

MONAI Label app conversion to MONAI bundle for vertebra CT segmentation

Notes

1-18-23 and 1-24-23 Questions:

Our goal is to take a model trained using MONAI Label and apply it to a large cohort of patients from NCI Imaging Data Commons.

1. There are multiple ways that we can convert a pretrained model from MONAI Label App. What are the advantages/disadvantages of doing each of these methods?
 - a. **MONAI Bundle**
 - b. MONAI bundle vs a MONAI Deploy App SDK
 - i. Do we necessarily have to use DICOM input for MONAI Deploy App SDK?
 - ii. Monai application package - MAP - nifti
 - c. Or what if we call the MONAI Label App without starting a server?
 - i. <https://github.com/Project-MONAI/MONAILabel/blob/main/sample-apps/radiology/main.py>
2. What is the best way to include transforms in the bundle that are in MONAI Label or in the sample-app/radiology but not in monai.transforms for defining the inference.json file?
 - a. We see that there is a custom transforms option - could we use the same approach?
https://github.com/Project-MONAI/tutorials/blob/main/bundle/custom_component/scripts/custom_transforms.py
3. If we want to pursue the conversion to a bundle for the vertebrae segmentation task, we have some questions about the DeepEdit monai label app and bundle from by Andres:
 - a. Are we sure that the files shared with us are from the same model?
 - i. Output_channels do not match label/bundle
 - ii. Transforms did not match, see below
 1. The preprocessing transforms do not match
 - a. The first set of pre-transforms in the list 't' are in the bundle definition.
 - b. But the second set of pre-processing transforms Resized, DiscardAddGuidance, and EnsureTyped do not match the full list in the monai label app
 2. The postprocessing transforms do not match.
 - a. The bundle has the Invertd transform that is not included in the label app.
 - b. The label app has the AsDiscreted, SqueezeDimd, ToNumpyd, and Restored transforms that are not included in the bundle.
4. Concerning spine_localization specifically:
 - a. Why are there 25 labels and not 2? cf README
 - b. What is the best way to save the softmax preds using ActivationD transform? We get an out of memory cuda error.

Questions for meeting 1-12-23 with Roya/Steve etc.:

1. DeepEdit from MONAI Label app looks like it's for multi label segmentation, while the corresponding bundle is solely for spleen segmentation. Perhaps a better example are these two: https://github.com/Project-MONAI/MONAILabel/blob/main/sample-apps/radiology/lib/configs/segmentation_spleen.py and https://github.com/Project-MONAI/model-zoo/tree/dev/models/spleen_ct_segmentation/configs
2. Combine 3 spine segmentation models to one bundle or separate them ?
3. How many output labels are in the localization_spine model ? We thought it should be 1 label, but https://github.com/Project-MONAI/MONAILabel/blob/main/sample-apps/radiology/lib/configs/localization_spine.py has 25.

1-12-23 work

- For creating the spline localization inference.json we need to define:
 - Network architecture: Understand how to convert the network architecture from label app to bundle – this should be straightforward.
 - List of networks here: <https://github.com/Project-MONAI/MONAI/tree/dev/monai/networks/nets>
 - Preprocessing transforms: Understand how to get the list
 - https://github.com/Project-MONAI/MONAILabel/blob/main/sample-apps/radiology/lib/infers/localization_spine.py search for pre_transforms
 - Dataset and Dataloader:
 - Not sure yet where to find batch_size
 - Inferer:
 - https://github.com/Project-MONAI/MONAILabel/blob/main/sample-apps/radiology/lib/infers/localization_spine.py search for inferer
 - Postprocessing transforms:
 - https://github.com/Project-MONAI/MONAILabel/blob/main/sample-apps/radiology/lib/infers/localization_spine.py search for post_transforms
 - Handlers:
 - Evaluator:

1-19-23 Meeting notes with Andres, Jesse, Steve, Andrey

- Look into specifying bundle vs MONAI deploy app SDK (bundling apps into Docker containers)
- Andres - conversion of label app to bundle
 - We should start the github discussion!
 - Total segmentator model as first step?
 - Technical meeting next week
- Might be better to do this order:
 - Prostate lesion segmentation
 - Then vertebra segmentation
- Look more into custom transforms

Monai bundle

Standard across platforms

Redeployment basis == intermediate between monai label and map

Custom transforms

 In scripts folder ?

 Imported automatically

 __target__ : specify script.custom_transform

Monai Label

 Standalone Python script

 Automatic post transform

 Restore = resampling to original space

 Bundle = no automatic post-transforms

Tasks:

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- ☐ Compare from MONAI Label
<https://github.com/Project-MONAI/MONAILabel/blob/main/sample-apps/radiology/lib/configs/deepedit.py> to MONAI bundle
https://github.com/Project-MONAI/model-zoo/blob/dev/models/spleen_deepedit_annotation/configs/inference.json
- ☐ Check if this from MONAI Label
https://github.com/Project-MONAI/MONAILabel/blob/main/sample-apps/radiology/lib/configs/segmentation_spleen.py is the equivalent of
https://github.com/Project-MONAI/model-zoo/tree/dev/models/spleen_ct_segmentation/configs
- ☐ Run Steve's LNQ reviewer.py script to see how his batch performance runs in Slicer and compares to our approach.
 - ☐ Which pretrained model does he use? Cannot see where it is specified.
- ☐ Would be good to run MONAI Label app in Slicer for spine task to get a good understanding of each step

Notes:

- Two possible use cases:
<https://github.com/Project-MONAI/MONAILabel/tree/main/sample-apps/radiology#multistage-vertebra-segmentation> and
https://github.com/Project-MONAI/MONAILabel/blob/fullCTSegmentation/sample-apps/radiology/lib/configs/segmentation_full_CT.py
- Is there an easy way to lookup transforms?
 - ComponentLocator
 - https://docs.monai.io/en/stable/_modules/monai/bundle/config_item.html
 - ConfigComponent will help us find the location of the transform, using the monai bundle config. Still useful.
 - How do we include transforms that are in monaiLabel but not in monai transforms during definition of inference.json in bundle creation