

You Only **Scale** Once

Efficient Text Detection Using Adaptive Scaling

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So what is text detection?



ICDAR13



ICDAR15



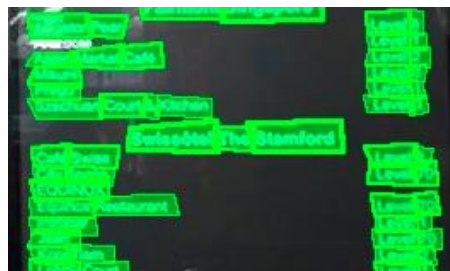
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What makes it difficult?

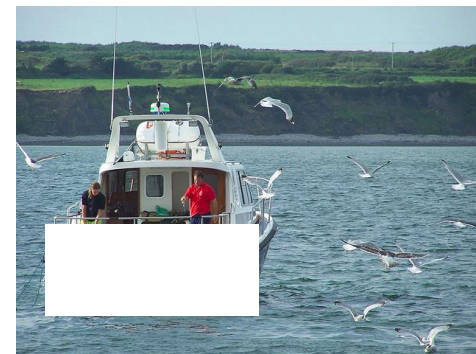
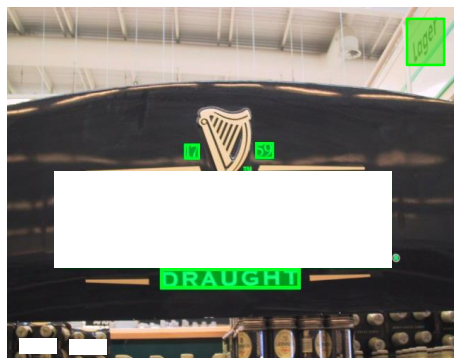
Scale Variability



Density



Irregular Shapes



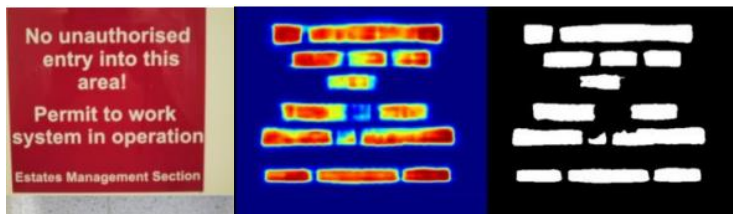
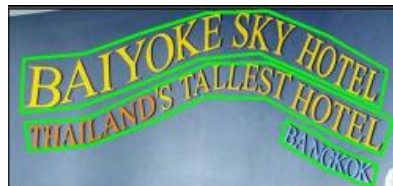
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So how do we solve it?

- Anchor-based methods dominate the Object Detection world
 - Widely used for Text Detection as well
- But Semantic Segmentation is getting pretty common
 - Works pretty good for text (Tagging is tight)
 - Better support for rotations and irregular text
- Tends to connect words
 - Solved using different regularizations

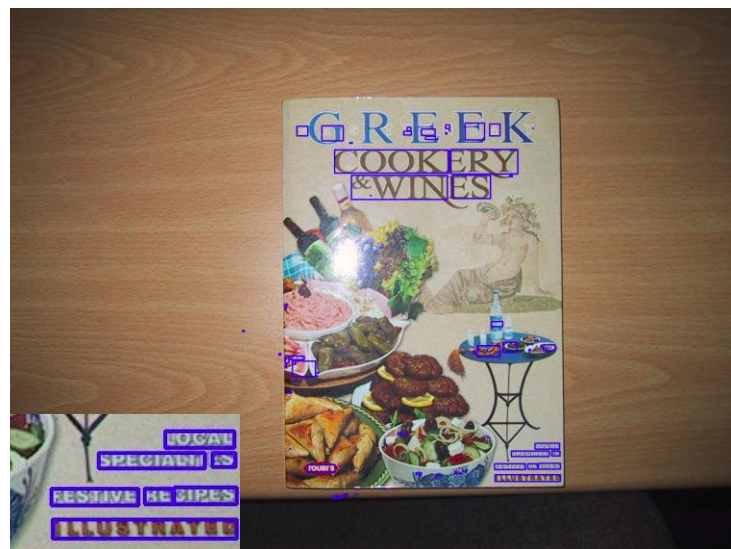
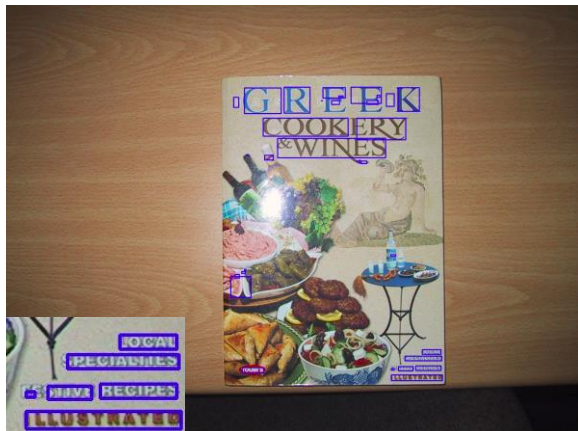
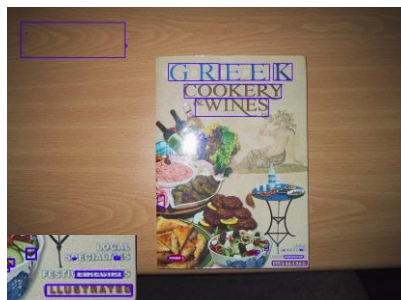


How can we improve our baseline?

- Simply run Multi-Scale
 - Using predefined scales (0.5, 0.7, 1, 1.4, 2)
 - Each scale captures different text regions
- But takes much more time
 - Not practical in many scenarios 😞

ICDAR15 Benchmark

Method	Recall	Precision	F-Score
EAST	0.73	0.83	0.78



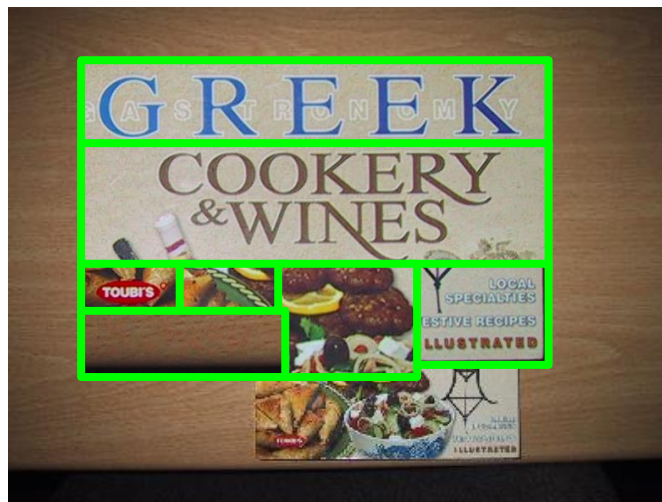
Can we do better?

- Base Scale is enough for “Coarse Detection”
- What if we filter background regions? 🤔
 - Get a compact image representation
- Apply Multi-Scale only on regions of interest



Can we do **even** better?

- Text detection works pretty well under the right scale
 - But we don't know the scale of each region 🙄
- So why not learn it?
 - Can resize all text to the desired scale!

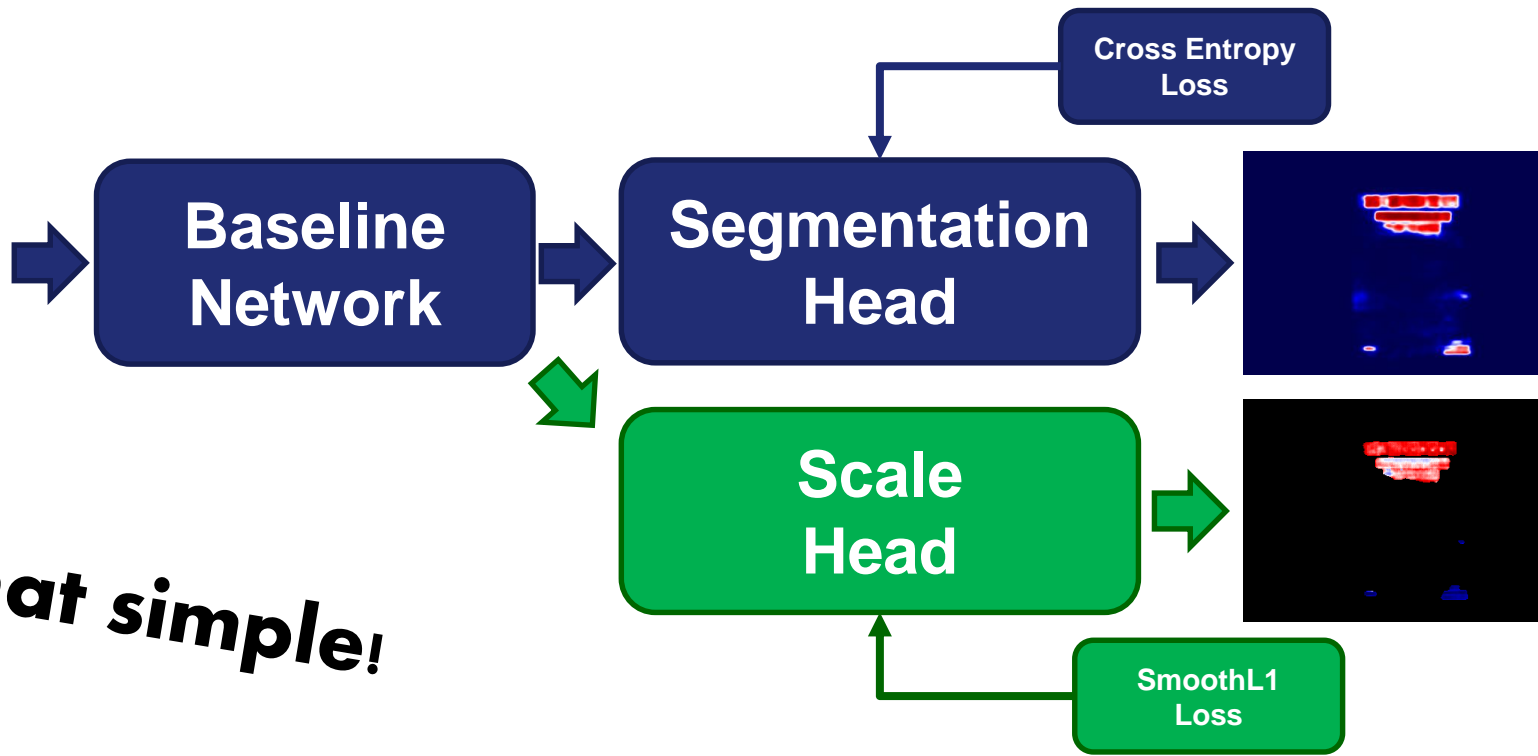
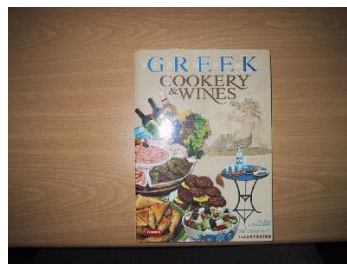


Our Solution In a Nutshell

- We already do a single forward pass
 - Let's gather some information there (segmentation + **scale**)
- Use it to create the “optimal scale”
 - And do only one additional forward pass 🙌



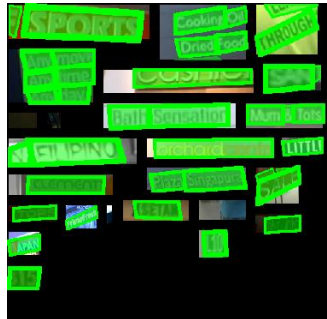
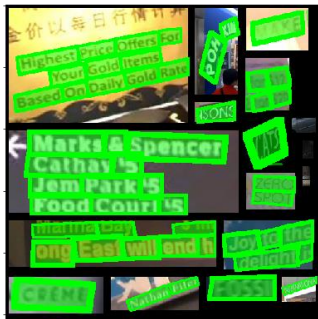
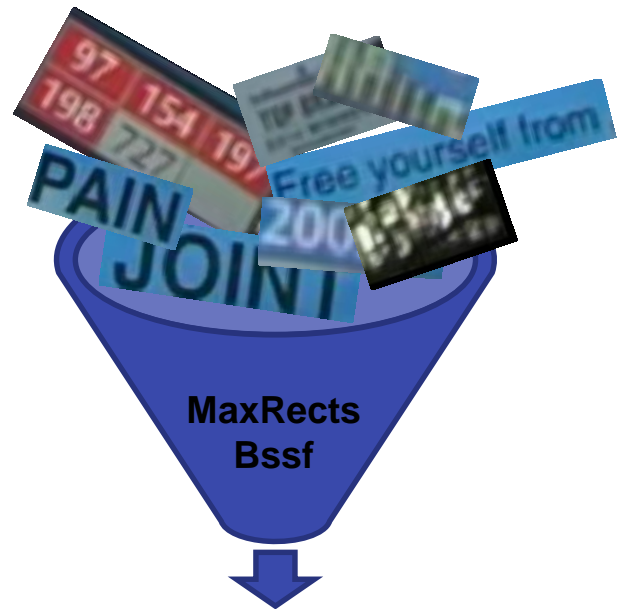
So what does it take?



It's that simple!

The Packing Problem

- How can we pack the blobs efficiently?
 - Use a 2D Knapsack solution
 - Specifically, the “Maximal Rectangles Best Short Side Fit” algorithm
- But knapsack images are not realistic
 - Add a knapsack augmentation to training!



Results!

DEK **2.17**
Knowledge Management (KM)

Dr. Faisal Shafait

Multimedia Analysis and Data Mining

2.17

Knowledge Management (KM)



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Knowledge Management (KM)

Dr. Faisal Shafiq

Knowledge Analysts and Data Analysts

Multimedia Analysis and Data Mining

Multimedia Management KM

Shafait

Dr.

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Multimedia Management KM

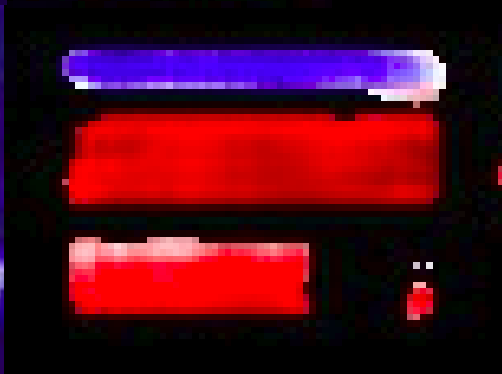
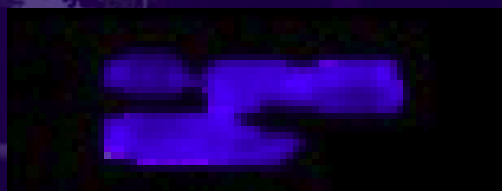
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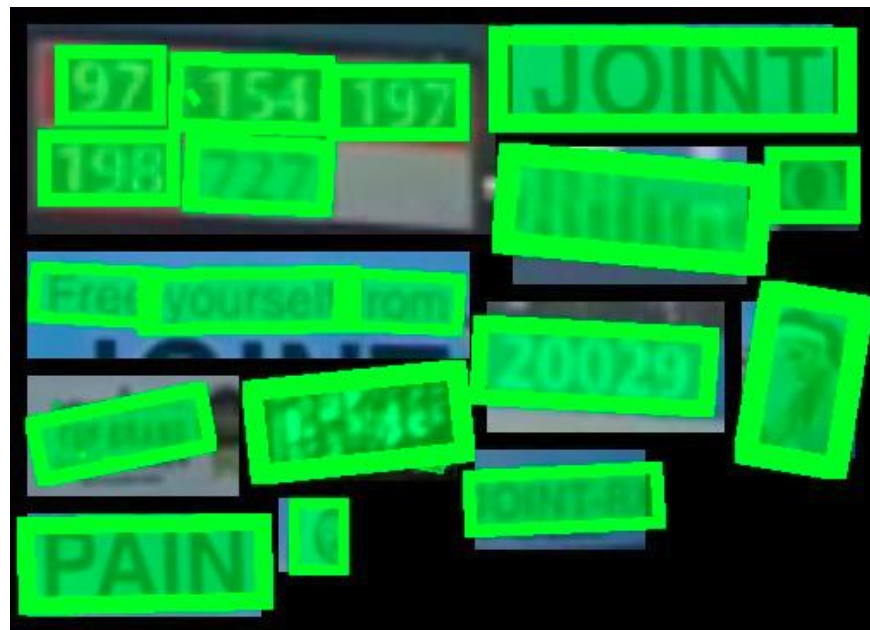
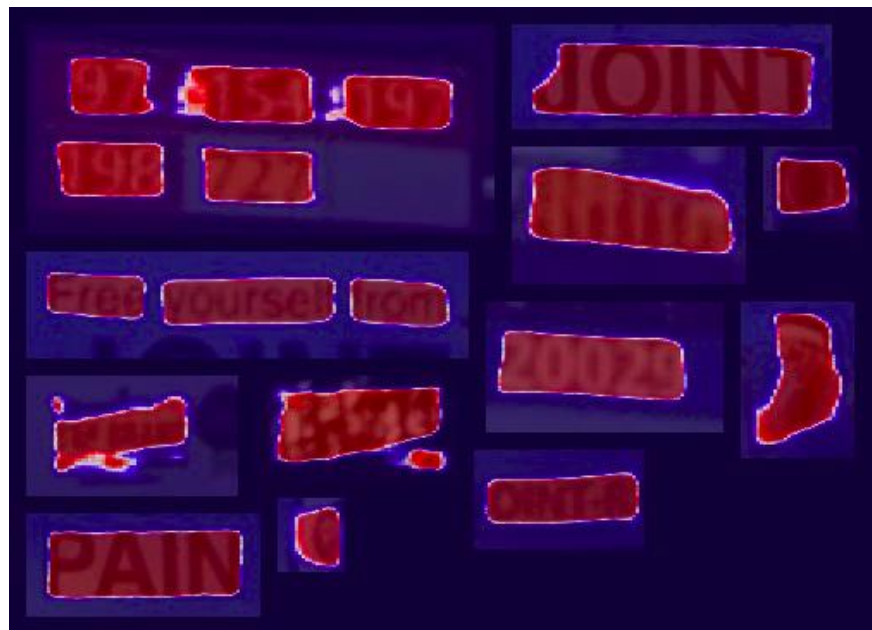
Dr.

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Faisal











How does it compare?

You Only Scale Once



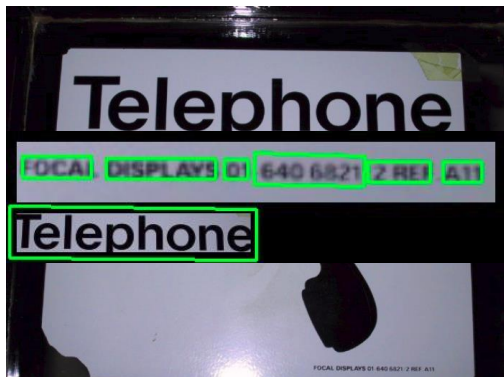
Multi-Scale



Method	Recall	Precision	F-Score
Baseline	41.47%	46.09%	43.81%
Ours	59.12%	51.25%	54.91%
Multiscale	59.7%	30.56%	40.42%

Conclusion

- A simple technique to boost single-scale methods
 - Without the overhead of running in multiscale 🙌
- Easily applied on top of any text detection algorithm
 - And possible general object detection
- Code available soon 😊



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Thanks!