This talk emphasizes the usefulness and the flexibility of optimization for finding optimized digital signal processing algorithms for various constrained and unconstrained optimization problems. This is illustrated by optimizing algorithms in six different practical applications. The first four applications include optimizing nearly perfect-reconstruction filter banks subject to the given allowable errors, minimizing the phase distortion of recursive filters subject to the given amplitude criteria, optimizing the amplitude response of pipelined recursive filters, and optimizing a modified Farrow structure with an adjustable fractional delay. In the last two applications, optimization algorithms are used as intermediate steps for finding the optimum discrete values for coefficient representations for various classes of lattice wave digital (LWD) filters and linear-phase finite impulse response (FIR) filters.

For the last application, linear programming is utilized, whereas for the first five ones the following two-step strategy is applied. First, a sub-optimum solution is found using a simple systematic design scheme. Second, this start-up solution is improved by using a general-purpose nonlinear optimization algorithm, giving the optimum solution. Three alternatives are considered for constructing this general-purpose algorithm.