Statistical Control of Shewhart Control Charts
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Data availability has increased immensely in the past years, and so has the need for data analysis techniques. A key point of interest is often to use process data to detect changes in the underlying process. This applies to numerous environments, ranging from standard manufacturing processes to intelligence agencies using complex network data to detect possible terrorist cells, or even our own body. Even though many processes may appear constant at first glance, the corresponding process data will vary over time. Certain variations are inherent to the process under consideration, and pinpointing the exact cause of these differences is often very difficult, if not impossible.

However, special events or disturbances can change the underlying process, bringing a different source of variation. If no corrective actions are taken, this may lead to undesirable and potentially harmful consequences, depending on the circumstances. The field of statistical process monitoring (SPM) provides tools to detect process changes by monitoring data streams. This dissertation revolves around the design of one of such tools, namely the Shewhart control chart. When constructing a control chart, process parameters have to be estimated. Because different practitioners obtain different samples, their estimates will differ as well. This leads to varying control chart performance across different practitioners. In this dissertation we derive new control chart limits that take this effect into account.