Challenge: Bee Counter
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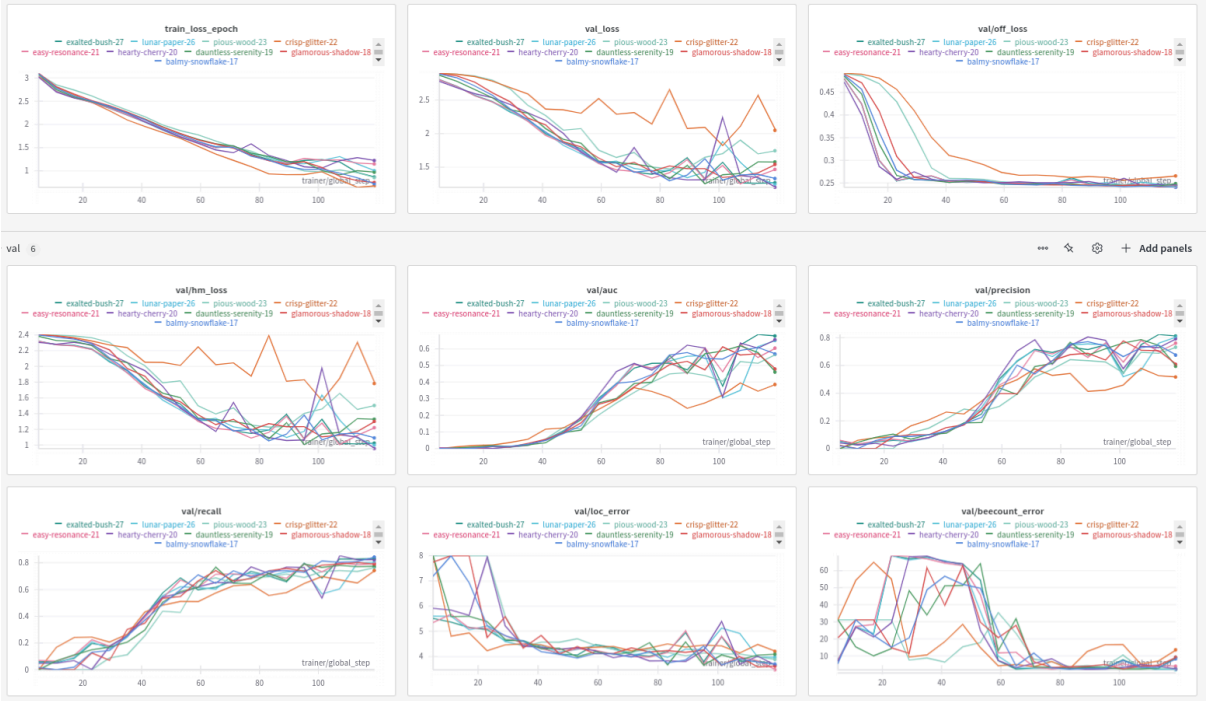
Solution Report[1]

The model CenterNet[2] was chosen as the base of the solution as it proposes a method which, in contrast to other object detectors, doesn't enumerate (almost) exhaustive lists of potential object locations to then classify them each. A light modification of its bounding-box-prediction variant to the task of detecting bee centres feels natural apart from the fact that the deep features are useful for detecting objects, in our case bees. Because it's differentiable end to end, the regression of points and the tuning of detection confidences can be done with practically the same bounding box training regime.

The provided data was partitioned into three subsets for training (75%), validation (15%) and testing (10%) respectively. The loss functions used are the pixel-wise logistic regression and the L1 loss for the pixel positions. As it can be foreseen, the number of classes in our problem gets reduced to one. The data augmentations are exactly the same used with CenterNet including Gaussian Blur, horizontal flip, affine transformation with a slight rotation and zoom. The metrics used for evaluation were *Corner Detection Average Precision,* based on precision and recall, and *Localization Error*, both of them proposed in SuperPoint[3] (eq. 11 and 12).

The submitted trained model was selected according to the validation losses and the metrics mentioned above. The following chart summarises the experiments:



[1] W&B report available here
[2] https://arxiv.org/pdf/1904.07850
[3] https://arxiv.org/pdf/1712.07629v4

These are the reported metrics on the test split for the submitted model:

Test metric	DataLoader 0
val/auc	0.6064714789390564
val/beecount_error	8.166666984558105
val/loc_error	3.3592803478240967
val/precision	0.9005296230316162
val/recall	0.6708436608314514