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# ***Historical Advances and Ethical Aspects of 3D Mesh Reconstruction Diffusion Models***

## **Seminar Paper**

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# Historical Advances and Ethical Aspects of 3D Mesh Reconstruction Diffusion Models

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## ABSTRACT

## 1 INTRODUCTION

The field of Generative 3D AI is constantly improving, and the potential for future advancements is vast. One very promising direction is the generation of 3D models from single 2D images. This particular process is called 3D mesh reconstruction and could revolutionize asset creation in many fields as it improves. Some examples include the newly released TripoSR (Tochilkin et al. (2024)) or the more established Zero-1-to-3 (R. Liu et al. (2023)).

This paper explores the historical evolution of this rapidly evolving field as well as its ethical implications and general applications. Beginning with an overview of the historical development of these techniques, ranging from early methodologies to modern advancements, covering significant milestones that have shaped the entire subject. Including a deeper look into the inner workings of some models, like the underlying methods for generating and predicting radiance fields for the reconstruction. Furthermore, a small peek at 3D-model datasets like Objaverse-XL (Deitke et al. (2023)) and how they have influenced model training.

The examination of the applications of 3D mesh reconstruction across diverse domains, including development and entertainment, highlights the potential for innovation and advancement. However, it also raises crucial ethical concerns. Privacy considerations, issues of representation and cultural sensitivity, as well as the implications of estimations and hallucinations, highlight the complex ethical landscape surrounding these technologies.

## 2 RELATED WORK

Introduce why this specific related work is important for your own work. Which areas do you cover and why? What do you take as inspiration and what do you do differently/improve upon?



Figure 1: Models generated by One-2-3-45++ (M. Liu et al. 2023)

## 3 HISTORICAL EVOLUTION

### 3.1 Models

#### 3.1.1 One-2-3-45

#### 3.1.2 Zero-1-to-3

#### 3.1.3 TripoSR

### 3.2 Comparison

## 4 APPLICATIONS OF 3D MESH RECONSTRUCTION

### 4.1 Development and Entertainment

The most prominent application of 3D mesh reconstruction could be in the development and entertainment industry. The ability to generate 3D models from 2D images could revolutionize the asset creation process. This could be especially beneficial for indie developers or small studios that do not have the resources to create high-quality 3D models from scratch. The generated models could be used in video games, movies, animations, and other forms of media. This could significantly reduce the time and cost associated with creating 3D assets, allowing developers and animators to focus on other aspects of their projects. (see Figure 1)

## 4.2 Medical

## 4.3 Other Applications

### 4.3.1 Cultural Heritage

## 5 ETHICAL IMPLICATIONS

### 5.1 Environmental Impact

### 5.2 Privacy Concerns

### 5.3 Cultural Sensitivity

### 5.4 Implications of Estimations and Hallucinations

## 6 EVALUATION

Describe your methodology. How did you evaluate your work? Why did you choose this methodology? Present results of your evaluation here.

## 7 DISCUSSION AND FUTURE DIRECTION

Discuss your results to answer your research question. Does your data support your hypotheses? Put your results into perspective by situating it in the research field/related work.

## 8 CONCLUSION

Summarize your work, outline limitations and future work.

## REFERENCES

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- Liu, Ruoshi, Rundi Wu, Basile Van Hoorick, Pavel Tokmakov, Sergey Zakharov, and Carl Vondrick. 2023. "Zero-1-to-3: Zero-shot One Image to 3D Object" [in en], 9298–9309.
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