# Supplementary Material for 'Mix-of-Show'

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# **1** Dataset and Implementation Details

### 1.1 Dataset Details

Previous works, such as Dreambooth [1] and Custom Diffusion [2], have primarily focused on object customization. In contrast, our research encompasses a more comprehensive investigation that involves characters, objects, and scenes. To facilitate our experiments, we curate a dataset comprising 19 different concepts, including 6 real-world characters, 5 anime characters, 6 real-world objects, and 2 real-world scenes. The object part is borrowed from Dreambooth [1] and Custom Diffusion [2].

# **1.2 Implementation Details**

**Pretrained Models.** Due to the well-known quality issues associated with Stable-Diffusion v1-5 on human faces, we adopt the Chilloutmix<sup>2</sup> as the pretrained model for real-world concepts. Additionally, we employe the Anything-v4<sup>3</sup> as the pretrained model for anime concepts. To ensure fair comparisons with other methods, we run all comparison methods using the same pretrained model.

**Single-Client Concept Tuning.** In the implementation of ED-LoRA tuning, we incorporate LoRA layers into the linear layers of all attention modules within the text encoder and Unet. Throughout our experiments, we maintain a consistent rank of r = 4 for the LoRA layers for simplicity. To optimize the different components, we utilize the Adam optimizer [3] with specific learning rates: 1e-3 for text embedding, 1e-5 for the text encoder, and 1e-4 for the Unet. We use a 0.01 noise offset for all experiments, which we have found to be crucial for encoding stable identity.

**Center-Node Concept Fusion.** In the center-node concept fusion, we apply layer-wise optimization to the layer connected with the LoRA layer. Each layer for optimization is initialized with pretrained weights, and we use the LBFGS optimizer [4]. In detail, we optimize the text encoder layer through 500 steps, while the Unet layer requires 50 steps for optimization.

**Sample Details.** In all the experiments and evaluations conducted in this paper, we utilize the DPM-Solver [5] with 20 sampling steps. To filter out undesired variations in diffusion models, we employ the same negative prompt for both our and the comparison methods during sampling: "longbody, lowres, bad anatomy, bad hands, missing fingers, extra digit, fewer digits, cropped, worst quality, low quality."

**Running Times.** In single-client concept tuning, the process of tuning each concept takes approximately 10-20 minutes on two Nvidia-A100 GPUs, taking into account variations in data volume. As for the center-node concept fusion, it takes 30 minutes on a single Nvidia-A100 GPU to merge 14 concepts within the pretrained model.

# 2 Quantitative and Qualitative Evaluation

# 2.1 Evaluation Setting

Our evaluation focuses on investigating the each concept in the **single-concept tuned model** and **the center-node fused model**. To assess the performance, we employ the evaluation metric, which includes image-alignment and text-alignment, as outlined in Custom Diffusion [2]. Specifically, for text-alignment, we evaluates the text-image similarity of the sampled image with the corresponding sample prompt in the CLIP feature space [6] by CLIP-Score toolkit<sup>4</sup>. For image-alignment, we evaluate the pairwise image similarity between the sampled image and the target concept data in the CLIP Image feature space [6].

For each concept, we utilize 20 evaluation prompts, which can be roughly categorized into four types: Recontextualization, Restylization, Interaction, and Property Modification. In Recontextualization, we assess the concept's performance by changing its context to different settings, such as the Eiffel Tower or Mount Fuji. In Restylization, we explore the concept's ability to adapt to various artistic styles. In Interaction, we investigate the concept's capability to interact with other objects, such as

<sup>&</sup>lt;sup>2</sup>https://civitai.com/models/6424/chilloutmix

<sup>&</sup>lt;sup>3</sup>https://huggingface.co/andite/anything-v4.0/tree/main

<sup>&</sup>lt;sup>4</sup>https://github.com/jmhessel/clipscore

	prompts for characters	prompts for pets	prompts for table
	A photo of <tok> on the beach, small waves, detailed</tok>	A <tok>, in the swimming pool</tok>	A <tok>, in the swimming pool</tok>
	symmetric face, beautiful composition	A <tok>, in front of Eiffel tower</tok>	A <tok>, in front of Eiffel tower</tok>
	A <tok>, in front of Eiffel tower</tok>	A <tok>, near the mount fuji</tok>	A <tok>, near the mount fuji</tok>
Recontextualization	A <tok>, near the mount fuji</tok>	A <tok>, in the forest</tok>	A <tok>, in the forest</tok>
	A <tok>, in the forest</tok>	A <tok>, walking on the street</tok>	A <tok>, walking on the street</tok>
	A <tok>, walking on the street</tok>		
	A <tok>, cyberpunk 2077, 4K, 3d render in unreal engine</tok>	A <tok>, cyberpunk 2077, 4K, 3d render in unreal engine</tok>	A <tok>, cyberpunk 2077, 4K, 3d render in unreal engine</tok>
	A watercolor painting of a <tok></tok>	A watercolor painting of a <tok></tok>	A watercolor painting of a <tok></tok>
Restylization	A painting of a <tok> in the style of Vincent Van Gogh</tok>	A painting of a <tok> in the style of Vincent Van Gogh</tok>	A painting of a <tok> in the style of Vincent Van Gogh</tok>
	A painting of a <tok> in the style of Claude Monet</tok>	A painting of a <tok> in the style of Claude Monet</tok>	A painting of a <tok> in the style of Claude Monet</tok>
	A <tok> in the style of Pixel Art</tok>	A <tok> in the style of Pixel Art</tok>	A <tok> in the style of Pixel Art</tok>
	A -TOK's sit on the chair	A cTOK's sit on the shair	A cTOK's sit on the shair
	A <tok> side a horre</tok>	A <tok> sit on the heat</tok>	A <tok> sit on the best</tok>
Interaction		A <tok> wearing a headphone</tok>	A <tok> wearing a headphone</tok>
	A CTOK, wearing a neauprione	A CIOKS, wearing a neadphone	A CIOKA, wearing a neadphone
	A <tok>, wearing a sunglass</tok>	A <tok>, wearing a sunglass</tok>	A <tok>, wearing a sunglass</tok>
	A <tok>, wearing a Santa nat</tok>	A < 10K> playing with a ball	A <10K> playing with a ball
	A smiling <tok></tok>	A sad <tok></tok>	A sad <tok></tok>
	An angry <tok></tok>	An angry <tok></tok>	An angry <tok></tok>
Property Change	A running <tok></tok>	A running <tok></tok>	A running <tok></tok>
1	A jumping <tok></tok>	A jumping <tok></tok>	A jumping <tok></tok>
	A <tok> is lying down</tok>	A <tok> is lying down</tok>	A <tok> is lying down</tok>
	prompts for chair	prompts for vase	prompts for scene
	prompts for chair	prompts for vase	prompts for scene
	prompts for chair A <tok>, in the snow A <tok>, at night</tok></tok>	prompts for vase A <tok>, in the snow A <tok>, at night</tok></tok>	prompts for scene A <tok>, in the snow A <tok>, at night</tok></tok>
Recontextualization	prompts for chair A <tok>, in the snow A <tok>, at night A <tok>, in autumn</tok></tok></tok>	prompts for vase A <tok>, in the snow A <tok>, at night A <tok>, natumn</tok></tok></tok>	prompts for scene A <tok>, in the snow A <tok>, at night A <tok>, at night</tok></tok></tok>
Recontextualization	prompts for chair A <tok>, in the snow A <tok>, at night A <tok>, in a sunny day</tok></tok></tok>	prompts for vase A <tok>, in the snow A <tok>, at night A <tok>, in autumn A <tok>, in a sunny day</tok></tok></tok></tok>	prompts for scene A <tok>, in the snow A <tok>, at night A <tok>, in autumn A <tok>, in a sunny day</tok></tok></tok></tok>
Recontextualization	prompts for chair A <tok>, in the snow A <tok>, at night A <tok>, in autumn A <tok>, in autumn A <tok>, in thunder and lightning</tok></tok></tok></tok></tok>	prompts for vase A <tok>, in the snow A <tok>, in alpht A <tok>, in autumn A <tok>, in autumn A <tok>, in under and lightning</tok></tok></tok></tok></tok>	prompts for scene A <tok>, in the snow A <tok>, at night A <tok>, in auturnn A <tok>, in a sunny day A <tok>, in tunder and lightning</tok></tok></tok></tok></tok>
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Recontextualization	prompts for chair A <tok>, in the snow A <tok>, at right A <tok>, in autumn A <tok>, in ausumd ay A <tok>, in thunder and lightning</tok></tok></tok></tok></tok>	prompts for vase A <tok>, in the snow A <tok>, in autumn A <tok>, in autumn A <tok>, in a suny day A <tok>, in thunder and lightning A <tok>, cubercurk 2077, 4K, 3d render in upped ensine.</tok></tok></tok></tok></tok></tok>	prompts for scene A <tok>, in the snow A <tok>, in autumn A <tok>, in autumn A <tok>, in sumny day A <tok>, in thunder and lightning A <tok>, cubercurk 2072 4K 2d render in unseal angine</tok></tok></tok></tok></tok></tok>
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the style of Tok A <tok> in the style of Tok A <tok> in the style of Metal A</tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></td></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></td></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok>	Prompts for vase  A 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the="" van="" vincent=""> hop near the <tok> A dop near the <tok> A <tok> in minbow colors A <tok> in mabov colors A <tok> in mabov colors A <tok> in mabov colors A <tok> in the style of Tok A <tok> in the style of Tok A <tok> in the style of Metal A</tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></td></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok>	Prompts for scene A <tok>, in the snow A <tok>, in the snow A <tok>, an inght A <tok>, in autumn A <tok>, in autumn A <tok>, in autumn A <tok>, in sunny day A <tok>, other and lightning A <tok>, cyberpunk 2077, 4K, 3d render in unreal engine A watercolor painting of a <tok> A painting of a <tok> in the style of Vincent Van Gogh A painting of a <tok <tok="" a="" claude="" context="" gogh="" in="" monet="" of="" style="" the="" van="" vincent=""> hop near the <tok> A dop near the <tok> A <tok> in minbow colors A <tok> in mabov colors A <tok> in mabov colors A <tok> in mabov colors A <tok> in the style of Tok A <tok> in the style of Tok A <tok> in the style of Metal A</tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok>
Recontextualization Restylization Interaction Property Change	prompts for chair A <tok>, in the snow A <tok>, the snow A <tok>, the snow A <tok>, the snow A <tok>, in autumn A <tok>, in a sunny day A <tok>, in a sunny day A <tok>, in a sunny day A <tok>, the snow a vatercolor painting of a <tok> A watercolor painting of a <tok> A painting of a <tok> in the style of fluencet Van Gogh A painting of a <tok> in the style of Claude Monet A <tok> in the style of Pixel Art A dig near the <tok> A dog near the <tok> A dog near the <tok> A cat near the <tok> A <tok> in chainties Claude Many people near the <tok> A <tok> made of metal A close view of <tok> A top view of <tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok>	prompts for vase  A <tok>, in the snow A <tok>, in the snow A <tok>, an utumn A <tok>, in autumn A <tok>, in autumn A <tok>, in autumn A <tok>, in auny day A <tok>, oxperpunk 2077, 4K, 3d render in unreal engine watercolor painting of a <tok> A painting of a <tok <tok="" a="" claude="" fluencet="" gogh="" in="" monet="" of="" painting="" style="" the="" van="">, in the style of Fluel Art A girl near the <tok> A dog near the <tok> A cat near the <tok> A <tok> A <tok> in anibow colors A <tok> in anibow colors A <tok> in the style of meal A <tok> in anibow colors A <tok> in the style of MAN A <tok> in the style style A <tok> in the st</tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok>	Prompts for scene A <tok>, in the snow A <tok>, in the snow A <tok>, an inght A <tok>, in autumn A <tok>, in autumn A <tok>, in a suny day A <tok>, in thunder and lightning A <tok>, thunder and lightning A <tok>, tyberpunk 2077, 4K, 3d render in unreal engine watercolor painting of a <tok> A painting of a <tok> in the style of Vincent Van Gogh A painting of a <tok> in the style of Vincent Van Gogh A top is art the <tok> A dog near the <tok> A dog near the <tok> A <tok> in any be eart the <tok> A <tok> in any be of meal A <cok> in the style of Vincent Van A close view of <tok> A <tok> in the style of Vincent Van A <tok> in the of MAN A dog near the <tok> A <tok> in the style of MAN A <tok> in the style of TOK&gt; A <tok <tok="" of="" style=""> A <tok <tok="" of="" style=""> A top view of <tok> A top view of <t< td=""></t<></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></cok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok></tok>

Figure 1: Summarization of our evaluation prompts for each concept.

associations or actions like sitting on a chair. In Property Modification, we modify the internal state of the concept, including expressions or states like running or jumping. Each type consists of 5 prompts, some of which are borrowed from previous work, resulting in a total of 20 prompts per concept. We sample 50 images for each prompt, ensuring reproducibility by fixing the random seed within the range of [1, 50]. This yields a total of 1000 images for each concept. The evaluation prompts for each concept are presented in Fig. 1.

# 2.2 Quantitative Results

According to the evaluation setting described in Sec. 2.1, we have compiled the complete evaluation results for each concept, which are summarized in Table. 1. The summarized results of different categories can be found in Table. 1 of the main paper.

#### 2.3 Qualitative Results

The qualitative comparison of Mix-of-Show and other methods on the single-client tuned model and center-node fused model is presented in Fig. 2. From the results, it is evident that the LoRA experiences the most significant loss of concept identity after concept fusion. Additionally, due to the limited tunability of positions in the P+ and Custom Diffusion, they exhibit oversaturated results or semantic collapse in some examples. Conversely, Mix-of-Show consistently achieves the best concept identity and quality across various examples, while also minimizing the loss of identity after the center-node concept fusion.

# **3** Limitation and Future Work

# 3.1 Limitation

The first limitation is related to regionally controllable sampling, as depicted in Fig. 3(a), where attributes from one region may influence another due to the encoding of some attributes in the global

Single-Concept Mode	l Methods	Cat (5)	DogA (5)	Chair (5)	Table (4)	DogB (5)	Vase (6)	Mean
	Upper Bound	0.832	0.821	0.795	0.792	0.821	0.807	0.811
Text-alignment	P+ [7] Custom Diffusion [2]	0.828	0.801 0.744	0.726 0.698	0.696 0.689	0.799 0.786	0.776 0.768	0.771 0.745
	LoRA [8]	0.761	0.673	0.655	0.670	0.779	0.779	0.720
	Mix-of-Show (Ours)	0.771	0.703	0.666	0.671	0.772	0.759	0.724
	Lower Bound	0.753	0.755	0.674	0.682	0.769	0.692	0.721
Image-alignment	P+[7]	0.783	0.753	0.809	0.810	0.825	0.761	0.790
ininge unginnent	Custom Diffusion [2]	0.869	0.830	0.825	0.888	0.848	0.794	0.842
	LoRA [8]	0.859	0.871	0.872	0.917	0.887	0.778	0.864
	Mix-of-Show (Ours)	0.874	0.864	0.890	0.879	0.889	0.811	0.868
Fused Model	Methods	Cat (5)	DogA (5)	Chair (5)	Table (4)	DogB (5)	Vase (6)	Mean
Fused Model	Methods Upper Bound	Cat (5) 0.832	DogA (5) 0.821	Chair (5) 0.795	Table (4) 0.792	DogB (5) 0.821	Vase (6) 0.807	<b>Mean</b> 0.811
Fused Model	Methods Upper Bound P+ [7]	Cat (5) 0.832 0.828	DogA (5) 0.821 0.801	Chair (5) 0.795 0.726	Table (4) 0.792 0.696	DogB (5) 0.821 0.799	Vase (6) 0.807 0.776	Mean 0.811 0.771
Fused Model	Methods Upper Bound P+ [7] Custom Diffusion [2]	Cat (5) 0.832 0.828 0.756	DogA (5) 0.821 0.801 0.735	Chair (5) 0.795 0.726 0.726	Table (4)         0.792         0.696         0.724	DogB (5) 0.821 0.799 0.782	Vase (6) 0.807 0.776 0.758	Mean 0.811 0.771 0.747
Fused Model	Methods Upper Bound P+ [7] Custom Diffusion [2] LoRA [8]	Cat (5) 0.832 0.828 0.756 0.827	DogA (5) 0.821 0.801 0.735 0.803	Chair (5) 0.795 0.726 0.726 0.757	Table (4)         0.792         0.696         0.724         0.766	DogB (5) 0.821 0.799 0.782 0.814	Vase (6) 0.807 0.776 0.758 0.801	Mean 0.811 0.771 0.747 0.795
Fused Model  Text-alignment	Methods Upper Bound P+ [7] Custom Diffusion [2] LoRA [8] Mix-of-Show (Ours)	Cat (5) 0.832 0.828 0.756 0.827 0.801	DogA (5) 0.821 0.801 0.735 0.803 0.738	Chair (5) 0.795 0.726 0.726 0.757 0.673	Table (4)         0.792         0.696         0.724         0.766         0.709	DogB (5) 0.821 0.799 0.782 0.814 0.786	Vase (6) 0.807 0.776 0.758 0.801 0.761	Mean           0.811           0.771           0.747           0.795           0.745
Fused Model Text-alignment	Methods Upper Bound P+ [7] Custom Diffusion [2] LoRA [8] Mix-of-Show (Ours) Lower Bound	Cat (5) 0.832 0.828 0.756 0.827 0.801 0.753	DogA (5) 0.821 0.801 0.735 0.803 0.738 0.755	Chair (5) 0.795 0.726 0.726 0.757 0.673 0.674	Table (4)         0.792         0.696         0.724         0.766         0.709         0.682	DogB (5) 0.821 0.799 0.782 0.814 0.786 0.769	Vase (6) 0.807 0.776 0.758 0.801 0.761 0.692	Mean           0.811           0.771           0.747           0.795           0.745           0.721
Fused Model	Methods Upper Bound P+ [7] Custom Diffusion [2] LoRA [8] Mix-of-Show (Ours) Lower Bound P+ [7]	Cat (5) 0.832 0.828 0.756 0.827 0.801 0.753 0.783	DogA (5) 0.821 0.801 0.735 0.803 0.738 0.755 0.753	Chair (5) 0.795 0.726 0.726 0.757 0.673 0.674 0.809	Table (4)           0.792           0.696           0.724           0.766           0.709           0.682           0.810	DogB (5) 0.821 0.799 0.782 0.814 0.786 0.769 0.825	Vase (6) 0.807 0.776 0.758 0.801 0.761 0.692 0.761	Mean           0.811           0.771           0.747           0.795           0.745           0.721           0.790
Fused Model  Text-alignment  Image-alignment	Methods Upper Bound P+ [7] Custom Diffusion [2] LoRA [8] Mix-of-Show (Ours) Lower Bound P+ [7] Custom Diffusion [2]	Cat (5) 0.832 0.828 0.756 0.827 0.801 0.753 0.783 0.871	DogA (5)           0.821           0.801           0.735           0.803           0.738           0.755           0.753           0.813	Chair (5)           0.795           0.726           0.726           0.757           0.673           0.674           0.809           0.774	Table (4)         0.792         0.696         0.724         0.766         0.709         0.682         0.810         0.794	DogB (5) 0.821 0.799 0.782 0.814 0.786 0.769 0.825 0.823	Vase (6) 0.807 0.776 0.758 0.801 0.761 0.692 0.761 0.773	Mean           0.811           0.771           0.745           0.745           0.721           0.790           0.808
Fused Model Text-alignment Image-alignment	Methods Upper Bound P+ [7] Custom Diffusion [2] LoRA [8] Mix-of-Show (Ours) Lower Bound P+ [7] Custom Diffusion [2] LoRA [8]	Cat (5) 0.832 0.828 0.756 0.827 0.801 0.753 0.753 0.783 0.871 0.805	DogA (5) 0.821 0.801 0.735 0.803 0.738 0.755 0.753 0.813 0.800	Chair (5)           0.795           0.726           0.726           0.757           0.673           0.674           0.809           0.774           0.761	Table (4)         0.792         0.696         0.724         0.766         0.709         0.682         0.810         0.794         0.778	DogB (5) 0.821 0.799 0.782 0.814 0.786 0.769 0.825 0.823 0.808	Vase (6) 0.807 0.776 0.758 0.801 0.761 0.692 0.761 0.773 0.715	Mean           0.811           0.771           0.747           0.795           0.745           0.721           0.790           0.808           0.778

(a) Quantitative results from single-concept model and center-node fused model on *real-world objects*.

Single-Concept Mo	del Methods	Potter (14)	Hermione (15)	Thanos (15)	Hinton (14)	Lecun (17)	Bengio (15)	Mean
	Upper Bound	0.765	0.776	0.765	0.765	0.765	0.765	0.767
Text-alignment	P+ [7] Custom Diffusion [2] LoRA [8]	0.640 0.654 0.580	0.744 0.720 0.696	0.622 0.594 0.568	0.708 0.717 0.716	0.693 0.683 0.681	0.711 0.674 0.684	0.686 0.674 0.654
	Mix-of-Show (Ours)	0.575	0.650	0.562	0.665	0.680	0.662	0.632
	Lower Bound	0.485	0.458	0.510	0.422	0.510	0.441	0.471
Image-alignment	P+ [7] Custom Diffusion [2] LoRA [8]	0.778 0.737 0.866	0.608 0.663 0.679	0.809 0.852 0.917	0.582 0.627 0.683	0.614 0.694 0.716	0.629 0.710 0.705	0.670 0.714 0.761
	Mix-of-Show (Ours)	0.869	0.785	0.921	0.731	0.723	0.782	0.802
Fused Model	Methods P	otter (14) H	Hermione (15)	Thanos (15)	Hinton (14)	Lecun (17)	Bengio (15)	Mean
Fused Model	Methods P Upper Bound	otter (14) H 0.765	Hermione (15) 0.776	Thanos (15) 0.765	Hinton (14) 0.765	Lecun (17) 0.765	Bengio (15) 0.765	<b>Mean</b> 0.767
Fused Model Text-alignment	MethodsPUpper BoundP+ [7]Custom Diffusion [2]LoRA [8]	0.765 0.640 0.604 0.693	Hermione (15) 0.776 0.744 0.678 0.717	Thanos (15) 0.765 0.622 0.624 0.656	Hinton (14) 0.765 0.708 0.699 0.694	Lecun (17) 0.765 0.693 0.651 0.714	Bengio (15) 0.765 0.711 0.641 0.725	Mean 0.767 0.686 0.650 0.700
Fused Model Text-alignment	MethodsPUpper BoundP+ [7]Custom Diffusion [2]LoRA [8]Mix-of-Show (Ours)	otter (14)         H           0.765         0.640           0.604         0.693           0.632         0.632	Hermione (15) 0.776 0.744 0.678 0.717 0.677	Thanos (15)           0.765           0.622           0.624           0.656           0.611	Hinton (14) 0.765 0.708 0.699 0.694 0.673	Lecun (17) 0.765 0.693 0.651 0.714 0.678	Bengio (15) 0.765 0.711 0.641 0.725 0.701	Mean 0.767 0.686 0.650 0.700 0.662
Fused Model Text-alignment	Methods     P       Upper Bound     P+       P+ [7]     Custom Diffusion [2]       LoRA [8]     Mix-of-Show (Ours)       Lower Bound     Lower Bound	otter (14)         H           0.765         0.640           0.604         0.693           0.632         0.485	Hermione (15)           0.776           0.744           0.678           0.717           0.6677           0.458	Thanos (15) 0.765 0.622 0.624 0.656 0.611 0.510	Hinton (14) 0.765 0.708 0.699 0.694 0.673 0.422	Lecun (17) 0.765 0.693 0.651 0.714 0.678 0.510	Bengio (15) 0.765 0.711 0.641 0.725 0.701 0.441	Mean 0.767 0.686 0.650 0.700 0.662 0.471
Fused Model Text-alignment Image-alignment	Methods     P       Upper Bound     P+ [7]       Custom Diffusion [2]     LoRA [8]       Mix-of-Show (Ours)     D       Lower Bound     P+ [7]       Custom Diffusion [2]     LoRA [8]	otter (14)         H           0.765         0.640           0.604         0.693           0.632         0.485           0.778         0.765           0.558         0.558	Hermione (15)           0.776           0.744           0.678           0.717           0.677           0.458           0.608           0.680           0.600	Thanos (15) 0.765 0.622 0.624 0.656 0.611 0.510 0.809 0.749 0.792	Hinton (14) 0.765 0.708 0.699 0.694 0.673 0.422 0.582 0.603 0.412	Lecun (17) 0.765 0.693 0.651 0.714 0.678 0.510 0.614 0.693 0.523	Bengio (15) 0.765 0.711 0.641 0.725 0.701 0.441 0.629 0.671 0.447	Mean           0.767           0.686           0.650           0.700           0.662           0.471           0.670           0.694           0.555

(b) Quantitative results from single-concept model and center-node fused model on *real-world characters*.

Single-Concept Model	Methods	Rock (20)	Pyramid (20)	Mean	Fused Model	Methods	Rock (20)	Pyramid (20)	Mean
	Upper Bound	0.869	0.798	0.834		Upper Bound	0.869	0.798	0.834
Text-alignment	P+ [7] Custom Diffusion [2] LoRA [8]	0.801 0.809 0.737	0.716 0.686 0.697	0.759 0.748 0.717	Text-alignment	P+ [7] Custom Diffusion [2] LoRA [8]	0.801 0.793 0.786	0.716 0.682 0.734	0.759 0.738 0.760
	Mix-of-Show (Ours)	0.754	0.677	0.716		Mix-of-Show (Ours)	0.770	0.702	0.736
	Lower Bound	0.672	0.517	0.595		Lower Bound	0.672	0.517	0.595
Image-alignment	P+ [7] Custom Diffusion [2] LoRA [8]	0.821 0.808 0.863	0.770 0.800 0.784	0.796 0.804 0.824	Image-alignment	P+ [7] Custom Diffusion [2] LoRA [8]	0.821 0.742 0.810	0.770 0.757 0.728	0.796 0.750 0.769
	Mix-of-Show (Ours)	0.859	0.857	0.858		Mix-of-Show (Ours)	0.832	0.844	0.838

(c) Quantitative results from single-concept model and center-node fused model on *real-world scenes*.

Table 1: *Text-alignment* and *image-alignment* of the single-client tuned model and the center-node fused model. The upper bound of text-alignment and the lower bound of image-alignment are computed by replacing the concept's token with its class token and sampling using the pretrained model. For instance, to assess the upper-bound text alignment and lower-bound image alignment for the concept " $V^{dogA}$ ," we substitute " $V^{dogA}$ " in the sample prompts with the class token "dog" and sample it using the pretrained model. (N) means each concept has N images for tuning.



Center-Node Fused Model

Figure 2: Qualitative comparison of Mix-of-Show *vs.* P+ [7], Custom Diffusion [2], and LoRA [8]. Our Mix-of-Show demonstrates superior concept identity and quality in single-concept tuned model and achieves the least identity loss after concept fusion.

<sup>atman</sup>. V<sup>thanos</sup> and V<sup>ironman</sup> standing

V<sup>hermione</sup> is walking near the mount fuji.



(a) Limitation of Attribute Leakage

#### (b) Limitation in Small Face

Figure 3: Limitation of Mix-of-Show. (a) Attribute leakage in regionally controllable sampling. (b) Limitation in small face generation.

embedding. This issue can be partially alleviated by specifying undesired attributes using negative prompts for each region.

The second limitation concerns the center-node concept fusion, which requires a relatively lengthy time to merge concepts. The primary bottleneck in this process arises from the presence of large spatial features in the Unet layer during layer-wise optimization.

The final limitation relates to the generation of small faces. In the case of Stable Diffusion, the information loss in the VAE can affect the generation of high-quality full-body characters, especially in the small face region, resulting in a loss of facial details, as shown in Fig. 3(b). To mitigate this limitation, increasing the sample size can be a potential solution.

#### 3.2 Future Work

Our Mix-of-Show framework enables the reusability and scalability of tuned concepts, facilitating the creation of complex multi-concept compositions. In future work, it would be interesting to explore how Mix-of-Show can enhance storybook generation by generating character and object interactions across various plots. Furthermore, as Mix-of-Show supports stable identity encoding, it has the potential to assist in concept customization for video or 3D scenarios.

#### 3.3 Potential Negative Society Impact

This project aims to provide the community with an effective tool for decentralized creation of high-quality customized concept models and the ability to reuse and combine different concepts to compose complex images. However, a risk exists wherein malicious entities could exploit this framework to create deceptive interactions with real-world figures, potentially misleading the public. This concern is not unique to our approach but rather a shared consideration in other multi-concept customization methodologies. One potential solution to mitigate such risks involves adopting methods similar to anti-dreambooth [9], which introduce subtle noise perturbations to the published images to mislead the customization process. Additionally, applying unseen watermarking to the generated images could deter misuse and prevent them from being used without proper recognition.

# References

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