PCAD: A Real-World Dataset for 6D Pose Industrial Anomaly Detection (Supplementary Material)

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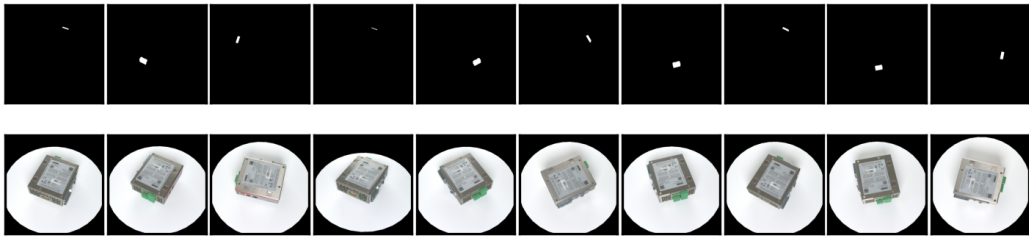[2]The author contributed to this work as part of the DAAD RISE program.

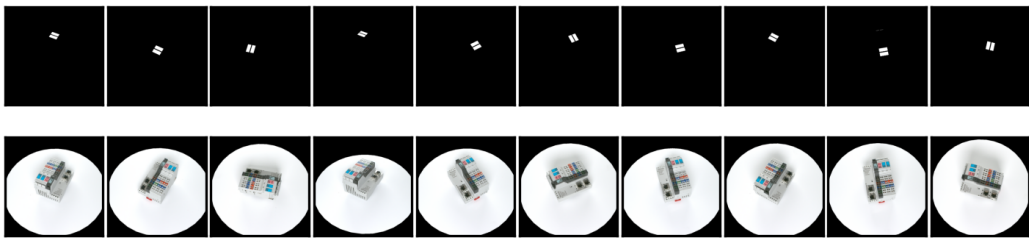Figure 1. Examples for product *Router* and defect class *Connector (TL)*

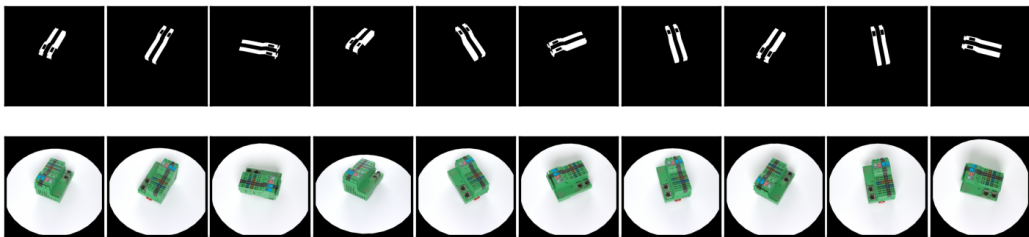Figure 2. Examples for product *Bus Coppler (Gray)* and defect class *Rails CL ⇄ CR*

Figure 3. Examples for product *Bus Coppler (Green)* and defect class *Rails L ⇄ CR*
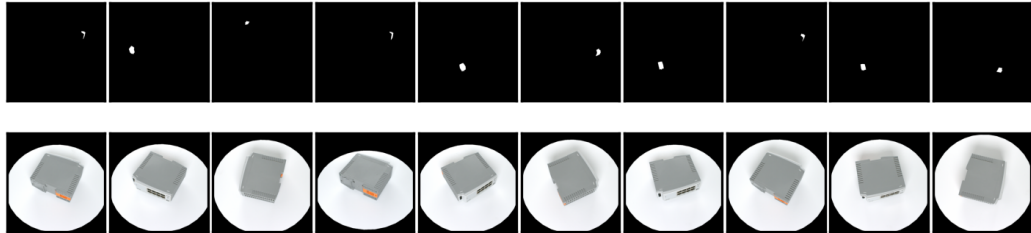
Figure 4. Examples for product *Switch*
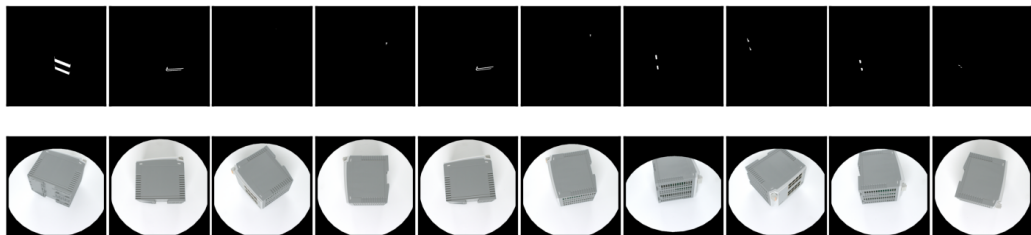*(8 x RJ-45)* and defect class *Connector (Side)*

Figure 5. Examples for product *Switch*
(16 x RJ-45) and defect class *Mount Clipper*

| Product Class	Defect Class	Type		2D AD					3D AD
		D	A	ReverseDistill	STFPM	PaDiM	EfficientAD	PatchCore	SplatPose
Router	Connector (BL)	M	STR	86.1/<u>97.1</u>/**65.7**	83.9/93.5/10.2	8.7/59.8/50.0	58.6/92.3/13.0	27.6/82.0/50.0	<u>92.3</u>/64.3/36.7
	Connector (BR)	M	STR	87.6/<u>95.7</u>/45.8	55.2/88.0/1.4	5.8/54.1/8.3	31.5/67.4/9.7	21.1/75.2/0.0	<u>90.6</u>/54.9/**47.5**
	Connector (TL)	M	STR	71.6/<u>94.1</u>/15.0	66.5/91.6/18.9	2.5/53.0/23.3	51.7/88.5/26.7	40.3/73.0/11.7	<u>89.5</u>/73.1/**58.0**
	Connector (TR)	M	STR	72.6/<u>93.9</u>/**58.9**	66.1/92.4/42.2	11.1/68.6/50.0	43.5/82.8/15.6	32.7/77.7/50.0	<u>86.3</u>/62.6/36.0
Bus Coppler (Gray)	Rails CL ⇌ CR	I	SEM	70.0/89.3/2.2	<u>82.3</u>/<u>94.6</u>/28.3	5.7/48.3/0.0	58.2/87.6/22.2	5.8/52.8/0.0	79.1/36.0/**38.0**
	Rails L ⇌ CR	I	SEM	<u>91.1</u>/<u>97.2</u>/**100**	86.0/95.4/53.3	15.8/69.3/0.0	72.9/91.8/90.6	62.4/88.8/2.8	90.6/68.2/31.0
	Mount Clipper	M	STR	88.2/<u>97.4</u>/31.7	72.3/93.1/19.0	4.5/63.4/**50.0**	71.7/91.4/42.9	44.8/87.7/34.1	<u>89.7</u>/62.1/41.4
	Rail CR	M	STR	<u>93.4</u>/<u>98.1</u>/**100**	84.3/95.8/63.3	10.6/60.3/3.3	59.1/87.4/96.7	72.0/93.4/61.7	90.7/70.2/21.0
	Rail L	M	STR	<u>93.7</u>/<u>98.7</u>/**65.6**	82.4/95.4/12.8	8.0/63.1/0.0	77.0/93.3/8.3	67.2/91.8/42.8	90.2/60.8/39.0
Bus Coppler (Green)	Rails CL ⇌ CR	I	SEM	66.5/90.9/0.0	<u>83.1</u>/<u>94.5</u>/3.9	1.7/41.8/**50.0**	61.8/85.0/36.7	12.5/54.8/0.0	69.3/21.2/6.0
	Rails L ⇌ CR	I	SEM	<u>91.9</u>/<u>97.7</u>/**87.2**	86.9/96.2/12.2	14.7/58.7/33.3	82.0/94.5/77.2	58.0/86.4/0.6	87.5/59.9/18.0
	Mount Clipper	M	STR	60.2/<u>93.0</u>/6.7	65.8/89.7/20.0	0.0/44.7/33.3	44.9/69.4/41.1	19.2/78.9/0.0	<u>86.7</u>/58.3/**54.0**
	Rail CR	M	STR	<u>92.7</u>/<u>98.0</u>/**100**	81.8/95.4/25.6	22.2/69.8/50.0	82.7/94.7/49.4	52.3/87.2/43.3	87.3/64.4/44.0
	Rail L	M	STR	<u>92.7</u>/<u>98.0</u>/**40.0**	78.8/95.1/2.8	6.4/59.7/28.3	75.3/94.6/23.3	52.5/85.4/1.1	86.6/57.0/17.0
Switch (16 x RJ-45)	Connector (Side)	M	STR	89.7/<u>97.3</u>/**100**	57.5/89.3/88.3	28.0/74.9/88.9	36.9/75.8/65.3	63.6/89.9/**100**	<u>89.8</u>/62.3/66.0
	RJ-45 Array	M	STR	<u>93.2</u>/<u>98.4</u>/**100**	81.0/95.1/**100**	12.6/69.3/83.3	75.8/94.8/48.5	54.4/95.4/**100**	88.2/55.7/65.0
	Mount Clipper	M	STR	82.2/<u>98.2</u>/**100**	79.2/95.1/**100**	21.8/66.7/91.7	75.7/94.1/69.7	71.1/97.2/**100**	<u>87.4</u>/74.0/47.5
Switch (8 x RJ-45)	Connector (Side)	M	STR	87.4/<u>97.7</u>/32.8	68.3/90.7/32.2	77.9/93.7/38.3	43.9/82.5/4.7	81.0/96.6/**55.6**	<u>95.7</u>/85.3/46.0
	RJ-45 Array	M	STR	78.1/<u>97.0</u>/**72.7**	78.7/94.5/57.6	16.5/84.2/51.5	44.2/89.6/0.0	23.0/85.5/31.8	<u>90.1</u>/56.8/42.5
	Mount Clipper	M	STR	79.5/<u>98.7</u>/**73.6**	72.9/93.3/6.9	48.5/84.4/50.7	26.1/87.6/0.0	55.1/97.6/56.9	<u>96.0</u>/80.8/66.2

Table 1. Results of training and evaluation of different anomaly detection methods on our five product classes with various defects. In the defect class name, the position of the rails of the *Bus Coppler* is designated as L, CL, CR, R from left to right and the exchange of parts is marked with the symbol ⇌. Likewise, the position of the connectors of *Router* is encoded as BL, BR, TR, TR from bottom-left to top-right. The defect type (D) is furthermore specified as M: *Missing Part* and I: *Interchanged parts*, and the anomaly type (A) is specified as STR: *Structural Anomaly* and SEM: *Semantical Anomaly*. The evaluation metrics occur in the order *Pixel AUPRO*, *Pixel AUROC* and *Image AUROC* and are seperated by the forward slash symbol (best underlined with dots, fully underlined and boldface).

Figure 6. Hardware setup for the dataset acquisition from the side. The servo motor is fixed to the table from the bottom-side and the axis is attached to the circular plate. The light panels to the left and right are fixed in position for the acquisiton of the main dataset. For the secondary dataset with variations in lighting, the light panels are randomly shifted to induce shadow casting. The camera is attached to the tip of robot arm. The gripper of the robot arm is not utilized and kept open.
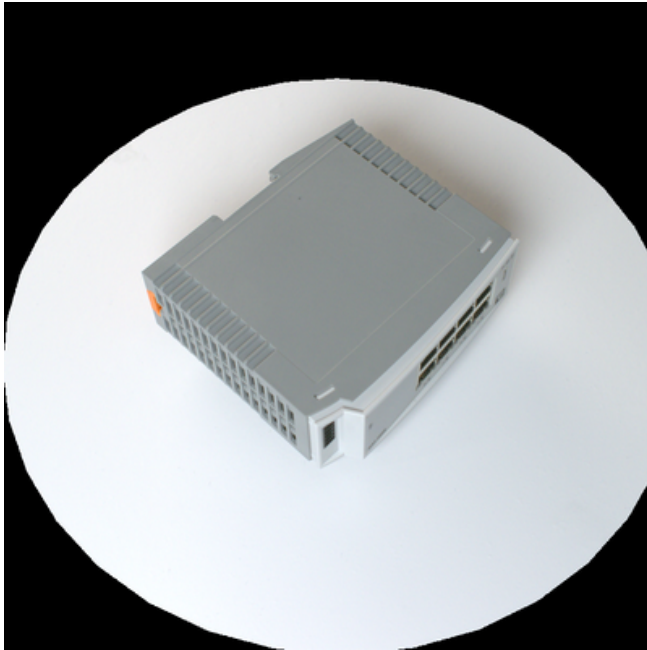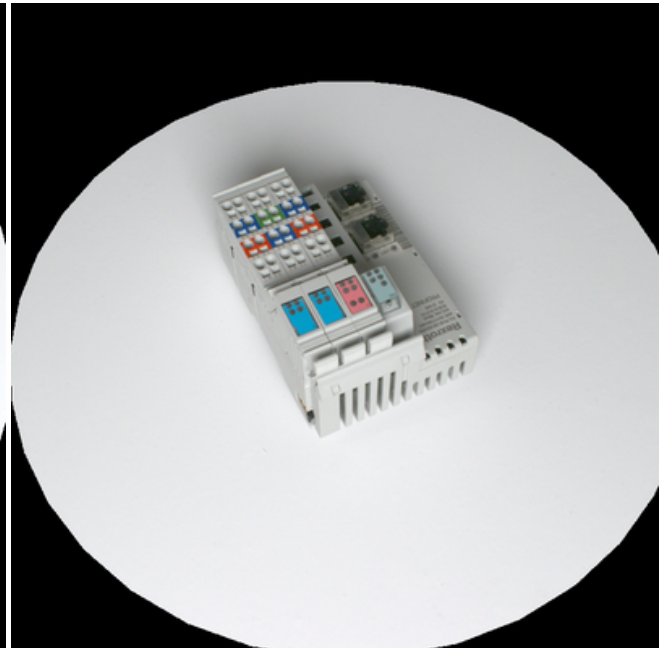
(a) Switch (8xRJ-45) Missing Connector (Side)
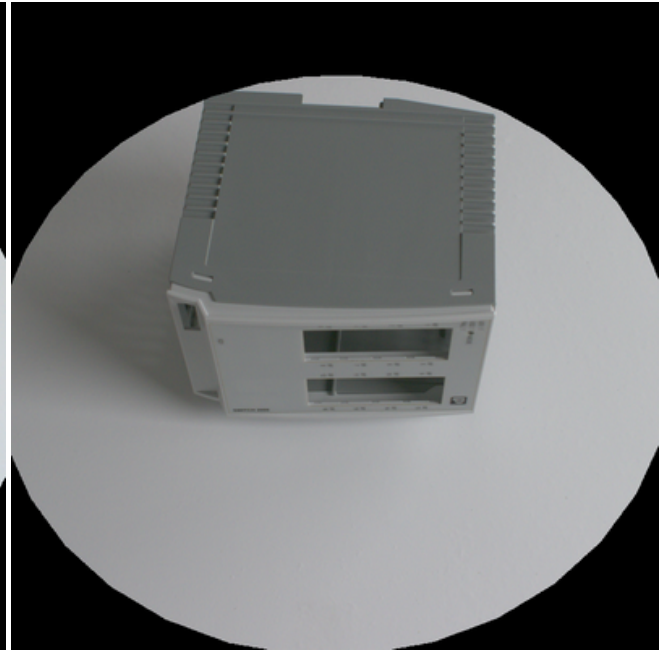
(b) Switch (16xRJ-45) Missing RJ-45 Array
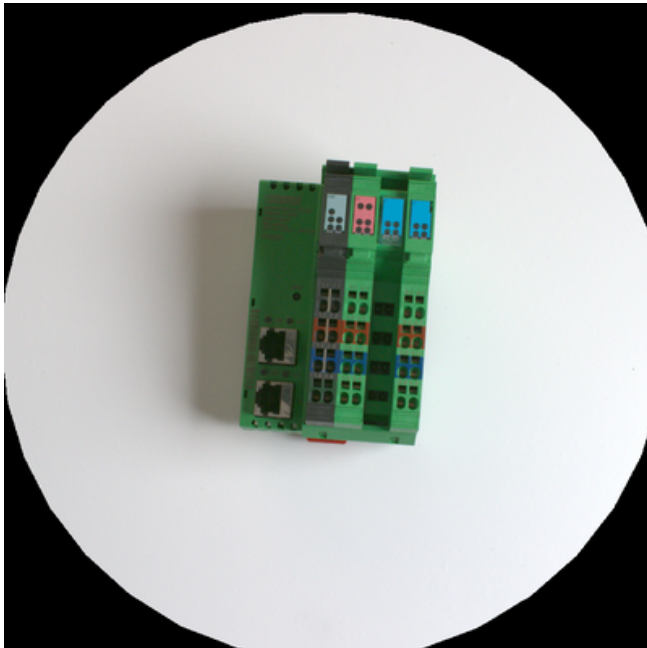
(c) Bus Coppler (Green) Missing Rail CR

(d) Bus Coppler (Gray) Missing Rail L

Figure 7. Examples for products with defects captured with randomly changing lighting conditions. The light pannel behind the camera remains in place. The light in front of the camera is randomly moved to different positions and light intensity is randomly changed. For each data acquisition round with a product and a specific defect, the lighting setup remains constant.

Figure 8. Example for result from 3D gaussian splatting for product *Router*.

Figure 10. Example for result from 3D gaussian splatting for product *Bus Coppler (Gray)*.
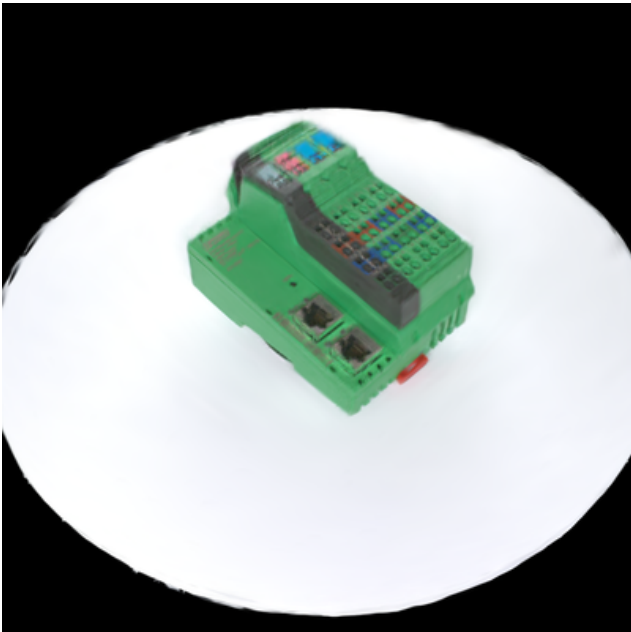

Figure 9. Example for result from 3D gaussian splatting for product *Bus Coppler (Green)*.

Figure 11. Example for result from 3D gaussian splatting for product *Switch (8 x RJ-45)*.

Figure 12. Example for result from 3D gaussian splatting for product *Switch (16 x RJ-45)*.