

**November 30:** Ali Altuğ (MIT), “Interactions between the discrete and geometric parts of the trace formula.”

Let  $G$  be a semisimple group over a number field  $F$ . A central problem in number theory is to understand the structure of those automorphic representations of  $G$  that occur discretely in the spectrum of  $L^2(G(F)\backslash G(\mathbb{A}_F))$ . The celebrated Arthur-Selberg trace formula contains most of the information about the discrete spectrum, however to extract it for applications one needs to isolate the contribution of the discrete spectrum in the so-called “discrete part” of the trace formula, which consists of all the distributions that occur discretely in the trace formula (there are more terms in the discrete part than just the trace of the operator on the discrete spectrum!). Concretely, this amounts to identifying the contributions of those distributions in the discrete part (excluding the trace of the operator on the discrete spectrum itself) in the geometric side of the trace formula. In this talk I will introduce the problem and, in particular, the discrete part of the trace formula. I will discuss the origins of the additional terms appearing in the discrete part in the context of  $GL(2)$ , and show how one may isolate them in the geometric side of the trace formula. If time permits I will also talk about how the structure *may* work for  $GL(n)$ . Most of the problems and results that I will discuss are either directly related to or motivated by beyond endoscopy and recent problems suggested by Arthur.