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Character sheaves over local fields: the example $\mathrm{SL}(2)$

Although character sheaves were devised with representations of finite groups of Lie type in mind, character sheaves are perfectly well defined for reductive algebraic groups over any algebraically closed field. Nevertheless, the relation between character sheaves of an algebraic group G over an algebraic closure of a field K and characters of representations of $G(K)$ is well understood only when K is a finite field and when K is the field of complex numbers.

In joint work with Hadi Salmasian, we consider the case when K is a non-Archimedean local field and explain how to match certain character sheaves of an unramified connected reductive algebraic group G with virtual representations of $G(K)$. In this talk I will illustrate this connection by treating the example $G = \mathrm{SL}(2)$ over the p-adic field $K = \mathbb{Q}_p$. In the process we will see lovely relations between certain character sheaves of $\mathrm{SL}(2)$ over $\bar{\mathbb{Q}}_p$ and L-packets of admissible representations of $\mathrm{SL}(2, \mathbb{Q}_p)$.

Joint work with Hadi Salmasian.