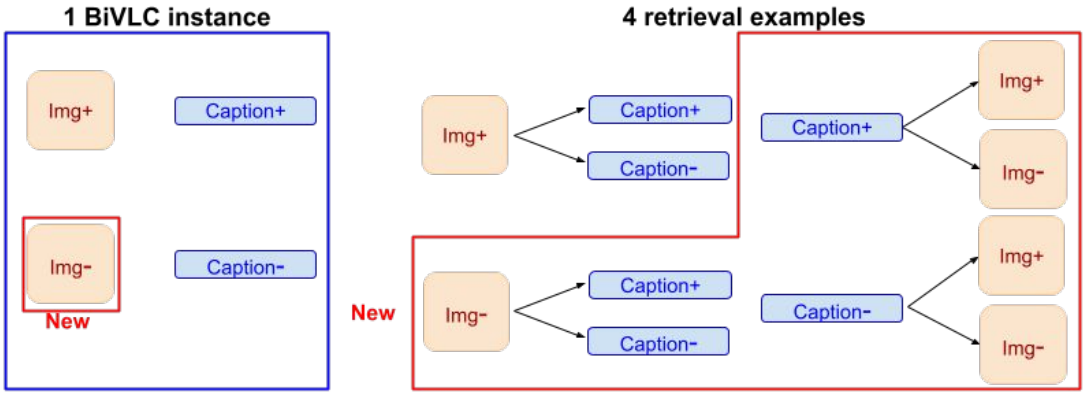
BiVLC: Extending Vision-Language Compositionality Evaluation with Text-to-Image Retrieval

Imanol Miranda, Ander Salaberria, Eneko Agirre, Gorka Azkune
HiTZ Center – Ixa, University of the Basque Country (UPV/EHU)
{imanol.miranda, ander.salaberria, e.agirre, gorka.azcune}@ehu.eus

Universidad del País Vasco Euskal Herriko Unibertsitatea
HiTZ Hizkuntza Teknologiako Zentroa Basque Center for Language Technology
NEURAL INFORMATION PROCESSING SYSTEMS

Adding negative images opens the door to many more retrieval examples



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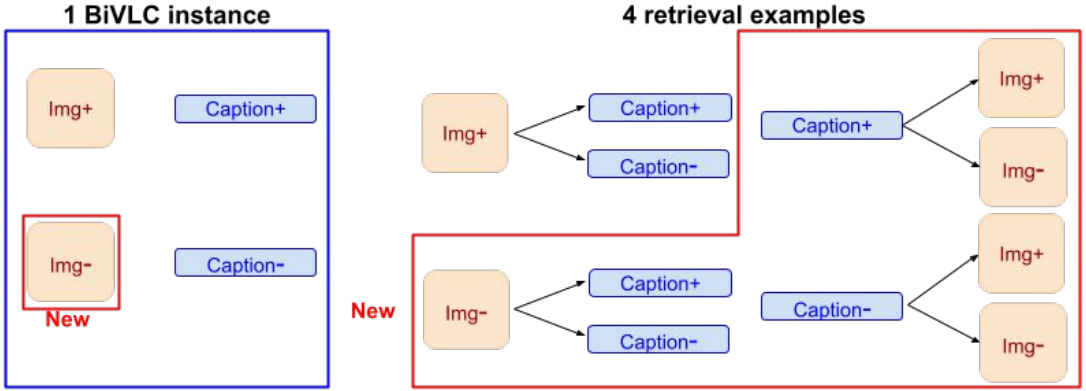

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			OBJ	ATT	REL	OBJ	ATT	REL	OBJ	ATT	
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SUGARCREPE	✓		1,652	788	1,406	246	666		2,062	692	7,512
BIVLC (ours)	✓	✓	4,800	1,748	1,848	324	1,112		1,596	304	11,732

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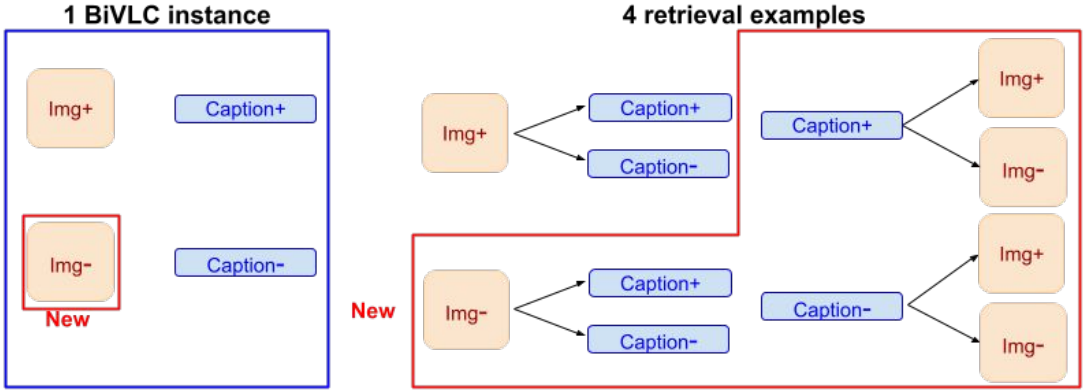

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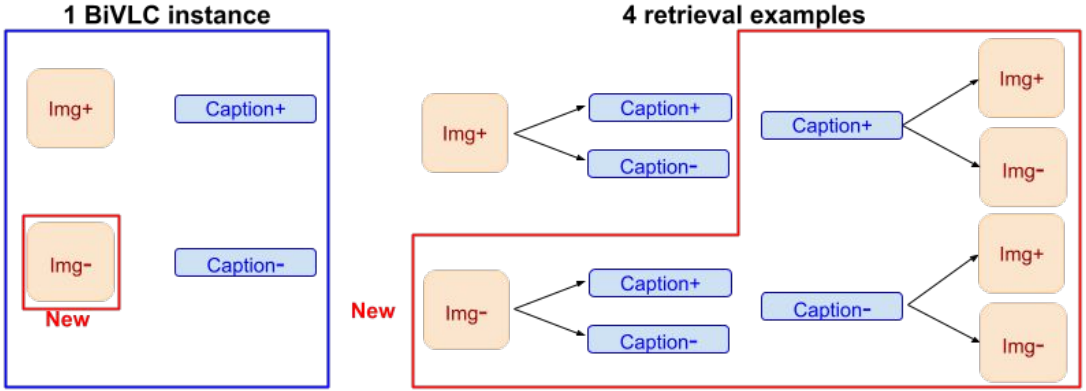

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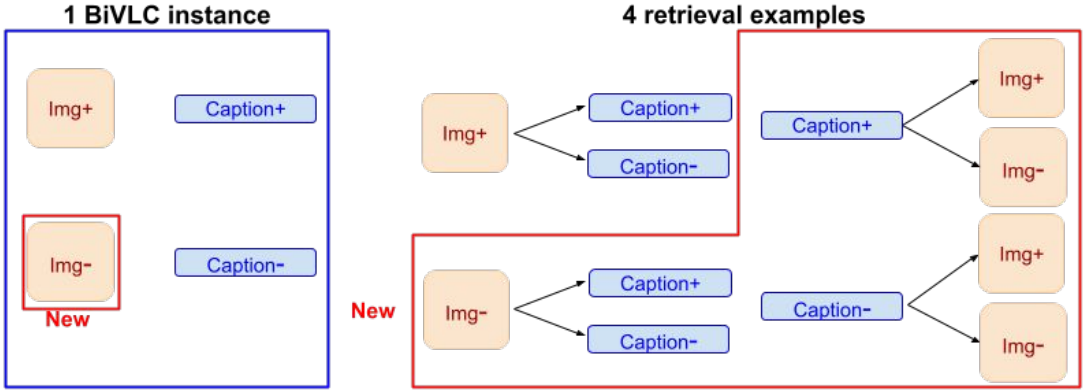

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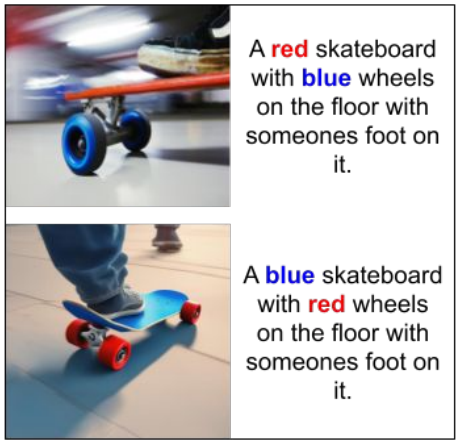

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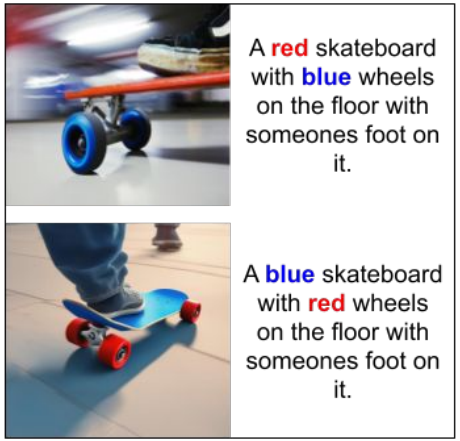

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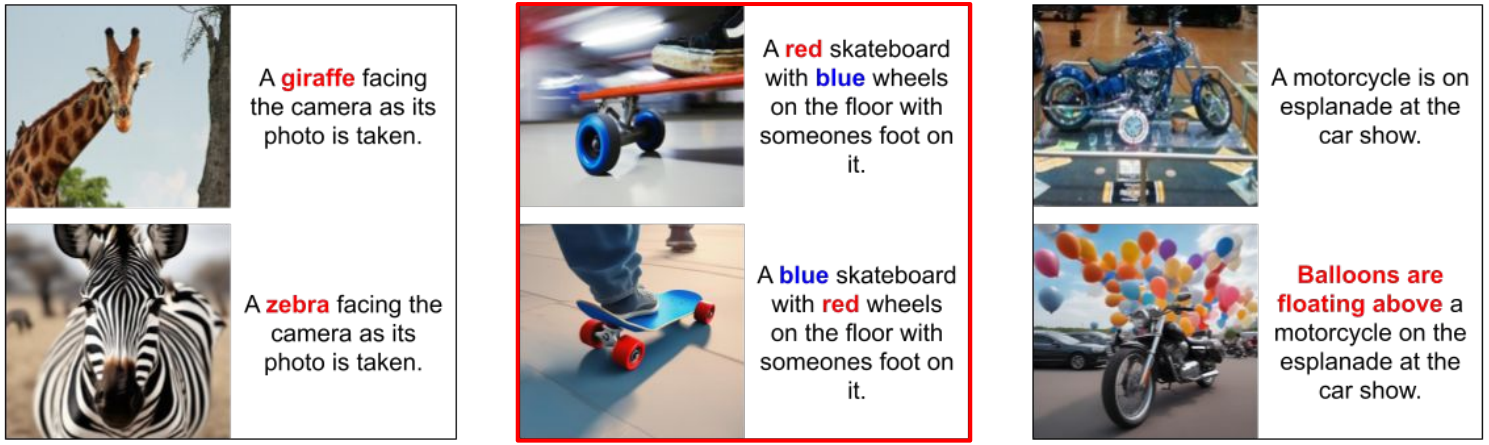

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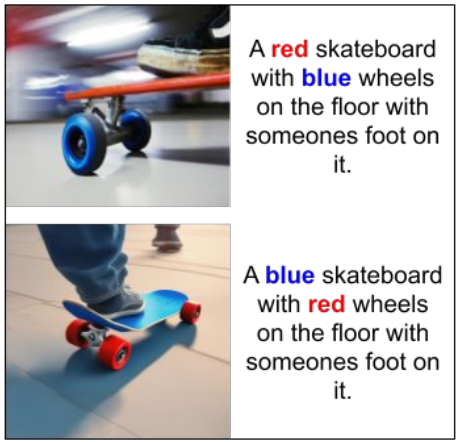

ADD

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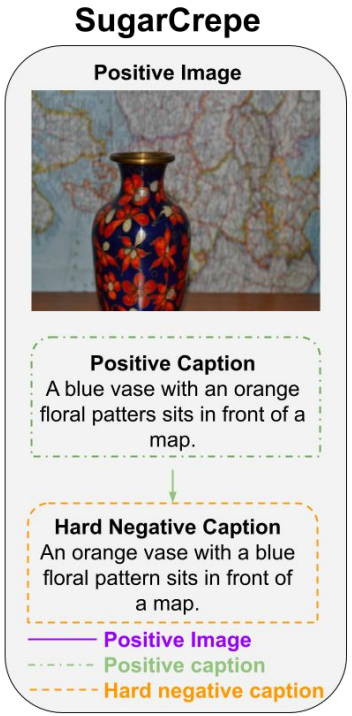

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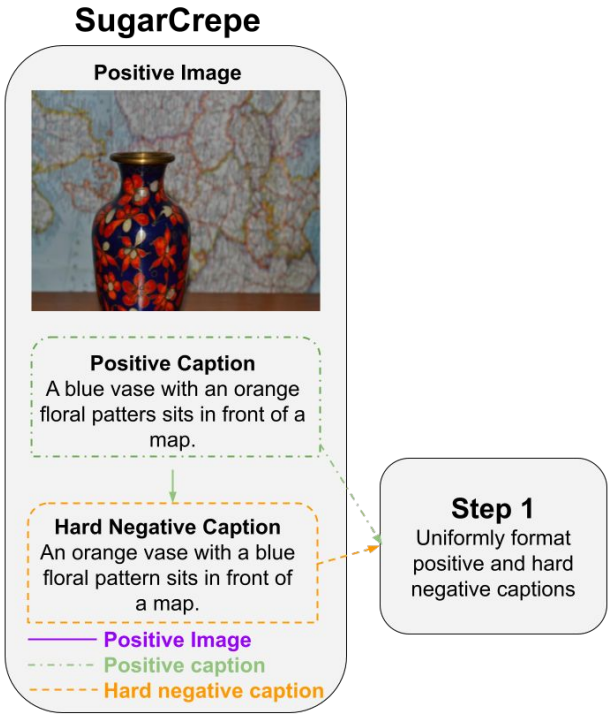

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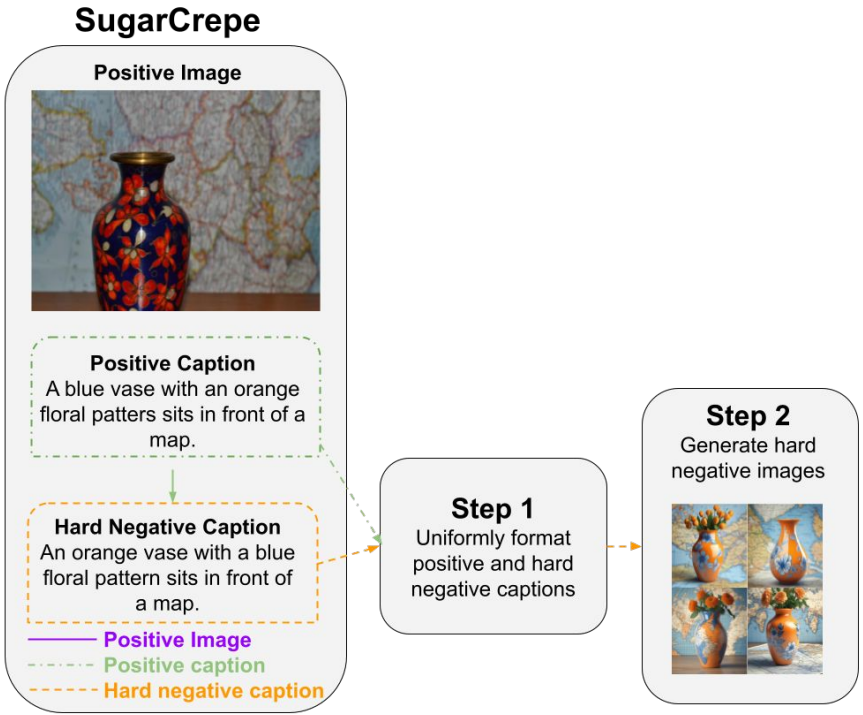

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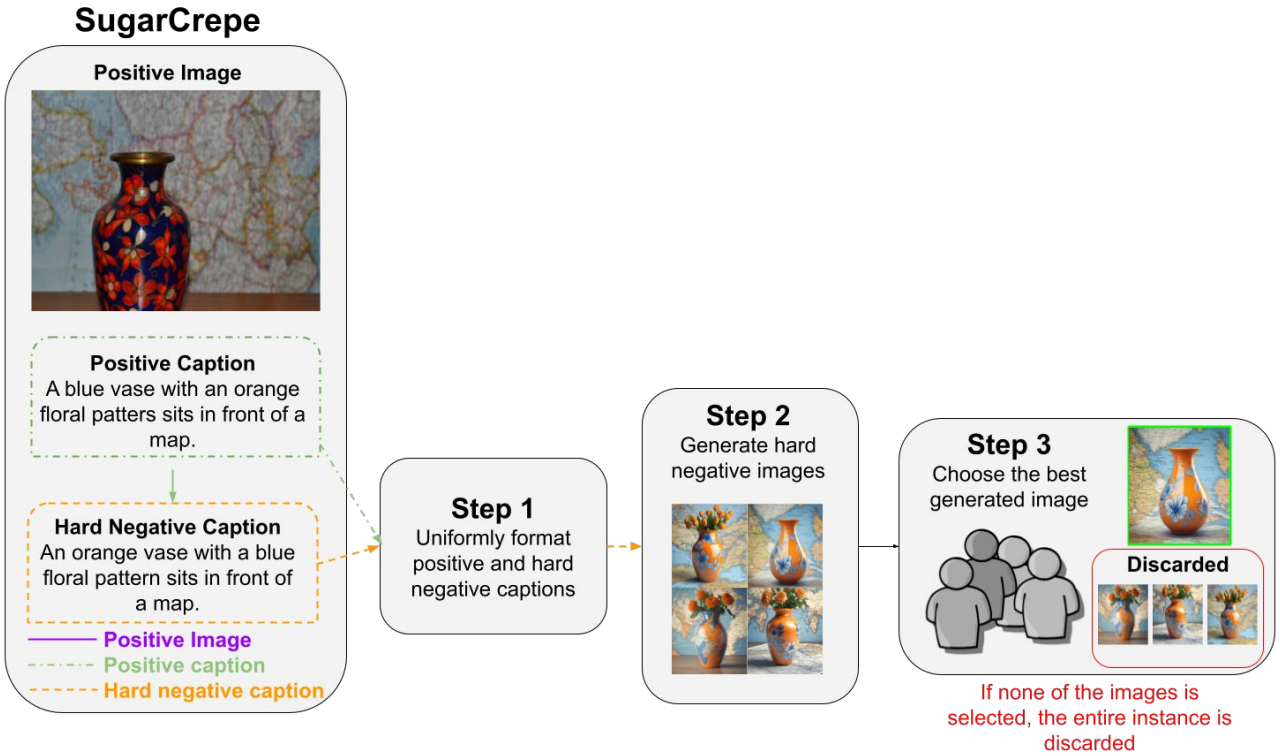

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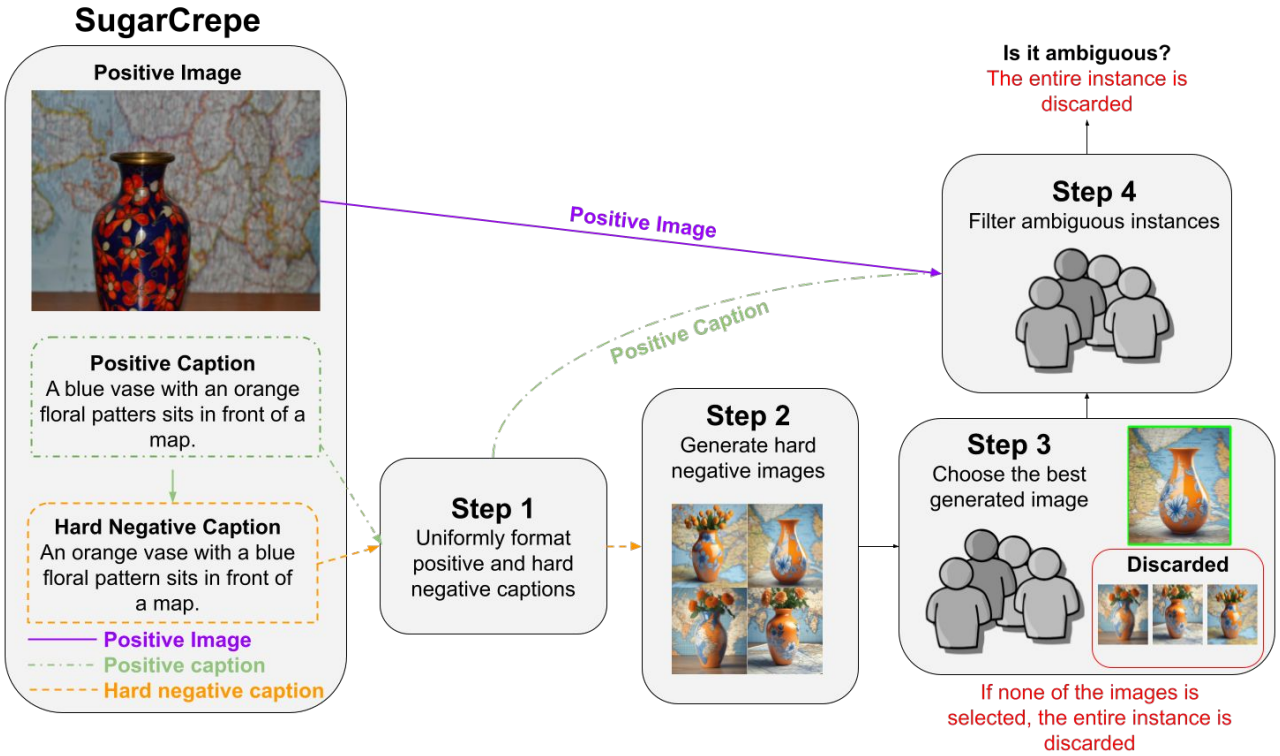

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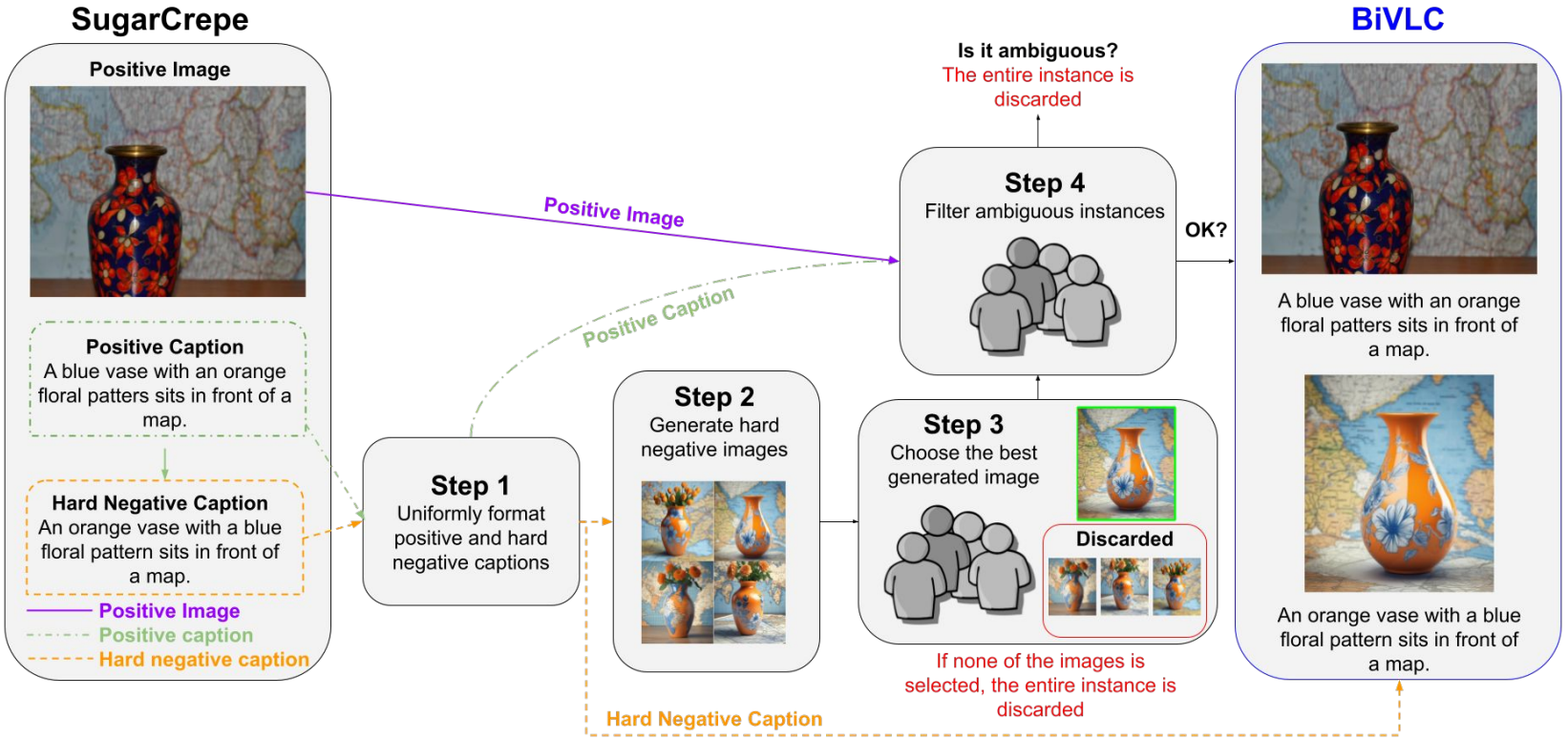

SOTA models results

	Model	Params	SugarCrepe	BiVLC I2T	BiVLC T2I	BiVLC Group
	Human	N/A	98.93	90.40	93.00	86.80
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	$\text{CLIP}_{\text{coco}}$		84.66	**82.75**	**63.89**	**60.96**
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	GNM		81.83	81.32	60.86	57.96
Generative	Open CapPa	676M	90.46	57.72	56.19	41.97
	VQAScore-XL	3B	90.85	81.96	76.61	70.20
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Finding 1: Current models underperform on text-to-image retrieval.

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Finding 2: The gap to humans is bigger in BiVLC than in SugarCrepe

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Finding 3: SugarCrepe and BiVLC performance are not correlated

Exploring training strategies

We **propose two new models based on the two main strategies in the literature** to improve the VLC skills of a multimodal model:

1. **CLIP$_{\text{TROHN-TEXT}}$** using hard negative texts for training**.**

2. **CLIP$_{\text{TROHN-IMG}}$** using both, hard negative texts and images.

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TROHN-Text has 10 times more hard negative texts

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GNM	81.83	81.32	60.86	57.96
$\text{CLIP}_{\text{TROHN-Text}}$	**93.40**	78.18	62.19	57.48
$\text{CLIP}_{\text{TROHN-Img}}$	<u>89.40</u>	**88.54**	**71.84**	**69.25**

Exploring training strategies

Model	SugarCrepe	BiVLC I2T	BiVLC T2I	BiVLC Group
Random	50.00	25.00	25.00	16.67
CLIP	76.56	75.83	52.40	49.06
$\text{CLIP}_{\text{COCO}}$	84.66	<u>82.75</u>	<u>63.89</u>	<u>60.96</u>
NegCLIP	85.64	80.74	61.95	58.75
GNM	81.83	81.32	60.86	57.96
$\text{CLIP}_{\text{TROHN-Text}}$	**93.40**	78.18	62.19	57.48
$\text{CLIP}_{\text{TROHN-Img}}$	<u>89.40</u>	**88.54**	**71.84**	**69.25**

VQAScore-XL Group score 70.20

3B vs 151M parameters for CLIP

Further analysis

- Why does training with hard negative images help?
- Which category is the most difficult?
- Why is $\text{CLIP}_{\text{TROHN-IMG}}$ still far from humans?
- Are our models just distinguishing between synthetic and natural?

Thank you!

- Project page: https://imirandam.github.io/BiVLC_project_page
- Github: https://github.com/IMirandaM/BiVLC
- Dataset: https://huggingface.co/datasets/imirandam/BiVLC
- Contact
  - by email {imanol.miranda, ander.salaberria, e.agirre, gorka.azcune}@ehu.eus
  - X @I_MirandaM @AnderSala @eagirre @gazkune