DIGITAL TRANSFORMATION FORUM FOR THE STEEL INDUSTRY

REGISTRATION INCLUDES
Reception Monday and Tuesday, breakfast and lunch Tuesday and Wednesday, and online access to presentations.

HOTEL ACCOMMODATIONS
A block of rooms has been reserved at The Westin Indianapolis. Please call the hotel at +1.317.262.8100 by 21 February 2022 to secure the AIST discount rate of US$165 per night for single/double occupancy.

ATTENTION NON-MEMBERS
Non-member registration fees include membership in AIST through 31 December 2023. Membership is not automatic. A completed membership application must be returned to AIST.

ABOUT THE PROGRAM
The digital transformation (DT) journey continues to be a critical component for all steel companies. The 2022 Digital Transformation Forum for the Steel Industry will build on the success of the preceding forums and incorporate suggestions from attendees. Presentations on how machine-learning works under the hood, change management and cultural challenges of implementing DT solutions, and additional panel discussions on actual use cases will be provided. In addition to machine learning and artificial intelligence topics, the forum will cover the importance and techniques for cybersecurity; the use of DT solutions for environmental and health and safety applications; practical uses of simulation, including augmented and virtual reality; and innovative uses of robotics. The essential roles that humans play in successful DT journeys will again be featured. These discussions include developing companywide initiatives, data visualization, self-serviced analytics and other aspects of human interaction.

WHO SHOULD ATTEND
Decision-makers and those with a technical background who are interested in learning more about how to make their areas smarter by utilizing digital transformation methods.

ORGANIZED BY
AIST’s Electrical Applications and Digitalization Applications Technology Committees.

PROFESSIONAL DEVELOPMENT HOURS
This course may qualify for up to 15.5 Professional Development Hour (PDH) credits. Each attendee will receive a certificate listing the quantity of PDH credits earned for this course. This course is not approved for PDH credit in New York, Florida, North Carolina and Oklahoma.

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from the initial data acquisition for troubleshooting functionality to a central component of a data landscape. The Gerdau Special Steel North America Fort Smith plant has expanded use of the ibaPDA system fosters collaboration among subject matter experts within their own domains. Consequently, more time and effort can be focused on the development of effective digitalization strategies. The focus of the presentation is to highlight applications in the steel industry, specifically relating to:

1) On-line monitoring (ML/AI model implementation, streaming analytics).
2) Data mining (key performance indicator (KPI)-based long-term analysis with drill-down).
3) Automated feature extraction (time- and length-based).
4) Energy optimization (efficiency improvements for planning and scheduling).

11:15 a.m. A Foundation for Data Analytics in Manufacturing Using ibaPDA and Open-Source Machine-Learning Tools
Marcelo Cardoso, Gerdau Special Steel North America
The Gerdau Special Steel North America Fort Smith plant has expanded use of the ibaPDA system from the initial data acquisition for troubleshooting functionality to a central component of a data analytics platform. With the upgrade to a historical data server, the ibaPDA system provides the

4:10 p.m. Applied Time Series AI for Anomaly Detection and Diagnosis in Steel Production
Crick Waters, Falkonry Inc.
AI and ML techniques have been used to solve complex operations problems. Applying ML and AI for anomaly detection and diagnosis at scale, however, has been a significant challenge. This presentation discusses how Falkonry’s time-series AI platform leverages ML/AI for automated detection and diagnosis of equipment in steelmaking. This methodology is scalable across use cases without the need for data scientists. Precendent detection of novel equipment conditions provides insight to maintenance operations that otherwise would have been missed. Such insights lead to proactive maintenance interventions, thus avoiding loss of production due to unexpected downtime events.

2:20 p.m. Production Increase and Energy Saving by Superheat Prediction Through AI Digital Autoheat Model
Maria Luisa Argáez, ECON Tech S.A. de C.V.
The steelmaking process consists of several stages. In the first stage, steel is melted in the electric arc furnace (EAF). It is then adjusted in the ladle furnace (LF), and unwanted gases are eliminated in the vacuum degasser. Finally, the steel goes from the tundish to the continuous casting machine. In each stage of the process, as well as during its transfer between processes, heat temperature loss is inevitable, and the time in each stage and the transfer time varies according to grade steel and operational features. For this reason, the steel must be superheated so that it reaches the optimum temperature for the solidification process. However, this superheat tends to be given by experience and many times the operator must wait for the temperature measurement in the tundish of the actual heat to adjust settings with respect to the heat, not giving adequate superheat and having to adjust the speed of the machine, which may affect the quality of the product. The objective of this model is to predict the superheating that must be given to the liquid steel in the LF in such a way that the heat arrives in the tundish with the optimum temperature and time, applying data analytics and artificial intelligence through digital tools. By optimizing the control process, an improvement in steel quality, and avoiding superficial and internal defects and material waste, a production increase in the LF of between 7.5% to 8.8% and energy savings in the LF of between 1.59% and 1.86% can be realized.

3 p.m.

3:15 p.m.
Reheating Furnaces – AI-Driven APL Optimization
AJ Alexander, SORBA.ai
Reheating furnaces are used in metallurgical processes in order to bring raw materials up to an adequate temperature for plastic deformation to be achieved. In steel manufacturing, these machines typically heat the billets up to a temperature of approximately 1,200°C before they are processed in the rest of the rolling mill. This process is highly controlled as the heating process is material specific and vital to achieving a good quality final product. Failure of this system would result in a catastrophic loss of quality for the manufacturer. Additionally, the furnace has a high gas consumption and as such, increasing the efficiency of the heating process has the potential for large cost savings. Savings in this system are likely possible since the furnace utilizes different heating zones for the billets as well as the potential for low energy input times when the furnace needs only to maintain temperature. In this application, advanced process controls (APCs) have been utilized to increase the efficiency of the heating process with the goal of reducing gas consumption.

3:55 p.m. Producer Panel Discussion
Panelist: Marcelo Cardoso, Gerdau Special Steel North America
5 p.m. Reception
Digital twins are becoming increasingly viable across many industries and are set to play a very impactful role in Industry 4.0. However, there are few good examples of practical implementation in many industries. The implementations that do exist typically have very limited functionality, or are mostly theoretical in design. As digital twins gradually get better, we will get closer to seeing the short- and long-term benefits from their incorporation into the workflow. A project was funded by the AIST Foundation Digital Transformation for Steel Manufacturing Grant to further develop a prototype software to provide a digital twin solution to incorporate different information and features from across many different casting human-machine interfaces (HMIs), combining them into one concise interface that can be modular. The digital twin functions to allow browsing of off-line and live database data to review both current and historical data in order to understand the conditions leading up to failure scenarios and other quality issues that are actively monitored for maintenance tasks, such as cooling, drive roll information, calibration data, casting throughout and many others. The resulting digital twin solution can be modified for many other processes outside of casting as well. The project work is carried out by a team of students and staff at the Center for Innovation Through Visualization and Simulation at Purdue University Northwest with industry mentors from Cleveland-Cliffs Burns Harbor.

9:30 a.m.
Condition Evaluation as Basis for Digitalization — Use Cases and New Analysis
Johannes Lepold and Benjamin Zimmerman, SMS group Inc.
For decades, condition monitoring has been an established, highly reliable means of monitoring the condition of machines and plants and preventing unplanned downtime. However, new analyses are constantly being developed to look into the condition of machines in even greater detail in order to get to the bottom of phenomena that were previously difficult to detect (e.g., spindle knocking). In addition, new methods of sensor technology open up new possibilities, even in components that were previously difficult to monitor (e.g., acoustic emission for monitoring slowly moving parts). Furthermore, the new methods of digitization and big data analytics are additional accelerators for the change from pure condition monitoring to condition evaluation, respectively predictive asset health (e.g., novelty detection). This presentation shows by means of practical examples that these technologies have left the concept stage and have already proven their industrial suitability in practical operation.

10:10 a.m.
Break

10:30 a.m.
Neural Nets at Nucor Steel-Decatur LLC
Bryan Petrus, Nucor Steel—Decatur LLC
At Nucor Steel-Decatur, artificial neural nets have been used in rolling mill setups since the steel mill started up in 1997. As technological improvements sped up training and increased the computational sophistication of neural nets, the use has expanded to more complicated applications, including property prediction and process optimization. Much of this has been done with locally developed or freely available source code. This presentation covers an overview of this history of neural nets at Decatur, lessons learned and plans for the future.

11:10 a.m.
Machine-Learning Applications in Alloy Optimization
Igor Nikiforovski, Quad Infotech Inc.
There has been a recent breakthrough in the use of newer machine-learning techniques to tackle steel manufacturing challenges. One important use case is the prediction of physical properties of steel based on chemical concentration and relevant process parameters. This use case is further extended by Quad Infotech Inc. and Nucor Steel-Idaho to optimize for alloy consumption cost while meeting chemical and physical quality specifications. An application has been designed to aid metalshop operators with alloy additions, allowing for shop floor integration of machine-learning tools.

11:55 a.m.
Lunch

1 p.m.
Machine Vision, Leveraging Artificial Intelligence to Solve Common Tasks in the Metals Industry
Enrico Plazzagna, Danieli Automation
Digitalization and artificial intelligence can support an easier and simpler metals industry. Nowadays, vision-based applications are globally reckoned as a new trend in the steelmaking industry, being utilized in a wide range of situations thanks to their advantages, such as contactless operation mode, quickness of response and quality of measurement, coupled with the reduced need for human intervention and, thus, error. A wide range of solutions has already been developed using deep learning and machine learning to significantly expand machine vision capabilities including profile detection, surface inspection or robot guidance but also scrap classification or marking identification. A perfect example of artificial vision application is the bar counter, adopting artificial vision technology to execute an essential task: counting the bars in a bundle, with an accuracy exceeding 99.9%. The system is natively integrated with the automation systems level 1 and 2, for setting the number of bars per bundle. This task is improving plant efficiency, reducing time losses and production stops, and eliminating the encumbrances for in-line installations.

1:40 p.m.
Neural Network Technologies for Visual Tracking
Gianluca Maccani, Polytec USA
In the steel industry, it is almost impossible to apply adhesive labels, radio frequency identification and other technologies, commonly used in other industries, to track the products. The current practice is to rely on sensors and logic to suppose the position of the products during the process. Machine vision and neural network technology can finally solve the common issues of the current tracking systems: the visual recognition of dimension, color, shape and other factors during the movements of the product dramatically increase the reliability and reduce potential mismatch and claims, benefitting quality and productivity.

2:20 p.m.
Application of Micro-CT 3D Scan Technique to Investigate As-Cast Slab Defects
Hongyang Yue, ArcelorMittal Global R&D
During continuous casting, cracking defects can occur at various locations in slabs for many reasons. The initiation and propagation of some defects can be hardly explained. Hence, in some cases, examining the 3D structure of these cracks can be very helpful to find the source and solution. In this paper, a micro-CT scanning device with a resolution of 60 micrometers was used on a couple of slab cracking cases. The 3D structure of the cracks was fully digitized and further incorporated with the traditional metallography methods. This work will demonstrate how to use the new tools to understand the crack formation. Further work will use AI to link 3D CT scan to casting parameters and casting models to solve cracking problems at the casters.

3 p.m.
Break

3:15 p.m.
ARMSS: Augmented Reality Maintenance and Safety Simulator
John Moreland, Purdue University Northwest
Lockout-tagout-tryout is a safety procedure used to prevent injury and fatality from the accidental discharge of hazardous energy when performing maintenance on industrial equipment. In the steel industry, many maintenance procedures involve multiple locations, multiple pieces of equipment and multiple lockout points. Printed procedures are typically used to document and guide personnel through lockout procedures, but complexity and/or unfamiliarity with a system can cause confusion and lead to incomplete or incorrect lockouts, which can result in injuries or fatalities. The Augmented Reality Maintenance and Safety System (ARMSS) is a research project aiming to use augmented reality to assist personnel conducting lockout-tagout procedures and reduce incomplete or incorrect lockouts. The system uses a headset to display procedures, images and videos to the user, while enabling them to keep both hands free to perform the lockout steps. The headset also includes camera and sensors that can be used to help document and verify steps of a lockout. Development and initial results are discussed.

3:55 p.m.
Digital Transformation Expert Panel Discussion

5:15 p.m.
Adjourn Conference