

Deploy object detection model with Deepness without a single line of code

Start off by installing python and pip.

Step 1) Export tiles from Deepness

- Start by opening deepness and add orthophoto containing the objects. Choose your area.
- Scroll down to Resolution (cm/px). This should be around the GSD of your orthophoto. Choose either 640 or 1280 tile size depending on your orthophoto. 640 is recommended but 1280 can be needed when detecting very small objects.
- Keep tile overlap at 15%.
- Scroll down to output dir path and choose path. Check "export image tiles" and press "export training data".

Step 2) Annotating your tiles and create a dataset

- Create an account at www.roboflow.com
- Create a new project and choose type "instance segmentation".
- Go to "upload" and upload your tiles. You might want to look them over and delete some that doesn't show your object.
- Press "save and continue", then "assign images" and then "start annotating".
- On the right hand side, choose the "magic select", then "enhanced". It's powered by segment anything.
- Click on your object. If magic select can identify it as an object, you can expect your model will do OK. If it selects a larger area you have to click around your target to help it detect your desired object.
- Play around with it and you will get used to it fast. **See shortcuts in the bottom left.**
- When you are done annotating go back and press "add X images to dataset", then "add images"

Step 3) Create your first dataset version and export

- In "preprocessing" make sure resize is set at the correct resolution of your images. Click "continue".
- In "augmentation" you can choose different factors that your object is effected by. *Optional.*
- Go next and "generate".
- Click "export dataset". Under "TXT", choose either YOLOv5 PyTorch or YOLOv8. YOLOv5 PyTorch is best for 1280 px tiles and YOLOv8 is best for 640 px tiles. Check "download zip to computer" and continue.

Step 4) Training your model

- Create an account at <https://ultralytics.com>
- Go to "datasets" then "upload dataset", choose your downloaded zip-file.
- Click on your uploaded dataset then "train model".
- Choose your pretrained model of choice. YOLOv8 (recommended) and YOLOv5-6 is best for 1280 px tiles.
- Go for a medium pretrained model for now. Either YOLOv8m or YOLOv5m6u. **This choice depend on your dataset size and wishes for inference speed. See mAP and Speed parameters. Smaller is better for streaming inference and bigger is good for big datasets.**

- In the next step you want to train your model by using ultralytics google colab. **If you are using 1280 px tiles you have to scroll down and change from 640 px before continuing.**
- In google colab, click on the play button left of %pip.
- After this, change the next cells API_KEY and model ID to what is presented on ultralytics site.
- Click the play button and your model should now begin to be trained.

Step 5) Exporting to .onnx-file and inference with deepness

- When your model is trained, go to “models” and choose your model. Go to “deploy” and export and download “ONNX”.
- Go back to QGIS and open Deepness. Import your orthophoto and choose desired area.
- Next, import your detection model. Choose the correct cm/px resolution and tile size that you trained your model with. **Leave the rest as default for now.**
- Scroll down and “run”.