

# Compression of Large Volumetric Datasets

## Using Deep Learning for Streaming and Interactive Rendering

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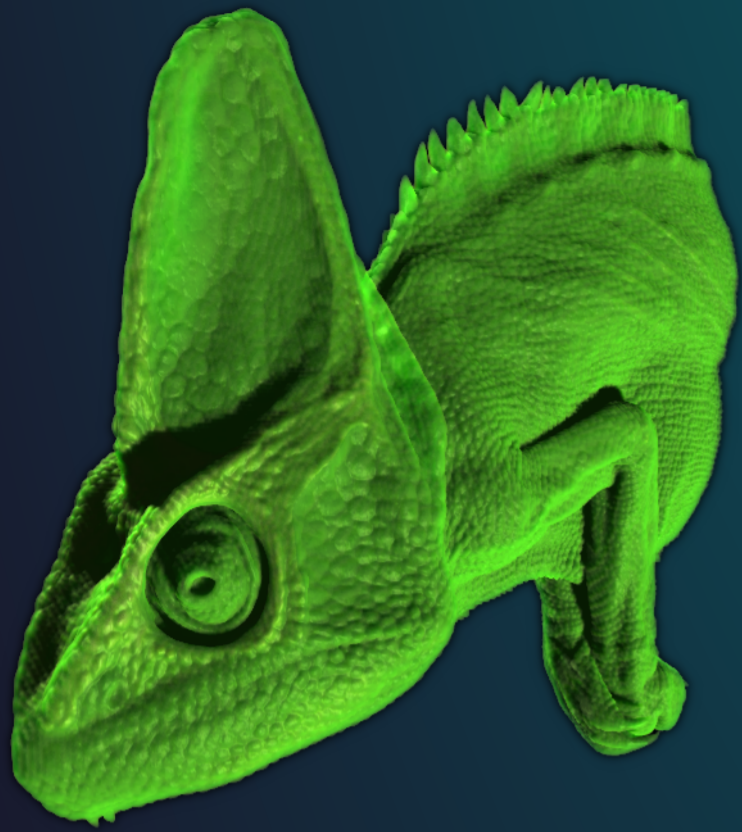


Fig. 6: Example of dataset visualization – Chameleon

### Objectives

- Develop a solution for compressing volumetric datasets
  - Support for massive data (> 100GB)
  - Structure suitable for streaming
  - Implicit neural representation
- Develop a solution for streaming and rendering compressed data
  - Interactive (real-time)
  - Realistic rendering

### Streaming

- .NET server, C++ client
- Builds on the author's previously developed solution
- By compressed blocks
  - Multiple compression levels for each
- Heuristics
- Local cache
- Compatible with CPU and GPU rendering

### Compression

- C++, CUDA
- Implicit neural representations
  - Multilevel hash grid
- Data format suitable for streaming
  - Partitioning into blocks
  - Multiple compression levels
- Automatic configuration
  - Based on desired output quality
    - SSIM on 4 levels
    - Suppresses the effect of noise
  - Custom data complexity metric
  - Neural network-based prediction

### Visualization

- C++, CUDA
- GPU
- Realism
  - Lighting and shadows
  - Advanced material properties
- Suitability for large datasets
  - Blocks with varying levels of detail
  - Performance
- CPU also available - author's previous work

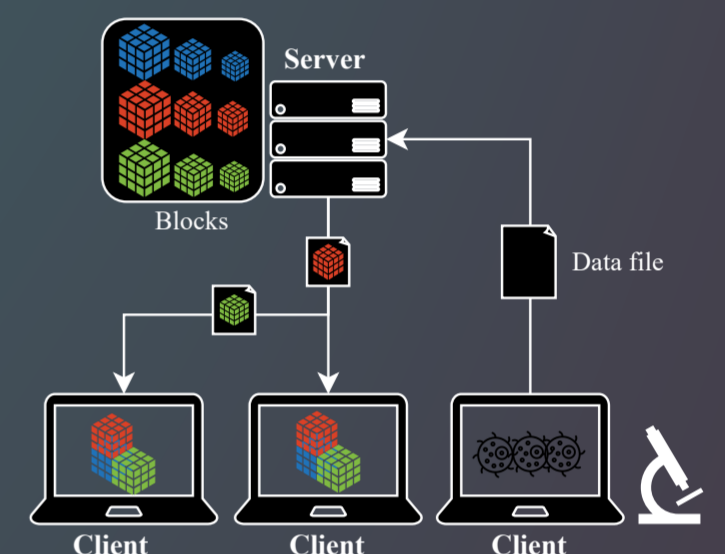


Fig. 1: General system diagram for data streaming

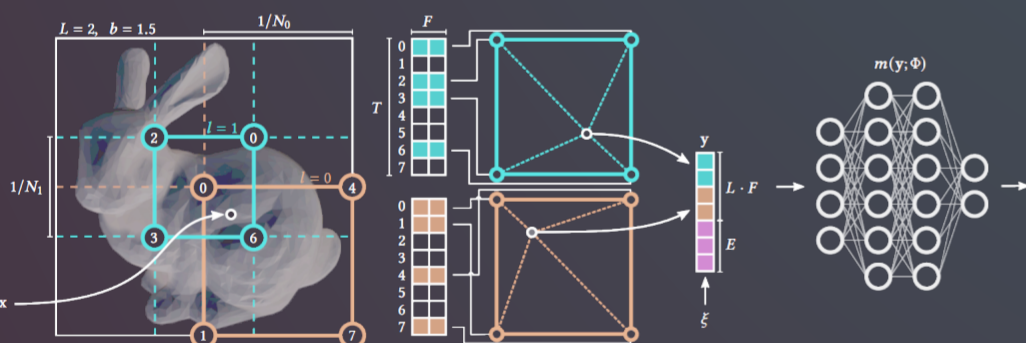


Fig. 2: Concept of multilevel hash grid [Muller et al.]

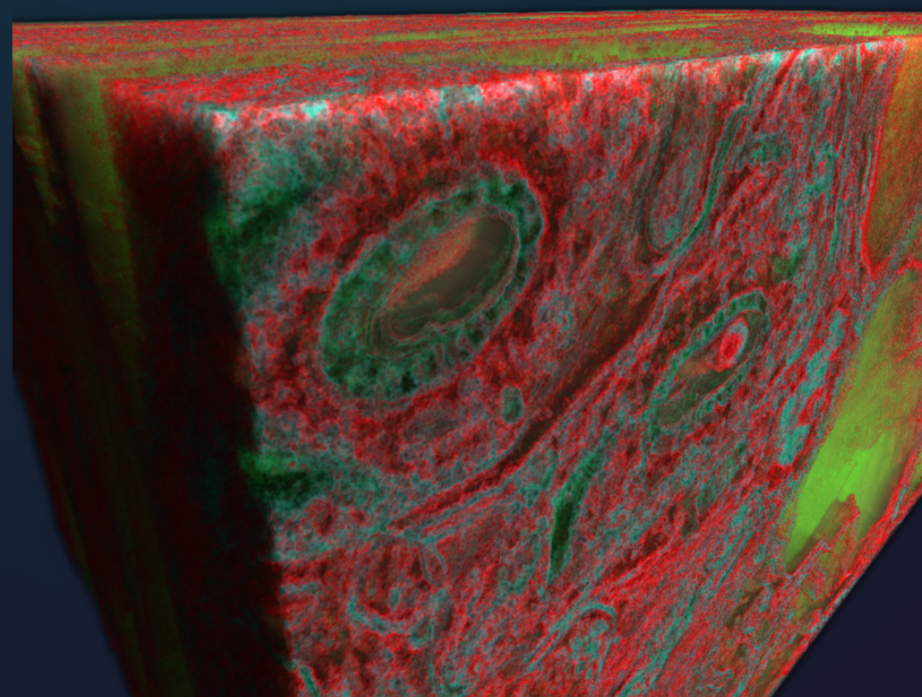


Fig. 7: Example of dataset visualization – Chaetoblast

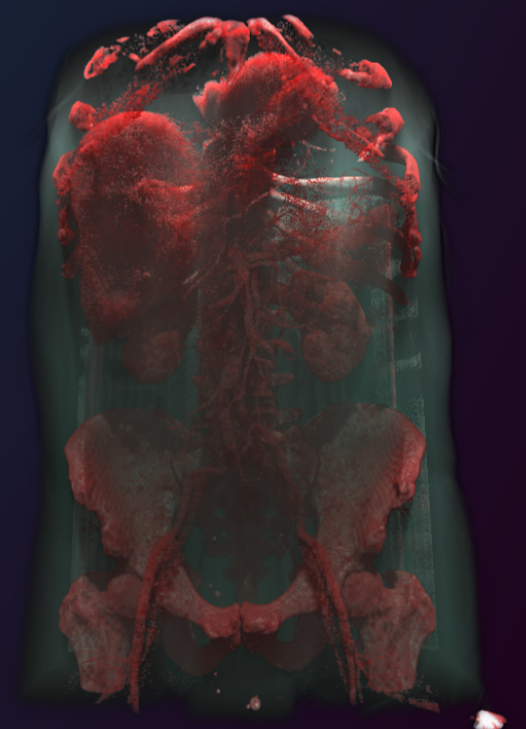


Fig. 8: Example of dataset visualization – CT Liver

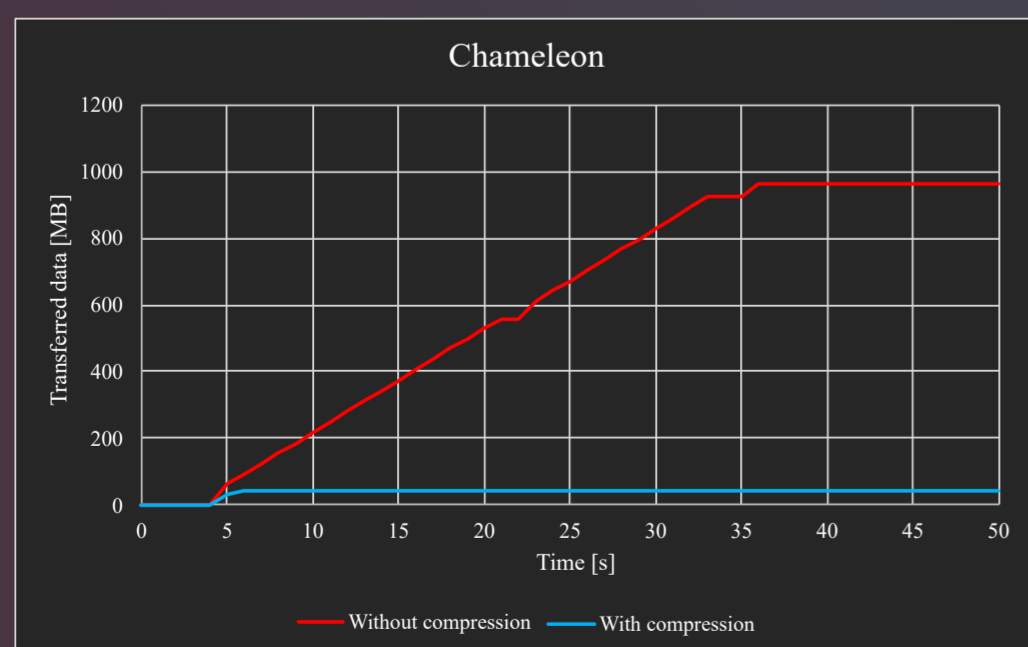


Fig. 3: Comparison of streaming the Chameleon dataset

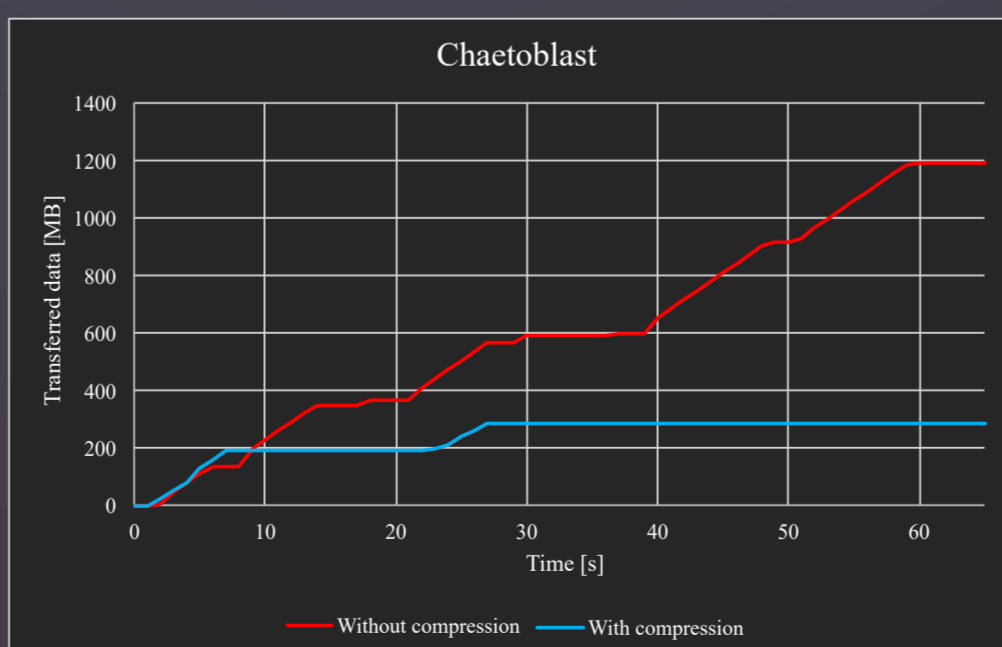


Fig. 4: Comparison of streaming the Chaetoblast dataset

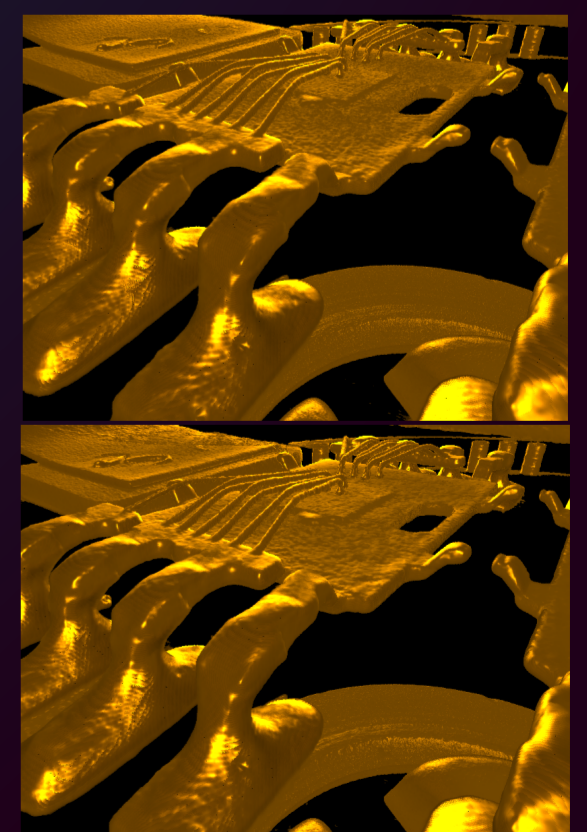


Fig. 5: 31:1 compression of the Stamina dataset