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# Development of a machine-learning (ML) image analysis tool for robotic glass melting

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## Abstract

Automated glass melting requires real-time process control to avoid problems such as melt overflow. To achieve this, a machine vision camera is placed directly above the furnace at a safe distance for live monitoring and data acquisition. A state-of-the-art pre-trained deep learning ResNet34 model together with a mathematical algorithm based on grey-scale brightness value histograms of the acquired live image were implemented to identify the melt process by assignment to granules, foaming and clear melt stages of multiple batches with different compositions in the sodium boroaluminosilicate (NABS) system. The validation dataset achieved 90% accuracy and 0.4 validation loss. The work is part of the joint research "GlasDigital: Data-driven workflow for accelerated exploration of glass" in Germany.

**Keywords:** Deep learning, Digital twin, Autonomous glass melting, Transfer learning

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