Generating Physically Stable and Buildable Brick Structures from Text

Ava Pun* **Kangle Deng*** **Ruixuan Liu*** **Deva Ramanan** **Changliu Liu** **Jun-Yan Zhu**

* Equal contribution

Carnegie Mellon University

Project page | avalovelace1.github.io/BrickGPT

Problem Given an input text prompt, output a *physically stable*, *buildable* brick structure

Prompt: *"A streamlined vessel with a long, narrow hull."*

Output structure **Intermediate building steps** **Real-world assembly**

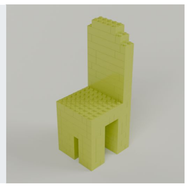
BrickGPT pipeline Fine-tune LLM to output the structure, brick by brick, in plain text

(a) Tokenization

Brick sequence

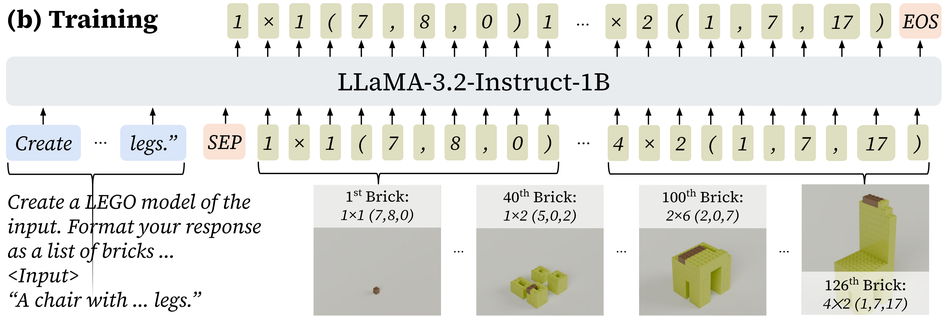
```
1     1×1 (7,8,0)
2     1×2 (7,6,0)
3     1×1 (7,2,0)
...   ...
125   1×2 (5,7,17)
126   4×2 (1,7,17)
```

Brick structure

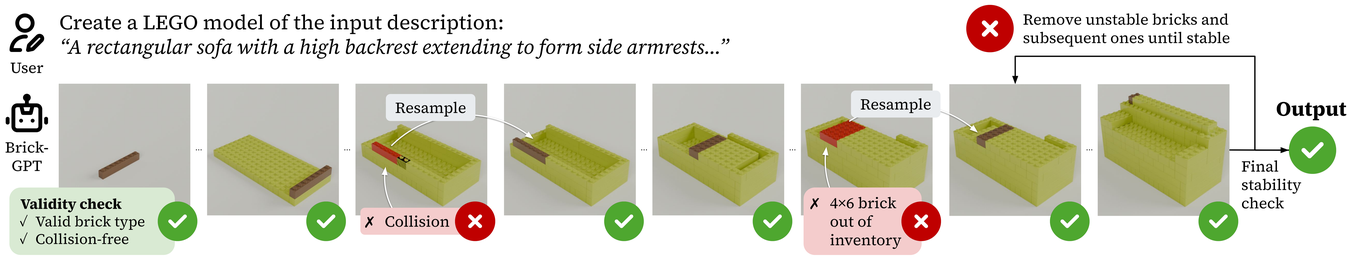


Each brick *h×w (x,y,z)* corresponds to 10 tokens.

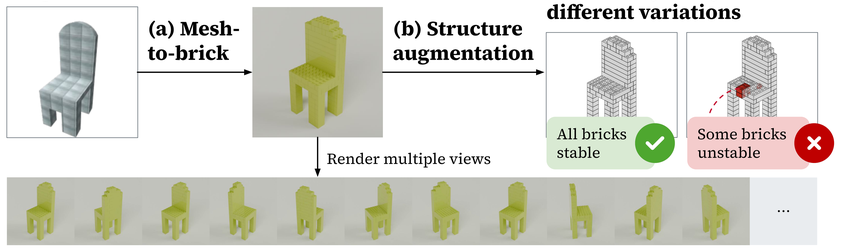
(b) Training



(c) Inference

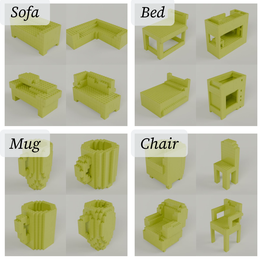


StableText2Brick dataset 47,000+ stable brick structures w/ captions



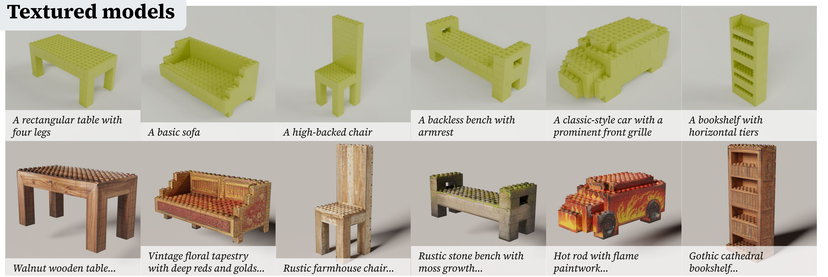
(d) Automated caption generation using GPT-4o on multi-view rendering

Dataset samples

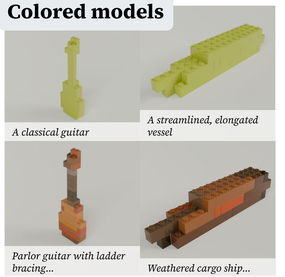


Results We can generate textures/brick colors and assemble the structures in real life

Textured models



Colored models



Human-assembled models