

The potential for machine learning algorithms to improve and reduce the cost of 3-dimensional printing for surgical planning

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Introduction: 3D-printed anatomical models play an important role in medical and research settings.

The recent successes of 3D anatomical models in healthcare have led many institutions to adopt the technology. However, there remain several issues that must be addressed before it can become more wide-spread. Of importance are the problems of cost and time of manufacturing. Machine learning (ML) could be utilized to solve these issues by streamlining the 3D modeling process through rapid medical image segmentation and improved patient selection and image acquisition.

The current challenges, potential solutions, and future directions for ML and 3D anatomical modeling in healthcare are discussed. Areas covered: This review covers research articles in the field of machine learning as related to 3D anatomical modeling. Topics discussed include automated image segmentation, cost reduction, and related time constraints. Expert commentary: ML-based segmentation of medical images could potentially improve the process of 3D anatomical modeling. However, until more research is done to validate these technologies in clinical practice, their impact on patient outcomes will remain unknown. We have the necessary computational tools to tackle the problems discussed. The difficulty now lies in our ability to collect sufficient data. © 2018 Informa UK Limited, trading as Taylor & Francis Group.

3D manufacturing

3D printing

additive manufacturing

anatomical modeling

artificial intelligence

automated image segmentation

computer-aided manufacturing

convolutional neural network

machine learning

medical image segmentation

personalized medicine

surgical model

surgical planning

three-dimensional printing

3D printers

Artificial intelligence

Clinical research

Computer aided instruction

Computer aided manufacturing

Cost reduction

Engineering education

Image enhancement

Image segmentation

Learning algorithms

Learning systems

Medical imaging

Neural networks

Surgery

3-D printing

Anatomical modeling

Convolutional neural network

Personalized medicines

Surgical planning

Medical image processing

clinical practice

cost

human

image segmentation

learning algorithm

outcome assessment

Review

three dimensional printing

treatment planning

algorithm

anatomic model

machine learning

surgery

time factor

Algorithms

Humans

Machine Learning

Models, Anatomic

Printing, Three-Dimensional

Surgical Procedures, Operative

Time Factors