Random Sampling in Shift Invariant Spaces

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The set of sampling in a shift invariant space plays an important role in signal processing and has many applications. In this talk, we consider the problem when some randomly chosen samples $X = \{x_j : j \in J\}$ forms a set of sampling in a shift invariant space. That is, when the inequality of the form

$$c_p \|f\|_{L^p(\mathbb{R}^d)}^p \leq \sum_{x_j \in X} |f(x_j)|^p \leq C_p \|f\|_{L^p(\mathbb{R}^d)}^p$$

holds uniformly for all functions $f$ in a shift invariant space, where $c_p$ and $C_p$ are positive constants ($1 \leq p \leq \infty$). We prove that with overwhelming probability, the above sampling inequality holds for certain compact subsets of the shift invariant space when the sampling size is sufficiently large.