Society Student Texts, 8. Cambridge University Press, Cambridge, 1987.

Course description: One of most powerful tools in the theory of Banach spaces is the so-called trace duality. This is a duality theory for linear maps on Banach spaces, and has been used in many occasions to detect properties of the underlying Banach spaces. We will illustrate this idea considering probabilistic aspects in the theory of Banach spaces, the notion of type and cotype, and the theory of p -summing maps.

In the second part we will consider similar problems in the category of operator spaces, that are quantized Banach spaces with an additional matrix structure. The best way is to understand these spaces as subspace of C^* -algebras. Our main intention here is to develop a calculus which is parallel to the classical Banach space theory. We will give applications to classical information and quantum information theory at the end.

We will use material from different sources, buying a textbook might not be necessary.

Additional material: 1) Pisier, G.: Factorization of linear operators and geometry of Banach spaces. CBMS Regional Conference Series in Mathematics, 60.

2) Pisier, G.: Probabilistic methods in the geometry of Banach spaces. Probability and analysis (Varenna, 1985), 167–241, Lecture Notes in Math., 1206, Springer, Berlin, 1986.

3) Pisier, G.: Operator spaces. Handbook of the geometry of Banach spaces, Vol. 2, 1425–1458, North-Holland, Amsterdam, 2003.

4) Tomczak-Jaegermann, N.: Banach-Mazur distances and finite-dimensional operator ideals. Pitman Monographs and Surveys in Pure and Applied Mathematics, 38. Longman Scientific & Technical, Harlow.