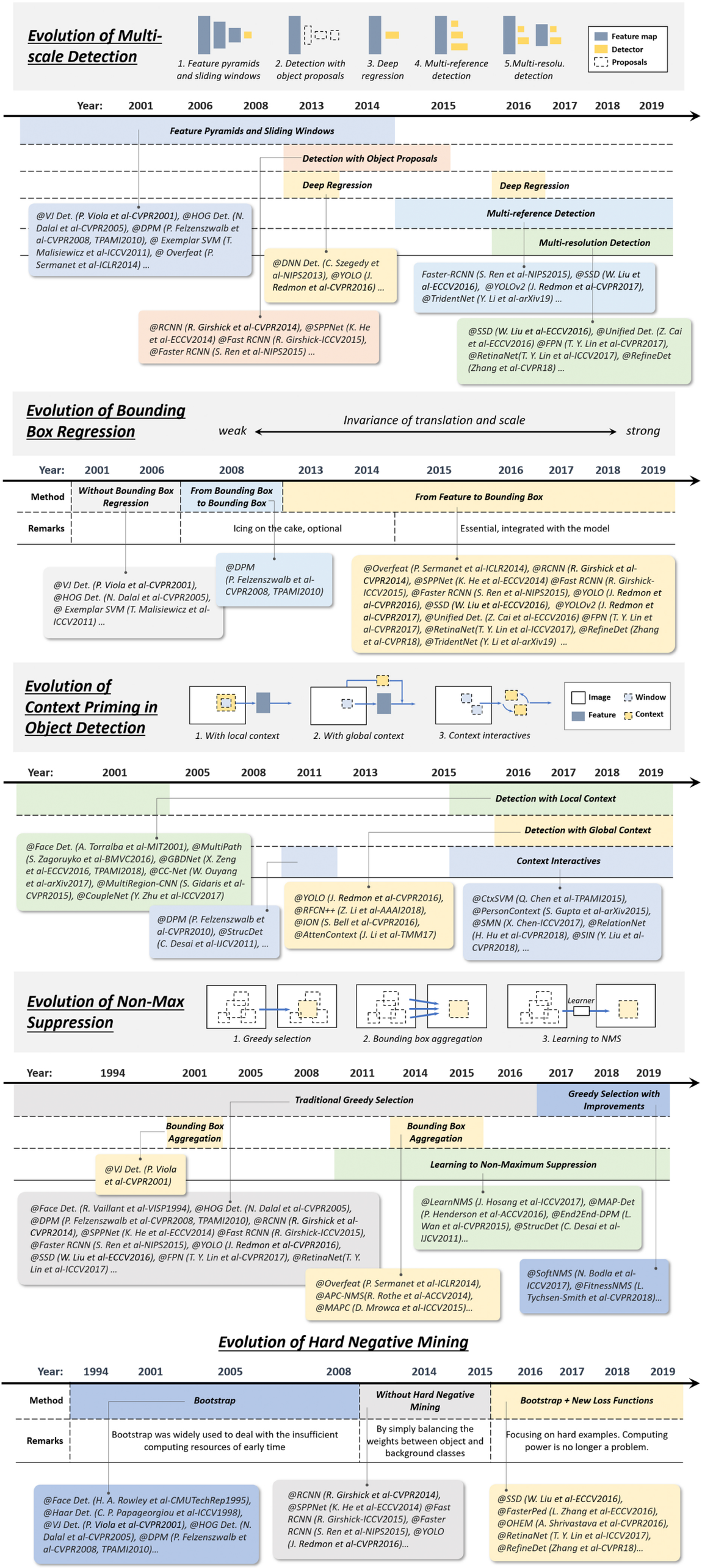
Evolution of Multi-scale Detection
1. Feature pyramids and sliding windows
2. Detection with object proposals
3. Deep regression
4. Multi-reference detection
5.Multi-resolu. detection
Feature map
Detector
Proposals
Year: 2001 2006 2008 2013 2014 2015 2016 2017 2018 2019
Feature Pyramids and Sliding Windows
Detection with Object Proposals
Deep Regression
Deep Regression
Multi-reference Detection
Multi-resolution Detection
@VJ Det. (P. Viola et al-CVPR2001), @HOG Det. (N. Dalal et al-CVPR2005), @DPM (P. Felzenszwalb et al-CVPR2008, TPAMI2010), @ Exemplar SVM (T. Malisiewicz et al-ICCV2011), @ Overfeat (P. Sermanet et al-ICLR2014) ...
@DNN Det. (C. Szegedy et al-NIPS2013), @YOLO (J. Redmon et al-CVPR2016) ...
Faster-RCNN (S. Ren et al-NIPS2015), @SSD (W. Liu et al-ECCV2016), @YOLOv2 (J. Redmon et al-CVPR2017), @TridentNet (Y. Li et al-arXiv19) ...
@RCNN (R. Girshick et al-CVPR2014), @SPPNet (K. He et al-ECCV2014) @Fast RCNN (R. Girshick-ICCV2015), @Faster RCNN (S. Ren et al-NIPS2015) ...
@SSD (W. Liu et al-ECCV2016), @Unified Det. (Z. Cai et al-ECCV2016) @FPN (T. Y. Lin et al-CVPR2017), @RetinaNet(T. Y. Lin et al-ICCV2017), @RefineDet (Zhang et al-CVPR18) ...
Evolution of Bounding Box Regression
weak
Invariance of translation and scale
strong
Year: 2001 2006 2008 2013 2014 2015 2016 2017 2018 2019
Method
Without Bounding Box Regression
From Bounding Box to Bounding Box
From Feature to Bounding Box
Remarks
Icing on the cake, optional
Essential, integrated with the model
@VJ Det. (P. Viola et al-CVPR2001), @HOG Det. (N. Dalal et al-CVPR2005), @ Exemplar SVM (T. Malisiewicz et al-ICCV2011) ...
@DPM (P. Felzenszwalb et al-CVPR2008, TPAMI2010)
@Overfeat (P. Sermanet et al-ICLR2014), @RCNN (R. Girshick et al-CVPR2014), @SPPNet (K. He et al-ECCV2014) @Fast RCNN (R. Girshick-ICCV2015), @Faster RCNN (S. Ren et al-NIPS2015), @YOLO (J. Redmon et al-CVPR2016), @SSD (W. Liu et al-ECCV2016), @YOLOv2 (J. Redmon et al-CVPR2017), @Unified Det. (Z. Cai et al-ECCV2016) @FPN (T. Y. Lin et al-CVPR2017), @RetinaNet(T. Y. Lin et al-ICCV2017), @RefineDet (Zhang et al-CVPR18), @TridentNet (Y. Li et al-arXiv19) ...
Evolution of Context Priming in Object Detection
1. With local context
2. With global context
3. Context interactives
Image
Window
Feature
Context
Year: 2001 2005 2008 2011 2013 2015 2016 2017 2018 2019
Detection with Local Context
Detection with Global Context
Context Interactives
@Face Det. (A. Torralba et al-MIT2001), @MultiPath (S. Zagoruyko et al-BMVC2016), @GBDNet (X. Zeng et al-ECCV2016, TPAMI2018), @CC-Net (W. Ouyang et al-arXiv2017), @MultiRegion-CNN (S. Gidaris et al-CVPR2015), @CoupleNet (Y. Zhu et al-ICCV2017)
@DPM (P. Felzenszwalb et al-CVPR2010), @StrucDet (C. Desai et al-IJCV2011), ...
@YOLO (J. Redmon et al-CVPR2016), @RFCN++ (Z. Li et al-AAAI2018), @ION (S. Bell et al-CVPR2016), @AttenContext (J. Li et al-TMM17)
@CtxSVM (Q. Chen et al-TPAMI2015), @PersonContext (S. Gupta et al-arXiv2015), @SMN (X. Chen-ICCV2017), @RelationNet (H. Hu et al-CVPR2018), @SIN (Y. Liu et al-CVPR2018), ...
Evolution of Non-Max Suppression
Learner
1. Greedy selection
2. Bounding box aggregation
3. Learning to NMS
Year: 1994 2001 2005 2008 2011 2014 2015 2016 2017 2018 2019
Traditional Greedy Selection
Greedy Selection with Improvements
Bounding Box Aggregation
Bounding Box Aggregation
Learning to Non-Maximum Suppression
@VJ Det. (P. Viola et al-CVPR2001)
@Face Det. (R. Vaillant et al-VISP1994), @HOG Det. (N. Dalal et al-CVPR2005), @DPM (P. Felzenszwalb et al-CVPR2008, TPAMI2010), @RCNN (R. Girshick et al-CVPR2014), @SPPNet (K. He et al-ECCV2014) @Fast RCNN (R. Girshick-ICCV2015), @Faster RCNN (S. Ren et al-NIPS2015), @YOLO (J. Redmon et al-CVPR2016), @SSD (W. Liu et al-ECCV2016), @FPN (T. Y. Lin et al-CVPR2017), @RetinaNet(T. Y. Lin et al-ICCV2017) ...
@LearnNMS (J. Hosang et al-ICCV2017), @MAP-Det (P. Henderson et al-ACCV2016), @End2End-DPM (L. Wan et al-CVPR2015), @StrucDet (C. Desai et al-IJCV2011)...
@Overfeat (P. Sermanet et al-ICLR2014), @APC-NMS(R. Rothe et al-ACCV2014), @MAPC (D. Mrowca et al-ICCV2015)...
@SoftNMS (N. Bodla et al-ICCV2017), @FitnessNMS (L. Tychsen-Smith et al-CVPR2018)...
Evolution of Hard Negative Mining
Year: 1994 2001 2005 2008 2014 2015 2016 2017 2018 2019
Method
Bootstrap
Without Hard Negative Mining
Bootstrap + New Loss Functions
Remarks
Bootstrap was widely used to deal with the insufficient computing resources of early time
By simply balancing the weights between object and background classes
Focusing on hard examples. Computing power is no longer a problem.
@Face Det. (H. A. Rowley et al-CMUTechRep1995), @Haar Det. (C. P. Papageorgiou et al-ICCV1998), @VJ Det. (P. Viola et al-CVPR2001), @HOG Det. (N. Dalal et al-CVPR2005), @DPM (P. Felzenszwalb et al-CVPR2008, TPAMI2010)...
@RCNN (R. Girshick et al-CVPR2014), @SPPNet (K. He et al-ECCV2014) @Fast RCNN (R. Girshick-ICCV2015), @Faster RCNN (S. Ren et al-NIPS2015), @YOLO (J. Redmon et al-CVPR2016)...
@SSD (W. Liu et al-ECCV2016), @FasterPed (L. Zhang et al-ECCV2016), @OHEM (A. Shrivastava et al-CVPR2016), @RetinaNet (T. Y. Lin et al-ICCV2017), @RefineDet (Zhang et al-CVPR18)...