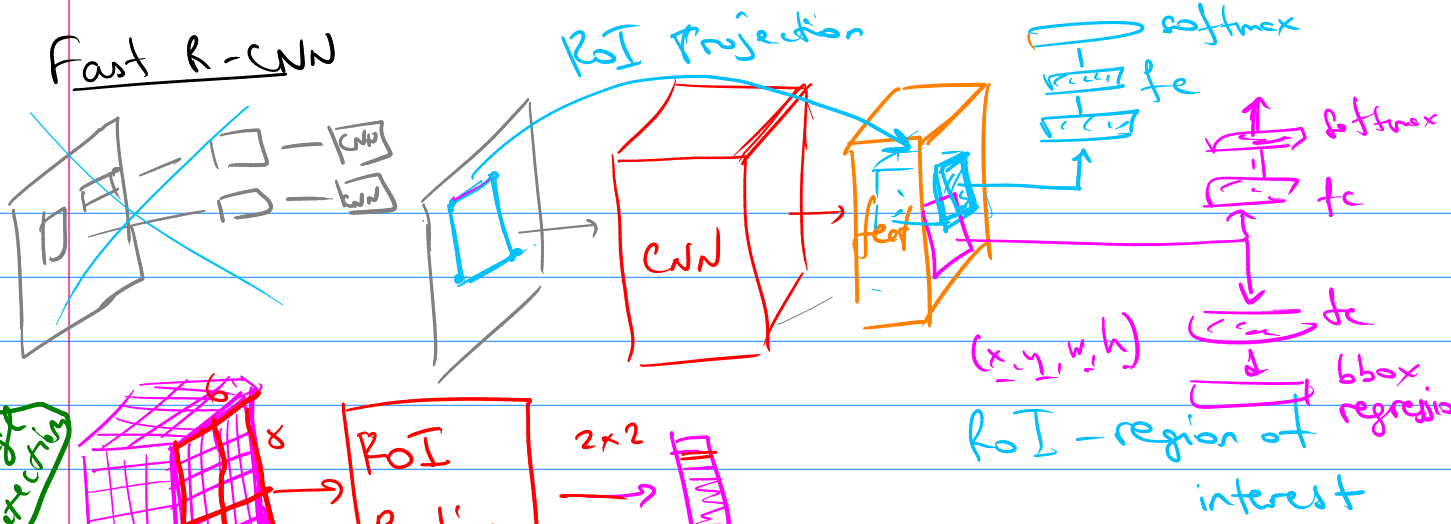
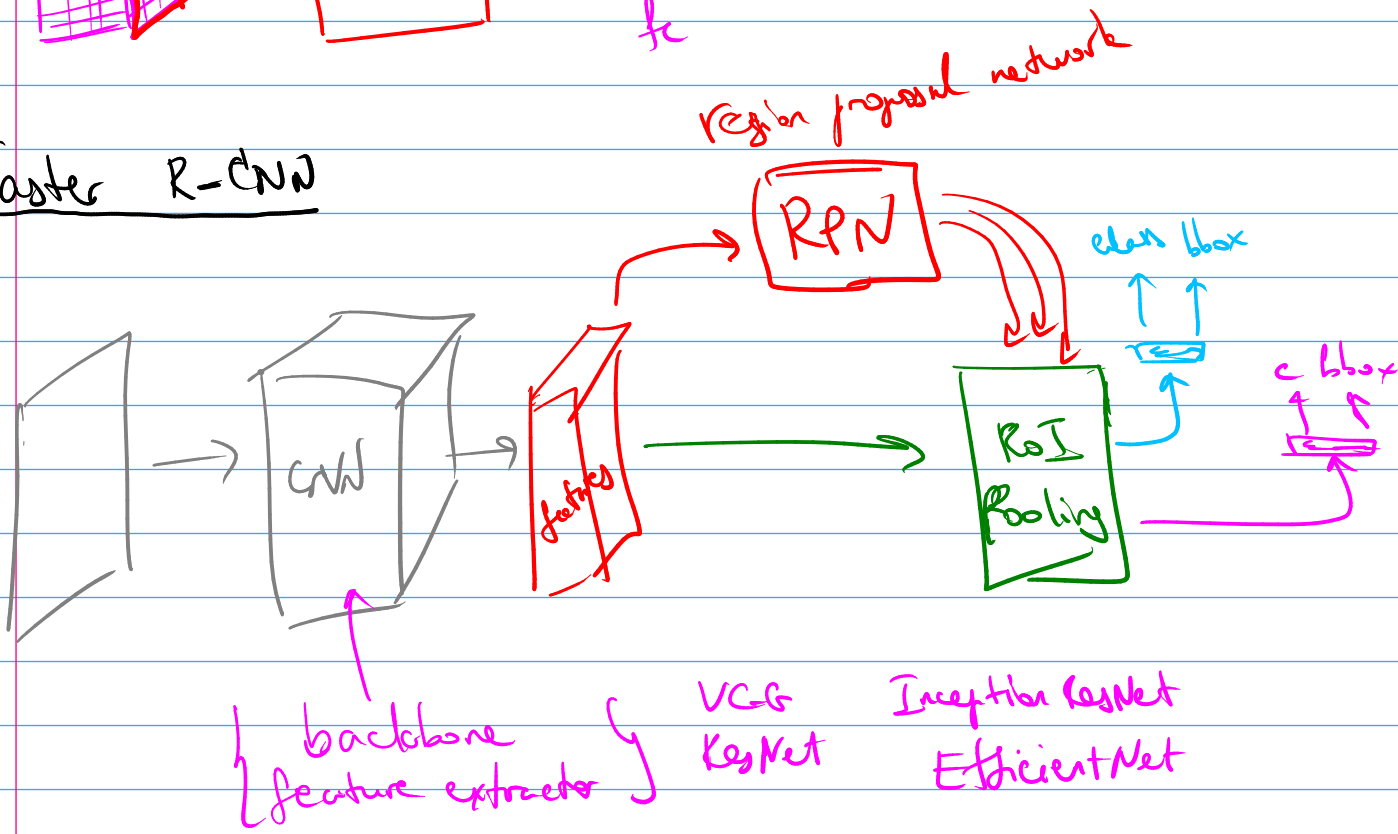
## Fast R-CNN



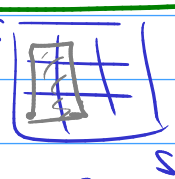

Two-stage object detection




## Faster R-CNN




## One-stage object detection



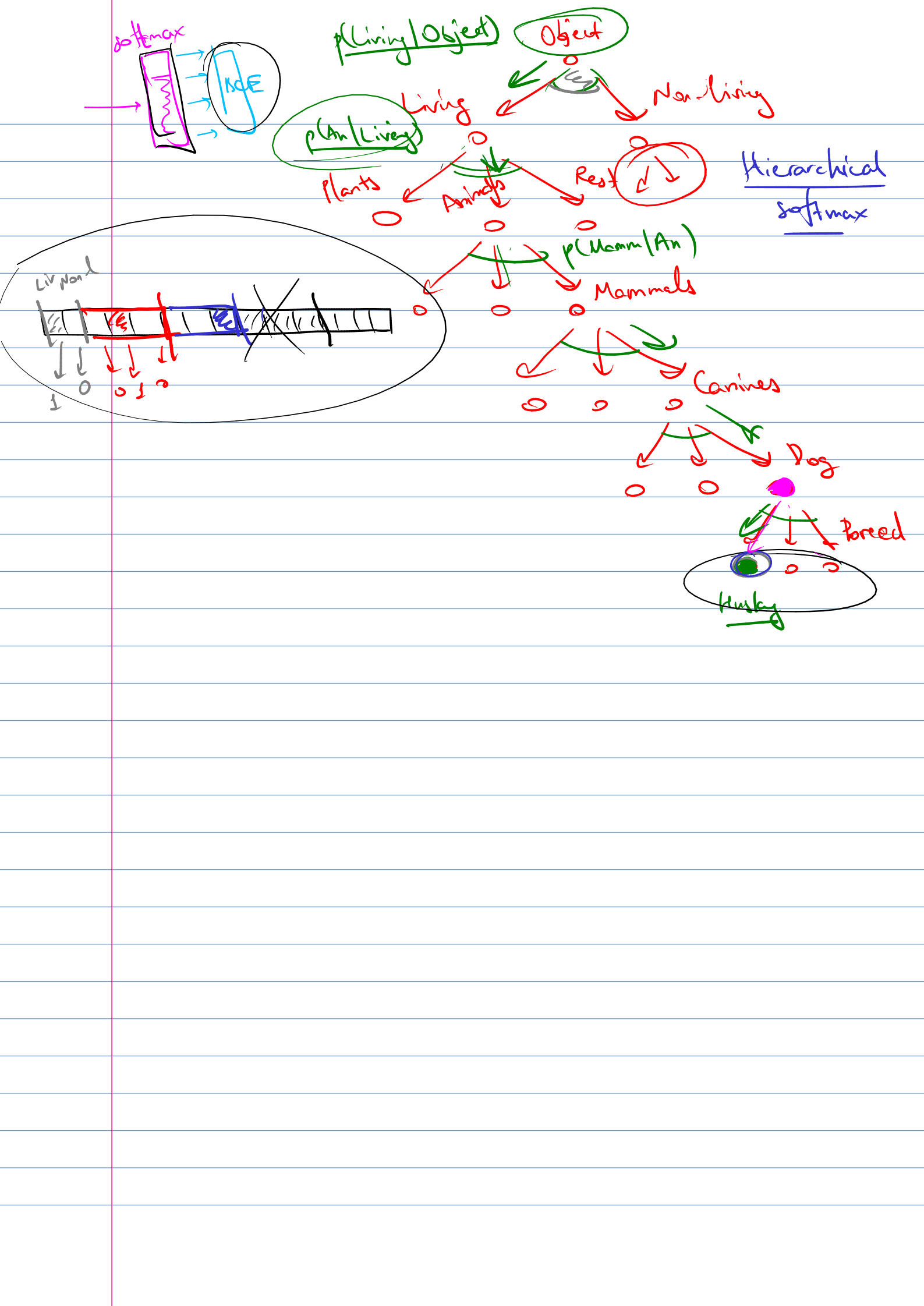

YOLO

$$L = \lambda_1 \sum_{i=0}^{S^2} [obj_i] \sum_{c} (p_i(c) - \hat{p}_i(c))^2$$

$$+ \lambda_2 \sum_{i=0}^{S^2} \sum_{j=0}^{B} [obj_{ij}] \left( (x_i - \hat{x}_i)^2 + (y_i - \hat{y}_i)^2 + \right.$$

$$\left. + (\sqrt{w_i} - \sqrt{\hat{w}_i})^2 + (\sqrt{h_i} - \sqrt{\hat{h}_i})^2 \right)$$

$$+ \lambda_3 \sum_{i=0}^{S^2} \sum_{j=0}^{B} [obj_{ij}] (\hat{C}_i - 1)^2 + \lambda_4 \sum_{i}^{S^2} \sum_{j}^{B} [noobj_{ij}] (\hat{C}_i - 0)^2$$


softmax
ISDE
p(Living|Object)
Object
Living
Non-living
p(An|Living)
Plants
Animals
Rest
Hierarchical softmax
p(Mamm|An)
Mammals
Canines
Dog
Breed
Husky