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Some natural extensions of the parking space

We construct a family of S_n -modules indexed by $c \in \{1, \dots, n\}$ with the property that upon restriction to S_{n-1} they recover the classical parking function representation of Haiman. The construction of these modules relies on an S_n -action on a set that is closely related to the set of parking functions. We compute the characters of these modules and use the resulting description to classify them up to isomorphism, and compute the number of isomorphism classes. Based on empirical evidence, we conjecture that when $c = 1$, our representation is h -positive and is in fact the (ungraded) extension of the parking function representation constructed by Berget and Rhoades.

Berget and Rhoades asked whether the permutation representation obtained by the action of S_{n-1} on parking functions of length $n - 1$ can be extended to a permutation action of S_n . We answer this question in the affirmative, by realizing our module in two different ways.

This is joint work with Robin Sulzgruber and Vasu Tewari.