An Optimal Mass Transportation-based Magnetic Resonance Imaging Brain Tumor Segmentation Framework

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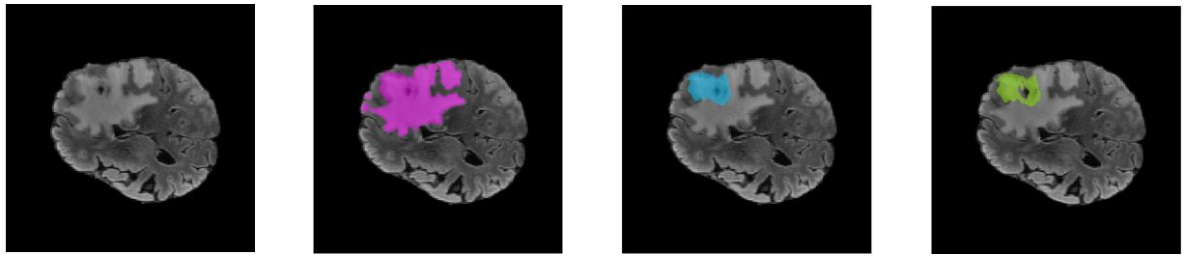
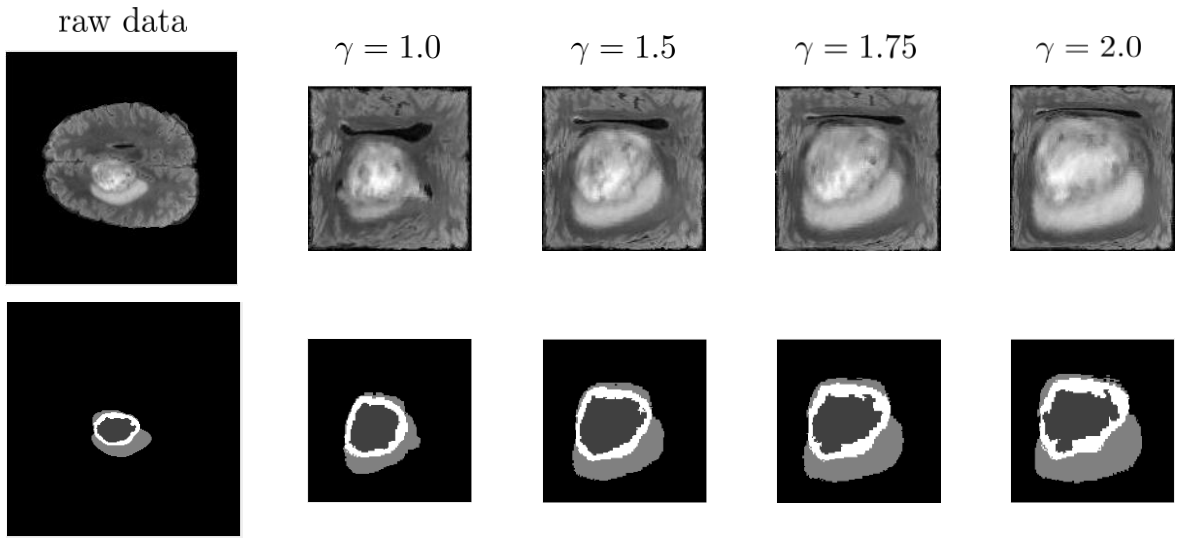


Flair | Whole Tumor | Tumor Core | Enhace Tumor

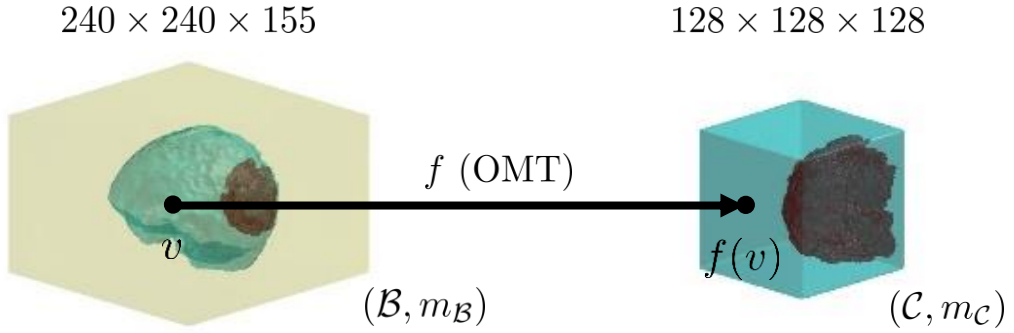
Data augmentation with different density: $\rho_{\mathcal{B}}(v) = e^{\gamma \cdot g(v)}$



Previous method:

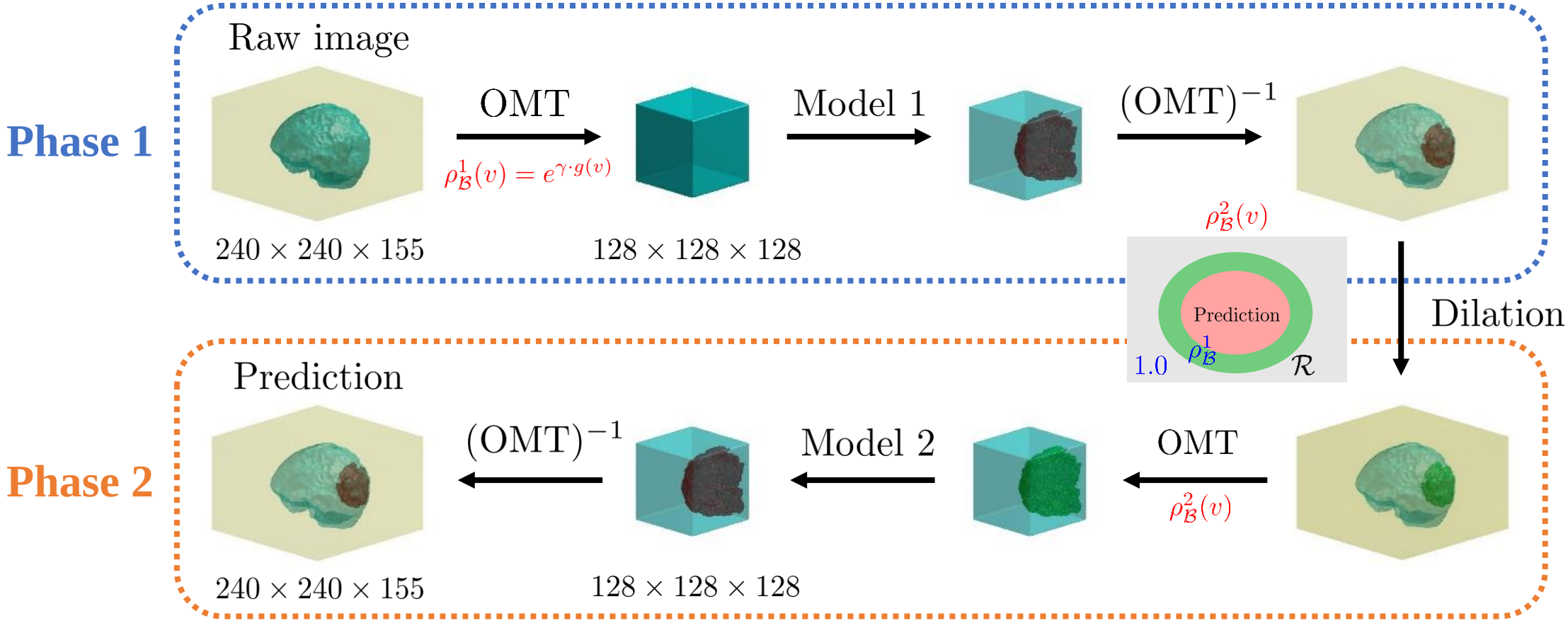
1. 2D slice
2. Random crop image

Proposed method: (OMT)



$$f^* = \arg\min_{f \in \mathrm{MP}} \int_{\mathcal{B}} \|v - f(v)\|_2^2 \, \mathrm{d}m_{\mathcal{B}}$$

$$\mathrm{MP} = \{f : \mathcal{B} \to \mathcal{C} \mid \rho_{\mathcal{B}}(\tau)|\tau| = |f(\tau)|, \forall \tau \in \mathcal{T}(\mathcal{B})\}$$



Tumor	Raw image	γ =1.0	γ =1.5	γ =1.75	γ =2.0
WT	6.49%	13.47%	18.27%	20.93%	23.72%
TC	2.42%	5.03%	6.84%	7.84%	8.90%
ET	1.45%	3.04%	4.14%	4.75%	5.40%

Model	Pre-processing	Cross-validation			Validation (online)		
		WT	TC	ET	WT	TC	ET
ResUNet	Random Crop	0.9305	0.9101	0.8610	0.9172	0.8586	0.8090
ResUNet	2POMT	**0.9321**	**0.9146**	**0.8683**	**0.9201**	**0.8667**	**0.8290**
SegResNet	Random Crop	0.9340	0.9082	0.8650	0.9194	0.8542	0.8242
SegResNet	2POMT	**0.9360**	**0.9157**	**0.8812**	**0.9203**	**0.8714**	**0.8452**