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Local Multiplicity One Theorem for GL_n and L-functions

In 1966, Andre Weil remarked that the results of the local theory in Tate's thesis can be viewed as stating that the space $\text{Hom}_{k^\times}(C_c^\infty(k), \chi)$ is one-dimensional for every smooth character χ of k^\times . Moreover, the origin of the generator of $\text{Hom}_{k^\times}(C_c^\infty(k), \chi)$ differs depending on the L-function of χ . Weil, then, asked for a generalization of such a result to $GL_n(k)$. A partial answer has been provided by Godement-Jacquet, and Mœglin, Vignéras, Waldspurger using zeta-integrals. In this talk, I will revisit this problem and discuss the connection between L-functions and the local multiplicity one theorem for $GL_2(k)$ in particular, and some partial results for $GL_n(k)$.