**Meta-Learning to Detect Rare Objects**
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**Motivation**
- Problem statement: under-explored few-shot object detection
  - Task: learn a detector for novel classes with few labeled bounding box examples
  - Challenge: classify & localize multiple objects & tackle distracting background
- Key insight: base-to-novel meta-knowledge transfer
- Meta-level network: operate on the space of model parameters
- Model dynamics: transform few-shot to large-sample detection models

**Meta-Learning Based Object Detection**
- Meta-learning procedure
  - An effective framework: general framework for few-shot object detection
  - Model dynamics: meta-level network
  - Challenge: deal with different concepts & few training samples

**Within-Domain Few-Shot Detection**
- PASCAL VOC benchmark: 15 base → 5 novel classes
  - Detector: Faster R-CNN pre-trained on ImageNet
  - Novelness: have seen global image-level labels of novel classes
- MS-COCO benchmark: 60 base → 20 novel classes
  - Detector: Faster R-CNN trained from scratch
  - Novelness: have seen novel classes as background without any labels

**Ablation Studies**
- Input to $T$: few-shot classification vs. detection
- Structure of $T$: robust to specific implementations

**Cross-Domain Generalization**
- COCO → PASCAL
  - Setting: 60 COCO classes as base → 20 PASCAL classes as novel
- COCO → ImageNet
  - Setting: 80 COCO classes as base → 50 ImageNet classes as novel

**Conclusion**
- Meta-knowledge: category-shared parameters or parameter dynamics in detectors
  - Simultaneously tackle few-shot classification and localization in a coherent way
  - Generality: apply to different types of detectors & a variety of realistic settings