Recent interest in machine-learning based methods has produced many sophisticated models for performance modeling and optimization. These models tend to be sensitive to architectural parameters and are most effective when trained on the target platform. Training of these models, however, is a fairly involved process and requires knowledge of statistics and machine learning that the end users of such models may not possess. This poster presents a framework for automatically generating machine-learning based performance models. Leveraging existing open-source software, we develop a tool-chain that provides automated mechanisms for sample generation, dynamic feature extraction and selection, data labeling, validation and model selection. The resulting models yield high prediction accuracy and can deliver improved performance and energy efficiency in many different contexts. We present summary experimental results that demonstrate the utility and efficiency of the system.