AIM-NET

Generative Models for Sustainable Product Design

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Generative Models for Product Design

Challenges/Needs:

- The lack of quantified indicators that trigger optimal design capabilities.

- The role of designers within a Social Manufacturing Framework results a bottleneck.

Solution:

- Generative Models to a design tool that provides furniture designs.

- Introduce the outcome of the design tool in a AR application to let the user explore the impact of the design in their environment.

- Introduce a DSS to provide recommendations in terms of costs and environmental impact of the design.
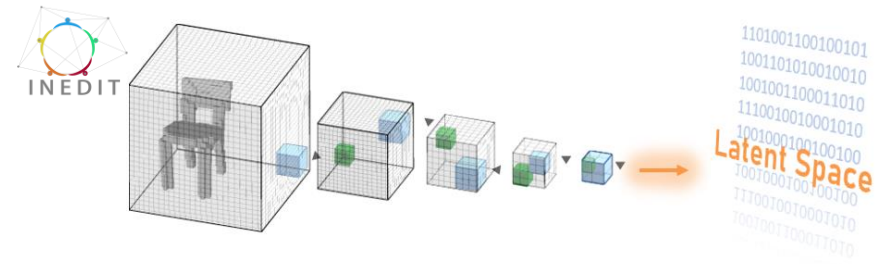
Benefits:

- Reduction of time and costs
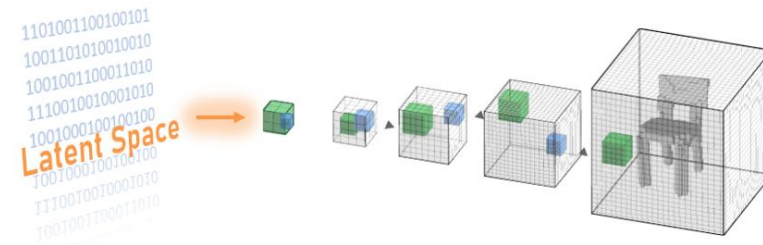
- Sustainability assessment benchmarking
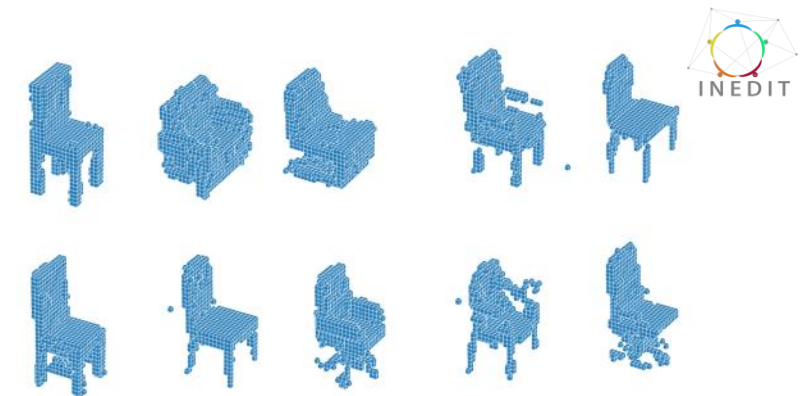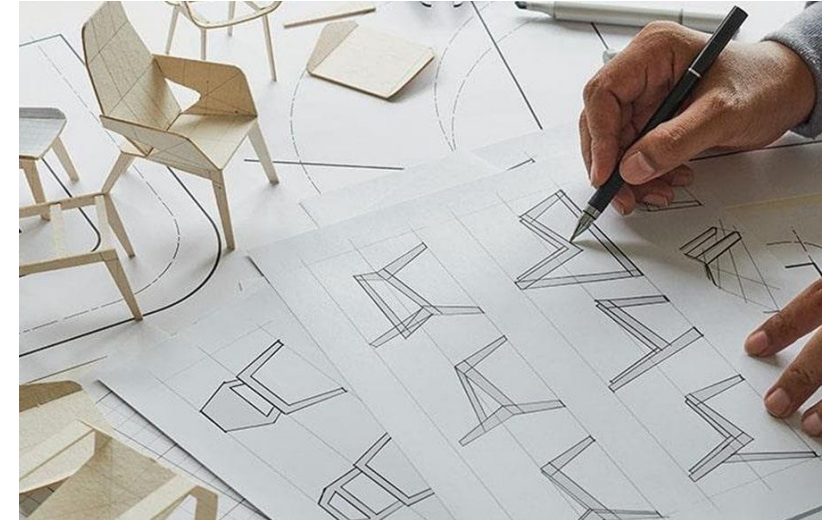
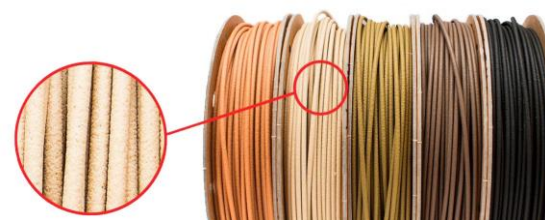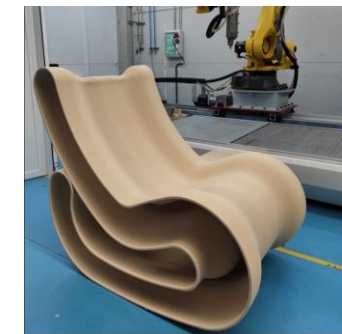# Generative Models for Product Design

Development Challenges:

- Huge amount of possible items to stablish classes.

- Lack of large datasets

- Definition of magnitudes of interest to evaluate designs or study their evolution.

- Manufacturability assessment

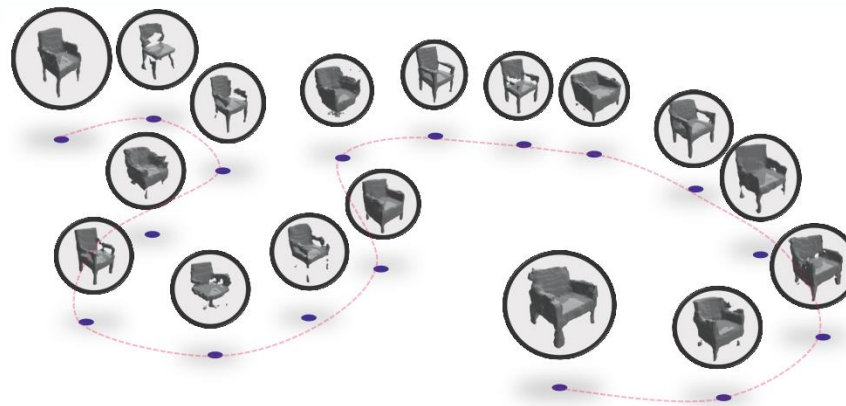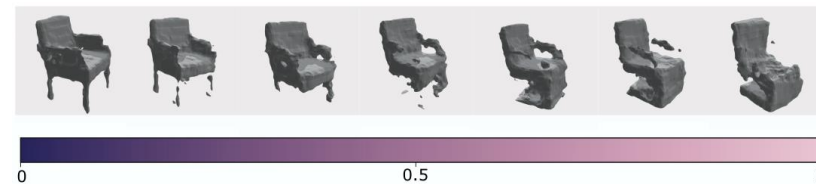Encoded Information about design parameters

*Gonzalez-Val et al. Generative Design for Social Manufacturing ECAI2020 (https://zenodo.org/record/4597558#.Yp2zy4XP2Uk)*
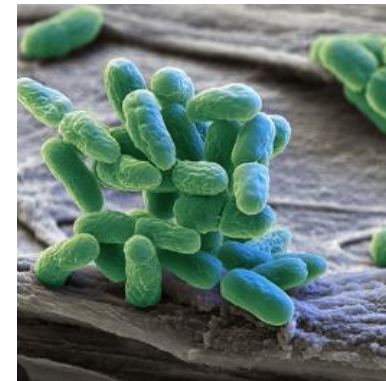
Generative Models for Material Design

Development Challenges:

- Large amount of designs

- Interaction among designers

- Impact of designers interaction in the design evolution

R. Angosto et al. A bio-inspired framework for the study of product design evolution within a Social Manufacturing environment *(To submit)*
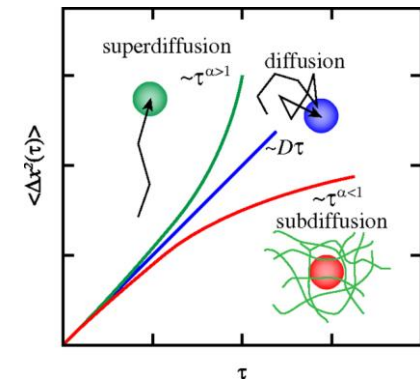
Generative Models for Material Design

Challenges/Needs:

- Countless amount of combinations of elements that can provide an optimal alloy for a given application

- Reduction of testing phase of candidate materials

Solution:

- Generative Models to provide materials candidates

- Introduce GM outcomes in a Reinforcement Learning framework using simulations to address expected material performance.

Benefits:

- Reduction of time and costs

- Sustainability assessment benchmarking

- Accessible knowledge
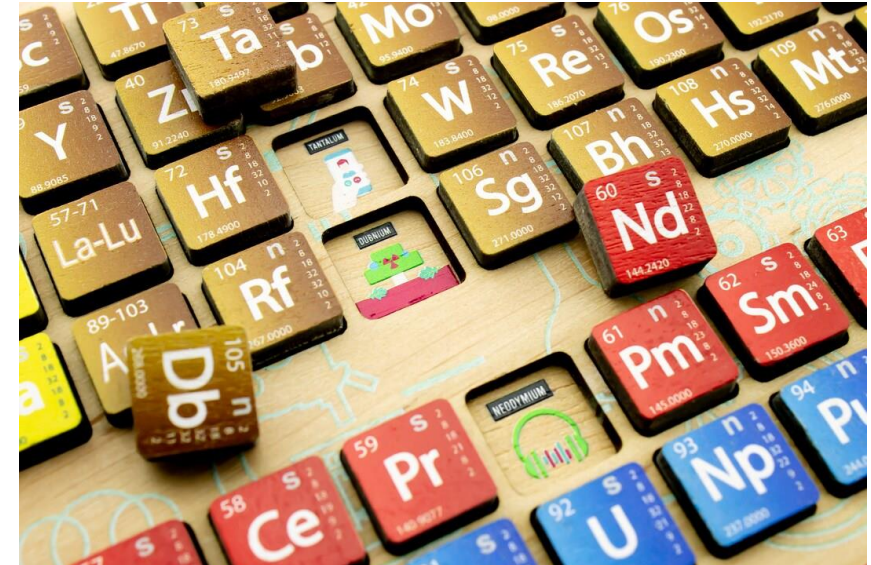
$$\binom{78}{2} = 3,003 \qquad \binom{78}{5} = 21,111,090$$

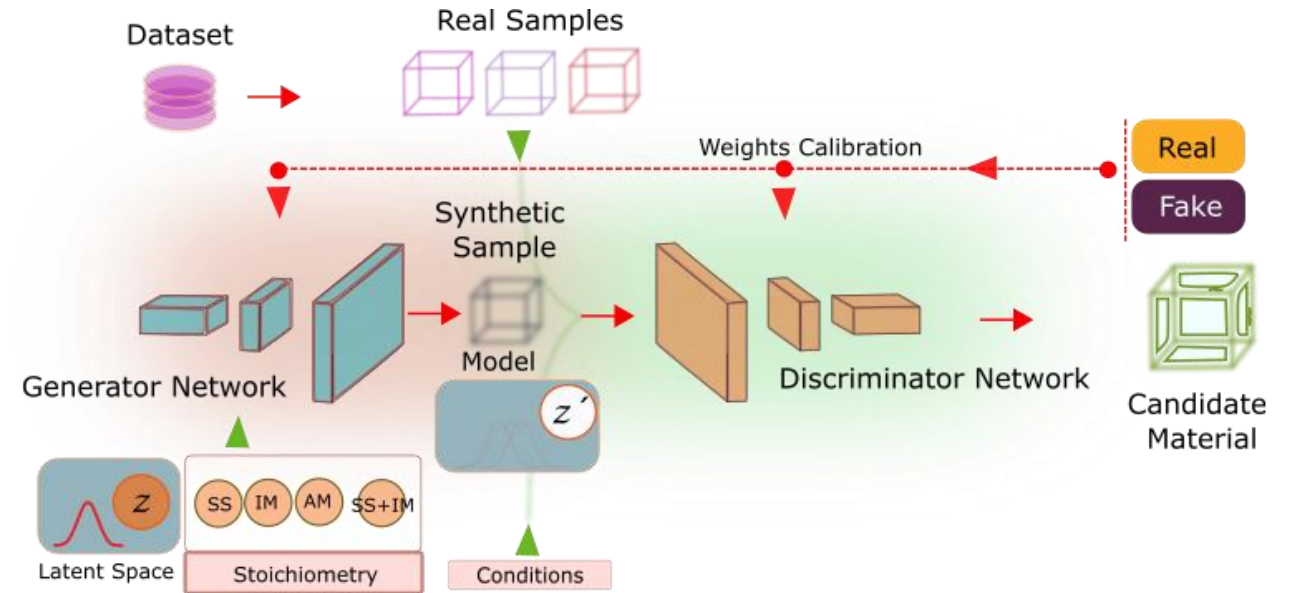$$\binom{78}{3} = 76,076 \qquad \binom{78}{6} = 256,851,595$$

$$\binom{78}{4} = 1,426,425$$

Generative Models for Material Design

Development Challenges:

- Huge amount of possibilities (material screening)

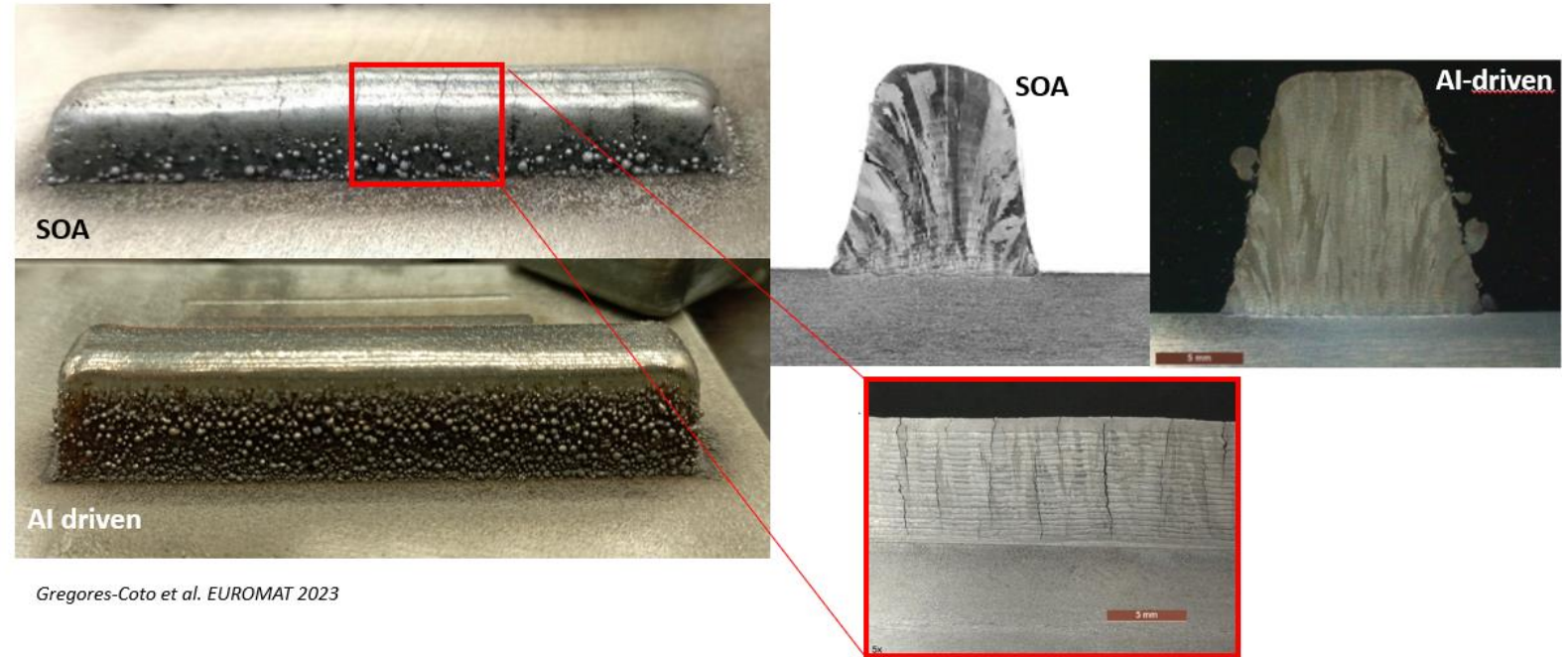- Large and well structured datasets

- Evaluation of material candidates

Gregores-Coto et al. The Use of generative models to speed up the
Discovery of materials
Computer Methods in Material Science 2023

Generative Models for Material Design

Development Challenges:

- The is a huge impact of the manufacturing process in the material performance.

Gregores-Coto et al. EUROMAT 2023

# Generative Models for Sustainable Design

Development Challenges:

- Indicators to evaluate the outcome of the generative model must be clearly identified in order to provide feedback to the design procedure.

- A sustainability assessment within the evaluation of a candidate material or product design in general is one of the more easy indicators to define.

Generative Models for Sustainable Design

Development Challenges:

- Design constrains imposed by manufacturer

- In addition to LCA values that can be indicators of goodness of the design, remanufacturability might be defined as an additional indicator.

- Methods to quantify the remanufacturability.
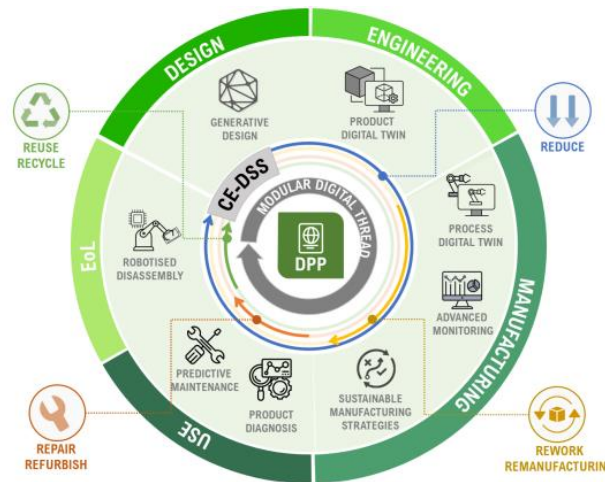
Thank you for your attention!

- Santiago Muiños Landin
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