Tampereen yliopisto
Tampere University

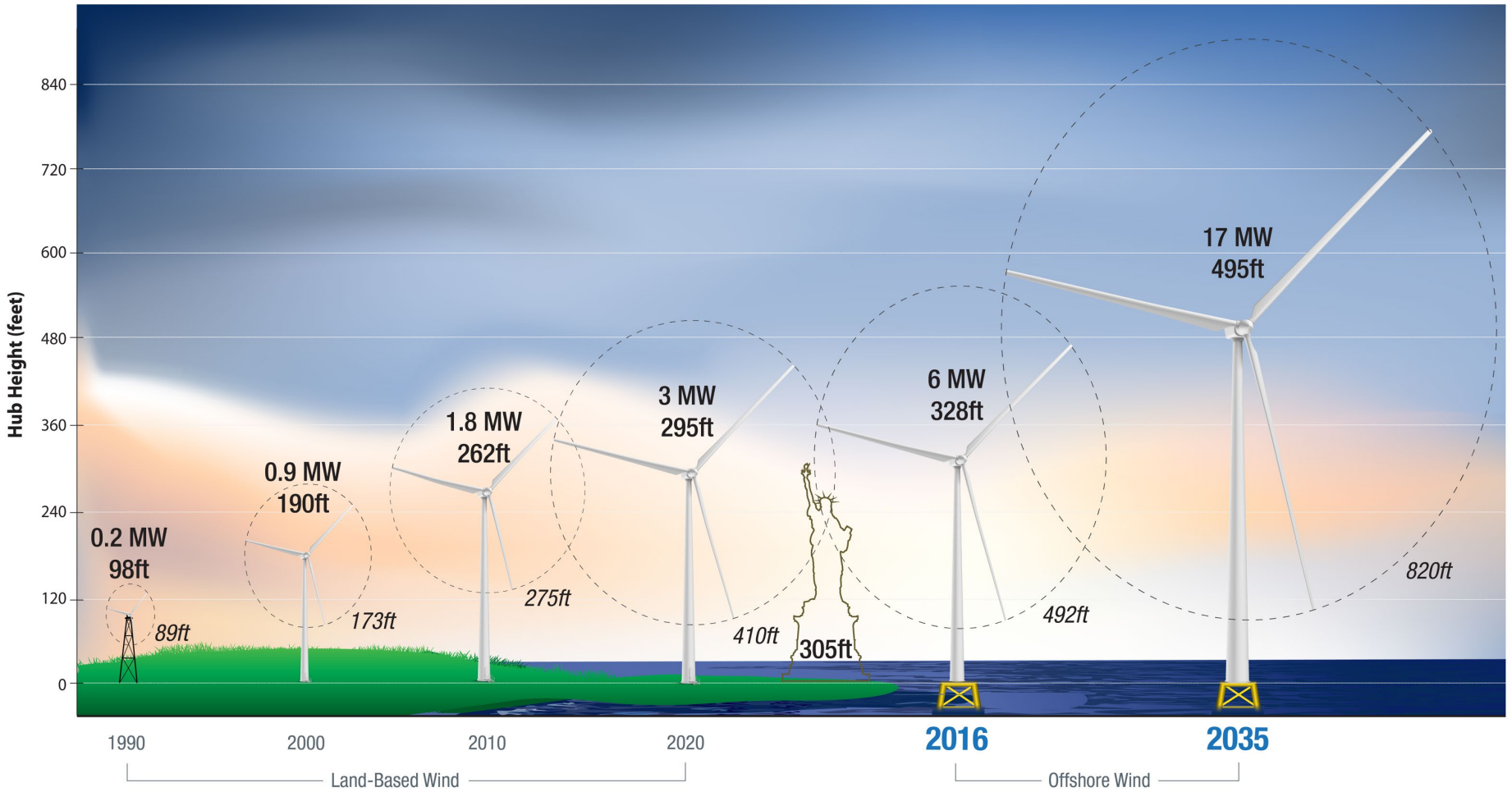
Visioita komposiittimaailman kehityssuunnista

Jyrki Vuorinen, Tampereen yliopisto

Millaisia visioita voisi olla näkyvissä?

- Jotkut trendit vahvistuvat?
- Jotkut trendit heikkenevät?
- Tulee uusia trendejä

Tuulivoima



Wind Turbine Capacity (Megawatt) | Hub Height (feet)
Rotor Diameter (feet)

98ft = 30m
190ft = 58m
262ft = 80m
295ft = 90m
328ft = 100m
495ft = 151m

Tuulivoima

Tuulivoima

Optimized Carbon Fiber Composites in Wind Turbine Blade Design, SANDIA REPORT, SAND2019-14173, Printed November 2019

Komposiitit autoissa

VS

Composite-based battery housing solutions in particular have recently seen a great deal of interest. Compared to state-of-the-art metal-based housings, they exhibit greater weight-saving potential, superior corrosion resistance and thermal insulation, and various other benefits

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Vetytalous

NPT

"We are excited to extend our unique airless tire architectures into new forms of mobility," said Michael Rachita, Goodyear's senior program manager, non-pneumatic tires. "The micro delivery space presents a different set of needs as it relates to the tire, and our NPT technology is ideal to meet those needs to help enable a maintenance-free and long-lasting experience."

MANUFACTURING OF MONO-MATERIAL TUNABLE THERMAL EXPANSION STRUCTURES USING ADDITIVE EXTRUSION

SAMPE Europe Belfast 24: Erik Johannsen, Hans Peter Monner:
German Aerospace Center (DLR), Institute of Lightweight Systems

- https://eur04.safelinks.protection.outlook.com/?url=https%3A%2F%2Fgamma.app%2Fdocs%2FKeynote-The-Future-of-Composite-Material-Manufacturing-k6v8gwq1nsa4ug9&data=05%7C02%7Cjyrki.vuorinen%40tuni.fi%7C9415644be42c49d0174408dcedcd3c93%7Cfa6944afcc7c4cd89154c01132798910%7C0%7C0%7C638646715897541969%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C0%7C%7C%7C&sdata=VZTLV6erbw%2BwXnHkIrT210ZX8AgG%2BXCYIdIxGPIaceo%3D&reserved=0

Tekoäly
(Gen AI and LLMs)

- Ohessa keynote esitysehdotus. Se perustuu liitteenä olevaan paperiin. Generoin esityksen sisällön ChatGPTn avulla. Prosessi toimii siten, että etsin google scholarilla ne artikkelit, jotka ovat tärkeitä esityksen kannalta. Nyt otin vain yhden, joka vaikutti hyvältä. Lataan sen chatgpt:lle ja pyydän tekemään niiden pohjalta tai tässä tapauksessa tämän yhden pohjalta keynote esityksen ja erikseen slide notes. Kopioin nämä gamma.app sovellukseen, jolla voi tehdä esityksiä. Se sitten tekasi siitä version, joka ohessa.

What Role Will AI Play in the Future of Industrial Composites

https://www.aerodinecomposites.com/news/ai-industrial-composites/

Material Development and Design

- Through machine learning algorithms and generative models, our industry can use AI to develop brand new materials no one has ever used before. Using AI-driven design tools, we can experiment with all sorts of new materials in a virtual environment, learning some of the most critical information before the materials are ever put to a physical test.
- AI will even help our industry predict optimal compositions and microstructures to ensure that the material selected for each project meets all mechanical, thermal, and strength specifications.

Manufacturing Optimization

- We are especially excited about AI's potential to help us optimize manufacturing processes. A good example lies in automated fiber placement (AFP)..
- AI can drastically reduce the time involved with AFP. AI-driven software can work faster than a human being and produce more consistent quality.
- In addition, our industry can leverage AI algorithms for process monitoring, predictive maintenance, and insights that will allow us to automate certain manufacturing processes more effectively.

Quality Assurance

- AI has the ability to capture data from advanced imaging, analyze that data for microstructural details, and make accurate assessments about a material's mechanical properties. This will help us improve the quality of each of the materials we work with. But it gets better.

- As data analysis and predictive models are added to the AI database, AI and machine learning tools will have more information to work with. As time goes on, their ability to improve quality will only increase. That is the beauty of AI. It thrives on data. The more data it produces, the better AI does its job.

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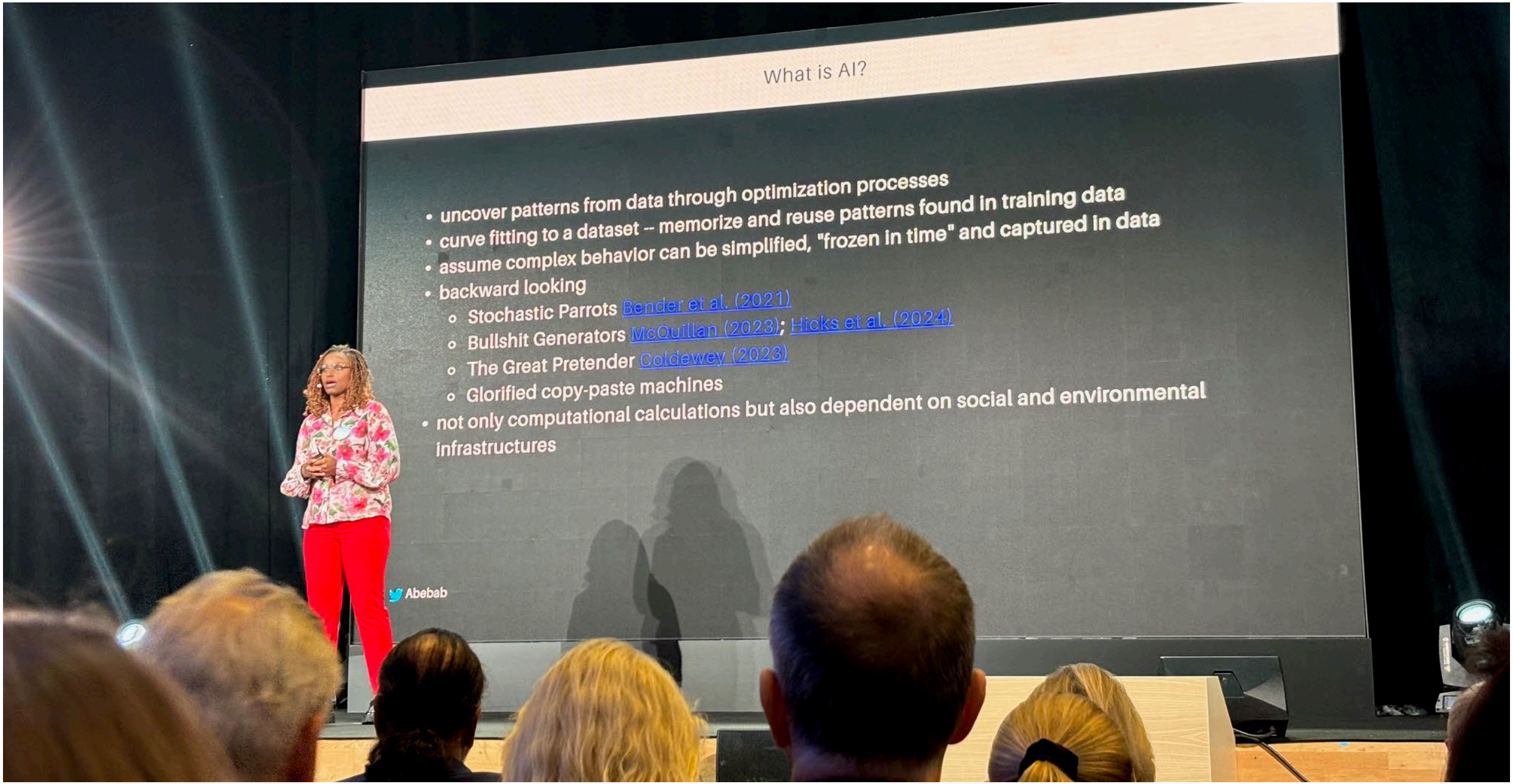
FIBER VOLUME CONTENT CHARACTERIZATION OF FLAX FIBER REINFORCED PLASTICS USING DEEP LEARNING

Ava Chavoshi, Jörg Kaufmann, Holger Cebulla, Technical University of Chemnitz, SAMPE Europe Belfast 24


What is AI?
• uncover patterns from data through optimization processes
• curve fitting to a dataset -- memorize and reuse patterns found in training data
• assume complex behavior can be simplified, "frozen in time" and captured in data
• backward looking
◦ Stochastic Parrots Bender et al. (2021)
◦ Bullshit Generators McQuillan (2023); Hicks et al. (2024)
◦ The Great Pretender Coldewey (2023)
◦ Glorified copy-paste machines
• not only computational calculations but also dependent on social and environmental infrastructures
Abebab

Artificial intelligence was asked to make a picture of Mother Teresa fighting against poverty.