

Ready for HAL 9000 to Run Your Mill?

Did 2001: Space Odyssey offer true insights into the future of AI?

Learn how AI has transformed the bio-industry at IBBC 2022

Remember the story of HAL 9000, the killer supercomputer in Stanley Kubrick's landmark movie *2001: A Space Odyssey*? Luckily in the 50 years since the film hit the movie screen, there have been no recorded accidents or disasters caused directly by a malicious computer. But many of the problems and challenges of Artificial Intelligence (AI) introduced in the film still face us today. Effective and reliable AI requires accurate data and timely processing. Perhaps with better algorithms and accurate data, Hal would have been as docile as Alexa and Siri.

Artificial Intelligence (AI) is the science of training machines to perform human tasks. A subset of AI, Machine Learning (ML) trains a machine how to learn. ML models can identify patterns from a dataset and automatically learn without being programmed.

Today there has been a resurging interest in ML due to key factors such as large volumes and varieties of available data, faster and more powerful computational processing, affordable data storage, and more reliable algorithms. These elements make it possible to produce models that can analyze bigger, more complex data and deliver faster, more accurate results. And more precise models can help organizations across all industries identify new opportunities and avoid risks. The biomass industry is no exception, and TAPPI's [International Bioenergy and Bioproducts Conference \(IBBC\)](#), October 30 – November 2, Providence, RI, surfaces potential approaches, including a presentation by the University of Georgia's Dr. Sudhagar Mani.

Complex processes such as pyrolysis, a promising technology for converting biomass into renewable biofuels, can benefit greatly from machine learning. Its thermochemical conversion technology converts lignocellulosic biomass into bio-oil, biochar and non-condensable gas mixtures. The yield of bio-oil depends on the biomass feedstock composition which can vary widely depending upon the type of biomass, time of harvesting, and other logistical practices. In addition, the pyrolysis operating conditions such as pyrolysis temperature, heating rate, and residence time further influence product yields. This variability poses significant challenges to producing consistent and predictable quality bio-oil for utilization into biofuels at a commercial scale. Therefore, there is a need to develop a predictive model for the pyrolysis process under varying biomass properties for commercial applications.

Dr. Mani shares insights about the effectiveness and accuracy of current machine learning tools (MLT) when predicting pyrolysis processes during his presentation, *The Current State of Predicting the Performance of Biomass Pyrolysis Process using Machine Learning Tools*. As part of IBBC's *Biomass Conversion & Densification* session, Dr. Mani will discuss different machine learning methods: [Multi-Variable Regression (MVR), Support Vector Regression (SVR), and Grid Search Random Forest (GSRF) and their ability to predict the bio-oil yield based on the biomass compositions with close to 97% accuracy. Attendees will also hear how these models can be applied to real-time prediction and process control of pyrolysis operations at a commercial scale in a biorefinery.

Additional session presentations include:

- The Effects of Hot Water Extraction and Recovered Lignin Addition on Fuel Pellet Properties – *Autumn Elniski, SUNY-ESF*

- Briquette Produced with Torrefied Agroforestry Biomass to Generate Energy – *Solange Araújo, Instituto Superior de Agronomia*
- Sandwich Belt High Angle Conveyors Lifting the Value of Biomass – *Amy Duncan, Dos Santos International, LLC*

IBBC 2022

IBBC offers attendees a comprehensive technical program focused on critical issues associated with biomass. Developed by industry professionals, the peer-reviewed sessions are expert-led and include high-level discussions on industry trends, new technologies and advancements. The technical program includes the following sessions:

- Bioenergy Research from DOE National Labs
- Innovative Bioproducts and Biopolymers from Biomass
- Biomass Pretreatment Methods
- Biomass Conversion & Densification
- Biomass Conversion Pathways

[View technical program](#)

Attendees also have the opportunity to hear a [keynote presentation](#) from Thomas Meth, Chief Commercial Officer and Co-Founder of Enviva, a leading global energy company specializing in sustainable wood bioenergy. In addition, IBBC offers a Student Poster Session and Competition, Hot Topics Breakfasts, New Technology Showcase, exhibits and multiple networking opportunities.

IBBC is co-located with TAPPI's [Pulping, Engineering, Environmental, Recycling and Sustainability \(PEERS\) Conference](#). Attendees can attend both conferences for only one registration fee.

Registration will open soon. To learn more about each session and speakers, visit tappi-ibbc.org.