

Instruction of FAIR-CSAR-V1.0 Dataset

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Reference and Citation Format for FAIR-CSAR-V1.0 dataset:

- [1] Y. Wu, Y. Suo, Q. Meng, W. Dai, T. Miao, W. Zhao, Z. Yan, W. Diao, G. Xie, Q. Ke, Y. Zhao, K. Fu, X. Sun, "FAIR-CSAR: A Benchmark Dataset for Fine-Grained Object Detection and Recognition Based on Single-Look Complex SAR Images," in *IEEE Transactions on Geoscience and Remote Sensing*, vol. 63, pp. 1-22, 2025, Art no. 5201022, doi: 10.1109/TGRS.2024.3519891.
- [2] 吴有明, 刁文辉, 索玉玺, 孙显. FAIR-CSAR 复图像目标数据集 V1.0 (FAIR-CSAR-V1.0) [OL]. 雷达学报, 2025. https://radars.ac.cn/web/data/getData?dataType=FAIR_CSAR..
- Youming Wu, Wenhui Diao, Yuxi Suo, Xian Sun. A Benchmark Dataset for Fine-Grained Object Detection and Recognition Based on Single-Look Complex SAR Images (FAIR-CSAR-V1.0) [OL]. Journal of Radars, 2025.
- https://radars.ac.cn/web/data/getData?dataType=FAIR_CSAR_en&pageType=en.

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Dataset Overview: FAIR-CSAR-V1.0 dataset aims to advance research in fine-grained SAR object detection and recognition by providing the SAR complex-valued samples and corresponding scattering characteristic annotations of various sub-categories. Derived from 175 full-scene Gaofen-3 Level-1 Single-Look Complex (SLC) products, this dataset covers 32 global regions covering airports, refineries, ports, and riverways. With a total volume of 250GB and over 340K instances across 5 major categories and 22 subcategories, it stands as the largest SAR target dataset to date, featuring the most refined annotation granularity and highest bit-depth storage

precision. In addition, to facilitate SAR target characteristic-guided algorithm optimization, FAIR-CSAR-V1.0 provides detailed annotations of satellite-ground azimuth angles and strong scattering point distributions, offering foundational support for exploiting SAR target scattering properties.

The FAIR-CSAR-V1.0 dataset contains two sub-datasets, the SL dataset and the FSI dataset. The SL dataset is in Spotlight mode with a nominal resolution of 1m, which contains 170K instances covering a total of 22 classes. The specific label is Airbus_A220, Airbus_A320, Airbus_A330, Airfreighter, Boeing737, Boeing747, Boeing767, Boeing777, Fokker-50, Gulfstream, Helicopter, Other_Aircraft, Bulk_Carrier, Container_Ship, General_Cargo_Ship, Motion_Defocusing_Ship, Oil_Tanker, Warship, Other_Ship, Bridge, Tank, Tower_Crane; The FSI dataset is in Fine Stripmap Mode with a nominal resolution of 5m, which contains 170K instances across 3 classes, namely Bridge, Ship, and Tank.

Both SL and FSI datasets are divided into training-validation sets (SL-TRAINVAL and FSI-TRAINVAL) and test sets (SL-TEST and FSI-TEST) with the following directory structure:

1. SL数据集 1) SL-TRAINVAL a) SLCMats b) PNGImages c) Annotations d) METAXmls e) KeyPoints 2) SL-TEST a) SLCMats b) PNGImages c) Annotations d) METAXmls e) KeyPoints	2. FSI数据集 1) FSI-TRAINVAL a) SLCMats b) PNGImages c) Annotations d) METAXmls e) KeyPoints 2) FSI-TEST a) SLCMats b) PNGImages c) Annotations d) METAXmls e) KeyPoints
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Directory Structure and File Descriptions:

1) SLCMats-Float32 single-look complex images stored as complex matrices in .mat files.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
1	-6.0137e+...	26.2677 -	-74.3496 +	-21.7402 -	-7.3298e+...	-1.0804e+...	2.6201e+0...	-24.7521 -	-1.1214e+...	-99.3405 +	4.8961e+0...	34.8589 +	-36.5102 -	2.7029 -	5.1079e+...	-19.9078 -	7.0415e+0...	-2.61
2	-48.9436 -	-2.9913 -	1.100607 +	-4.6201 +	-2.6424 -	6.130506 -	12.6247 -	-13.5347 -	-39.8538 -	-54.8814 -	-8.4127 +	22.1205 +	-46.5553 -	5.0179 +	-16.4603 -	-39.7224 -	6.2892 -	8.333
3	1.5243 -	3.41938 -	-4.5544 -	4.750162 -	-1.1233e+...	-24.8220 +	-19.9910 -	40.3554 -	49.3657 +	50.6764 -	60.1359 +	-26.8872 +	20.0686 +	-10.3595 +	-17.2986 +	-22.2712 -	26.6792 -	6.10E
4	-3.8426 -	1.359227 -	-4.4528 -	3.500884 -	72.1485 -	57.7393 -	16.7362 -	70.6532 +	23.8881 +	-51.2164 +	11.2636 +	34.4414 -	43.7160 -	22.5919 -	36.2203 -	11.4150 -	22.1650 -	6.28
5	1.84750 +	8.7796 -	41.4006 +	18.9781 +	35.1983 +	-20.8812 -	-1.2654 +	-30.1989 -	3.1772 -	8.01786 +	-21.5506 +	12.4913 -	22.8677 -	10.3496 +	-26.3950 -	31.1134 -	54.5294 -	15.4
6	1.5141 -	27.2004 -	-23.0292 -	21.0090 -	12.9909 -	5.6721e+0...	2.2175 -	-28.4714 +	-32.9532 -	-36.0466 +	-58.7340 -	-52.6110 +	-10.8168 -	-1.1868 +	-47.1892 +	-80.8717 -	46.4524 -	-55.0
7	16.2403 +	-27.7793 +	-24.5530 -	32.6436 -	-54.7057 -	-28.9462 +	-1.2237 -	4.17038 -	7.29634 -	1.3170 +	1.3087 +	-95.8886 +	-5.8391 +	-2.1311 +	-38.2721 -	12.1753 -	-63.4873 -	-18.3
8	8.109154 -	31.0744 -	3.7254 +	-24.3214 -	-22.9613 -	13.3541 -	-15.5144 -	-11.6391 -	-41.2437 -	-77.5899 -	0.4982 -	1.7145 -	-25.5252 -	40.3042 -	43.0554 -	-23.5752 -	-14.9532 -	8.422
9	-15.8489 +	-29.9122 -	1.3874 -	3.31359 -	-3.2919 -	-3.22071 -	-9.5216 +	-15.5473 +	31.7237 +	-40.2457 +	-52.2388 +	-37.4111 +	-10.7473 -	1.1533 +	1.24292 +	63.4285 +	2.8751 +	9.422
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11	11.28.2050 +	14.6105 -	25.0932 -	2.2183 -	6.52.3085 -	47.3163 -	-30.4077 -	24.5902 -	11.7694 -	-14.6748 -	-27.5404 -	-28.3277 -	26.8191 -	27.3654 -	42.0479 -	-22.8067 -	51.4851 -	35.0
12	11.9714 -	-36.1765 +	-45.8563 -	24.7852 -	-53.7713 -	9.9378 -	3.64231 -	67.0473 -	-15.9243 +	0.9789 -	9.3878 -	26.8878 -	-1.5553 -	8.19.8438 -	1.1822 +	1.34.9136 -	-44.3485 -	19.5
13	13.30.4975 -	5.2031 -	3.6.1858 +	27.9750 -	5.0349 -	6.1.2461 -	1.22.7698 -	36.5719 -	5.0407 -	6.56307 -	5.29.7643 +	-8.7815 +	81.2334 -	13.6095 +	-20.1604 -	48.3071 -	-21.4907 -	-66.8
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16	16.58.5020 -	-2.1639 -	0.36.7499 +	35.4800 +	11.2542 -	1.0724e+0...	88.1195 -	56.7159 -	40.0607 -	-25.0069 -	-7.9168 -	-45.2013 +	-3.5481 -	1.12.4159 +	4.1526 +	4.60.3625 +	-10.4697 -	-63.5
17	17.31.3444 -	14.0977 +	-21.3058 -	-13.7644 -	-33.4580 -	-34.9999 +	-39.8518 -	-17.0283 -	4.4602 +	2.32.9879 +	13.0705 -	-72.4908 -	1.5295 +	2.5.2010 -	1.13.8646 -	5.5028 -	18.2112 -	42.9
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26	8.2037 +	3.19.9845 -	-9.7979 +	-24.5014 -	7.0561 -	3.18.6662 -	-22.4374 -	-16.8826 -	-16.4413 -	-8.4298 +	-51.4510 -	-54.1210 +	28.8228 -	15.9019 -	-15.3323 -	30.7653 -	14.8905 -	1.64
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31	31.46.5662 +	-27.6548 -	23.7653 -	16.2070 -	-24.7561 +	-9.9916 -	-32.7466 -	34.4665 -	31.4320 -	11.6913 -	9.1479 +	-25.8866 -	-8.1189 -	-9.1435 -	-31.1974 -	-1.0505 -	45.1355 +	38.75
32	32.16.0561 -	31.9416 -	-14.8065 -	3.3456 -	0.1.0937 +	9.42.6690 -	-18.5613 +	-7.9644 +	-76.7607 -	-1.1223e+...	-58.0568 -	-17.4693 +	11.6954 -	19.0183 -	-27.3193 +	-3.4482 -	-39.9196 -	-84.5
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35	8.64799 -	1.2.4335 -	2.16.2777 +	-26.4363 +	2.1905 +	4.17.8639 +	48.8232 -	16.3262 -	7.2870 -	6.37.2903 -	-48.1692 -	-19.7440 -	-58.8242 +	-56.8824 +	-11.0311 -	19.4278 -	55.9987 -	83.2
36	38.47.0543 +	-11.4297 +	-3.4818 -	7.41.7419 +	-5.64.5161 +	-27.7307 +	1.6.6581 -	-17.7624 -	14.1687 +	-2.9.6454 -	1.7.7396 -	4.9.4607 +	-11.5747 +	11.8528 -	-2.9.8920 -	3.1.2453 -	0.9.7318 -	14.4F

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(GF3_KAS_SL_022725_E100.9_N12.6_20201203_L1A_HH_L10000000001_02048_26208.mat)

2) PNGImages-Uint8 intensity images in .png format.



(GF3_KAS_SL_022725_E100.9_N12.6_20201203_L1A_HH_L10000000001_02048_26208.png)

3) **Annotations**-oriented bounding box (OBB) annotations in DOTA format.

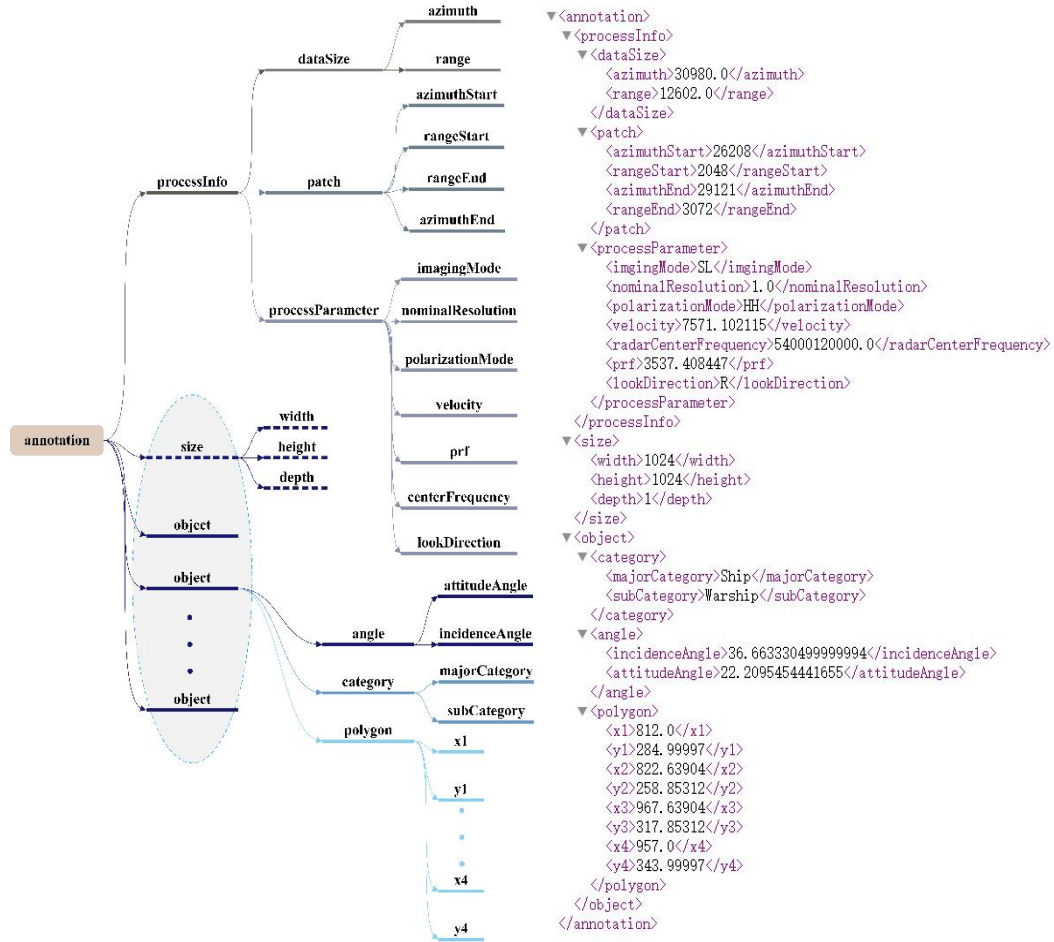
812.0 284.9999694824219 822.6390380859375 258.8531188964844 967.6390380859375 317.8531188964844 957.0 343.9999694824219 Warship 0



(GF3_KAS_SL_022725_E100.9_N12.6_20201203_L1A_HH_L10000000001_02048_26208.txt)

4) **METAXmls**-Extensible markup language (XML) files containing imaging parameters (e.g.,

pulse repetition interval) alongside bounding boxes and class labels.



(GF3_KAS_SL_022725_E100.9_N12.6_20201203_L1A_HH_L10000000001_02048_26208.xml)

- 5) **KeyPoints-XML** based annotations of strong scattering point distribution. Each target instance is labeled with 9 key scattering points to characterize its topological structure.





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