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*Nested Recursions, Simultaneous Parameters and Tree Superpositions*

We apply a tree-based methodology to solve certain families of nested recursions of the form  $R(n) = \sum_{i=1}^k R(n - a_i - \sum_{j=1}^p R(n - b_{ij}))$ , where  $k$  and  $p$  denote "arity" and "order", respectively. Our method associates such recursions with counting leaves of certain infinite labelled trees. We characterize some recursions within  $R(n)$  by introducing "simultaneous parameters" that appear both within the recursion and that also specify structural properties of the corresponding tree. We extend and unify results concerning two well known families of arity  $k = 2$ , order  $p = 1$  recursions. We also solve new recursion families for arity  $k = 2$  and general order  $p$  by applying tree superpositions of simpler trees.