Applications of MTL&TL

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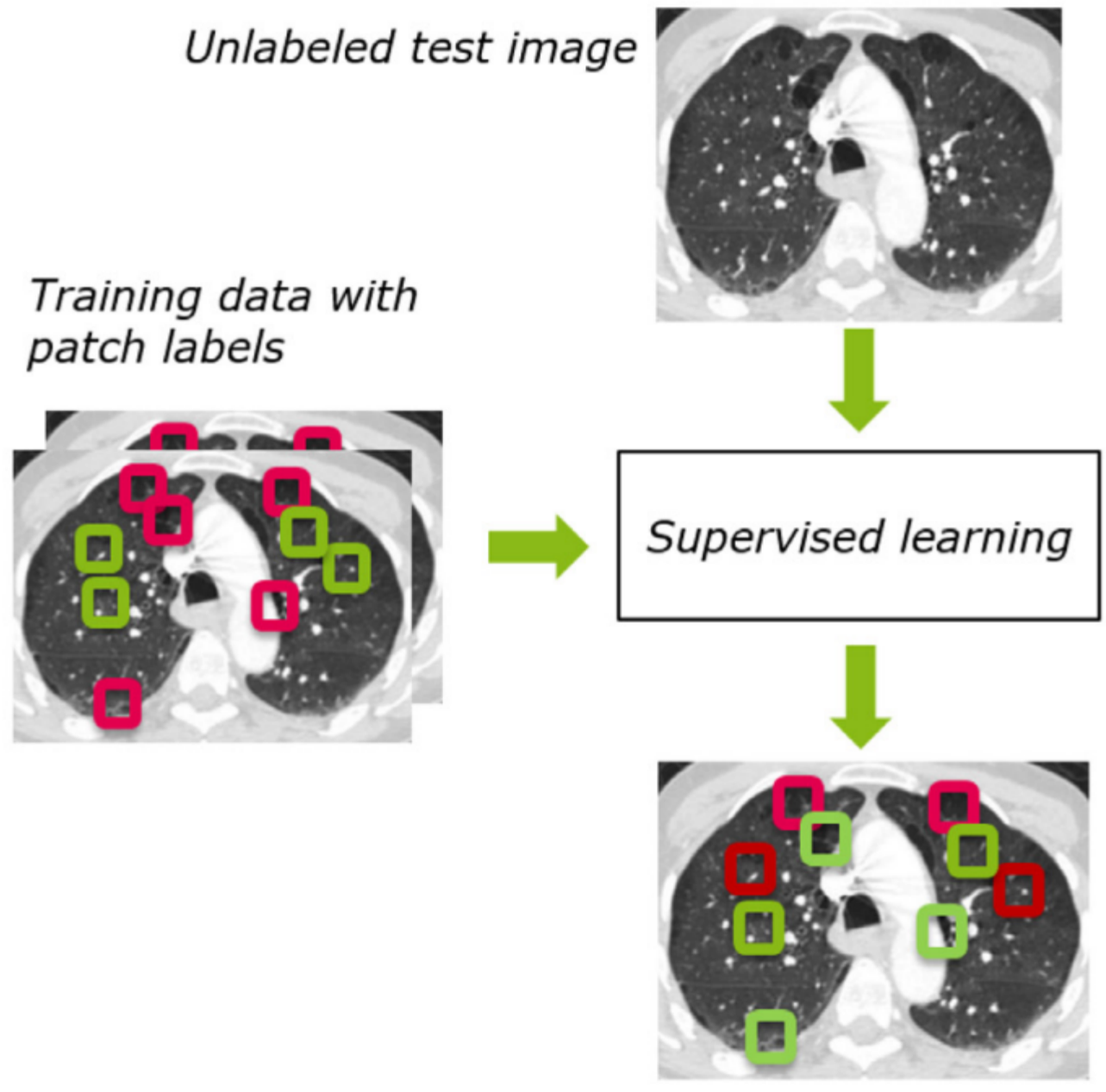
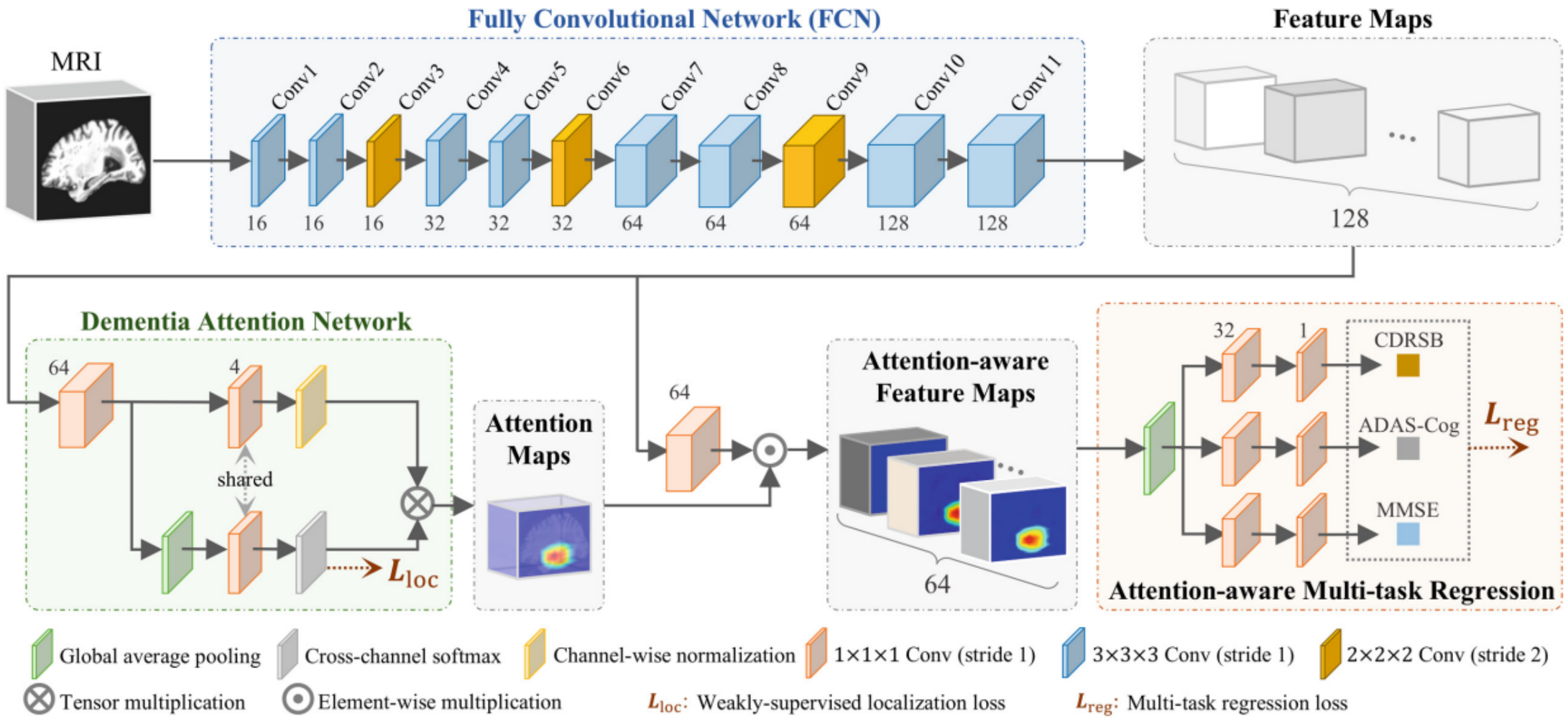


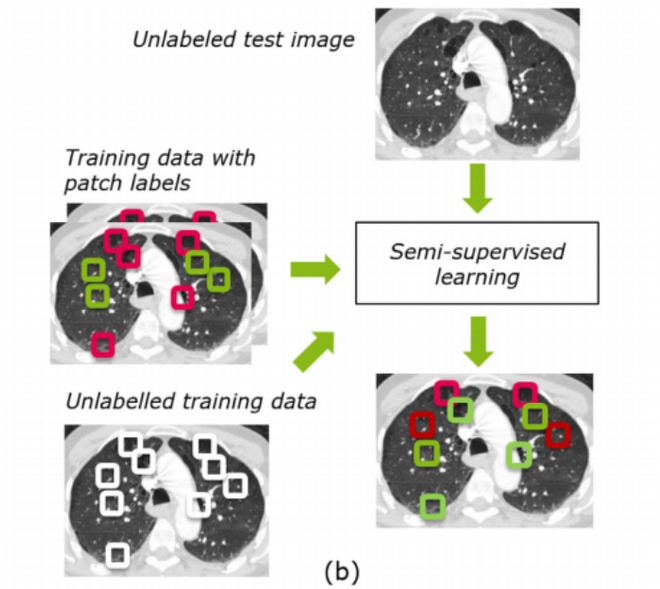
Multi-task Weakly-Supervised Attention Network



Multi-task Weakly-Supervised Attention Network

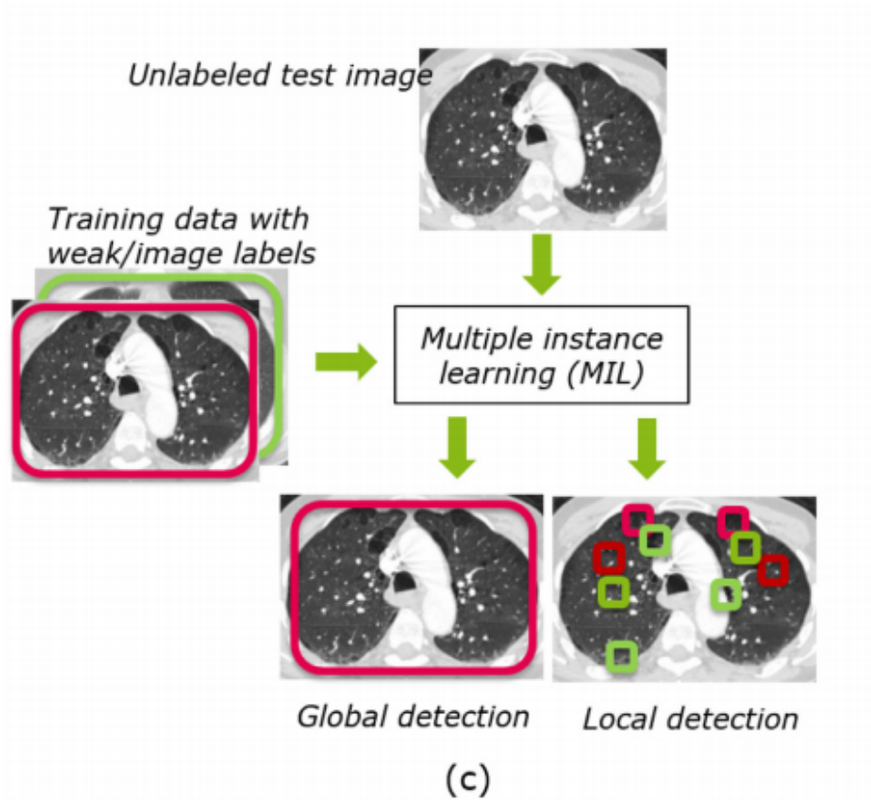
Method	CDRSB		ADAS-Cog		MMSE	
	CC	RMSE	CC	RMSE	CC	RMSE
VBM	0.278	2.010	0.290	7.406	0.289	2.889
ROI	0.380	1.893	0.360	7.358	0.325	2.899
LBM	0.431	1.772	0.527	6.245	0.331	2.754
DM^2L	0.533	1.666	0.565	6.200	0.567	2.373
MTN	0.447	1.685	0.539	6.308	0.458	2.595
MWAN-S	0.616	1.589	0.631	5.874	0.603	2.263
MWAN (Ours)	**0.621**	**1.503**	**0.648**	**5.701**	**0.613**	**2.244**

Semi-Supervied Learning



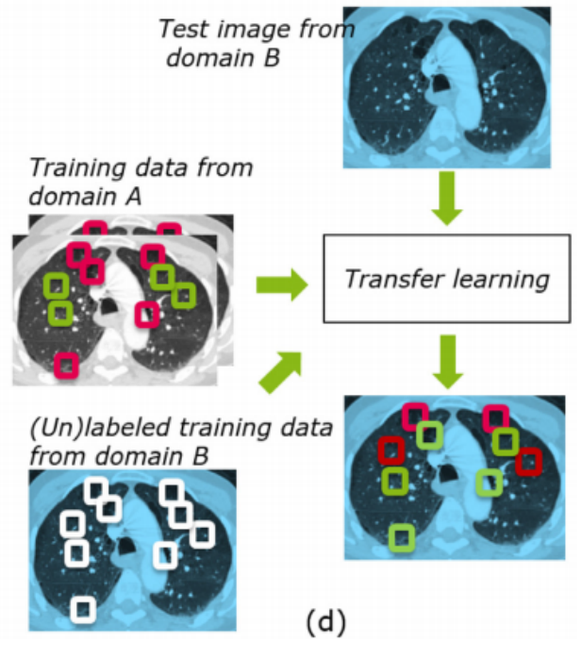
Brain		
Song et al. (2009)	tumor segmentation	graph-based
Iglesias et al. (2010)	skull stripping	self-training
Filipovych et al. (2011)	classification of MCI	semi-supervised SVM
Batmanghelich et al. (2011)	classification of AD, MCI	graph-based
Xie et al. (2013)	tissue segmentation	graph-based
Meier et al. (2014)	tumor segmentation	graph-based
Dittrich et al. (2014)	fetal brain segmentation	self-training
Wang et al. (2014)	lesion segmentation	self-training, active
An et al. (2016)	AD classification	graph-based
Baur et al. (2017)	MS lesion segmentation	graph-based
Moradi et al. (2015)	classification of MCI	semi-supervised SVM

Multiple Instance Learning



Brain			
Tong et al. (2014)	AD classification	global	excl bag
Chen et al. (2015b)	cerebral small vessel disease detection	global	instance
Dubost et al. (2017)	enlarged perivascular space detection	local	instance

Transfer Learning



Reference	Topic	Task	Domain	Transfer type
Brain				
Zhang and Shen (2012)	MCI conversion prediction	different	same	feature, multi-task
Wang et al. (2013)	tissue, lesion segmentation	same	different	instance, weight
van Opbroek et al. (2015a)	tissue, lesion segmentation	same	different	instance, weight
Guerrero et al. (2014)	AD classification	same	different	instance, align
van Opbroek et al. (2015b)	tissue, lesion segmentation	same	different	instance, weight
Cheng et al. (2015)	MCI conversion prediction	different	same	feature, multi-task
Goetz et al. (2016)	tumor segmentation	same	different	instance, weight
Wachinger and Reuter (2016)	AD classification	same	different	instance, weight
Cheplygina et al. (2016a)	tissue segmentation	same	different	instance, weight
Ghafoorian et al. (2017)	lesion segmentation	same	different	feature, pretraining
Kamnitsas et al. (2017)	segmentation of abnormalities	same	different	feature, pretraining
Alex et al. (2017)	lesion segmentation	different	same	feature, pretraining
Hofer et al. (2017)	AD classification	same	different	instance, align
Hon and Khan (2017)	AD classification	different	different	feature, pretraining
Kouw et al. (2017)	tissue segmentation	same, different	instance, align	

One-pass Multi-task Network

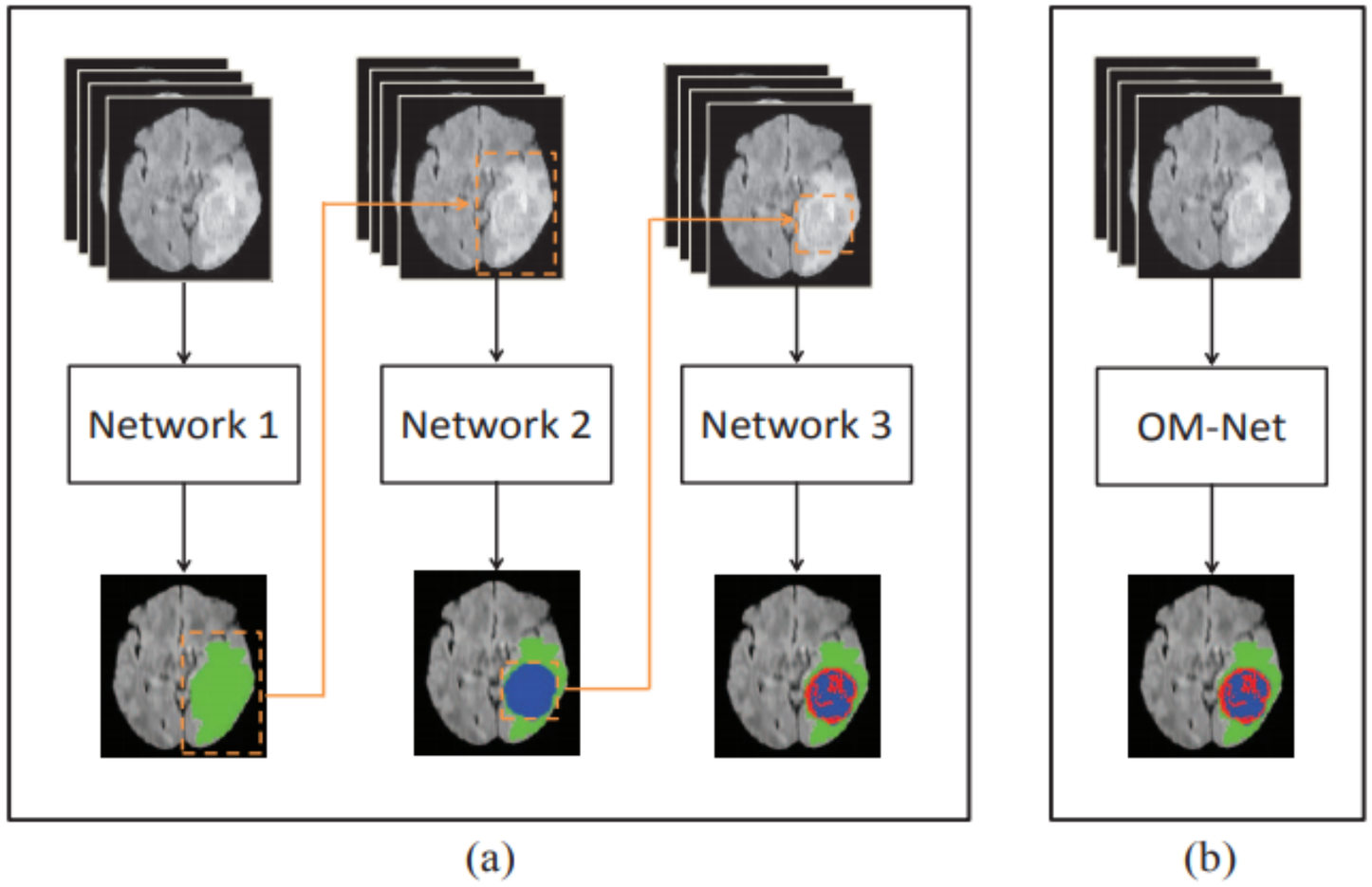
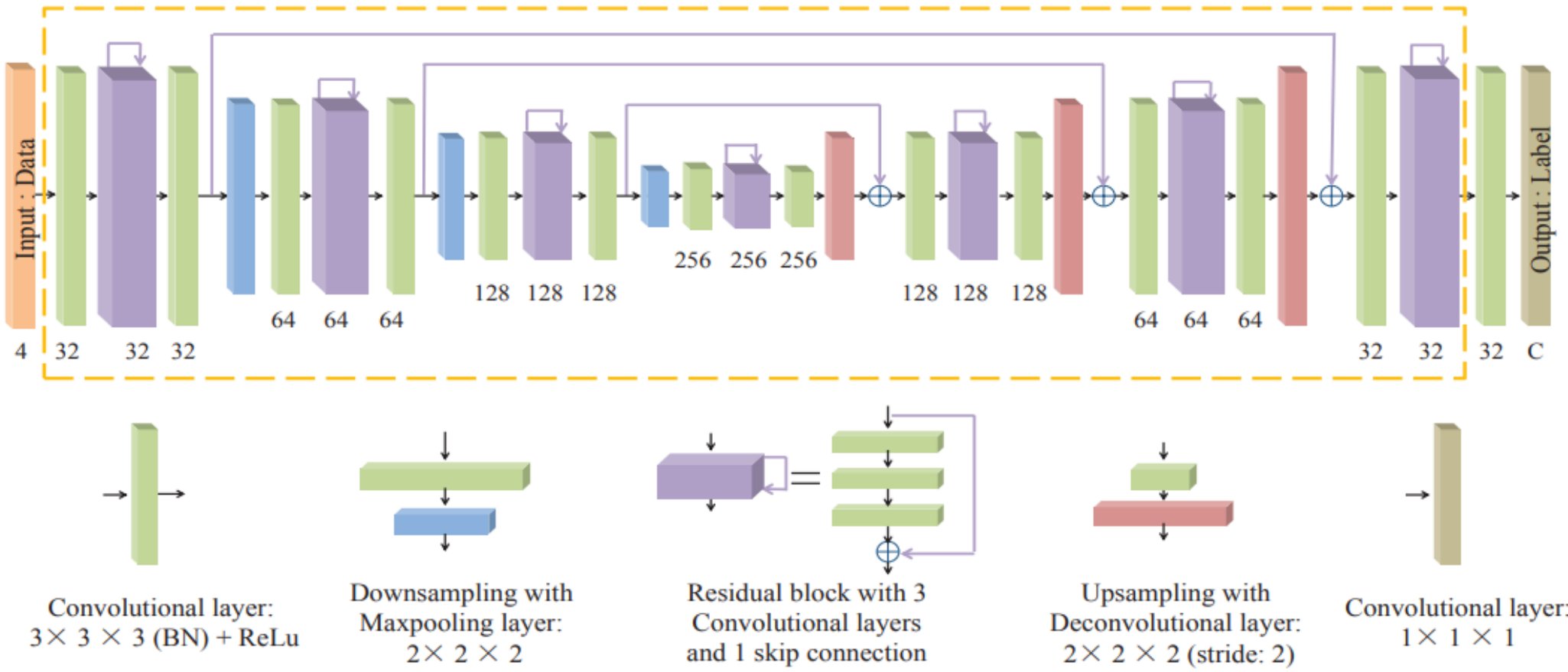


Fig. 1. Illustrations of (a) a three-model cascade pipeline and (b) our proposed OM-Net. The model cascade pipeline contains three networks that segment different tumor regions sequentially. OM-Net is a novel end-to-end deep model that simplifies prediction using one-pass computation.

One-pass Multi-task Network



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