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Scribbles for All: Benchmarking Scribble Supervised Segmentation Across Datasets

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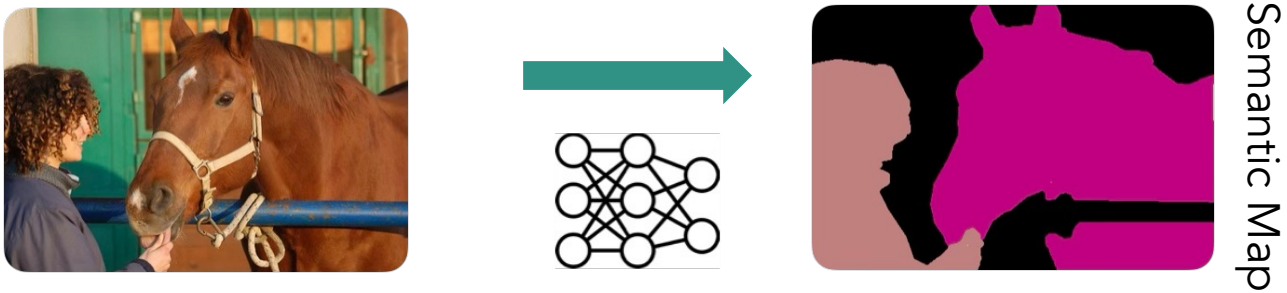
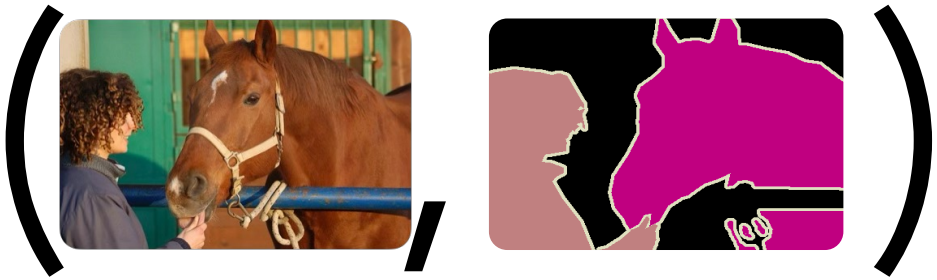
wbkit.github.io/Scribbles4All/

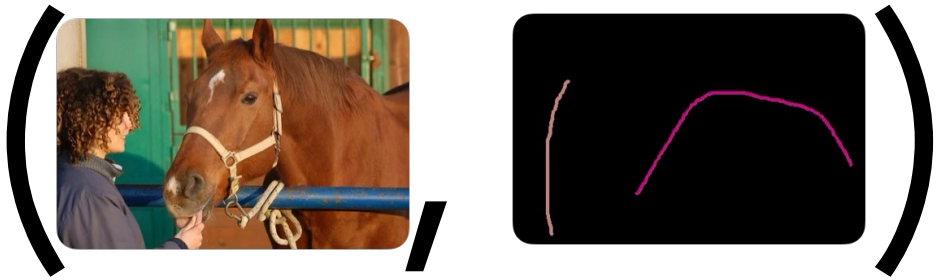
What is Scribble Supervised Segmentation?



Full Supervision



Scribble Supervision



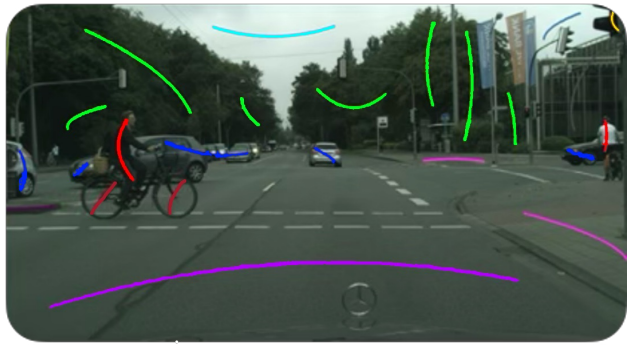
- Relative Performance (ScribbleSup): ≈ 90 %

Why Scribble Supervised Segmentation?

Fully Supervised

≈ 1.5 hrs.

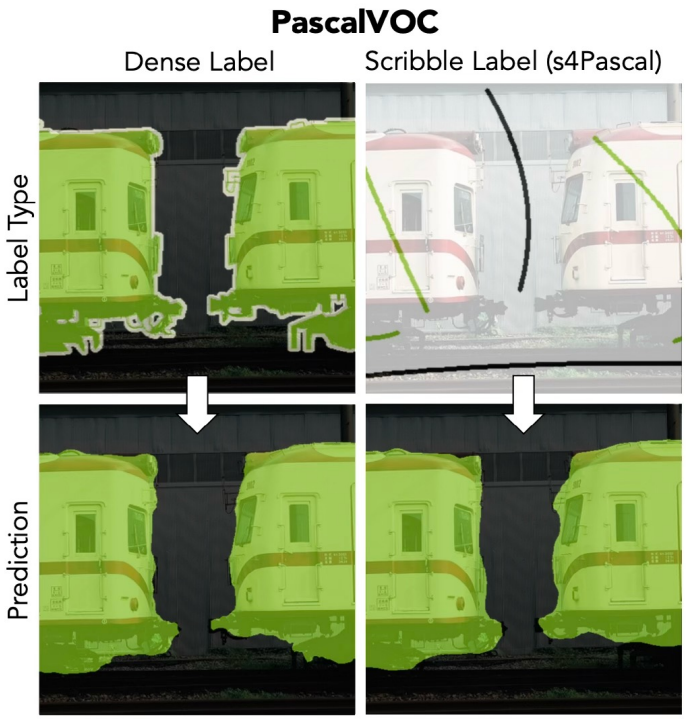
Scribble Supervised



≤ 1.5 min.

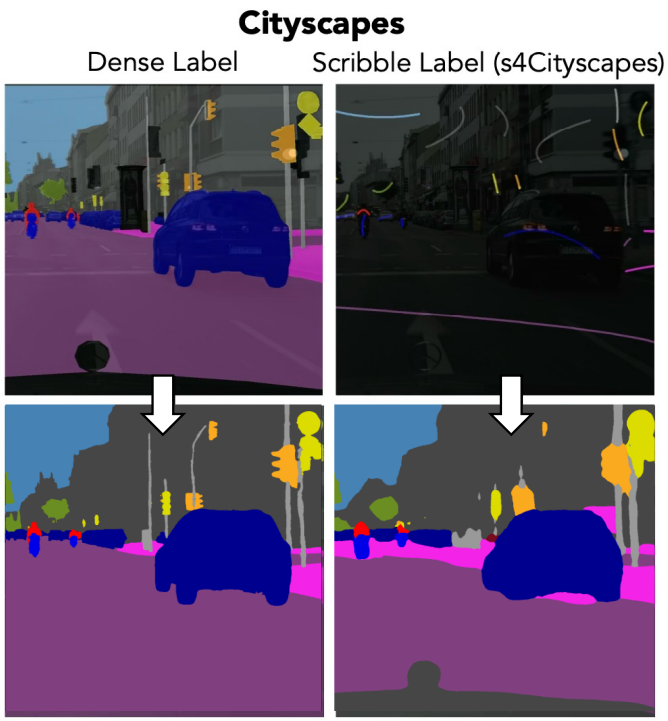
- Scribble labels are significantly cheaper than full annotations
- Scribble labels are more expressive than point labels at similar labelling cost
- Scribble labels have no ambiguity like bounding-boxes (overlap, covering non-object parts)

Why New Datasets?

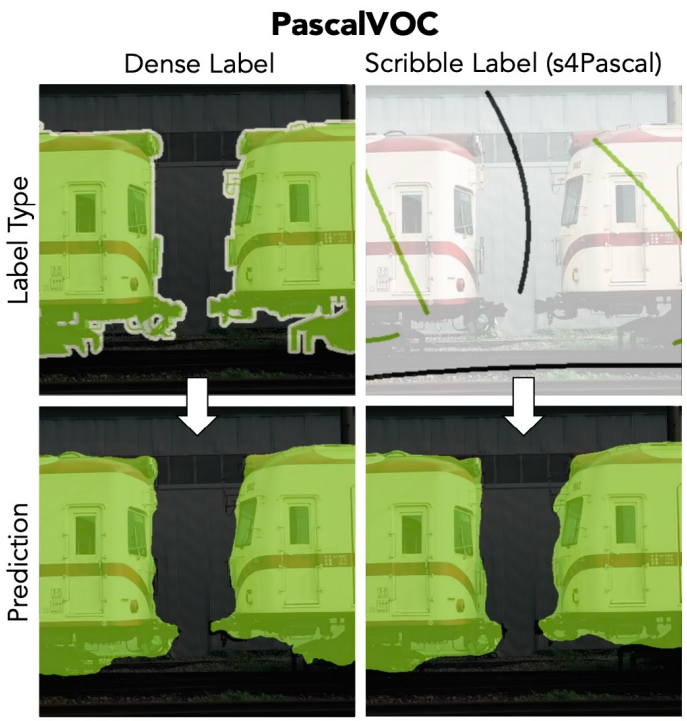


- PascalVOC outdated benchmark
- Fully-supervised and scribble-supervised results visually similar
- Relative Performance:

  ≈ 90 %



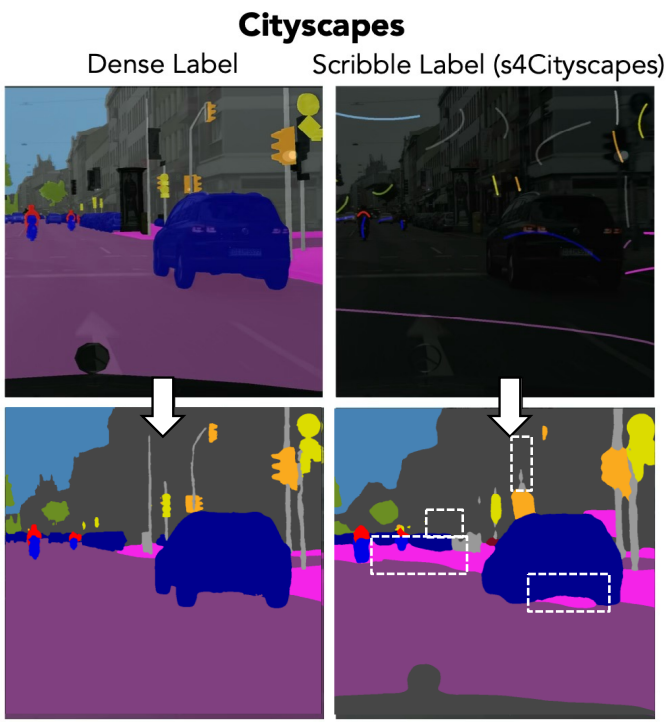
Why New Datasets?



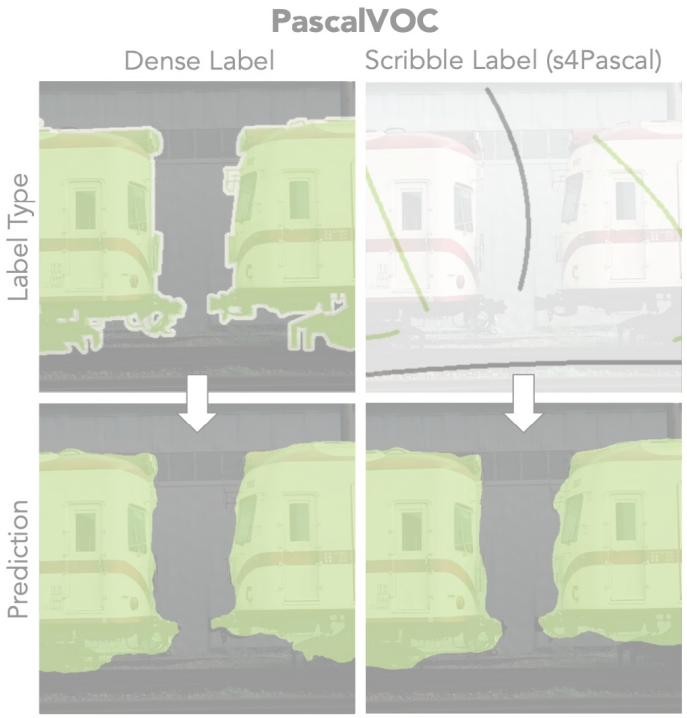
≈ 90 %

- Scribble-supervised results visually weaker
- Relative Performance:

  ≈ 72-82 %



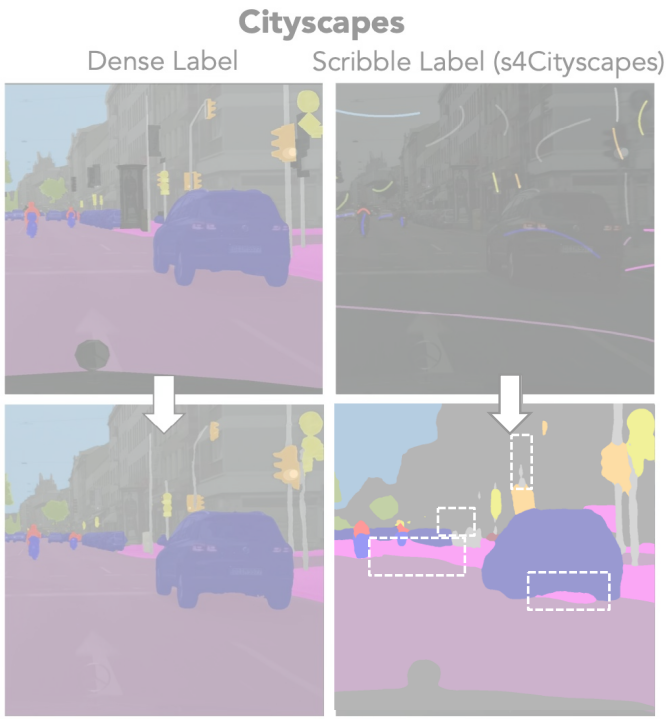
Why New Datasets?



≈ 90 %

→Necessity for more complex datasets

→Need for more diverse datasets



≈ 72 %

How to Obtain Scribble Labels?

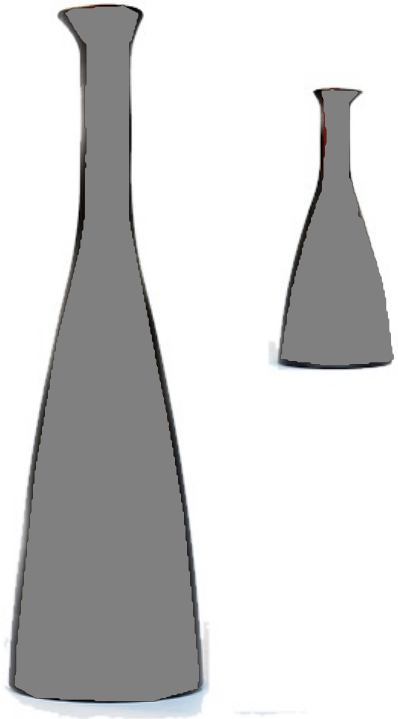
Hand-Annotation?

- Scribbles are a strict subset of Full Labels
- Using pre-existing datasets is preferable for consistency sake
- Hand-labelling still incurs cost

Synthetic Scribble Generation

How to Get New Datasets?

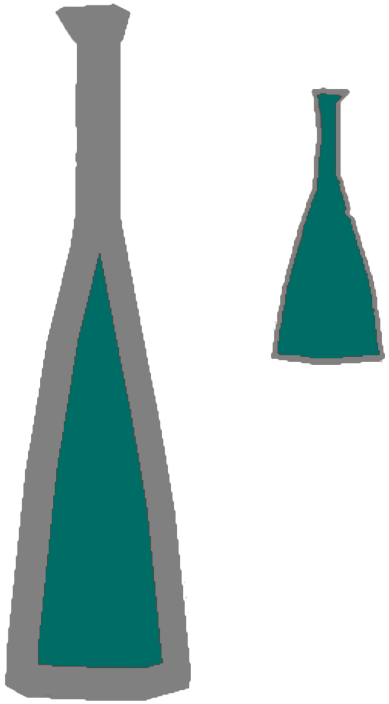
Synthetic Scribble Generation



- Separate objects into blobs

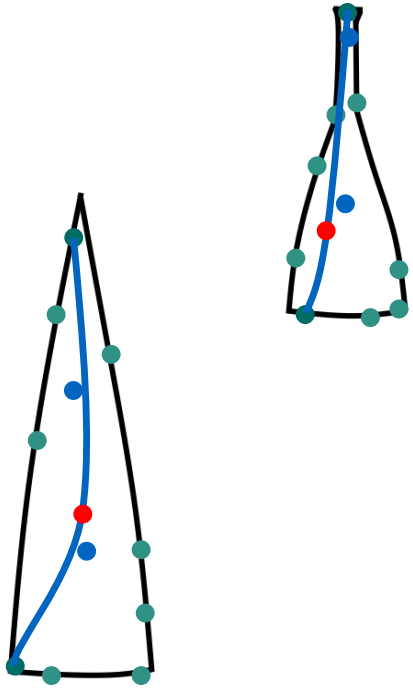
How to Get New Datasets?

Synthetic Scribble Generation



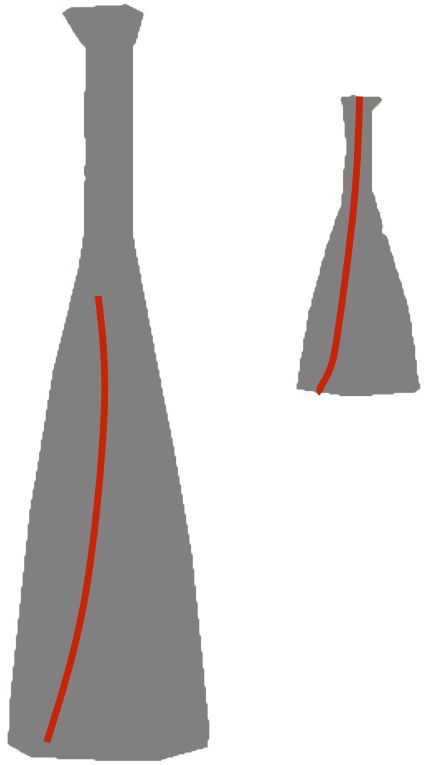
- Size dependent blob erosion

How to Get New Datasets?



- Obtain center-of-mass + noise
- Sample points on edge of blob
- Approximate max-distance point-pair
- Fit 2nd order polynomial
- 2 random points along the polynomial

How to Get New Datasets?



- Fit 4th order polynomial —

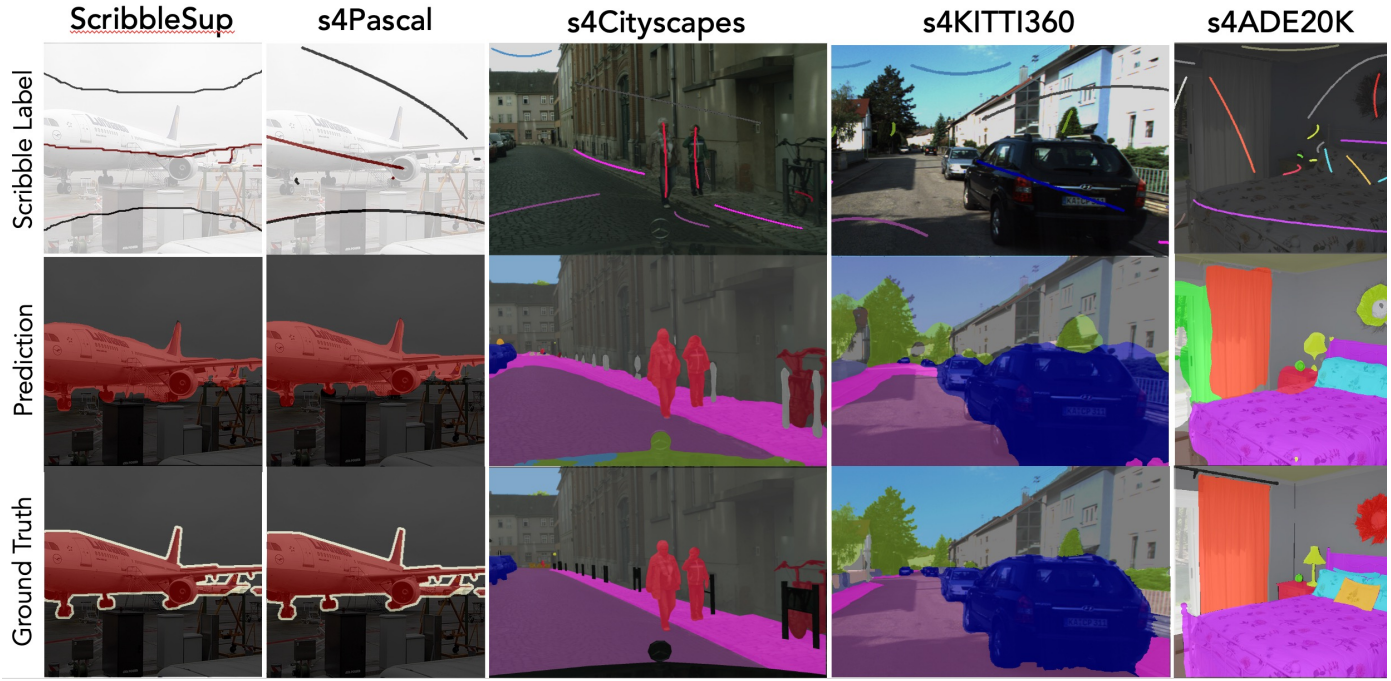
The s4-Dataset Family

- Initial Set of s4-datasets

	Classes	Labels	% px. Lab.	
PASCAL2 Pattern Analysis, Statistical Modelling and Computational Learning	21	≈ 10.000	≈ 2.1 %	Comparison
CITYSCAPES DATASET	19	≈ 3000	≈ 2.4 %	Detailed shapes
KITTI-360	16	≈ 50.000	≈ 2.5 %	High # images
ADE20K	150	≈ 25.000	≈ 4.7 %	Many classes

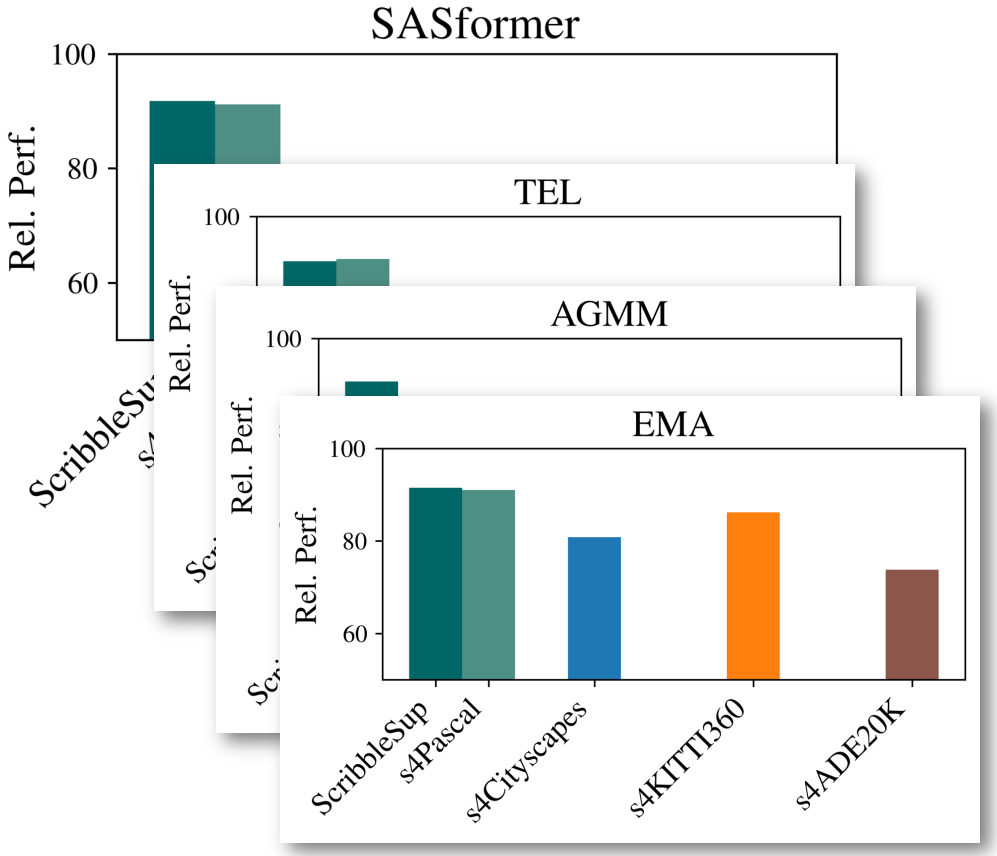
The Scribbles for All algorithm can generate scribble labels for ANY densely annotated dataset

The s4-Dataset Family



The Scribbles for All algorithm can generate scribble labels for ANY densely annotated dataset

How do SOTA Methods Perform?



- Performance of s4Pascal(ours) scribbles is identical to ScribbleSup
- Diverging SOTA performance on complex datasets
- Rel. Performance drops to around 82 %

Contributions

- Automatic **scribble generator** for **ANY** fully labeled segmentation dataset
- Introduce **s4-scribble Dataset family**:
  - s4Pascal
  - s4Cityscapes
  - s4KITTI360
  - s4ADE20K
- **Benchmark** SOTA methods on our datasets
- More **complex datasets** show **widening gap** between full supervision and scribbles

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Thank you for Listening!

- For further information, please visit the project page:
  wbkit.github.io/Scribbles4All/
- For the datasets, please got to our GitHub page:
  github.com/wbkit/Scribbles4All