

# SemanticPaint

Adam Kosiorek

Computer Aided Medical Procedures Technische Universität München

10.12.2015



#### Outline

- 1 Introduction
- 2 State of the Art
- 3 Pipeline
- 4 Results
- **5** Discussion and Outlook







State of the Art





# Pipeline





# Results



# Segmentation

Table: Segmentation Results

Component	LivingRoom	Bedroom	Kitchen	Desk	Average
User Interaction	99.35%	97.61%	96.09%	97.73%	97.7%
Forest Prediction Final Inference	94.57% 96.26%	88.31% 95.19%	82.58% 90.69%	90.29% 95.55%	88.94% 94.42%



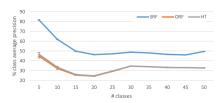
#### **Features**

Table: Feature Comparison

Feature	LivingRoom	Bedroom	Kitchen	Desk	Average
VOP	94.57%	88.31%	82.58%	90.29%	88.94%
$\triangle$ RGB mean	80%	71.84%	76.29%	73.42%	75.39%
Depth Probe	77.54%	61.79%	84.9%	68.9%	73.06%
Color Probe	56.39%	65.68%	60.77%	60.74%	60.9%
SURF	43.74%	67.12%	57%	58.13%	56.5%
SPIN	58.77%	43.22%	48.41%	36.1%	46.63%



# Streaming Random Forest



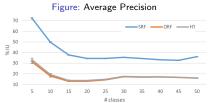


Figure: Intersection/Union

Data: 300 objects 51 classes full revolution 3 points of view

SRF - Streaming Random Forest ORF - Online Random Forest HT - Hoeffding Tree



Discussion and Outlook



# Summary



### **Failures**



### Future Work



### Two columns

Left Right



# How to include an image





#### References

- Roberts, L. G. 1963. Machine perception of three-dimensional solids. Ph.D. thesis, Massachusetts Institute
  of Technology.
- Kim, B.-S. et. al. 2013. 3D scene understanding by voxel-CRF. In Proc. ICCV.
- Pradeep, V. et. al. 2013. Monofusion: Real-time 3D reconstruction of small scenes with a single web camera. In Proc. ISMAR.
- Herbst, E. et.al. 2014. Toward online 3-d object segmentation and mapping. In IEEE International Conference on Robotics and Automation (ICRA).
- Valentin, J. P. et. al. 2013. Mesh based semantic modelling for indoor and outdoor scenes. In Proc. CVPR.
- Levoy , M. et. al. 2000. The digital Michelangelo project: 3D scanning of large statues. In Proc. SIGGRAPH. ACM.
- Newcombe , R. A. et. al. 2011. KinectFusion: Real-time dense surface mapping and tracking. In Proc. ISMAR.
- Curless , B. et. al. 1996. A volumetric method for building complex models from range images. In Proceedings of the 23rd annual conference on Computer graphics and interactive techniques. ACM, 303312.
- Niessner , M. et. al. 2013. Real-time 3D reconstruction at scale using voxel hashing. ACM TOG 32, 6



#### References cont'd

- Saffari , A. et. al. 2009. On-line random forests. In IEEE ICCV Workshop.
- Vitter , J. S. 1985. Random sampling with a reservoir. ACM TOMS 11, 1.
- Lower , D. G. 1999. Object recognition from local scale-invariant features. In Proc. ICCV.
- Lafferty , J. et. al. 2001. Conditional random fields: Probabilistic models for segmenting and labeling sequence data.
- Ktahenbl, P. et. al. 2011. Efficient inference in fully connected CRFs with Gaussian edge potentials. In NIPS.
- Koller , D. et.al , N. 2009. Probabilistic Graphical Models: Principles and Techniques. MIT Press
- Domingos, P. et. al. 2000. Mining high-speed data streams. In Proc. SIGKDD.
- Lai, K. et. al. 2011. A large-scale hierarchical multi-view rgb-d object dataset. In Proc. ICRA.
- Valentin, J. et. al. 2015. SemanticPaint: Interactive 3D Labeling and Learning at your Fingertips. SIGGRAPH.