Class 259B, Winter 2020: *Classification results for* II_1 *factors*
Instructor: Sorin Popa
Meetings: MWF 3-4pm in MS5118.

A central problem in von Neumann algebras is the classification of II_1 factors $L(\Gamma)$, $L(\Gamma \curvearrowright X)$ arising from countable groups Γ and their measure preserving actions $\Gamma \curvearrowright X$ on probability spaces (X, μ). These algebras tend to forget their building data, for instance, by a Theorem of Connes in [1], all II_1 factors $L(\Gamma), L(\Gamma \curvearrowright X)$ with Γ amenable are known to be isomorphic to the hyperfinite II_1 factor R. But for non-amenable groups the situation can be quite rigid, for example the II_1 factors associated with Bernoulli actions $\Gamma \curvearrowright X = [0,1]^\Gamma$ of property (T) groups Γ are isomorphic iff the groups Γ are isomorphic [3].

We'll first prove Connes Theorem in [1], using an approximation technique in [2]. We'll then develop some tools known as *deformation-rigidity theory*, that will allow us to prove the above rigidity result [3].

Some familiarity with Operator Algebra and II_1 factors (255A&B, 259A) will be assumed (one can use https://www.math.ucla.edu/ popa/Books/IIun-v14.pdf to fill in the gaps). All registered students will get an A, but will have to make presentations in the Participating Seminar 290I Mondays 4-5:30 in MS5137.

[1] A. Connes: *Classification of injective factors*, Ann. Math., **104** (1976), 73-115.
[2] S. Popa: *A short proof that injectivity implies hyperfiniteness for finite von Newmann algebras.* J. Operator Theory, **16** (1986), 261-272.
[3] S. Popa: *Strong Rigidity of* II_1 *Factors Arising from Malleable Actions of w-Rigid Groups* I, II, Invent. Math., **165** (2006), 369-408, 409-453.