Through the Lens of Sequence Submodularity

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- Several applicative problems involve the maximization of a recursive sequence function with the following structure:

  $$F_g(S) = \sum_{k=1}^{n} g(S_k)\left[F(S|_1^k) - F(S|_1^{k-1})\right] \text{ for } S = (S_1, \ldots, S_n) \in \mathbb{H}(\Omega)$$

  where Ω is a set, $\mathbb{H}(\Omega)$ set of sequences on Ω, $g : \Omega \to \mathbb{R}^+$ any function, $F : \mathbb{H}(\Omega) \to \mathbb{R}$ permutation invariant, monotonic, submodular function
- Standard greedy algorithm, which adds new elements to the right side of the sequence, does not yield strong theoretical guarantees for $F_g(S)$
- We introduce a generalized greedy algorithm that allows a new element to be added in any position among the elements already in the sequence
- The generalized greedy algorithm ensures finding solutions that are $(1 - \frac{1}{e})$ from the optimal
- Experiments on a real-world domain (search & tracking) directly show the power of the new algorithm