DEEP LEARNING WITH 3D DATA

Fisher Yu
Princeton University
Code

- https://github.com/PrincetonVision/marvin
- https://github.com/fyu/util3d
3D Shapes
Shape Analysis

- Shape classification
- Shape segmentation
- Shape correspondence
- Shape features
- ...

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Princeton Shape Benchmark
Shape Analysis

- Shape classification
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M. Aubry et al. 2011
Shape Analysis

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Ovsjanikov et al. 2010
**Shape Analysis**

- Shape classification
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- ...

X. Chen et al. 2012
Example: Shape Classification

Chair!
Example: Shape Classification

- Subset of ModelNet40
  - http://modelnet.cs.princeton.edu/

Chair!
Voxel Representation

Mesh → Voxelized → Voxels
3D Network

- A simple 3D convolutional network
- marvin/examples/3dshapenets
3D Network
3D Network

- A simple 3D convolutional network
- `marvin/examples/3dshapenets`
  - `prepare_data.sh`: download data in tensor
  - `3dshapenets.json`: network definition
Solver Parameters

"solver": "SGD",
"regularizer": "L2",
"momentum": 0.9,
"weight_decay": 0.0005,
"base_lr": 0.001,
"lr_policy": "LR_step",
"lr_gamma": 0.1,
"lr_stepsize": 40000,
Data Augmentation

- An important part trick for deep learning
- Each model is rotated 12 times
- Also used in testing phase
Training

- From scratch
  - `./marvin train examples/3dshapenets/3dshapenets.json`

- From snapshot
  - `./marvin train examples/3dshapenets/3dshapenets.json examples/3dshapenets/3dshapenets_snapshot_50000.marvin`
Summary

- Use a subset of ModelNet40
- Convert the 3D models to voxel representation.
- Build a simple 3D network.
From here

- Bigger data
  - ShapeNet
- Deeper network
- Depth data
  - The following talks
ShapeNet

ShapeNet

http://arxiv.org/abs/1512.03012

ShapeNet: An Information-Rich 3D Model Repository

http://www.shapenet.org

Angel X. Chang¹, Thomas Funkhouser², Leonidas Guibas¹, Pat Hanrahan¹, Qixing Huang³, Zimo Li³, Silvio Savarese¹, Manolis Savva*¹, Shuran Song², Hao Su*¹, Jianxiong Xiao², Li Yi¹, and Fisher Yu²

¹Stanford University — ²Princeton University — ³Toyota Technological Institute at Chicago

Authors listed alphabetically
3D Shape Retrieval

- https://shapenet.cs.stanford.edu/shrec16/

Eurographics Workshop on 3D Object Retrieval (2016)
J. Jorge and M. Lin (Guest Editors)

SHREC’16 Track
Large-Scale 3D Shape Retrieval from ShapeNet Core55


1 Stanford University, USA
2 Princeton University, USA
3 University of Massachusetts Amherst, USA
4 Huazhong University of Science and Technology, China
5 Tel Aviv University, Israel
6 Shandong University, China
7 Beijing University of Posts and Telecommunications, Beijing, China
8 Toyohashi University of Technology, Japan
*Track organizers
shrec2016shapenet@gmail.com
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@fyu
Questions?