Contribution ID: **131** Type: **Oral Presentation**

Explainable AI for Property Prediction in Scrap-Based Steel Production: A Public Data Implementation

Thursday 9 October 2025 14:20 (20 minutes)

The global shift towards greener practices has created significant challenges for the material manufacturing sector. One key example is the need to increase the use of scrap metals in production to reduce the strain on natural resources and promote a circular economy. However, using scrap metals inevitably introduces impurities, which can greatly affect the properties of the final material. This risk has resulted in resistance within the industry to adopt scrap metals widely.

To promote circularity in material manufacturing, it is crucial to improve the industry's understanding, confidence, and ability to work with scrap metals. One way to achieve this is by developing an AI tool that can assist in material production, helping users make informed decisions to mitigate the impact of impurities. This tool would rely on a deep understanding of the relationships between material properties, microstructure, processing methods, and composition. As with any AI system, the quality and quantity of training data are critical. Therefore, multiple datasets are used to investigate those relationships after careful data pre-processing.
Building upon my previous work, which successfully utilized industrial data to predict material properties through machine learning and explainable AI techniques, this research transitions to publicly accessible datasets. I demonstrate a comprehensive data pipeline for predicting mechanical properties of steel using chemical composition and process parameters. While my analysis focuses on public datasets, the methodology is readily transferable to industrial environments when appropriately adapted. Furthermore, I examine the integration of microstructural data to deepen our understanding of the underlying processes.

Primary author: MILLNER, Gerfried (School of Material Science and Engineering, Nanyang Technological University)

Presenter: MILLNER, Gerfried (School of Material Science and Engineering, Nanyang Technological University)

Session Classification: Digital transformation - Steelmaking Continuos Casting

Track Classification: Digital tranformation