Introduction:  
  
Operating profitably in the current market, requires the capability to adapt to increasingly individualized customer demands, strict adherence to deadlines, and expected quality requirements. Failure to provide the requested services on time or with unacceptable quality deficit will result in a loss of business and lead to being squeezed out of the market.  
In the current state of “Industrie 4.0” and Big-Data, multiple opportunities arise to improve speed and accuracy in the production environment. Adaptive process scheduling, for example, can lead to optimal usage of machinery and adherence to the production schedule. Both of those effects will benefit the costumer, as the product will be manufactured faster and cheaper. When it comes to creating a product for the customer, the production part is only one of the aspects, where the new application possibilities of data-driven algorithms can support the manufacturer. Data-driven algorithms can support the designer to conceptualize more effective mechanisms or help the machinist to react to changing machining parameters, like wear and tear on cutting tools.  
Quality control is one of the sections of the production chain where those algorithms can support the identification of rejects or suggest improvements for the production process. The significant advancements in computer science, especially in Machine Learning (ML), can be adapted and transformed to the specific needs of the quality control department, to achieve higher precision rate and efficiency in identifying faults in the final product, than could be done with human labor.  
Machine learning contains those algorithms that are capable of solving tasks without explicitly being programmed to do so. They are based on pattern recognition and their performance improves as more data is available. This property proves them advantageous as more and more data is available from the increasingly digitized production environment. One of the commonly used algorithms in ML are Neural Networks (NNs), which find use in Supervised Learning, Unsupervised Learning and Reinforcement Learning. The main advantage of NNs is that they can be deployed in a multitude of ways, specifically optimized for their intended use cases.  
This report will provide an exemplary use-case for classifying welds in the domain of laser beam welding. This process can easily be applied to any other classification problem just by adapting a few variables. From a given set of data, multiple preprocessing and feature extraction steps are performed. This procedure follows the general KDD-process (Knowledge Discovery in Databases).  
The found features serve as decision bases for the algorithms to classify the welds as “OK” and “not OK”.