

**UNIVERSITY OF TRENTO
NEXT GENERATION
NETWORKS**

**IMPORT AND ANALYZE
ONLINE NETWORKING
DATASETS**

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[REPOSITORY](#)



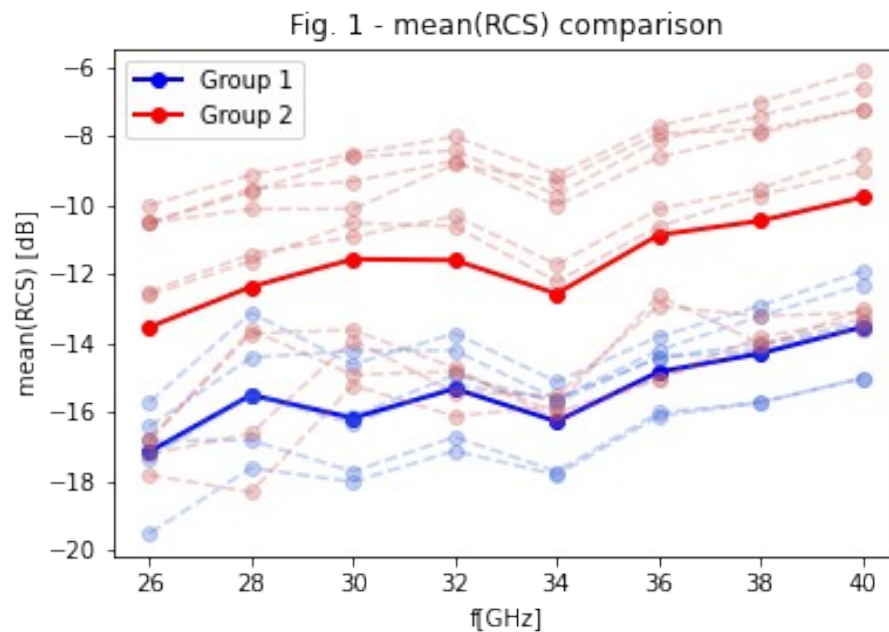
GOAL

- Build a software for automated processing and visualization of extracted information from online datasets
- Build a Software for distinction of drones according to RCS measurements

TABLE 2

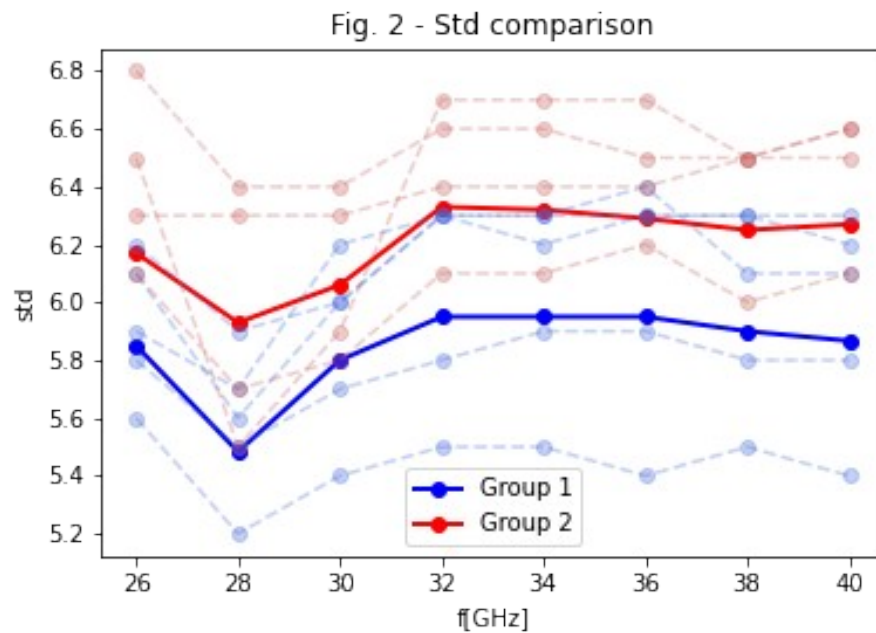
Mean, standard deviation and maximal value of the RCS of each drone over the frequency range																								
Model	26GHz			28GHz			30GHz			32GHz			34GHz			36GHz			38GHz			40GHz		
	μ	std	max	μ	std	max	μ	std	max	μ	std	max	μ	std	max	μ	std	max	μ	std	max			
Group I																								
F450 (HH)	-17.1	5.9	3.3	-15.5	5.7	6.3	-16.1	6.2	7.6	-14.9	6.3	7.0	-15.7	6.3	8.0	-14.4	6.4	8.1	-14.2	6.1	8.3	-13.5	6.1	9.3
Helicopter (HH)	-17.3	5.8	6.3	-15.5	5.5	2.3	-16.3	5.7	8.6	-15.2	5.8	6.9	-15.6	5.9	5.4	-14.4	5.9	12.4	-14.0	5.8	8.8	-13.4	5.8	8.4
Mavic (HH)	-16.8	6.1	2.3	-16.8	5.6	2.4	-17.7	6.0	4.3	-16.7	6.3	6.5	-17.7	6.2	1.7	-16.0	6.3	7.1	-15.7	6.3	6.5	-15.0	6.2	7.5
Parrot (HH)	-19.5	6.2	4.6	-17.6	5.9	3.1	-18.0	6.0	5.7	-17.1	6.3	6.5	-17.8	6.3	8.2	-16.1	6.3	7.7	-15.7	6.3	9.5	-15.0	6.3	11.7
P4P (HH)	-16.4	5.6	2.6	-14.4	5.2	1.1	-14.2	5.4	3.0	-14.2	5.5	1.8	-15.6	5.5	2.5	-14.2	5.4	3.11	-13.2	5.5	2.5	-12.3	5.4	5.7
P4P (VV)	-15.7	5.5	0.1	-13.1	5.0	5.4	-14.6	5.5	3.8	-13.7	5.5	4.1	-15.1	5.5	2.6	-13.8	5.4	2.8	-12.9	5.4	4.6	-11.9	5.4	5.1
Group II																								
Hexa (HH)	-10.5	6.3	10.9	-10.1	6.3	14.0	-10.1	6.3	11.5	-8.8	6.4	12.6	-9.3	6.4	20.0	-7.9	6.4	14.0	-7.8	6.5	15.0	-7.2	6.5	16.6
Hexa (VV)	-10.5	6.2	11.4	-9.5	5.8	11.9	-9.3	6.2	12.2	-8.7	6.4	14.0	-10.0	6.4	12.8	-8.6	6.4	14.9	-7.9	6.4	15.8	-7.2	6.4	18.3
M100 (HH)	-10.5	6.8	15.8	-9.6	6.4	19.6	-8.6	6.4	16.0	-8.4	6.6	20.0	-9.7	6.6	20.5	-8.1	6.5	20.3	-7.4	6.5	19.7	-6.6	6.6	22.5
M100 (VV)	-10.0	6.5	14.8	-9.1	6.3	23.0	-8.5	6.4	17.8	-8.0	6.6	20.9	-9.1	6.5	18.3	-7.7	6.6	19.4	-7.0	6.5	20.0	-6.1	6.5	25.0
M100 (VH)	-17.2	5.4	0.1	-16.6	5.3	5.5	-13.9	5.5	5.0	-15.4	5.7	3.3	-15.5	5.9	4.0	-12.9	5.7	5.5	-13.2	5.6	5.8	-13.1	5.8	7.0
M100 (HV)	-17.8	5.5	-1.3	-18.3	5.8	1.2	-15.2	5.8	3.8	-16.1	5.9	3.5	-15.8	5.9	4.5	-12.6	5.6	6.1	-14.0	5.7	5.0	-13.6	5.7	7.2
Walkera (HH)	-12.6	6.1	8.1	-11.6	5.7	9.2	-10.5	5.8	9.4	-10.6	6.1	10.0	-12.2	6.1	8.4	-10.6	6.2	12.3	-9.7	6.0	11.0	-9.0	6.1	11.7
Walkera (VV)	-12.5	5.8	7.4	-11.4	6.7	9.9	-10.9	6.0	9.3	-10.3	6.1	11.5	-11.7	6.0	8.7	-10.1	6.0	12.6	-9.5	6.0	11.4	-8.5	5.9	13.2
Y600 (HH)	-16.8	6.5	6.3	-13.7	5.5	8.0	-13.6	5.9	8.1	-14.7	6.7	9.3	-16.2	6.7	9.7	-15.0	6.7	10.0	-13.8	6.5	13.5	-13.3	6.6	12.3
Y600 (VV)	-16.8	6.6	6.7	-13.6	5.5	8.8	-14.9	6.3	7.8	-14.8	6.8	11.8	-16.0	6.7	9.1	-15.0	6.8	11.8	-14.1	6.8	11.8	-13.0	6.6	12.3

mean(RCS) comparison



- mean(RCS) of group I and II are significantly different
- mean(RCS) it grows increasing frequency, but it does not depend on the group or single drone
- Therefore, it is not necessary to use ALL the frequencies in the statistical model, and we can limit ourselves to a few (see table 2 of the paper)

Std comparison



- The Std does not depend on the drone or on the frequency
- difference of an order of magnitude
- we don't use it in the statistical model

HH – VV comparison

Fig. 3.0 - Std comparison - P4P

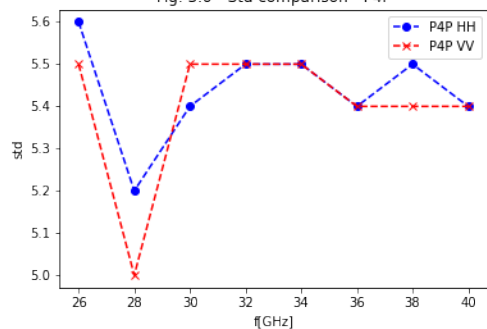


Fig. 3.2 - Std comparison - HEXA

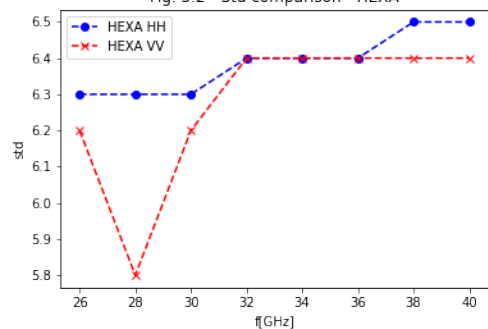


Fig. 3.4 - Std comparison - M100

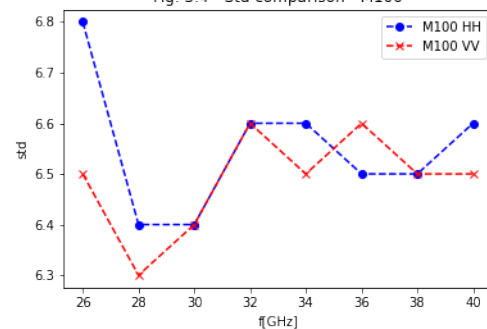


Fig. 3.6 - Std comparison - WALKERA

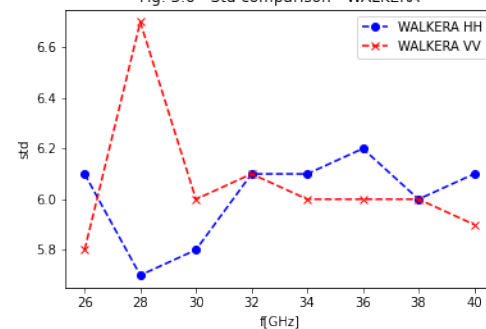


Fig. 3.8 - Std comparison - Y600

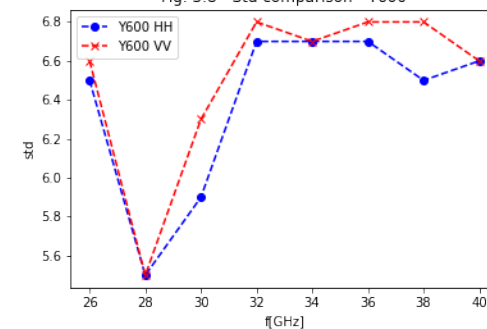


Fig. 3.1 - Mean comparison - P4P

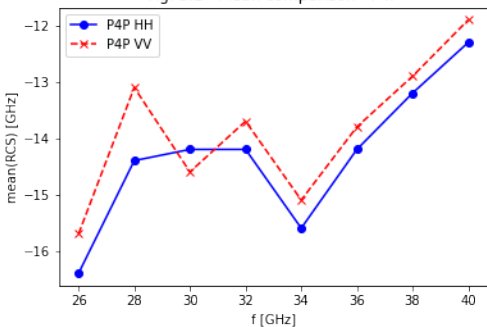


Fig. 3.3 - Mean comparison - HEXA

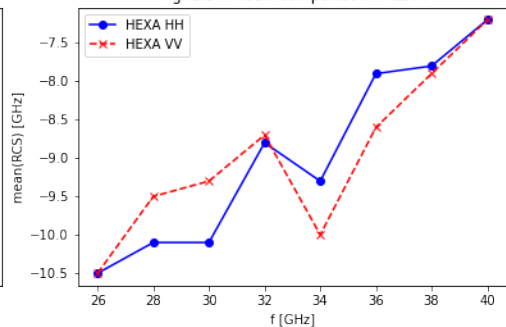


Fig. 3.5 - Mean comparison - M100

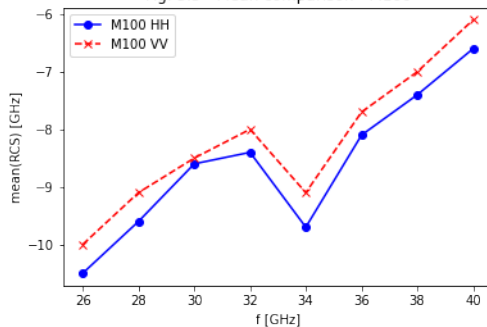


Fig. 3.7 - Mean comparison - WALKERA

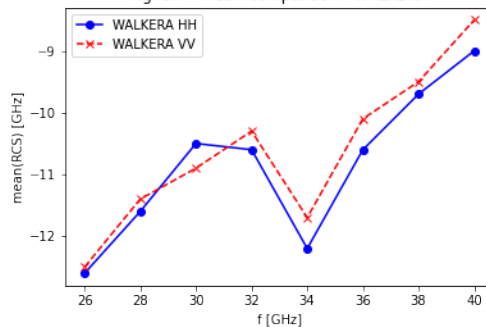
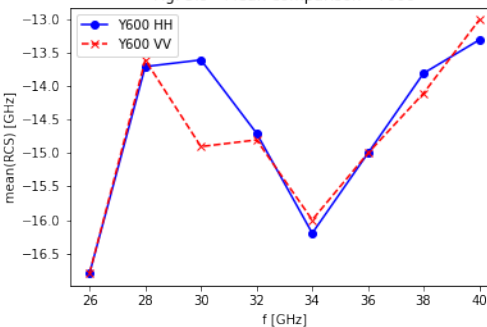


Fig. 3.9 - Mean comparison - Y600



Cross - polarization

Fig. 4.0 - Mean comparison - M100

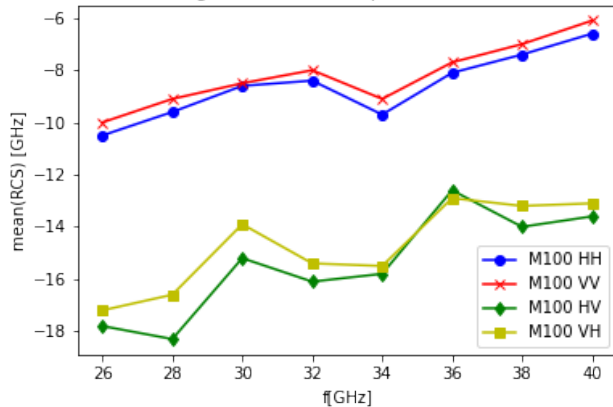
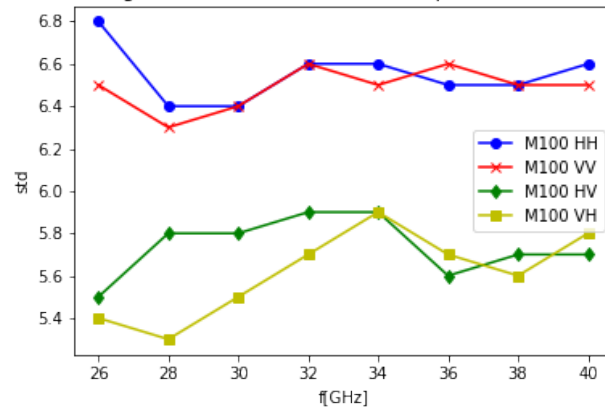
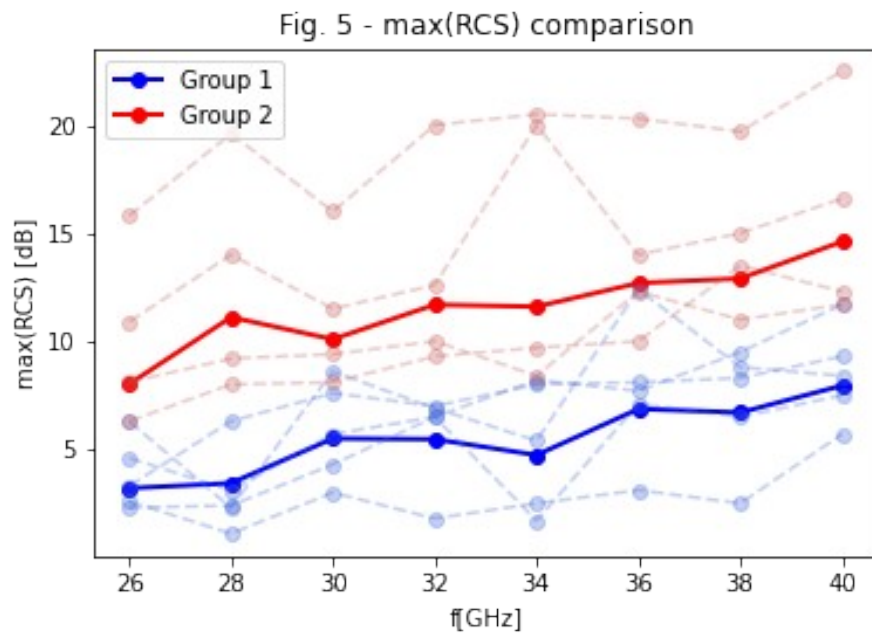


Fig. 4.1 - Standard deviation comparison - M100



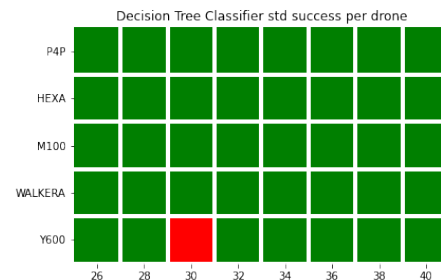
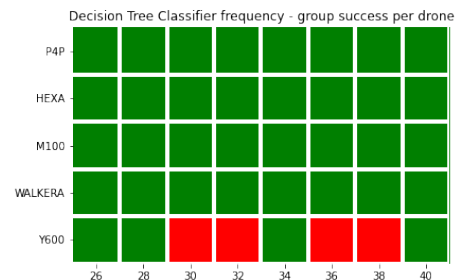
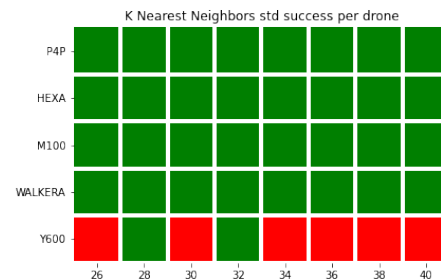
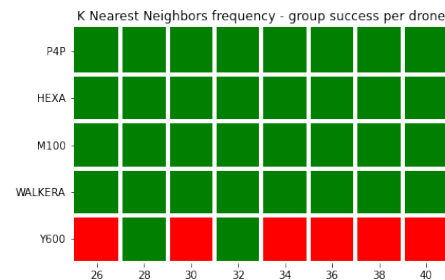
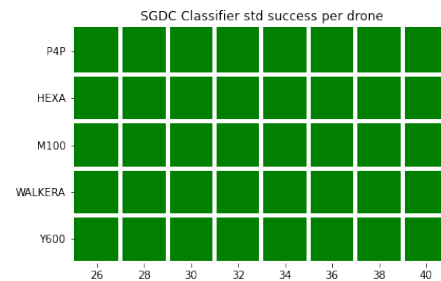
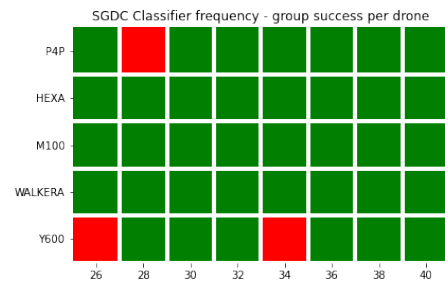
- HV cross-polarizations give small RCS compared to HH and VV, mean and std are smaller.
- HV's std is offset from that of HH, we don't use HV.

max(RCS) comparison



- max(RCS) is used to distinguish groups and/or single drones

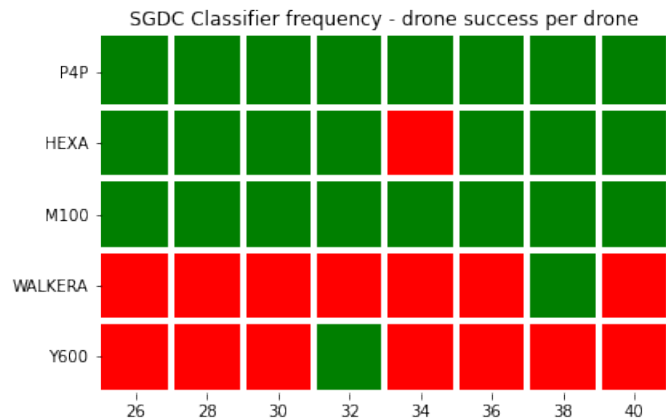
Classifiers - Groups



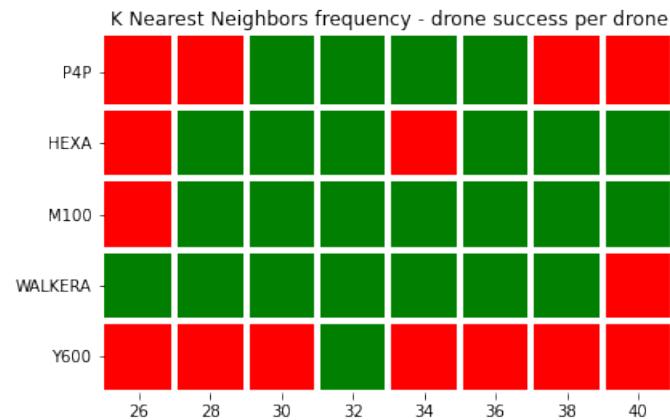
- The std has very little influence on the results, so it can be excluded

	NO Std		Std	
	HH	VV	HH	VV
SGDC	1,0	1,0	1,0	1,0
KNN	<u>0,9</u>	0,85	0,9	0,85
DTC	1,0	1,0	1,0	1,0

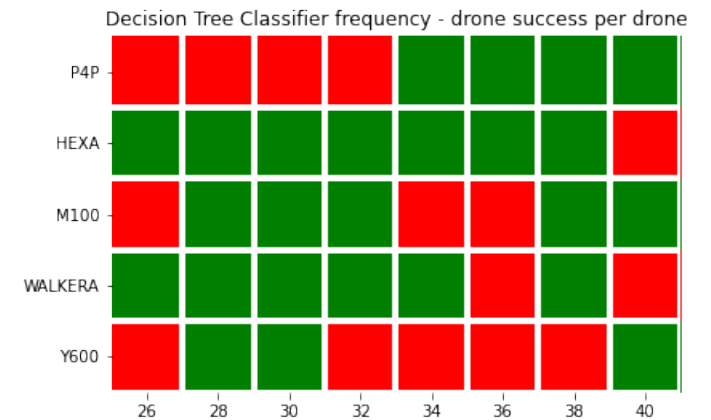
Classifiers - Drones



Score(HH): 0.55
Score(VV): 0.625



Score(HH): 0.48
Score(VV): 0.625



Score(HH): 1.0
Score(VV): 0.575



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