

TGCRBNW: A Dataset for Runner Bib Number Detection (and Recognition) in the Wild



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Massive surge in running competitions







Existing datasets

Only one public dataset [1], 290 images in good daylight conditions





[1] I. Ben-Ami, T. D. (Basha), and S. Avidan, "Racing bib number recognition" British Machine Vision Conference, BMVC 2012.



We provide a richer dataset: +images , +complexity (daylight/nightlight)

Dataset	# images	# RBNs	Available	Daylight/Nlghtlight
Ben-Ami, 2012	217	290	yes	yes/no
Shivakumara, 2017	212	-	no	yes/no
lvarsson, 2019	262131	-	no	yes/no
Ours	2530	3232	yes	yes/yes



[1] I. Ben-Ami, T. D. (Basha), and S. Avidan, "Racing bib number recognition" British Machine Vision Conference, BMVC 2012.



[13] Is not a public dataset, also, annotations are not handcrafted:

"...FF-RBN dataset contains pseudo-labels, meaning that the images have been labelled through the algorithms of FlashFrame's software and not manually." [13]

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[13] E. Ivarsson and R. M. Mueller, "Racing bib number recognition using deep learning," **Proceedings of the 25th Americas Conference on Information Systems (AMCIS), 2019.**





Description of our dataset

Dataset taken from long distance competition (130 km), images taken from several Recording Points (**RP**) with **night** and **day** conditions







Dataset taken from long distance competition (130 km), images taken from several Recording Points (**RP**) with **night** and **day** conditions

Recording point	km	# ids annot.	# RBNs annot.	# images annot.
RPO	1	-	_	_
RP1	16.5	419	1522	1033
RP2	27.9	586	706	637
RP3	84.2	203	478	407
RP4	110.5	139	241	209
RP5	124.5	114	285	244
Total	-	-	3232	2530



A total of **3232 RBN** (Runner Bib Number) annotated from **2530 images**

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Dataset taken from long distance competition (130 km), images taken from several Recording Points (RP) with night and day conditions

Dataset taken from long distance competition (130 km), images taken from several Recording Points (**RP**) with **night** and **day** conditions

Testing the Dataset

To test the complexity of the new dataset we train several **Faster R-CNN** detectors

- **1. NIGHT**: Model trained with images captured in RP1 and RP2 (nightlight conditions)
- 2. DAY: Model trained with exclusively images captured in RP3, RP4 and RP5 (daylight conditions)
- 3. FULL: Model trained with images from any RP (day and nightlight conditions)

	No filtering			
Model	RP1-2	RP3-5	RP1-5	
DAY	0.23/0.59	0.58/0.77	0.30/0.65	
NIGHT	0.4070.86	0.4870.61	0.42/0.78	
FULL	0.41/0.85	0.46/0.74	0.42/0.82	
	In runner BBs			
Model	RP1-2	RP3-5	RP1-5	
DAY	0.48/0.56	0.67/0.69	0.53/0.60	
NIGHT	0.54/0.80	0.60/0.57	0.55/0.73	
FULL	0.59/0.80	0.62/0.67	0.60/0.76	
	In runner BBs and coherently located			
Model	RP1-2	RP3-5	RP1-5	
DAY	0.60/0.54	0.76/0.68	0.65/0.58	
NIGHT	0.69/0.77	0.69/0.57	0.69/0.71	
FULL	0.73/0.77	0.70/0.67	0.72/0.74	

Precision values are average (54,2%) which shows much room for improvement

	No filtering			
Model	RP1-2	RP3-5	RP1-5	
DAY	0.23/0.59	0.58/0.77	0.30/0.65	
NIGHT	0.4070.86	0.4870.61	0.42/0.78	
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NIGHT	0.69/0.77	0.69/0.57	0.69/0.71	
FULL	0.73/0.77	0.70/0.67	0.72/0.74	

Recall values far from perfect (70,8%) which also shows room for improvement

	No filtering			
Model	RP1-2	RP3-5	RP1-5	
DAY	0.23/0.59	0.58/0.77	0.30/0.65	
NIGHT	0.4070.86	0.4870.61	0.42/0.78	
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NIGHT	0.69/0.77	0.69/0.57	0.69/0.71	
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In essence, we miss some (Recall) and we make a lot of mistakes (Precision)

If we change the threshold (JI) the same behaviour can be seen

Let's take a look at the results:

Thanks, check our paper!!

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