CoSaMP Algorithm

The Compressed Sampling Matching Pursuit (CoSaMP) algorithm is a type of greedy algorithm that recovers the signal of interest iteratively. The goal of the greedy algorithm is to solve the equation (1) without an exhaustive search of the atoms in the sensing matrix. Instead, it searches the atoms greedily based on the set of indices it acquired and update the solution iteratively.



CoSaMP algorithm starts with an initial null approximation α = 0. It iteratively per- forms five major steps as described below:

1. **Identification:** each iteration the algorithm forms an intermediary of the residual from the present samples and identify the largest component of the intermediary.
2. **Support Union:** The algorithm will skip this step during the first iteration. On the following iteration, it combines the support of present signal estimation and the newly identified elements, that is T = Ω ⋃ supp (αi-1)
3. **Estimation:** This is the core step of the CoSaMP algorithm. In this step the algorithm will solve the matrix inversion problem to estimate the original signal on the support set T. This step required to solves the Moore-Penrose inverse problem. The sub-matrix ΦT is constructed by concatenating the atoms of sensing matrix Φ according to the index of the support set T.
4. **Pruning:** The algorithm will generate the new estimation by possessing only the largest component in the least-square signal estimation.
5. **Sample Update:** Finally, the samples and residuals are updated.

These mentioned steps of the algorithm will run until the stopping condition is satisfied.