Supplementary Material for "Prior-aware Neural Network for Partially-Supervised Multi-Organ Segmentation"

This document contains the supplementary material for "Prior-aware Neural Network for Partially-Supervised Multi-Organ Segmentation". The primary goal of the supplementary material is to present a list of partially-labeled abdominal CT datasets we have collected in Sec. 1. More qualitative examples are given in Sec. 2. Additionally, we also provide the full results of Table 3 in Section 4.4 of the main text.

1. Summary of Partially-labeled Datasets

To facilitate the research on partially-supervised multi-organ segmentation, we have collected a list of partially-labeled datasets to the best of our knowledge. We present them in Table 1 for the fellow researchers to explore partial supervision in multi-organ segmentation problems by leveraging these partially-labeled datasets. Note that our method can be also easily applied to these datasets for improving the segmentation performance.

Name	Target Organs	N	Link
Anatomy3	Liver Pancrea Stomach Spleen Gallbladder	20	http://www.visceral.eu/benchmarks/anatomy3-open/
Pancreas-CT	Pancreas	82	https://wiki.cancerimagingarchive.net/display/Public/Pancreas-CT
ISBI 2019 Challenge	Liver	30	https://chaos.grand-challenge.org/Data/
Medical Segmentation Decathlon	Liver Spleen Pancreas	131 41 282	http://medicaldecathlon.com
Sliver07	Liver	20	http://sliver07.org/
MICCAI 2017 LiTS	Liver	131	https://competitions.codalab.org/competitions/17094

Table 1. Summary of partially-labeled datasets for multi-organ segmentation. N denotes the number of annotated cases.

2. Qualitative Evaluation

We include more qualitative results in Fig. 1, where we also show improved regions compared with fully-supervision other than the pancreas, portal vein & splenic vein, left adrenal gland as discussed in the main manuscript. In Fig. 1, we can see an evident improvement of the pancreas (row 1-3), the gallbladder (row 2), the left adrenal gland (row 3-4), the stomach (row 3-6), and the portal vein & the splenic vein (row 6).

3. Generalization to Other Datasets

The **complete** results of Table 3 in the main manuscript are summarized in Table 2, where the proposed PaNN also achieves the best performance compared with existing methods.

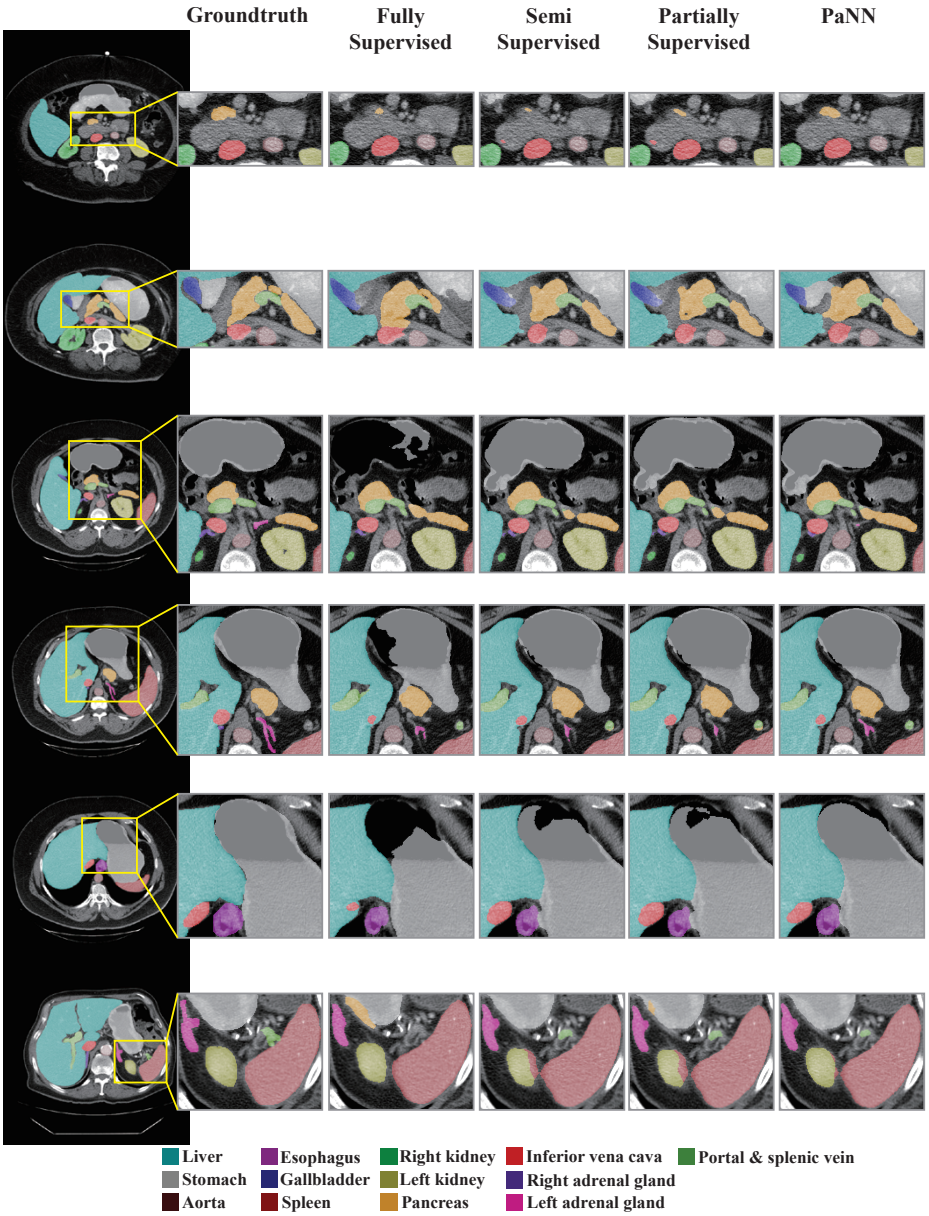

Figure 1. Qualitative comparison of different methods, where all the 3 partially-labeled datasets **A**,**B**,**C** are used as the partial supervision with ResNet-101 as the backbone model. We exhibit 5 cases (6 slices) as examples. Improved segmentation regions are zoomed in from the axial view to demonstrate finer details. Besides the pancreas, portal vein & splenic vein, left adrenal gland, we also show other improved regions such as the stomach, gallbladder, *etc*.

Organ	Fully Supervised	Semi Supervised	Partially Supervised (**ours**)	PaNN (**ours**)
Spleen	0.9640	0.9651	0.9673	0.9666
Right kidney	0.9626	0.9627	0.9625	0.9615
Left kidney	0.9530	0.9547	0.9526	0.9541
Gallbladder	0.8225	0.8399	0.8465	0.8467
Liver	0.9684	0.9691	0.9691	0.9689
Stomach	0.9344	0.9363	0.9396	0.9361
Aorta	0.9110	0.9096	0.9121	0.9133
IVC	0.8083	0.8175	0.7995	0.8266
Pancreas	0.7831	0.7994	0.8079	0.8193
avg. Dice	0.9008	0.9060	0.9063	**0.9103**

Table 2. Performance comparison on a newly collected high-quality abdominal dataset, where our method achieves the best result.