


Editorial

# Editorial for the Special Issue: Computer-Aided Manufacturing and Design

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## 1. Introduction

Recent advancements in computer technology have allowed designers to have direct control over the production process through the help of computer-based tools, creating the possibility of completely integrated design and manufacturing processes. Over the last few decades, artificial intelligence (AI) techniques such as machine learning and deep learning have been topics of interest in computer-based design and manufacturing research fields. This Special Issue aims to collect novel articles covering artificial intelligence-based design, manufacturing, and data-driven design.

## 2. Content

This Special Issue comprises 10 selected papers that demonstrate the successful application of computer-based tools in design and manufacturing research fields.

Among these works, three papers focus on engineering optimization by combining computer-aided engineering (CAE) models with intelligent optimization algorithms. Specifically, in Reference [1], the finite element analysis (FEA) model for simulating the filling and packing stage was combined with a gradient-based algorithm and robust genetic algorithm to design the conformal cooling channels. In Reference [2], the hydraulic optimization of automotive electronic pumps was finished by combining the computational fluid dynamics (CFD) technology with a multi-island genetic algorithm. In Reference [3], the design optimization of an underwater vehicle base was successfully performed by integrating the FEA simulation-based design with the Kriging surrogate model and genetic algorithm.

Six of these papers focus on data-driven design and optimization. Specifically, in Reference [4], a stretchable micro-strip patch MSP (micro-strip patch) antenna-based strain sensor was optimized by a proposed design framework, which exploits dimensional reduction, machine learning-based surrogate modeling, structural optimization, and reliability assessment approaches. In Reference [5], a field repair kit for a complex product-service system was optimized in terms of the field inventory kit cost, while satisfying the availability requirement set by contract with the customer. In Reference [6], a methodology of a product image design integrated decision system based on Kansei engineering theory was developed. In Reference [7], to improve the quality of the large-scale assembly, an assemblability analysis and optimization method based on the coordination space model was developed. In Reference [8], a region-based convolutional neural network was constructed to recognize graphical symbols in piping and instrument diagrams. In Reference [9], the design specifications for a multifunctional console of Jangbogo class submarines that can accommodate, as much as possible, the anthropometric dimensions of Korean males were optimized.

The last paper [10] focuses on computer-based design for additive manufacturing. Specifically, the authors developed a design method to consolidate parts for considering maintenance and product recovery at the end-of-life stage.

### 3. Results

AI techniques shine in many areas, including the computer-based design and manufacturing research fields. The 10 papers described here show some successful applications of machine learning and intelligent optimization algorithms in different cases. It is believed that the collection of 10 papers in this Special Issue will be beneficial to readers who have interests in applying AI techniques in the computer-based design and manufacturing domain.

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### References

1. Chung, C.-Y. Integrated Optimum Layout of Conformal Cooling Channels and Optimal Injection Molding Process Parameters for Optical Lenses. *Appl. Sci.* **2019**, *9*, 4341. [[CrossRef](#)]
2. Si, Q.; Lu, R.; Shen, C.; Xia, S.; Sheng, G.; Yuan, J. An Intelligent CFD-Based Optimization System for Fluid Machinery: Automotive Electronic Pump Case Application. *Appl. Sci.* **2020**, *10*, 366. [[CrossRef](#)]
3. Qian, J.; Yi, J.; Zhang, J.; Cheng, Y.; Liu, J. An Entropy Weight-Based Lower Confidence Bounding Optimization Approach for Engineering Product Design. *Appl. Sci.* **2020**, *10*, 3554. [[CrossRef](#)]
4. Hwang, S.; Gorguluarslan, R.; Choi, H.-J.; Choi, S.-K. Integration of Dimension Reduction and Uncertainty Quantification in Designing Stretchable Strain Gauge Sensor. *Appl. Sci.* **2020**, *10*, 643. [[CrossRef](#)]
5. Suh, E.S. Product Service System Availability Improvement through Field Repair Kit Optimization: A Case Study. *Appl. Sci.* **2019**, *9*, 4272. [[CrossRef](#)]
6. Xue, L.; Yi, X.; Zhang, Y. Research on Optimized Product Image Design Integrated Decision System Based on Kansei Engineering. *Appl. Sci.* **2020**, *10*, 1198. [[CrossRef](#)]
7. Cui, Z.; Du, F. A Coordination Space Model for Assemblability Analysis and Optimization during Measurement-Assisted Large-Scale Assembly. *Appl. Sci.* **2020**, *10*, 3331. [[CrossRef](#)]
8. Yun, D.-Y.; Seo, S.-K.; Zahid, U.; Lee, C.-J. Deep Neural Network for Automatic Image Recognition of Engineering Diagrams. *Appl. Sci.* **2020**, *10*, 4005. [[CrossRef](#)]
9. Lee, J.; Cho, N.; Yun, M.-H.; Lee, Y. Data-Driven Design Solution of a Mismatch Problem between the Specifications of the Multi-Function Console in a Jangbogo Class Submarine and the Anthropometric Dimensions of South Koreans Users. *Appl. Sci.* **2020**, *10*, 415. [[CrossRef](#)]
10. Kim, S.; Moon, S.K. A Part Consolidation Design Method for Additive Manufacturing based on Product Disassembly Complexity. *Appl. Sci.* **2020**, *10*, 1100. [[CrossRef](#)]

