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Encoding the vertices of a hyper cube

A concept class $\mathcal{C}$ over a finite domain $\mathcal{X}$ is a subset of the powerset of $\mathcal{X}$. The elements of $\mathcal{C}$ are called concepts. A concept class $\mathcal{C}$ over a domain $\mathcal{X}$ is said to shatter a set $A \subseteq \mathcal{X}$ if $\forall\ a \subseteq A, \exists\ c \in \mathcal{C}$ such that $a = A \cap c$. The VC-dimension of $\mathcal{C}$, denoted as $VCD(\mathcal{C})$, is defined as the cardinality of the largest subset of $\mathcal{X}$ that $\mathcal{C}$ shatters. A concept class $\mathcal{C}$ over a domain $\mathcal{X}$ with $VCD(\mathcal{C}) = d$ is called a maximum concept class if it attains equality in the well-known upper bound $|\mathcal{C}| \leq \sum_{i=0}^{d} \binom{|\mathcal{X}|}{i}$ due to Sauer, Shelah, and Perles. The subset teaching dimension of a concept class $\mathcal{C}$ measures the difficulty to encode the concepts of $\mathcal{C}$ in terms of their elements in a certain way. In this talk, we prove that every maximum concept class $\mathcal{C}$ with $VCD(\mathcal{C}) = 2$ has subset teaching dimension equal to 2. This result is extended to higher VC-dimension for a particular kind of maximum concept class known as Simple Linear Arrangement. This is joint work with Sandra Zilles.