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Generative AI for Quality Engineers – two use cases: image-based quality inspection and text classification

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Inez Zwetsloot is an associate professor in the Department of Business Analytics, University of Amsterdam. Her research interests include quality of AI, statistical process monitoring and data science. She received the Feigenbaum Medal (2022) from ASQ and the young statistician award from ENBIS (2021). She is director of the AI4Business Lab at UvA EB.

Generative AI is playing an increasingly important role in many professions, including the Quality Engineering profession. This talk explores a two papers in which we experiment with GenAI and various QE tasks.

First, we introduces a simplified approach to image-based quality inspection in manufacturing using OpenAI's CLIP (Contrastive Language-Image Pretraining) model adapted for fewshot learning. Our results show that CLIP can achieve high classification accuracy with relatively small learning sets (50-100 examples per class) for single-component and texture-based applications. However, the performance degrades with complex multi-component scenes. We provide a practical implementation framework that enables quality engineers to quickly assess CLIP's suitability for their specific applications before pursuing more complex solutions.

Second, we introduce a framework for evaluating consistency in large language model (LLM) binary text classification, addressing the lack of established reliability assessment methods. Our case study examines financial news sentiment classification
across 14 LLMs (including claude-3-7-sonnet, gpt-4o, deepseek-r1, gemma3, llama3.2, phi4, and command-r-plus), with five replicates per model on 1,350 articles. Models demonstrated high intra-rater consistency, achieving perfect agreement on 90–98% of examples, with minimal differences between expensive and economical models from the same families. Our framework provides systematic guidance for LLM selection, sample size planning, and reliability assessment, enabling organizations to optimize resources for classification tasks.

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All are welcome