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Covering Perfect Hash Families with Index Greater Than One

Given positive integers N, k, t and a prime power q, let A be an $N \times k$ array whose symbols are column vectors from $\mathbb{F}_q^t$. The entry in row r and column c of A is denoted by $\mathbf{v}_{r,c}$. Suppose that $\{\gamma_1, \ldots, \gamma_t\}$ is a set of distinct column indices. Row r is $covering$ (in A) for $\{\gamma_1, \ldots, \gamma_t\}$ if the $t \times t$ matrix $[\mathbf{v}_{r,\gamma_1} \cdots \mathbf{v}_{r,\gamma_t}]$ is nonsingular over $\mathbb{F}_q$. Then A is a *covering perfect hash family*, CPHF$_\lambda(N; k, q, t)$, if there are at least λ covering rows for each way to choose $\{\gamma_1, \ldots, \gamma_t\}$. When $\lambda = 1$, such CPHFs have been explored as a means to generate the smallest known covering arrays of strengths 3 through 6 having hundreds or thousands of columns, when the number of symbols is a (small) prime power. Motivated by applications that require additional coverage in testing, in this talk we explore the construction of CPHFs with $\lambda > 1$.