1116-05-1662   **William Kuszmaul*** (`kuszmaul@stanford.edu`), 37 Vaille Ave, Lexington, MA 02421. *30,000 Conjectures on Pattern-Avoidance.*

We introduce the first provably fast algorithm for generating $S_{\leq n}(\Pi)$, the permutations of sizes 1 through n avoiding a given set of patterns $\Pi \subseteq S_k$. Our algorithm runs in time $O(|S_{\leq n-1}(\Pi)| \cdot nk)$. In contrast, the best previous algorithms, based on generate-and-check, take exponential time per permutation analyzed.

Using our algorithm, we generate $|S_5(\Pi)|, \ldots, |S_{16}(\Pi)|$ for each $\Pi \subseteq S_4$, and analyze OEIS matches for $|\Pi| > 4$. This yields thousands of novel pattern-avoidance conjectures, fourteen of which we present.

Surprisingly, our algorithm extends to an $O(n!k)$-time and $O(n^{k+1})$-space algorithm for counting Π-patterns in each permutation in S_n.

Our data and implementations of our algorithms can be found at `https://github.com/williamkuszmaul/patternavoidance`. (Received September 21, 2015)