Fast RCNN

Fast R-CNN

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Abstract

This paper proposes a Fast Region-based Convolutional Network method (Fast R-CNN) *for object detection. Fast R-CNN builds on previous work to efficiently classify object proposals using deep convolutional networks. Compared to previous work, Fast R-CNN employs several innovations to improve training and testing speed while also increasing detection accuracy. Fast R-CNN trains the very deep VGG16 network 9× faster than R-CNN, is 213× faster at test-time, and achieves a higher mAP on PASCAL VOC 2012. Compared to SPPnet, Fast R-CNN trains VGG16 3× faster, tests 10× faster, and is more accurate. Fast R-CNN is implemented in Python and C++ (using Caffe) and is available under the open-source MIT License at* https://github.com/rbgirshick/fast-rcnn.

while achieving top accuracy on PASCAL VOC 2012 [7] with a mAP of 66% (vs. 62% for R-CNN).[1]

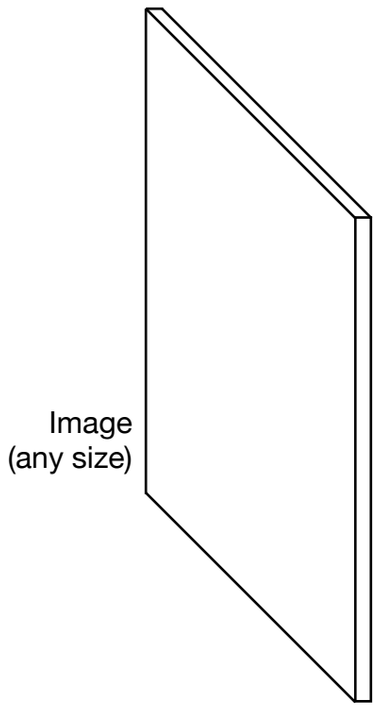
1.1. R-CNN and SPPnet

The Region-based Convolutional Network method (R-CNN) [9] achieves excellent object detection accuracy by using a deep ConvNet to classify object proposals. R-CNN, however, has notable drawbacks:

1. **Training is a multi-stage pipeline.** R-CNN first fine-tunes a ConvNet on object proposals using log loss. Then, it fits SVMs to ConvNet features. These SVMs act as object detectors, replacing the softmax classifier learnt by fine-tuning. In the third training stage, bounding-box regressors are learned.
2. **Training is expensive in space and time.** For SVM

2015

Fast RCNN



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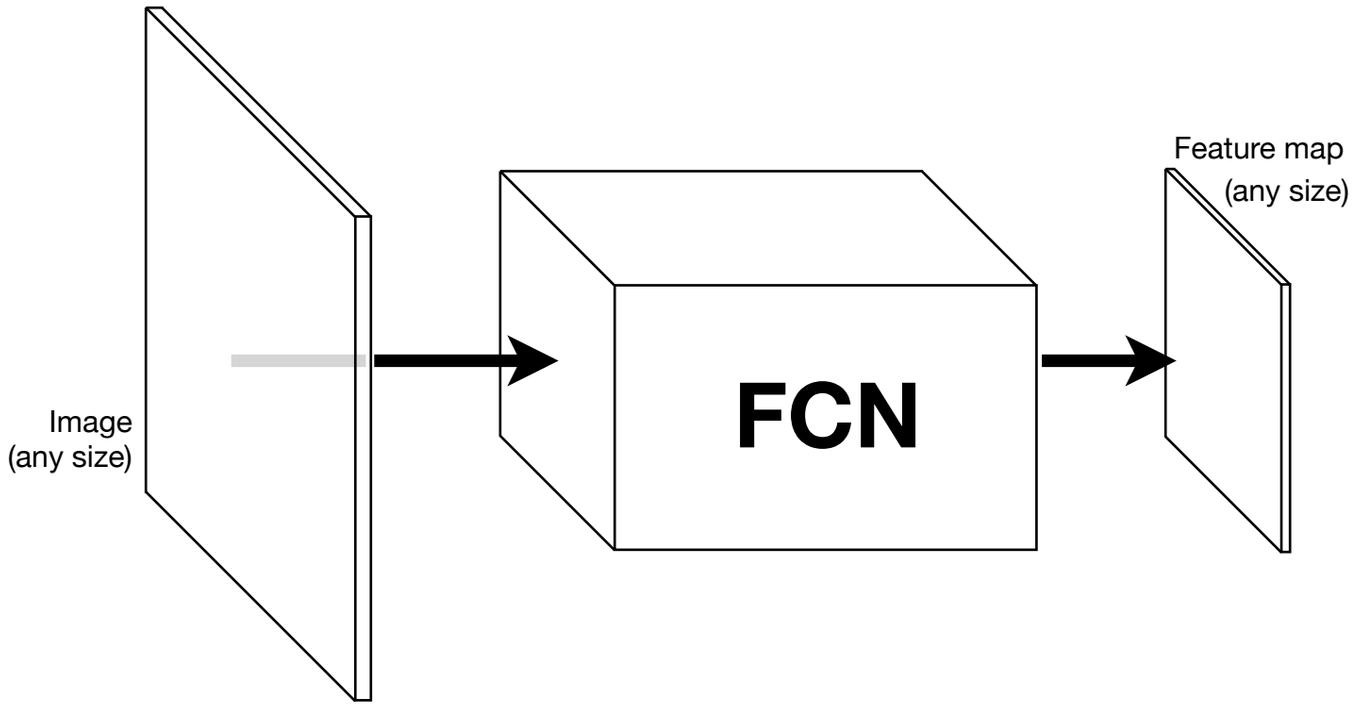

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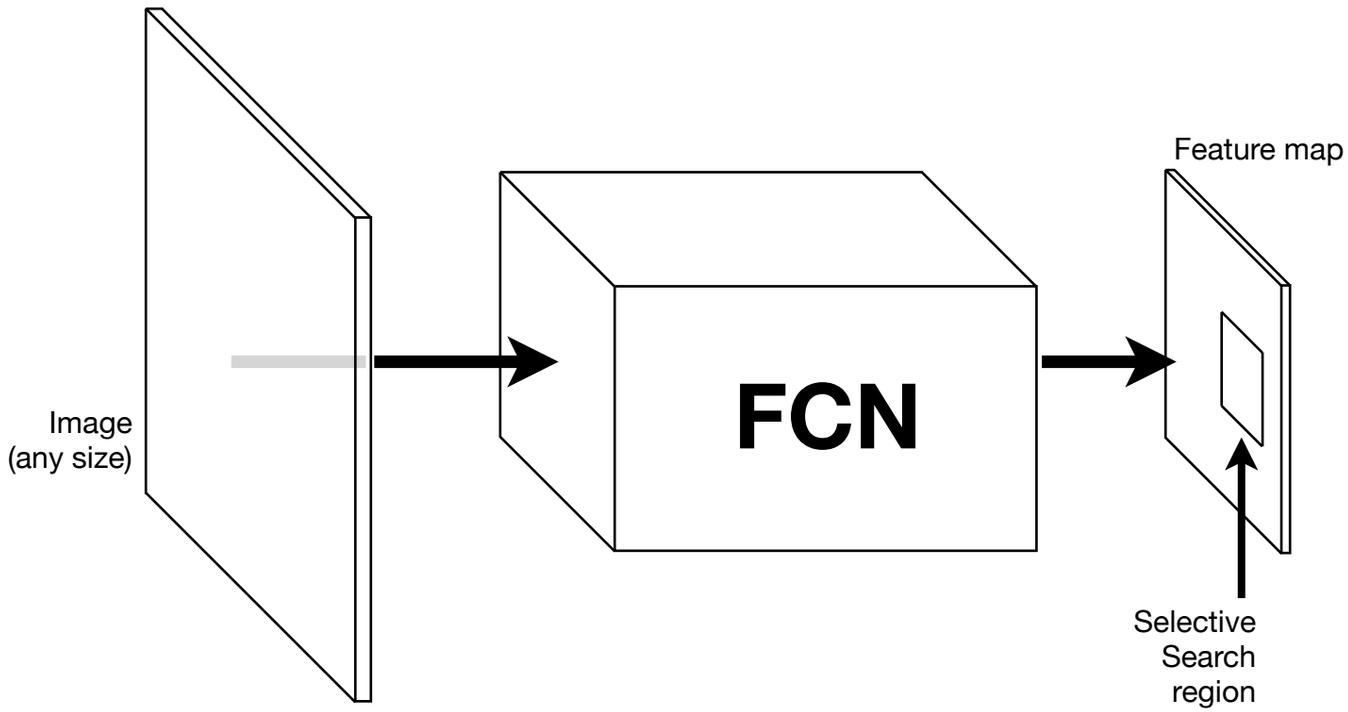

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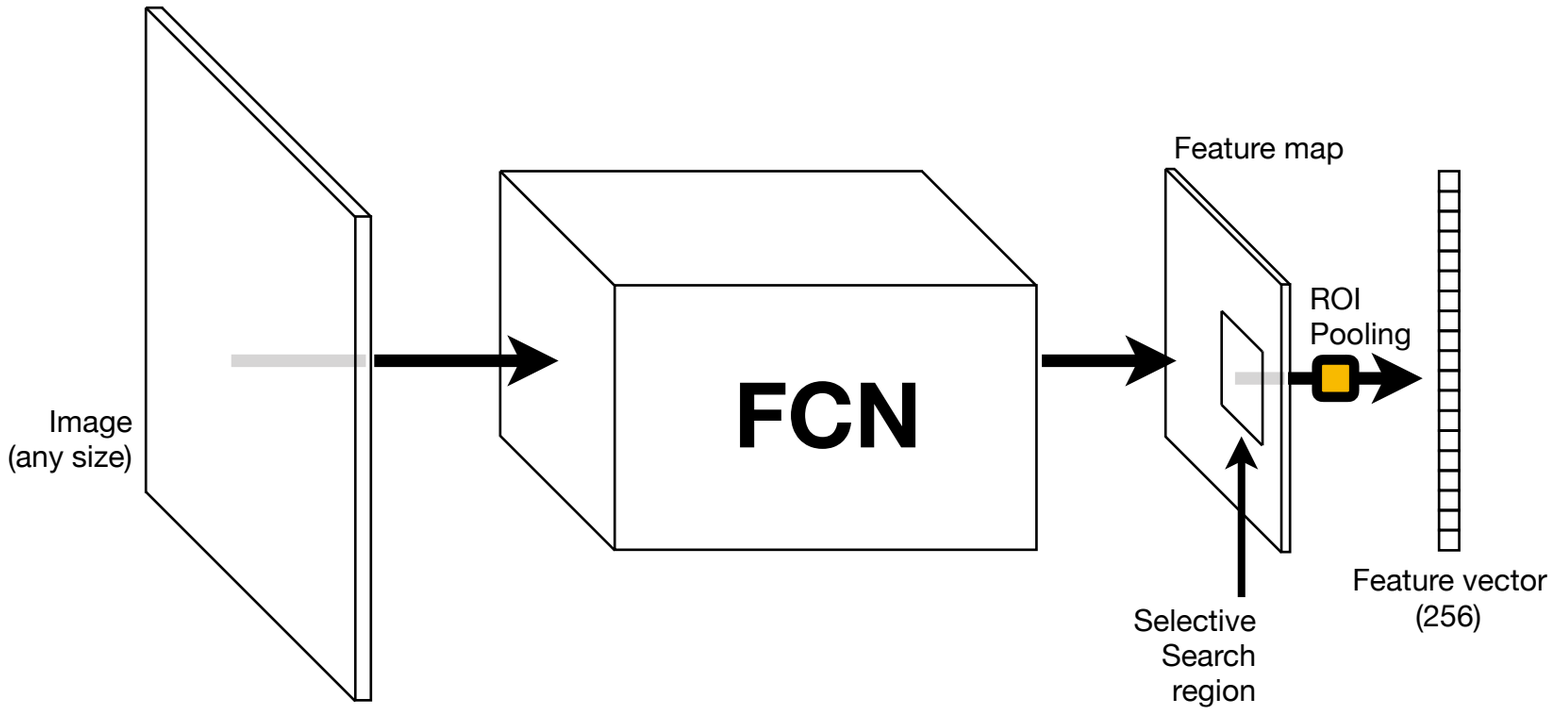
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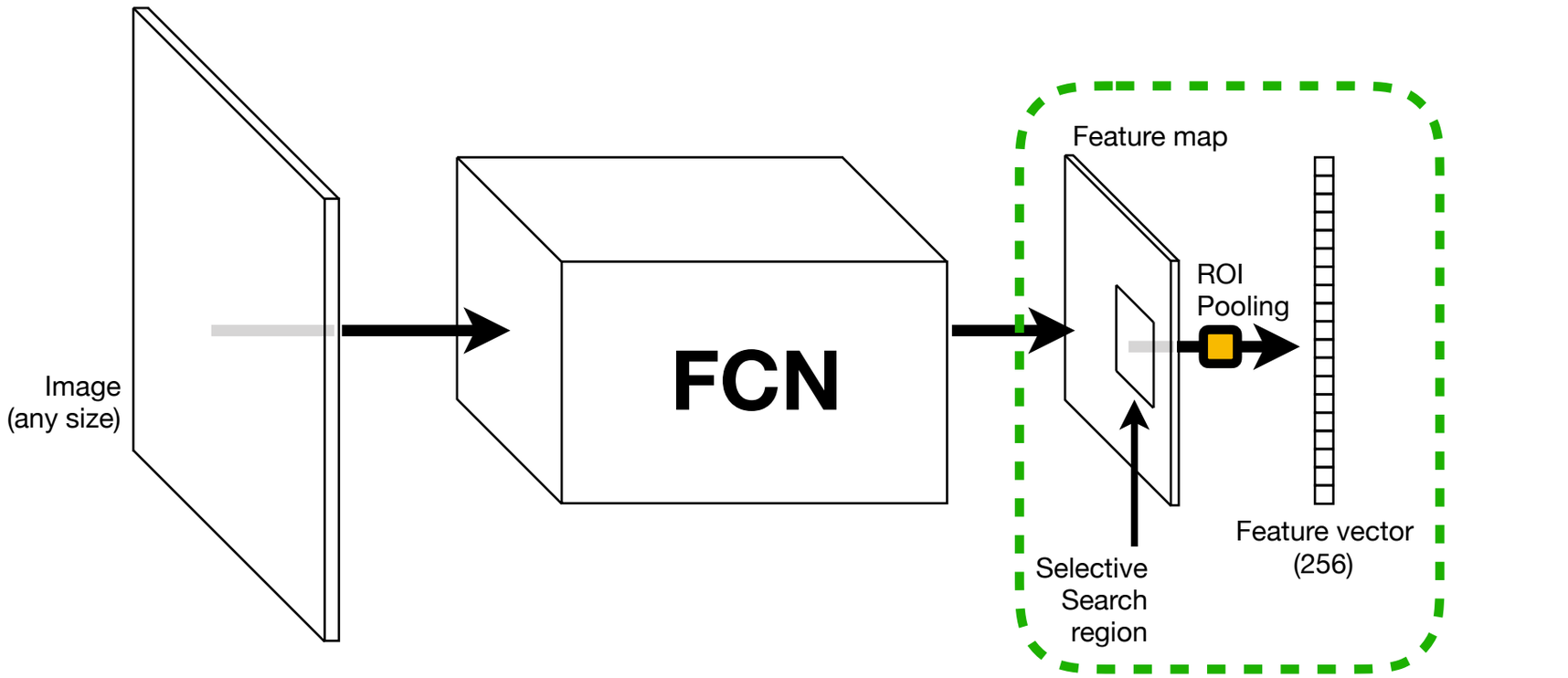
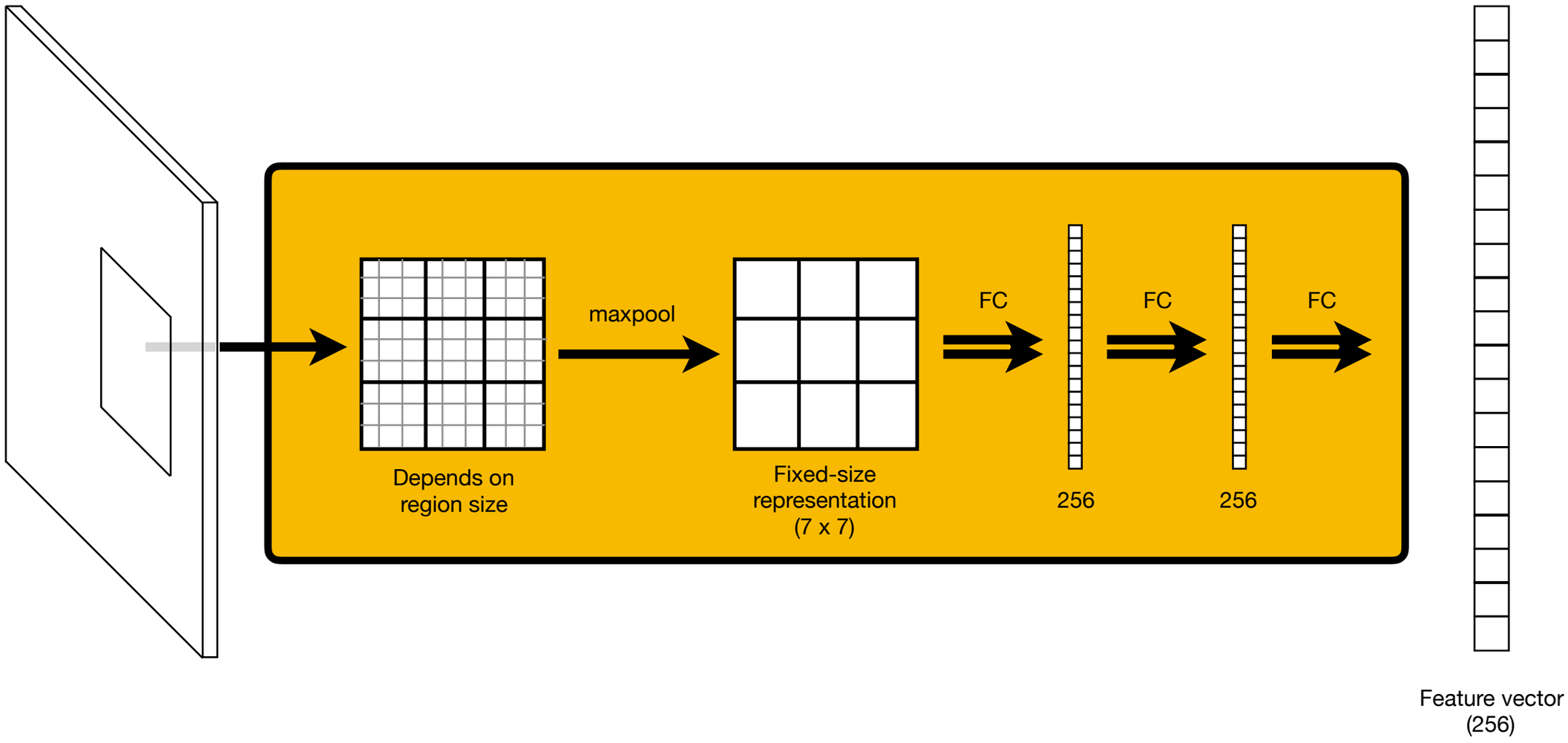
(any size)
FCN
Feature map
ROI
Pooling
Feature vector
(256)
Selective
Search
region

Fast RCNN



ROI Pooling Layer

ROI Pooling Layer



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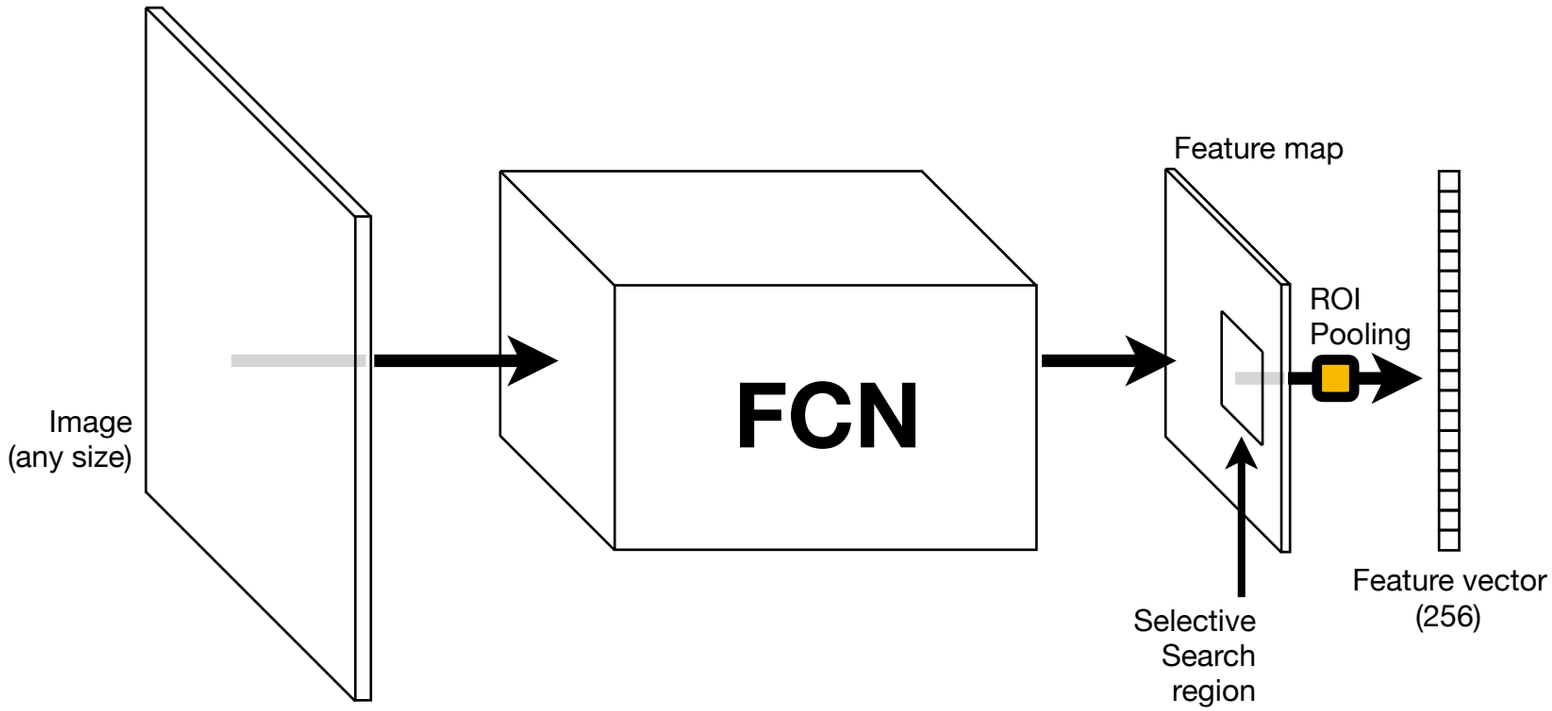
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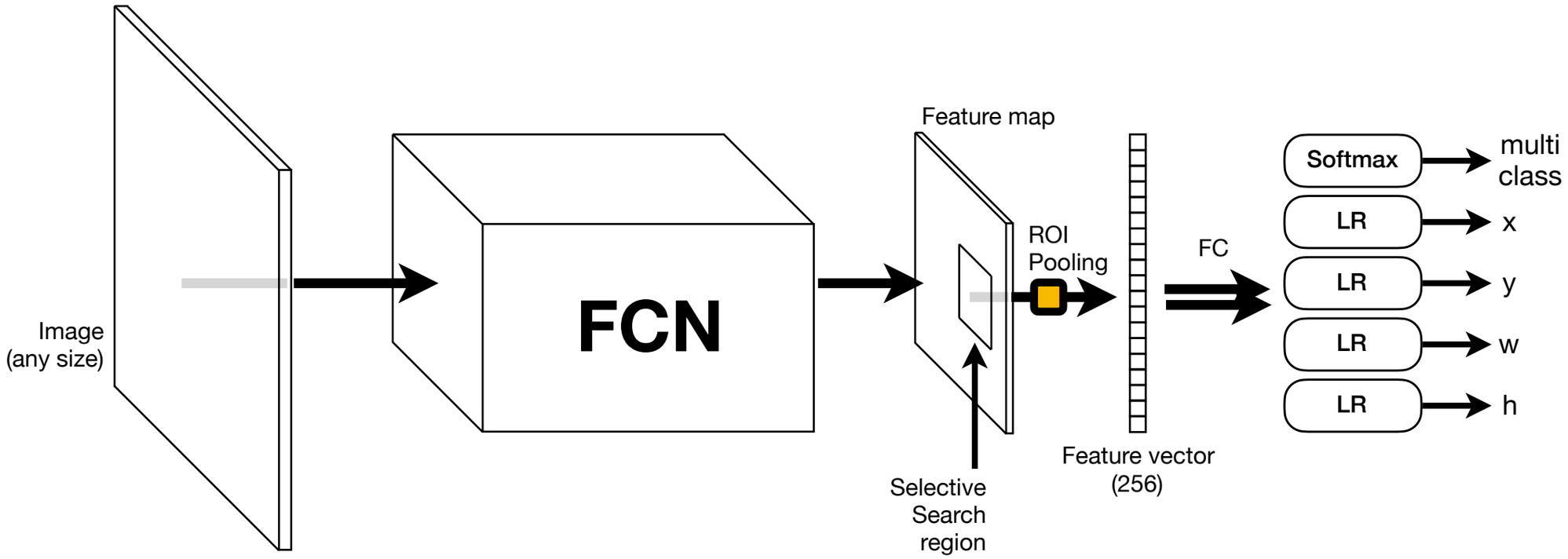
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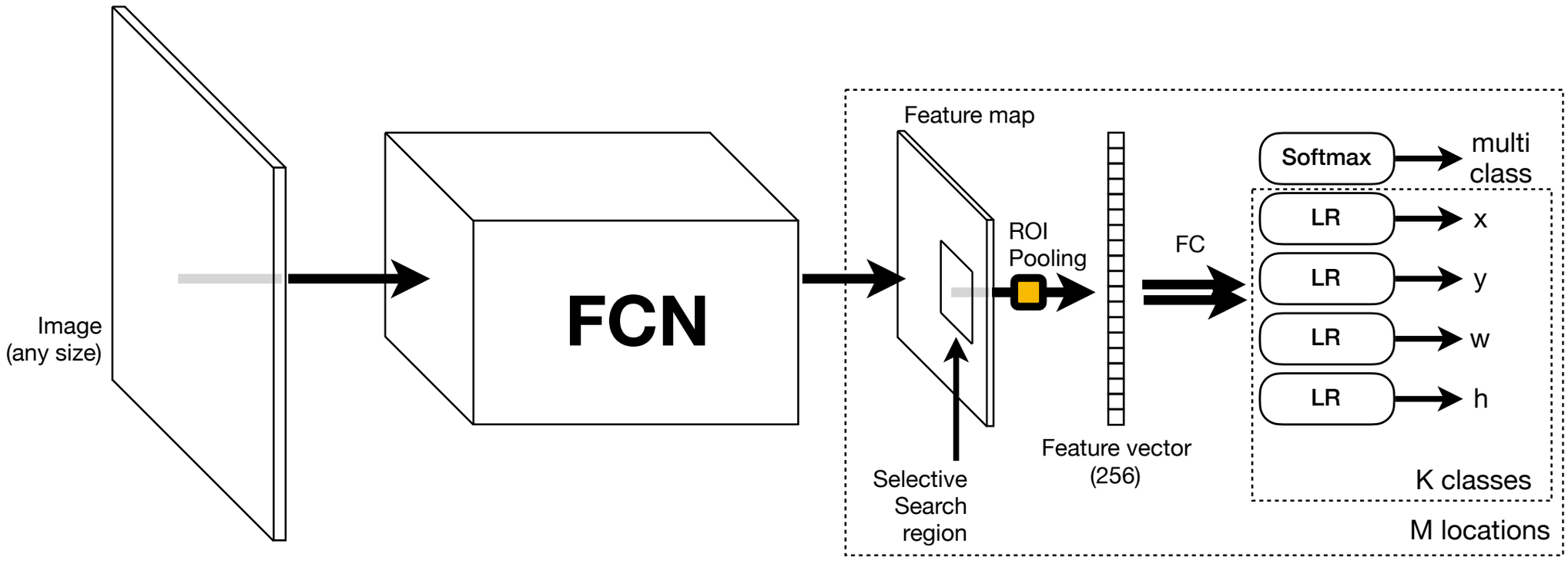
(any size)
FCN
Feature map
ROI
Pooling
Selective
Search
region
Feature vector
(256)
FC
Softmax
multi
class
LR
x
LR
y
LR
w
LR
h

Fast RCNN



Complete.

Important Concepts

- FCN conversion for variable sized input

- ROI Pooling

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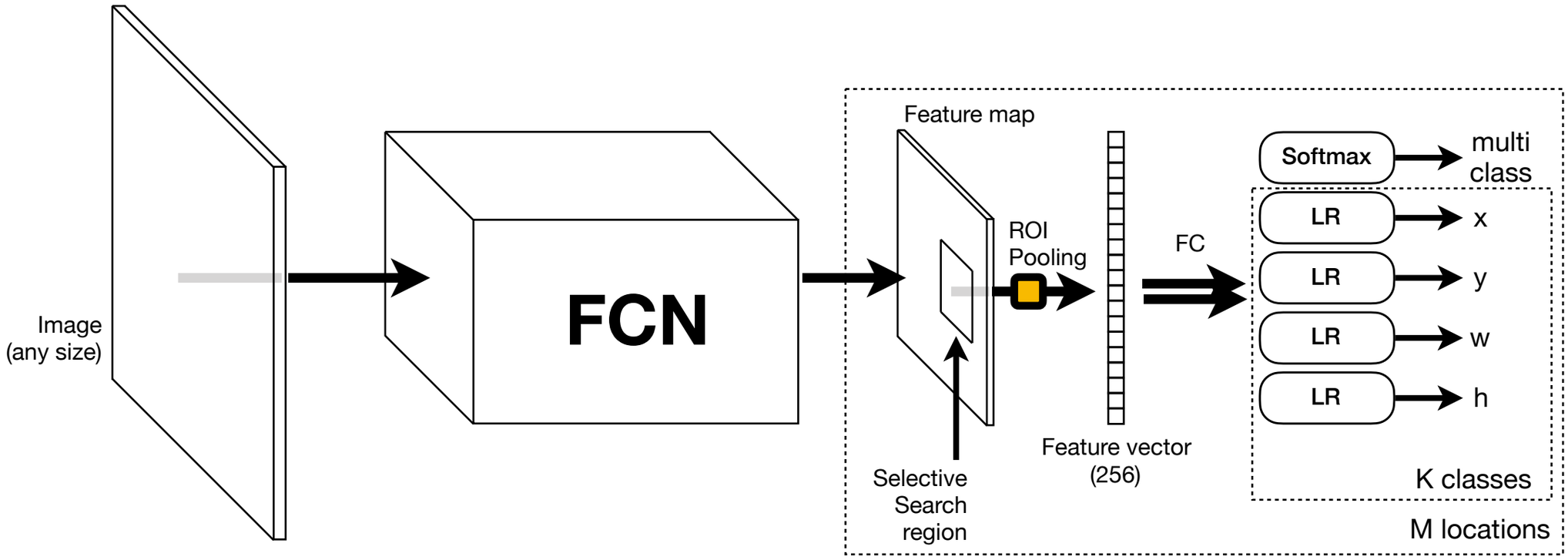

It turns out that Fast RCNN is not really that fast.
Why?

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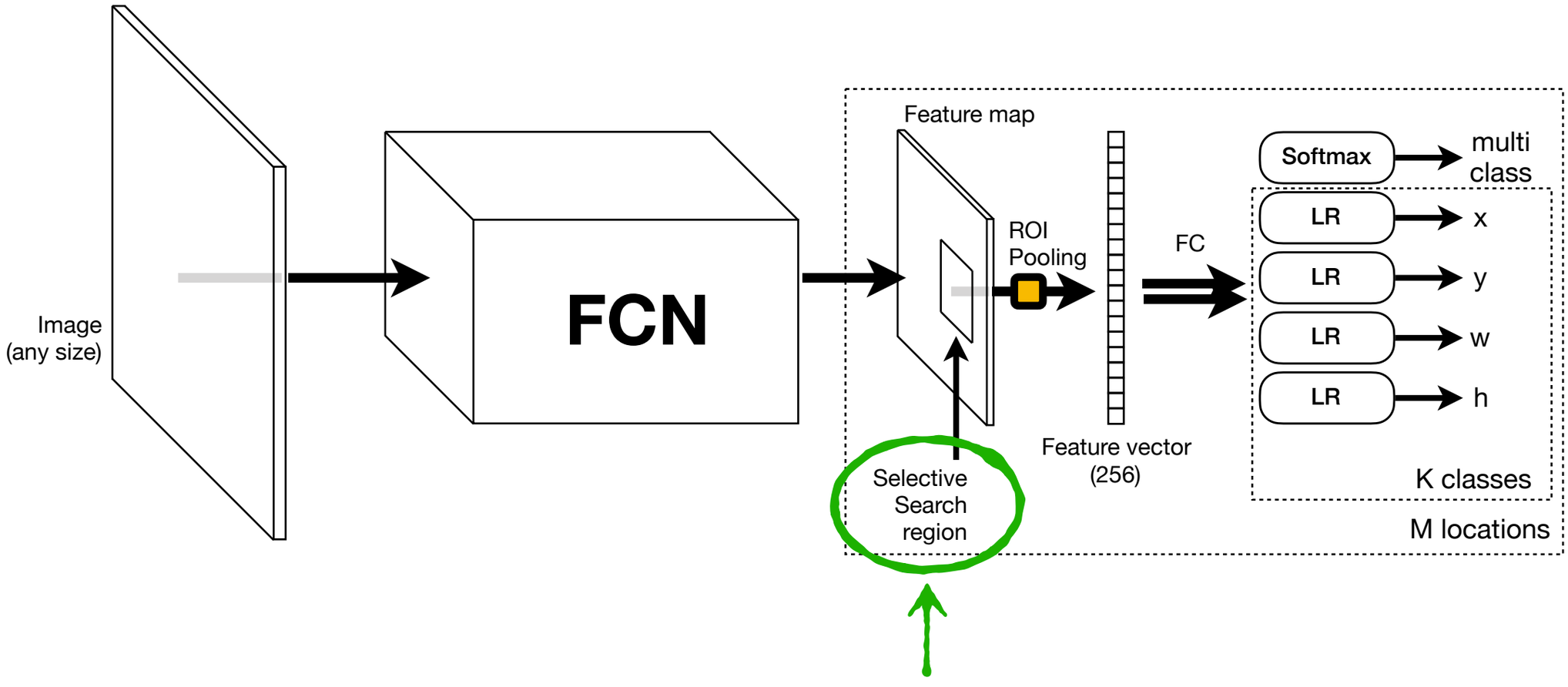

Selective search is really slow!

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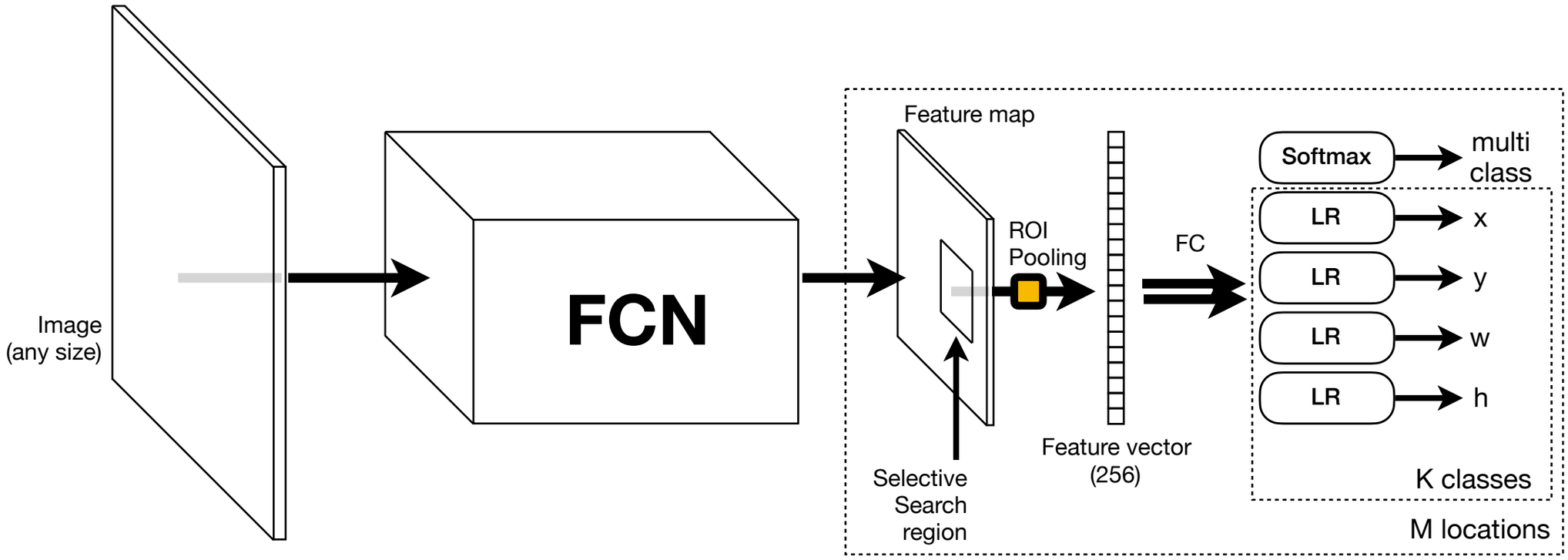

How can we make Fast-RCNN FASTER???

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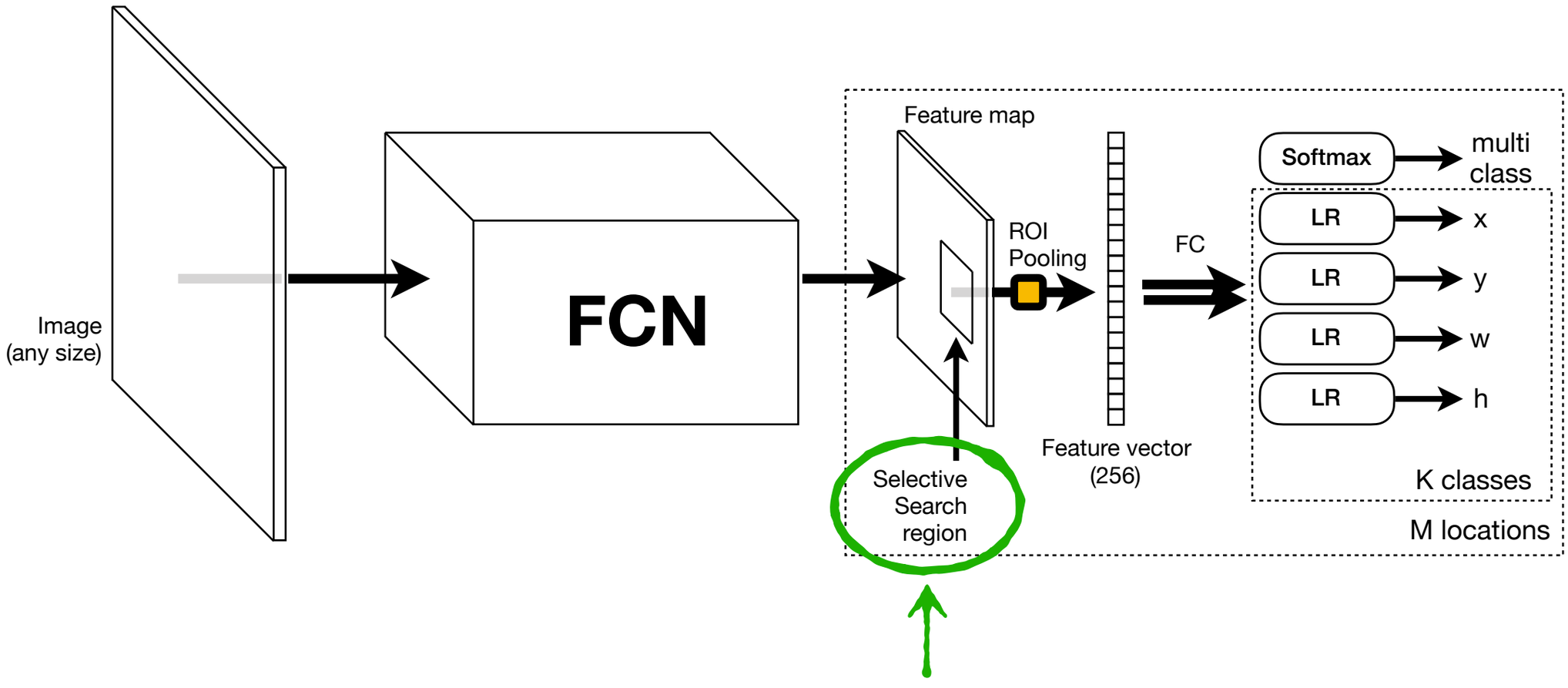

Use a deep network to generate proposals!

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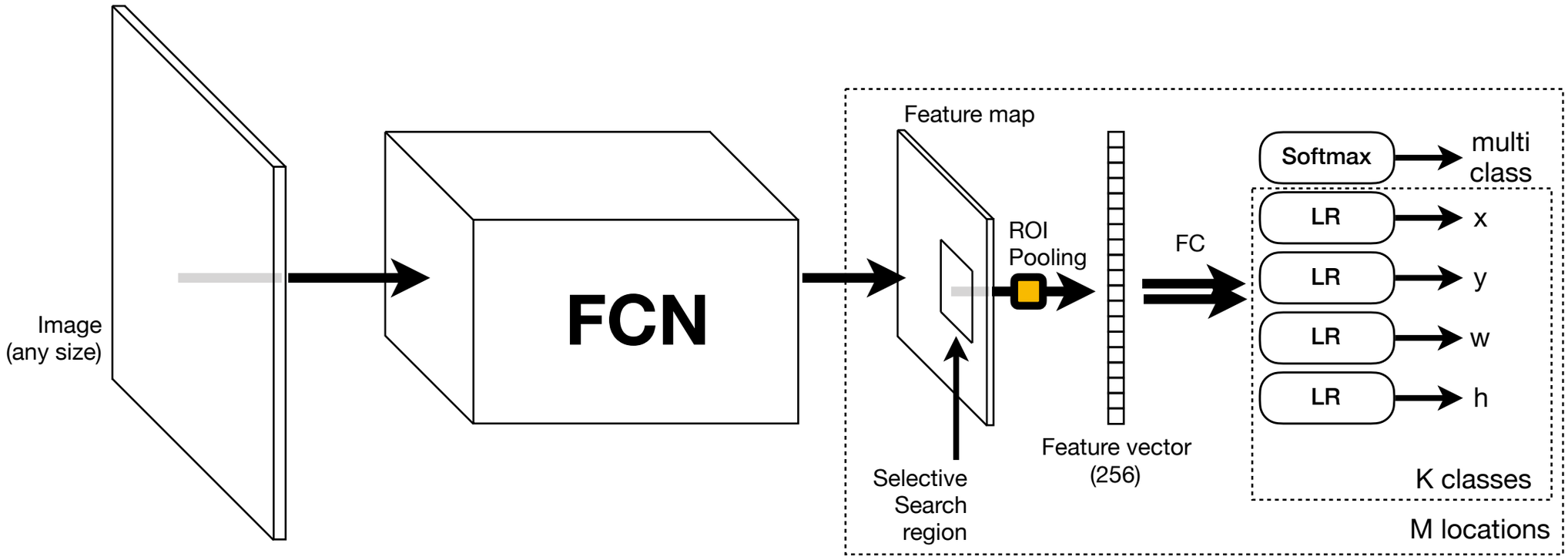
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K classes
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Search
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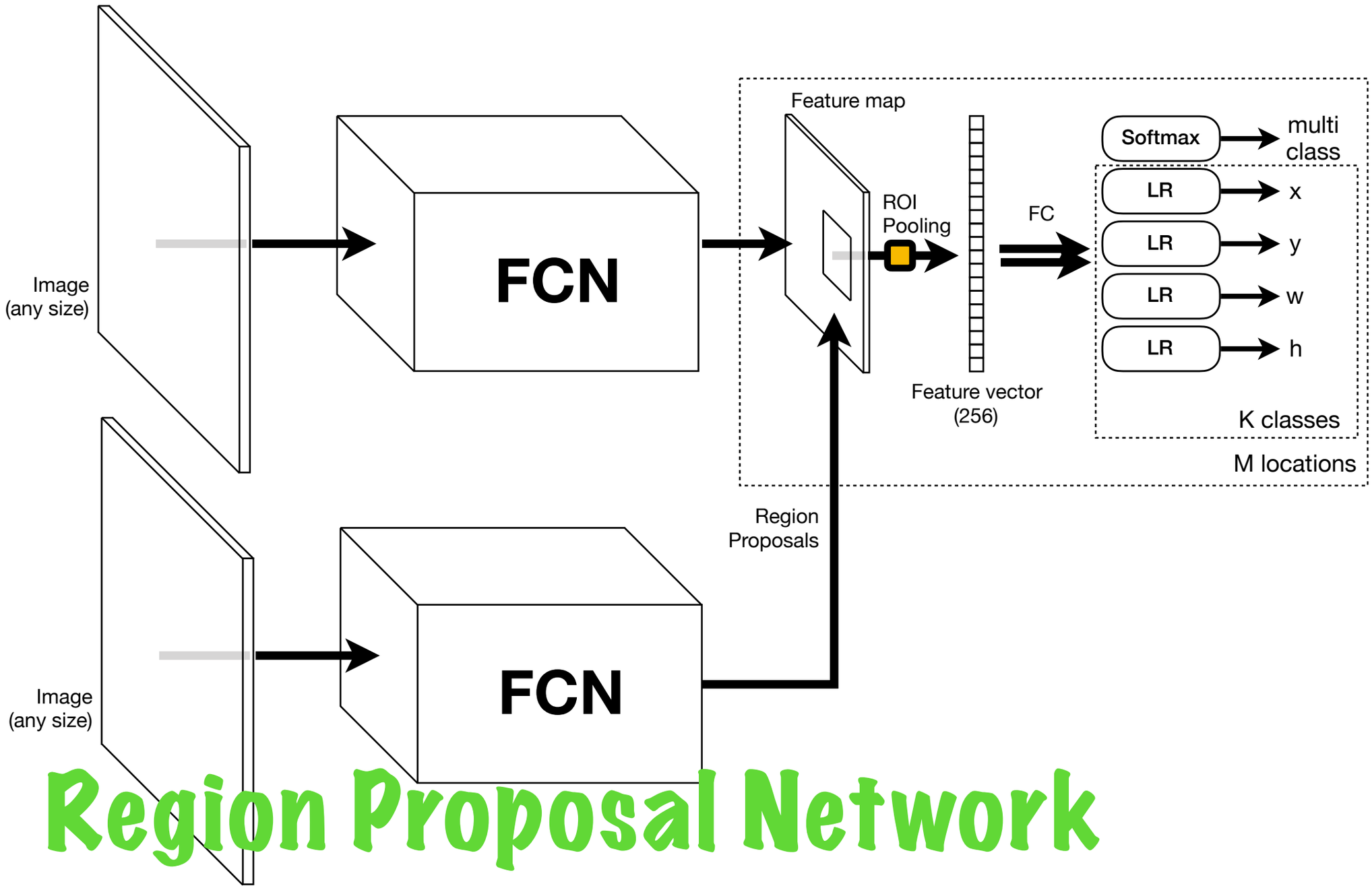
Faster

Fast RCNN



Region Proposal Network