

## Breakout Session D-2: Artificial Intelligence

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Lead Issues:

- Machine Learning Applications in MH
- Application of artificial intelligence (AI) like Chat GPT in higher education
- AI and Machine Learning in Material Handling
- Automation, Virtual Reality, and Artificial Intelligence
- Artificial Intelligence in Logistics
- The role of simulation-based AI in intralogistics

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The group began its discussion by identifying potential material handling (MH) applications for Artificial Intelligence (AI). (The terms AI and machine learning (ML) were used interchangeably). The following applications were suggested:

- Grippers (they are not plug & play; they need to be trained)
- Article classification/recognition for bin picking
- ARM
- Navigation
- Estimating weight
- Management of AGVs (dispatching, routing, congestion, traffic, blocking)
- Data analytics in predictive analytics
- Could be used to identify risk for humans and help them relax

There was a general discussion regarding how to determine whether AI is a suitable alternative to solve a problem. It was noted that there are some specific problems where ML shines (e.g., classification, clustering, dimensionality, regression, etc.). AI is also good for situations where there are many if-then-else scenarios as AI could be used to explore the scenarios and determine how to behave in each. Reinforcement Learning (a type of ML) could deal with these situations, such as the case in determining when to release work. When implementing AI, it is especially important to identify the appropriate KPIs. AIs tend to be black-box models that require a lot of data and are extremely sensitive to the quality of the data. The general feeling is that AI is more useful for operations than for design. AI yields a solution based on data, but the data keeps changing (live data).

The group reflected on our site visit to Edeka DC. A group member suggested that the DC probably uses AI for estimating pallet density, guiding the palletizer, and inventory validation. On the other hand, it was pointed out that the palletizer is associated with a bin packing problem and AI is unlikely to outperform algorithms in well-defined optimization problems; AI should be used for forecasting, not to replace algorithms.

We also discussed the application of AI technologies such as Chat GPT in higher education. It was noted that Chat GPT is not perceived as a big threat in engineering courses for now, but it will be as it continues to evolve. GPT already beats individual-level knowledge. Chat GPT could be useful for academicians in identifying good data sets and to update our slides. In general, Chat GPT can be perceived as an additional source of data that should be carefully used. When using Chat GPT for any academic purpose, it should be mentioned (for example, when it is used for a student's homework).

Lastly, the group discussed the difference between Virtual Reality (VR) and Augmented Reality (AR). AR technologies are used to project things without using goggles. On the other hand, Mixed Reality (MR) is where goggles are required for us to engage with VR.