Project idea: Generative Design for Giga-castings
Call area: Optimization of lightweight design approaches

Contact

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Project Describtion

Giga-casting is transforming automotive manufacturing by replacing hundreds of individual parts with a single, massive aluminum casting. This part consolidation reduces weight, complexity, and production time—key advantages in an industry pushing for efficiency and sustainability. AI and ML play a crucial role by enabling automated part consolidation, optimizing designs that combine multiple functions and thus of benefit for weight savings, material usage, CO_2 footprint, and recyclability

Project Objectives

- Establish ML-asssisted part-consolidation framework for HPDC.

- Integrate Gen-Design with casting constraints.

- Crate surrogate models for rapid design exporation of large-scale cast components.

- Manufacturing and quantifying the benefits of Giga-casting.

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Problem, State of the Art, and Envisioned Solution

Modern vehicle manufacturing faces major challenges tied to complexity, weight, and production efficiency. Traditional car body structures are made from hundreds of individual stamped, welded, and bolted parts. This leads to overlapping parts, excessive joints, and added reinforcements—all of which increase weight, manufacturing time, and cost. These challenges are magnified in electric vehicles, where weight increase affects battery size, range, and overall energy efficiency.

Giga-casting addresses this problem by enabling the creation of large, single-piece aluminum components—such as an entire rear or front underbody—replacing dozens or even hundreds of smaller parts. This drastically reduces part count, simplifies assembly, and cuts down on factory complexity. The result is a stronger, lighter, and more efficient structure.

However, designing such large, multifunctional components is highly complex. Structural loads, crash safety, casting constraints, and thermal behavior must all be considered simultaneously. This is where AI and machine learning play a transformative role. By automating part consolidation, exploring thousands of design variations, and incorporating real-world casting constraints into the design process, AI enables the generation of highly optimized, castable geometries.

Together, giga-casting and AI represent a step-change in vehicle design—enabling more sustainable, efficient, and scalable manufacturing for the future of mobility.

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Our Partners, Our Know-How…

- Deep knowledge in HPDC, including process simulation, alloy selection, and casting defect mitigation. Sweden's strong industrial base in automotive and advanced manufacturing provides a solid foundation for scaling giga-casting technologies.

- Upcoming full-scale HPDC testbed in Sweden, enabling rapid prototyping, physical validation of generative designs, and real-world evaluation of casting quality, cooling behavior, and structural performance.

We are looking for…

- To build a strong and complementary consortium, we are seeking European partners with expertise and capabilities in the following areas:
  - OEM:s and/or Tier-1 suppliers
  - AI/ML engineering design
  - Casting simulation and tooling