



# Honeybee Re-identification in Video: New Datasets and Impact of Self-supervision

Jeffrey Chan<sup>1</sup>, Hector Carrión<sup>2</sup>, Rémi Mégret<sup>2</sup>, José L. Agosto Rivera<sup>3</sup> and Tugrul Giray<sup>3</sup>

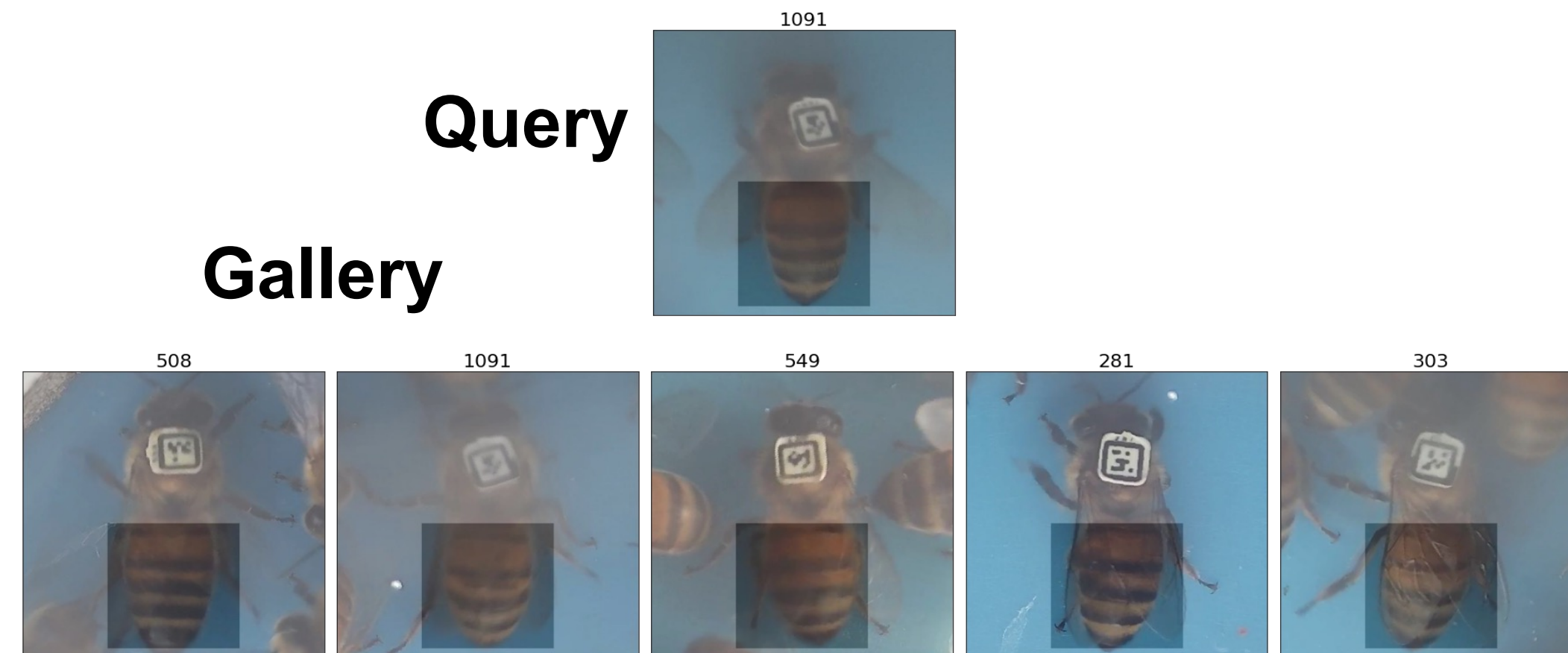
<sup>1</sup>Department of Mathematics, University of Puerto Rico, Río Piedras Campus, Puerto Rico

<sup>2</sup>Department of Computer Science, University of Puerto Rico, Río Piedras Campus, Puerto Rico

<sup>3</sup>Department of Biology, University of Puerto Rico, Río Piedras Campus, Puerto Rico



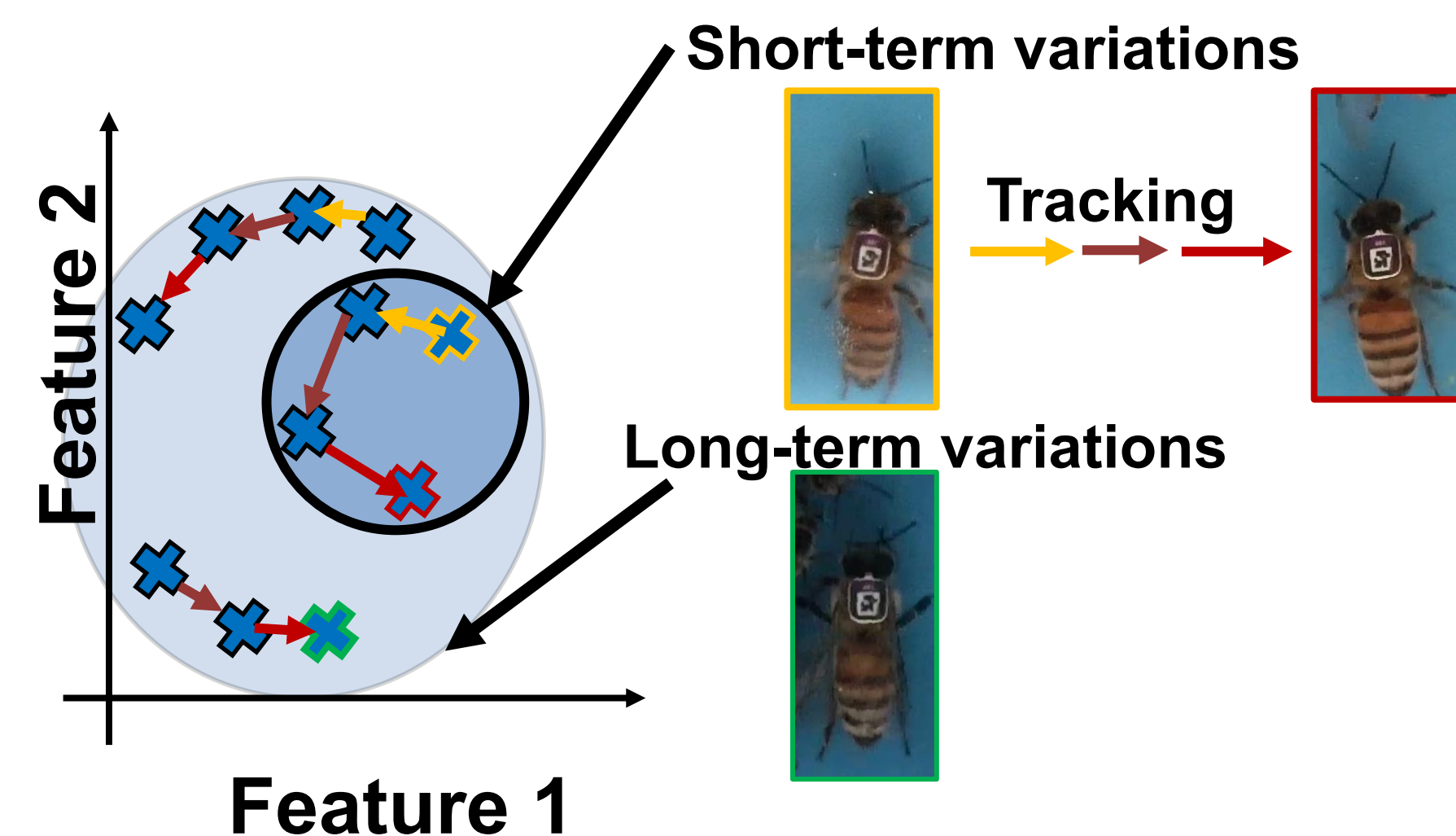
## Can you re-identify the following bee?



Marker less honeybees re-identification colonies will help beekeepers collect finer-grained information about the colony's health, threats, and behaviors avoiding colonies collapse.

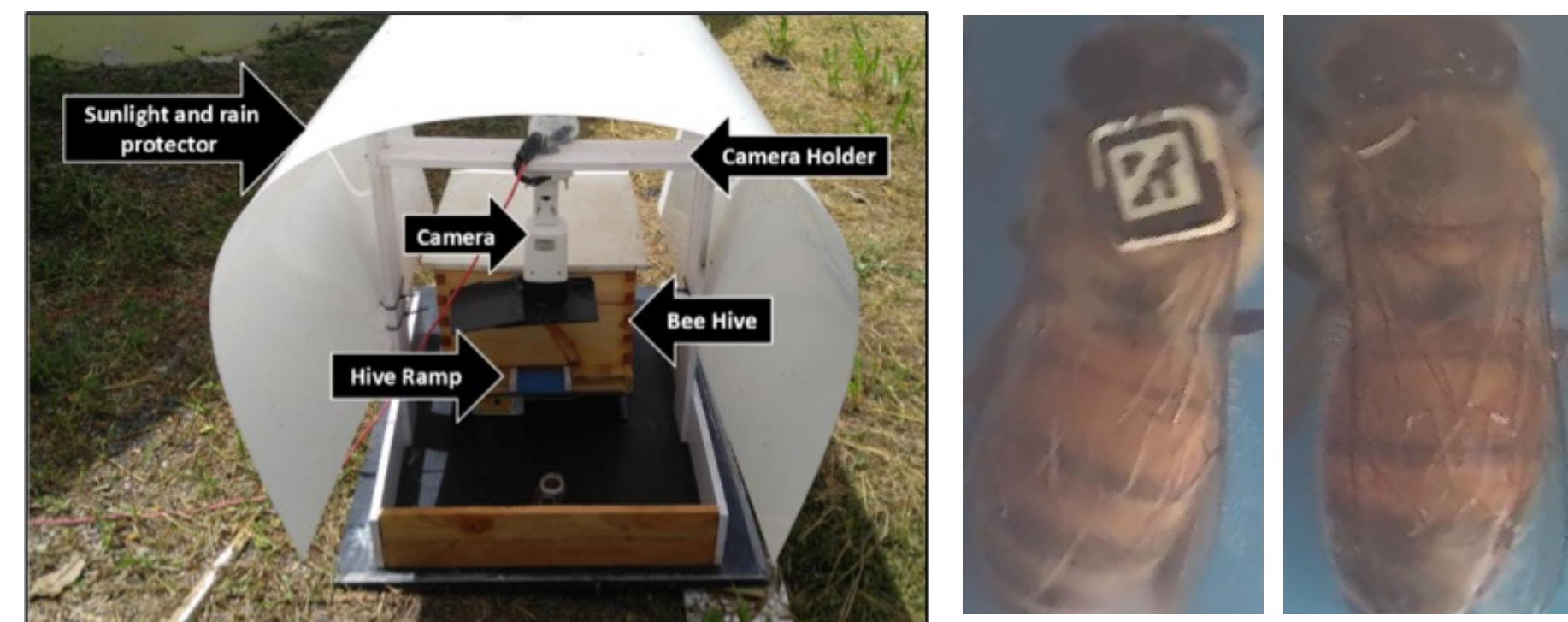
## Challenges

- Bees' re-identification beyond 15 minutes.
- Tagging individuals is an expensive process that is not scalable.
- Need for a large dataset for training and evaluation on re-id of honeybees.

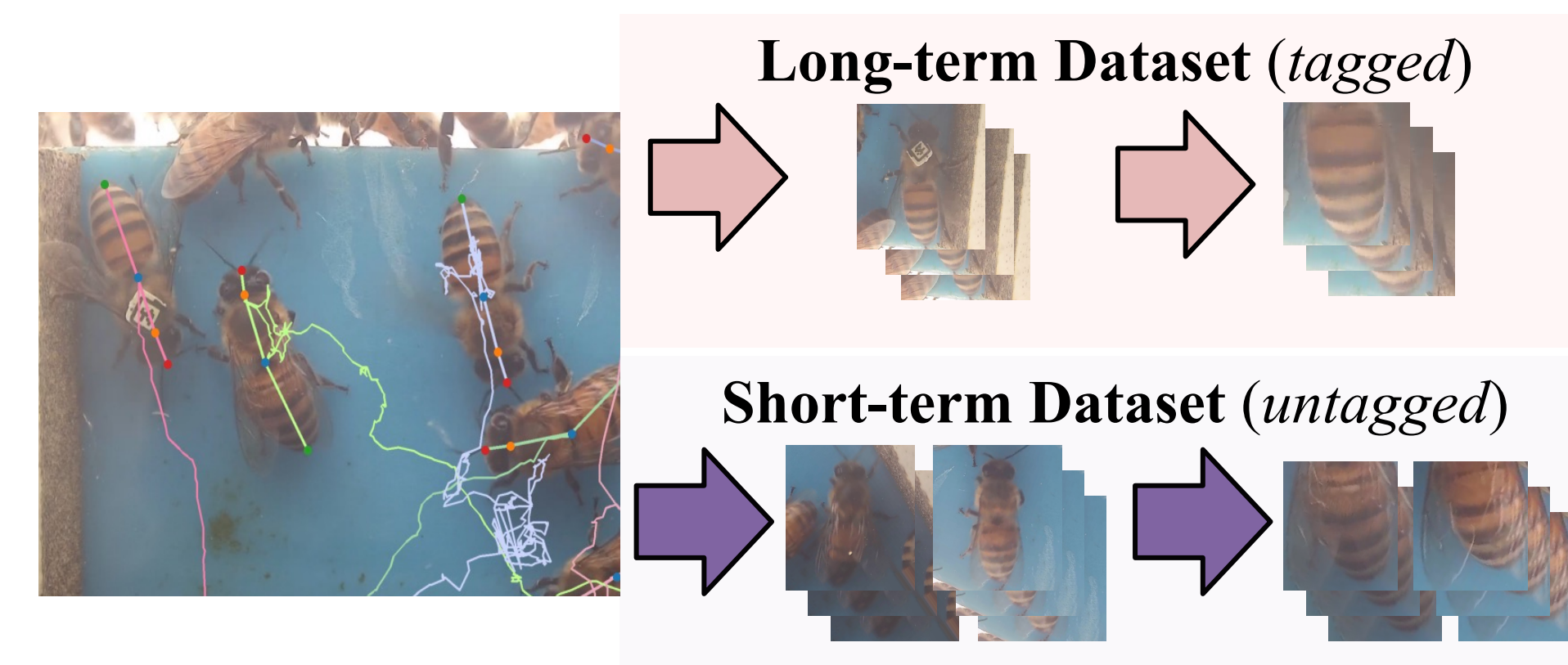


## Dataset Collection

### Video Setup



### Detection > Tracking > Tag detection > Split



- Tagged bees easily reidentified over long periods, e.g. days to weeks.
- Tracking collects a massive amount of data from all bees (tagged and untagged). It is short-term, on average 5 seconds.
- Our evaluation is based on tagged bees.
- Re-id is based on abdomen images to use markers as ground truth.

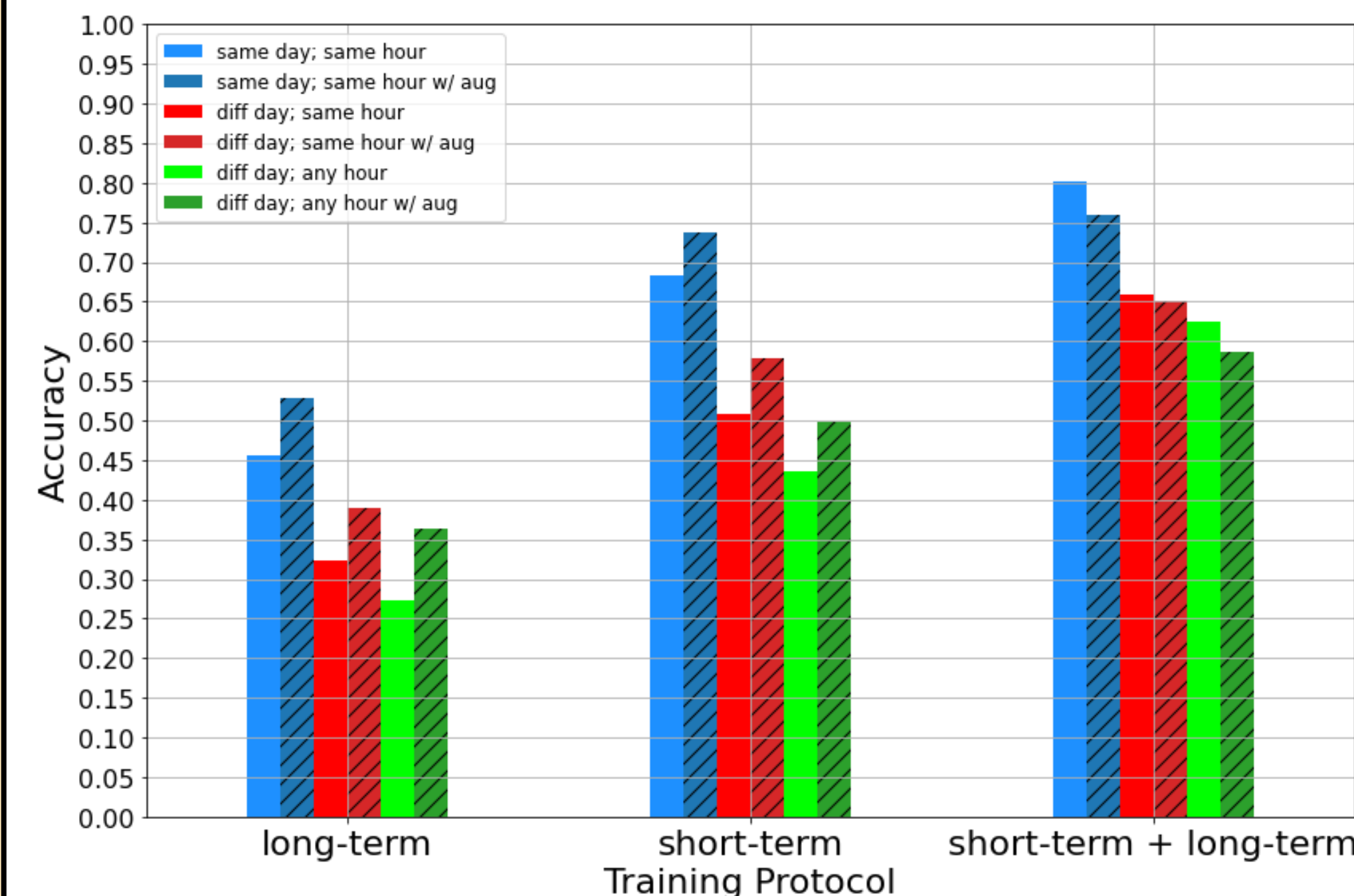
Dataset	Split	# individuals	# images	# tracks
Short-term	Train	-	109,654	4,949
Long-term (Tagged)	Train	181	3,777	801
	Valid	66	1,909	309
	Test	126	3,276	696

Table 1: Stats of the collected dataset.

## Training using short- vs long-term data

Our Re-ID models are CNN trained with triplet loss on the following protocols:

- **Long-term:** uses the tagged bees as training data. This dataset represents supervised training due to the manual effort required for placing tags.
- **Short-term:** uses untagged bees collected automatically. We assumed that different tracks belong to a different individuals. This assumption is justified with a low chance that the same untagged individual has multiple tracks.
- **Short-term + Long-term:** uses short-term protocol as pre-training and long-term protocol as fine-tuning.

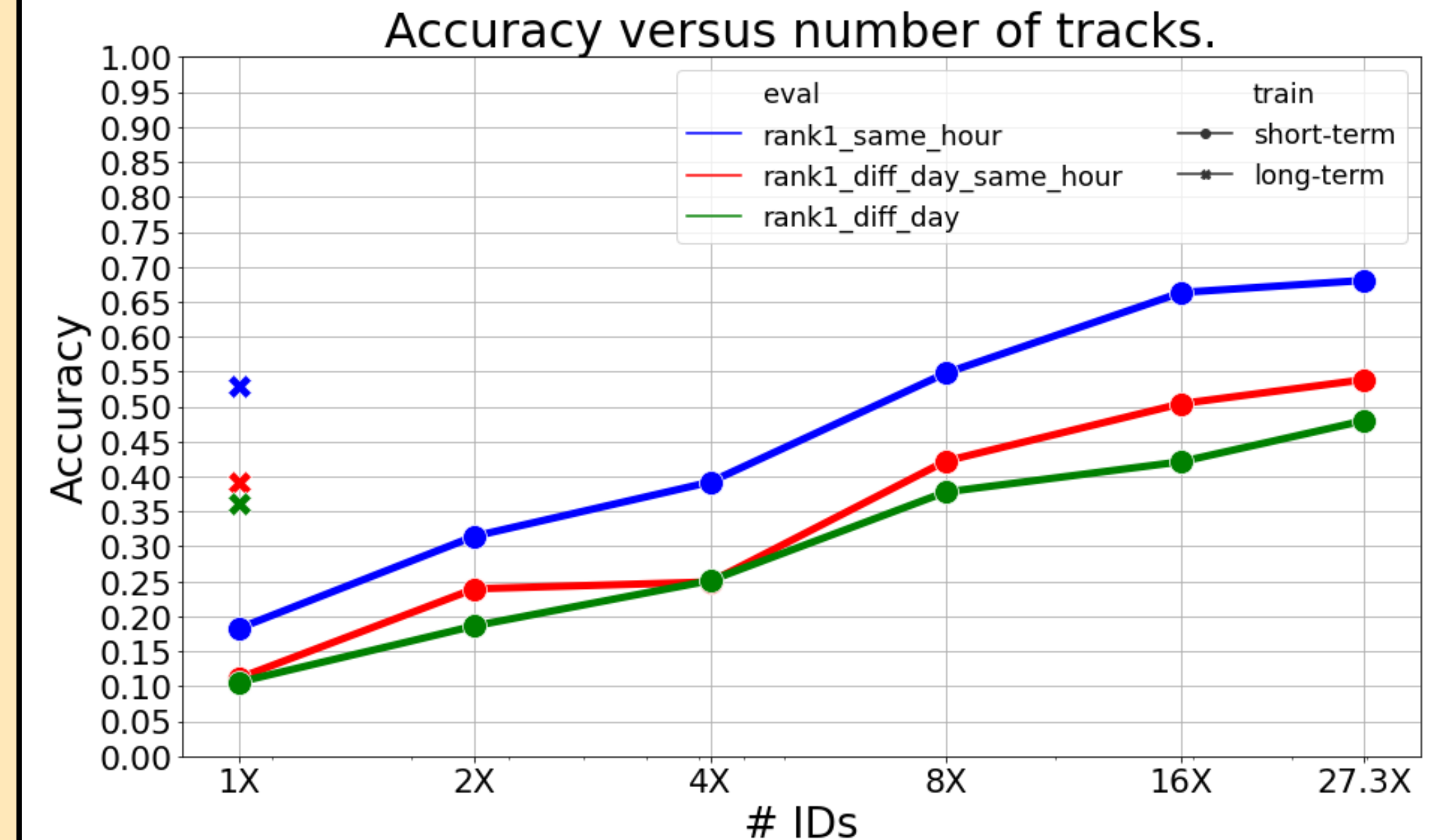


The evaluation consists of a query gallery comparison with 10 distractors and 1 positive sample.

Evaluation on 3 difficulty tiers, where positive pair is:

- **Same day, same hour** (at least 15 minutes apart but no more than 60 minutes)
- **Different day, same hour**
- **Different day, any hour**

## Effect of amount of short-term data



## Conclusion

- The amount of short-term data and data augmentation critically impacts the performance.
- Automatic short-term tracking can obtain a large amount of useful data for train re-identification models.
- Best performance is achieved using both datasets, short-term for pre-training and long-term for fine-tuning.

## Acknowledgements

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