# Informatics

# Vologram - Educational Craftworks for Volume Physicalization

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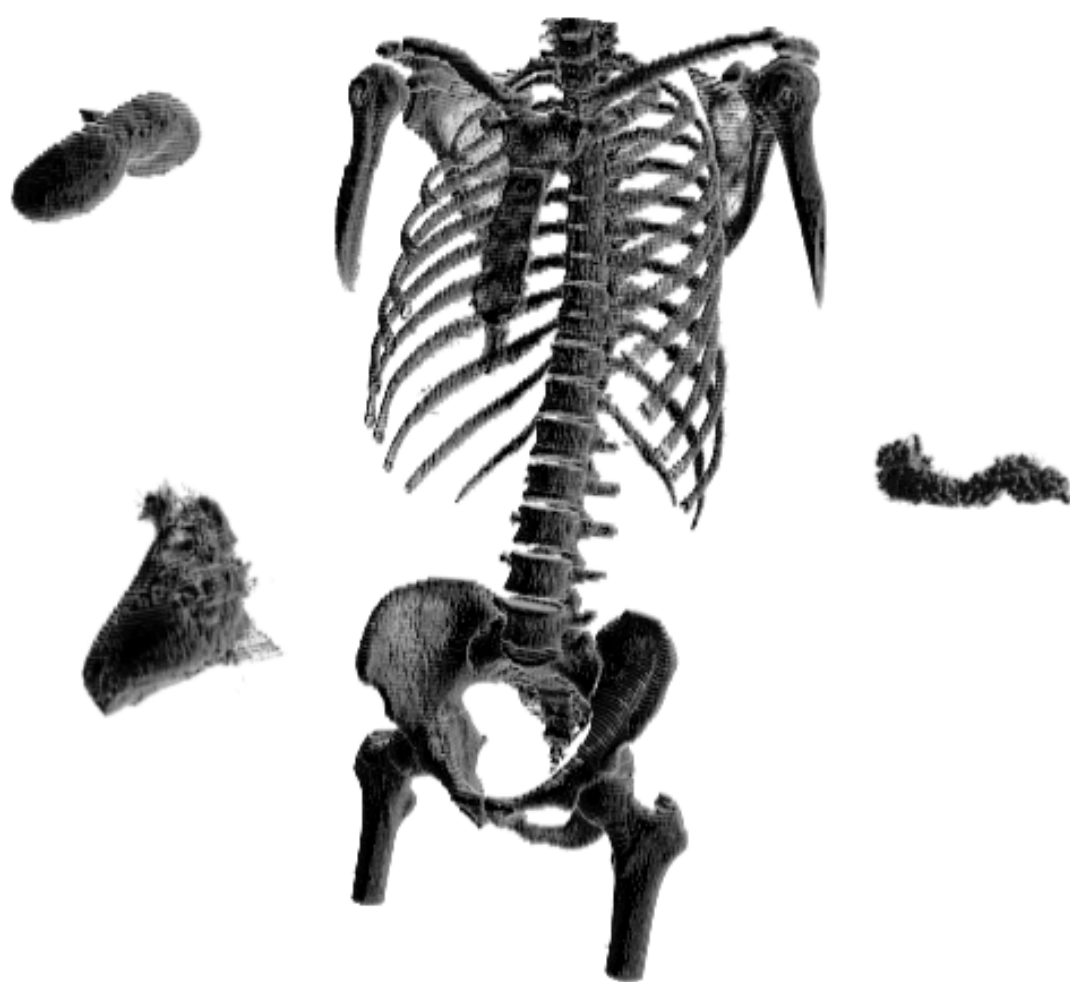Contact: daniel.pahr@gmail.com

## Problem & Motivation

🍖 Sculptures were often used for anatomy education in early medical history.

🍖 Recently, physical sculptures have been widely replaced by digital imaging and modern computer technologies.

🍖 Recent research in **physicalization** has shown that physical objects can add to information visualization in multiple ways.

🍖 The application of this concept is largely unexplored for layman anatomical education.

## Contribution

🍖 A concept for anatomical physicalization, made from **afforable materials** with **widely available tools**.

🍖 Design of a **workflow** for creating physicalizations from medical imaging data.

🍖 Development of an **interactive application** for parameter selection.

🍖 Study of **user performance** and **user experience** comparing physicalization and visualization.

## Vologram

A **hologram-like** physicalization, consisting of **two parts**:

Semitransparent **slides**, arranged in constant distance, containing cross-sections of a volume-data rendering.

A **receptacle** to support the construction. Sticks are used as guiding aides for the slides. Cardboard serves as a stable base
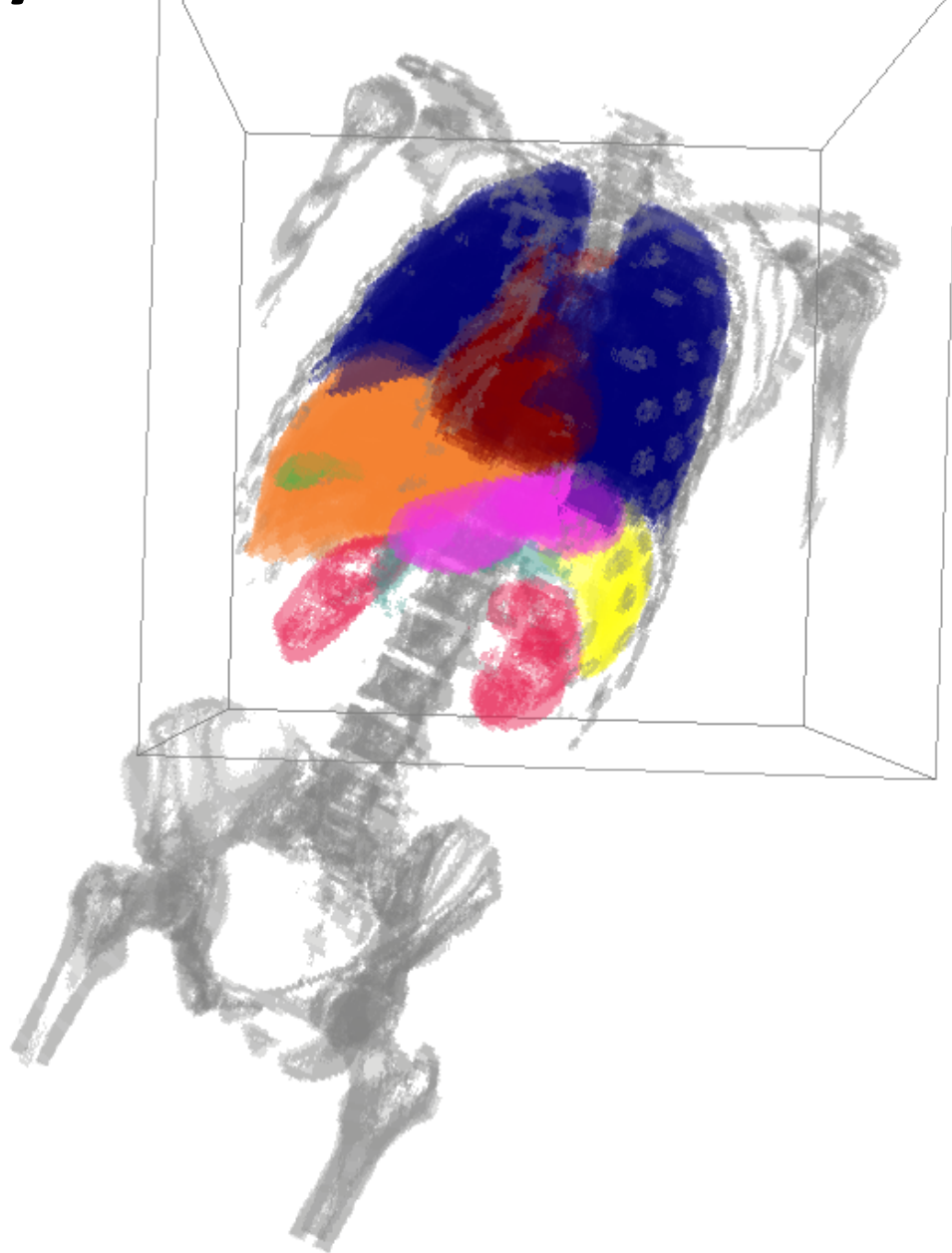
## Workflow



**0. Data Preparation**

Segmentation masks for the volume data are prepared.
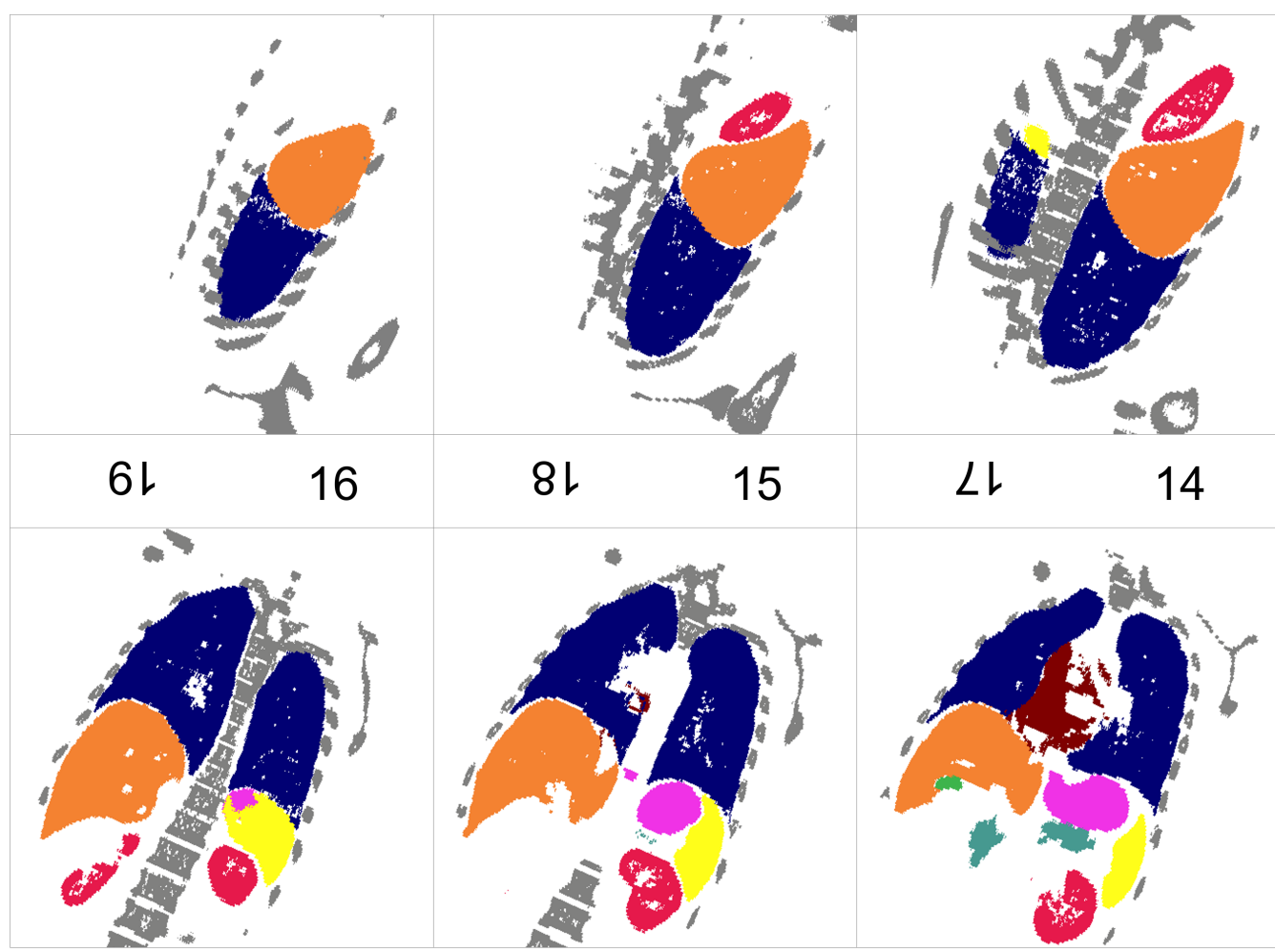


**1. Illustrative Rendering**
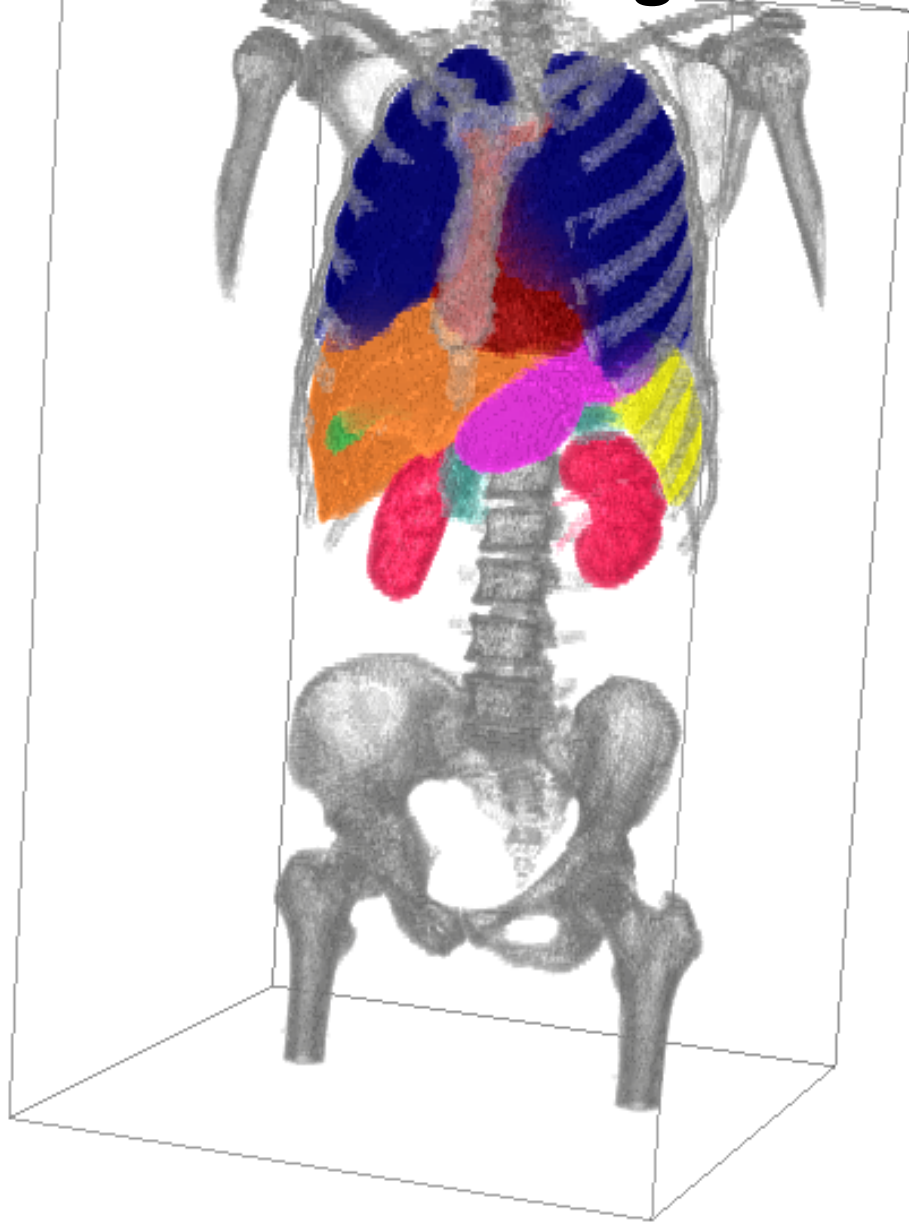
Filtering of prepared volume data, scale and slice distance selection.



**2. Physicalization Preview**

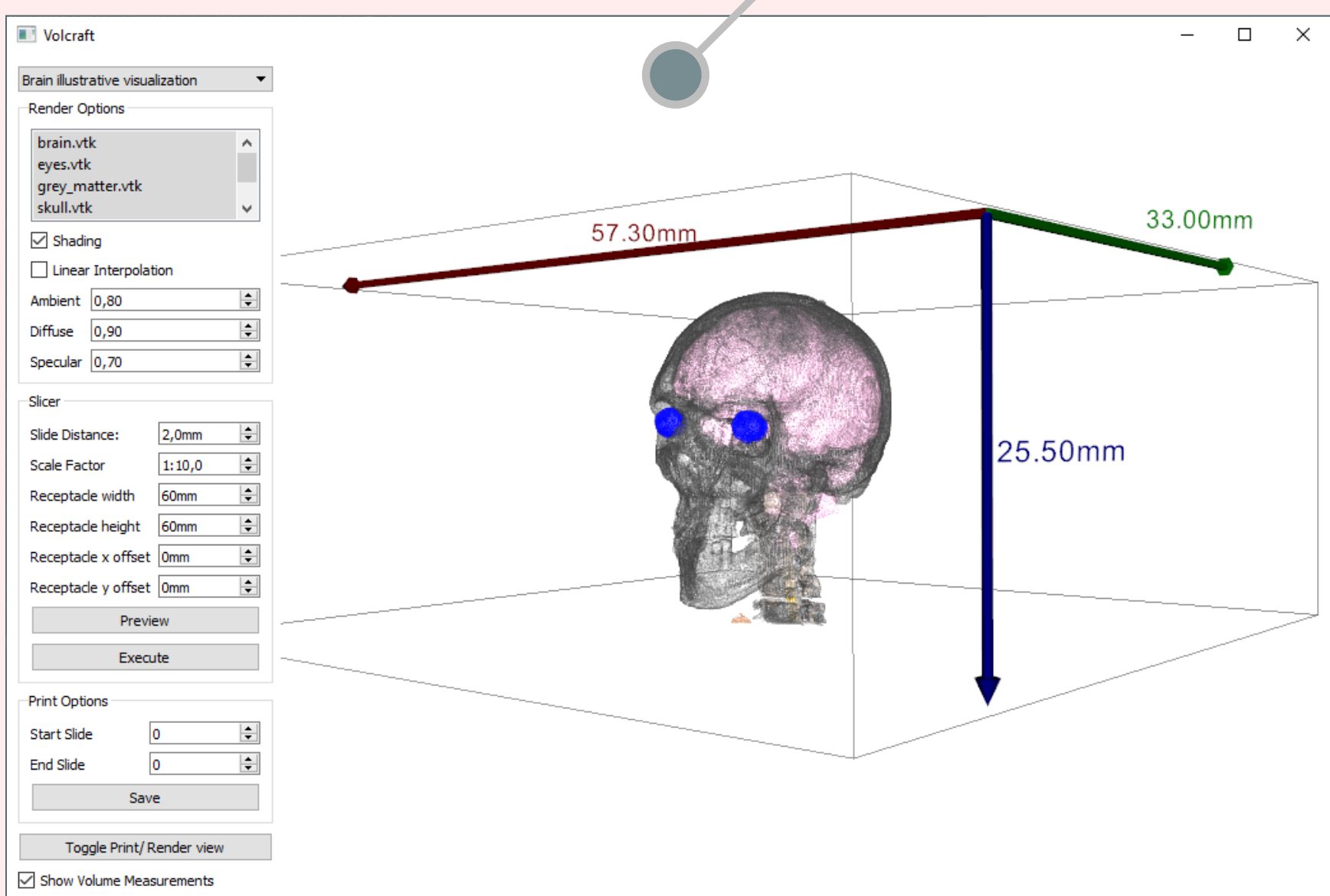Receptacle position is selected by adjusting the frame.



**3. Printable Template**

Printable page with positioned, numbered slides is created.



**4. Sculpture**

Pages are printed, slides are cut out and inserted into a receptacle.

## User Interface

Graphical interface for sculpture parameter customization



## Results
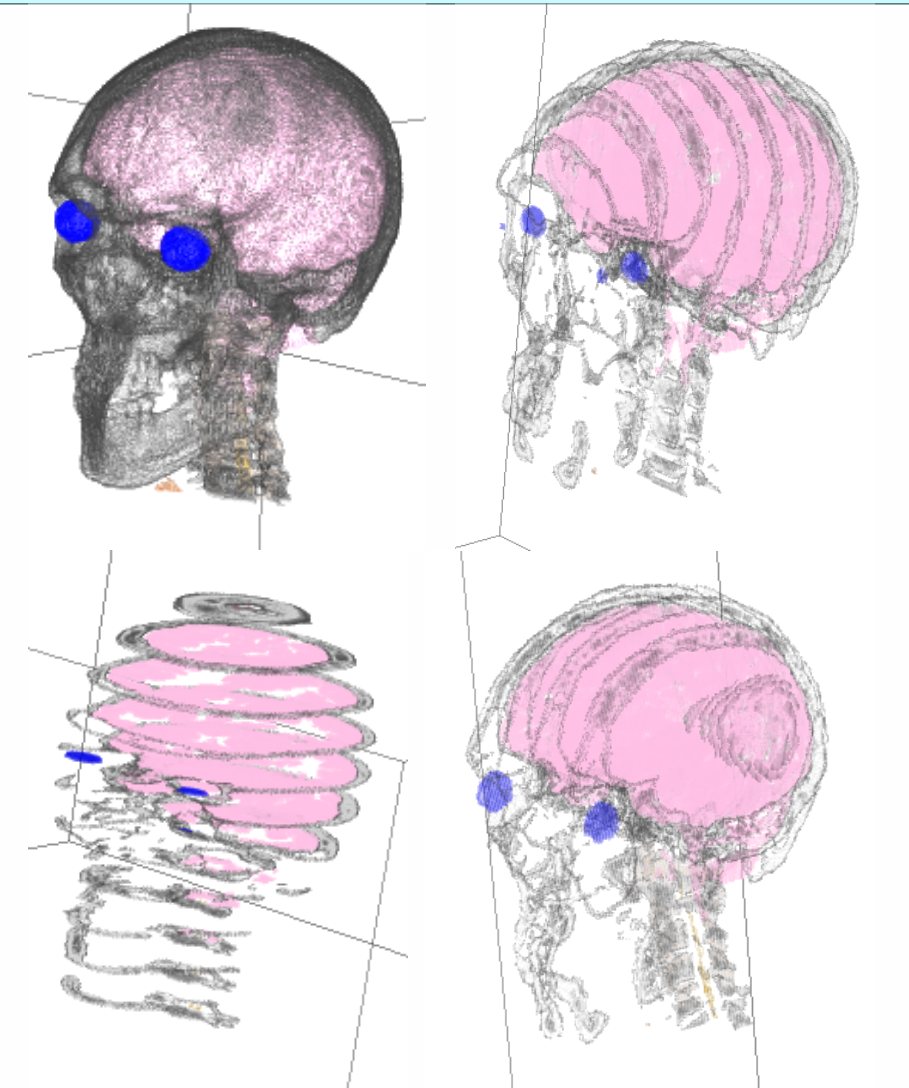


Examples for different slicing directions.

Background illumination enhances visibility.

Sculptures can be viewed from front and back.

## Conclusion

🍖 Vologram sculptures are illustrative **medical physicalizations** that can be fabricated affordably and fast.

🍖 Parameters for the transformation of the medical imaging data can be **adjusted interactively** in a graphical user interface.

🍖 An initial user experience evaluation with laymen shows **positive engagement** through visualization and physicalization.

🍖 Participants liked the hands-on nature and the colourful appearance of the sculptures.