1093-68-9 **A Rao*** (angie.rao@gmail.com), **Y Liu**, **Y Feng** and **J Shen**. *Bounds on the Number of Huffman and Binary-Ternary Trees.* Preliminary report.

Huffman coding is a widely used method for lossless data compression because it optimally stores data in Huffman trees based on how often the characters occur. An n-ary Huffman tree is a connected, cycle-free graph where each vertex has either n "children" vertices connecting to it, or 0 children. Vertices with 0 children are called *leaves*. We let $h_n(q)$ represent the number of n-ary Huffman trees with q leaves. We use a recursive method to generate bounds on $h_n(q)$ and get $h_2(q) \approx (0.1418532)(1.7941471)^q + (0.0612410)(1.2795491)^q$ for $n = 2$. This matches the best results achieved by Elsholtz et al. in 2011. Our approach reveals patterns in Huffman trees that we extended to Binary-Ternary (BT) trees we created, opening a new door in data compression. Our study of BT trees paves the way for designing data-specific trees, minimizing possible wasted storage space from Huffman coding. We prove a recursive formula for the number of BT trees with q leaves and provide further proofs to reach numeric bounds. Our discoveries have broad applications in computer data compression. These results also improve graphical representations of protein sequences that facilitate in-depth genome analysis used in researching evolutionary patterns. (Received March 24, 2013)