S1. Assembly of RefIMP

Tiles containing few particles (< 20), blurred areas or high background noise were excluded as far as possible. The most suitable tiles were collected in a folder and renamed systematically to build up the reference image. Care was taken to avoid the separation of tiles that were connected to each other in the original images. The re-named tiles were converted from the Agilent-specific format *.dmd to *.wno and *.spe using siMPle (https://simple-plastics.eu).

Single tiles can be replaced or another reference image can be built similarly.

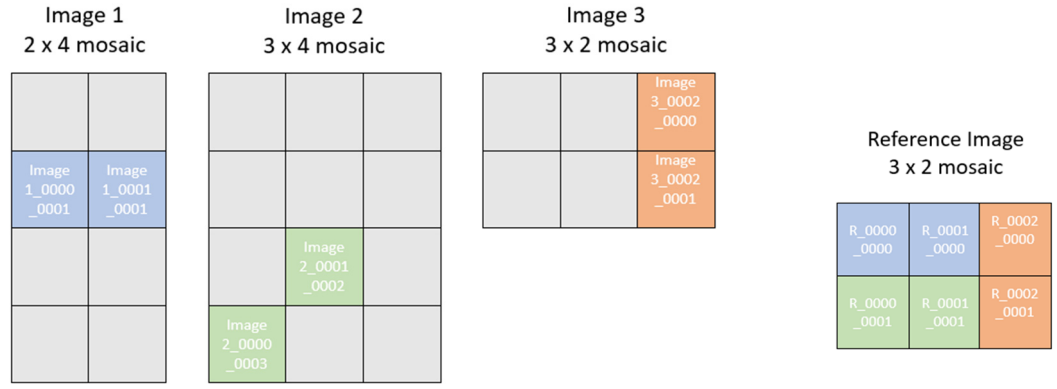
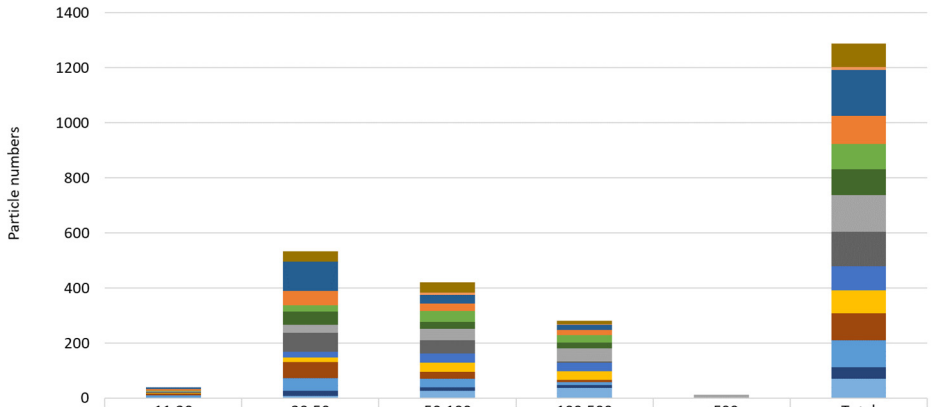


Figure S1. Assembly of RefIMP from single tiles

S2. Ground truth for RefIMP

Through a combination of manual evaluation and classification with a Random Decision Forest Model, the ground truth for RefIMP was established. Particle types present as well as their larger Feret diameters in µm are shown below:



	11-20	20-50	50-100	100-500	>500	Total
PET	0	37	36	14	0	87
Varnish-like	0	1	8	1	0	10
Protein	7	107	33	19	0	166
PUR	6	52	26	19	0	103
PVC	2	23	39	28	0	92
PA	1	47	27	19	0	94
Cellulose	2	30	41	49	11	133
PMMA	3	68	48	5	0	124
PC	1	22	34	30	2	89
PLA	1	17	33	32	0	83
PS	7	58	24	9	0	98

Figure S2. Plastic types and size distributions of MP particles in RefIMP

S3. Assignment of found particles to reference particles

Sketches of assignment of found particles to reference particles using the reference particles' bounding boxes and the found particles' centers

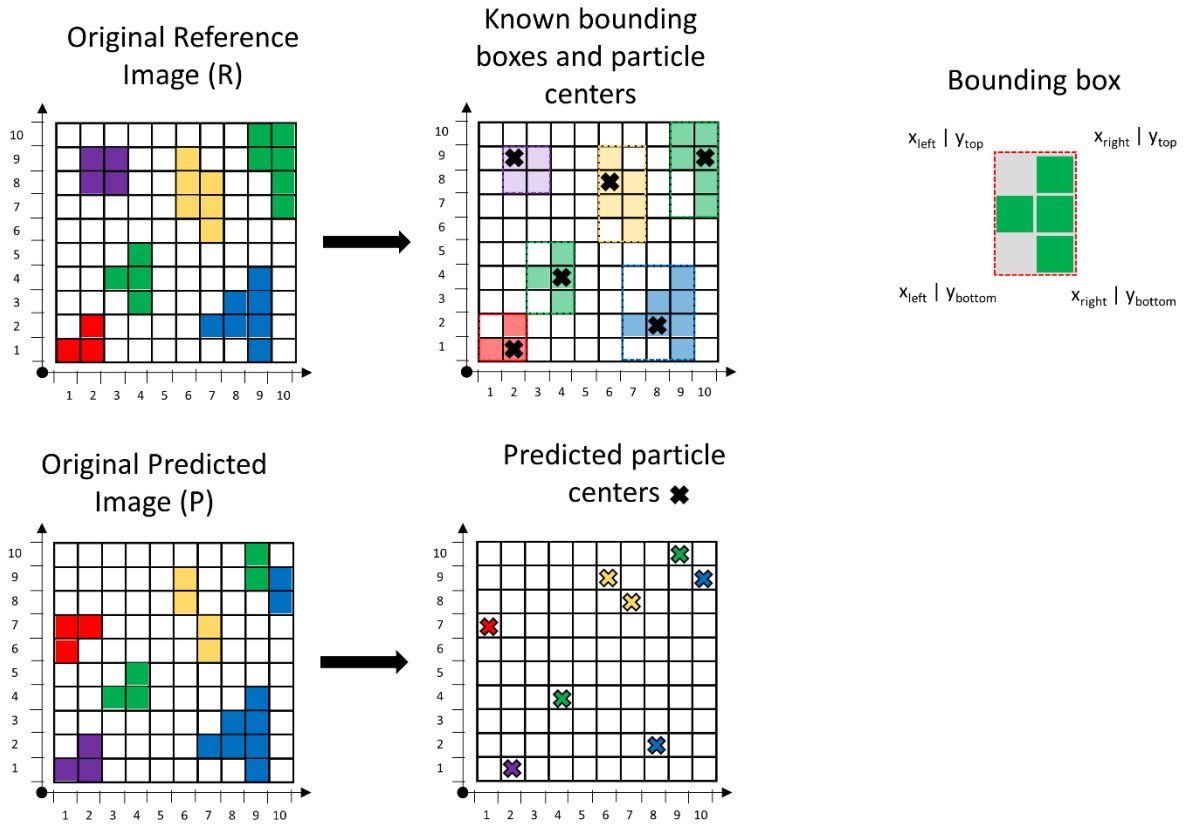


Figure S3. Illustration of assigment of found particles to reference particles

S4. PCA-based background masking

Score plot for PC1 vs. PC5 of RefIMP

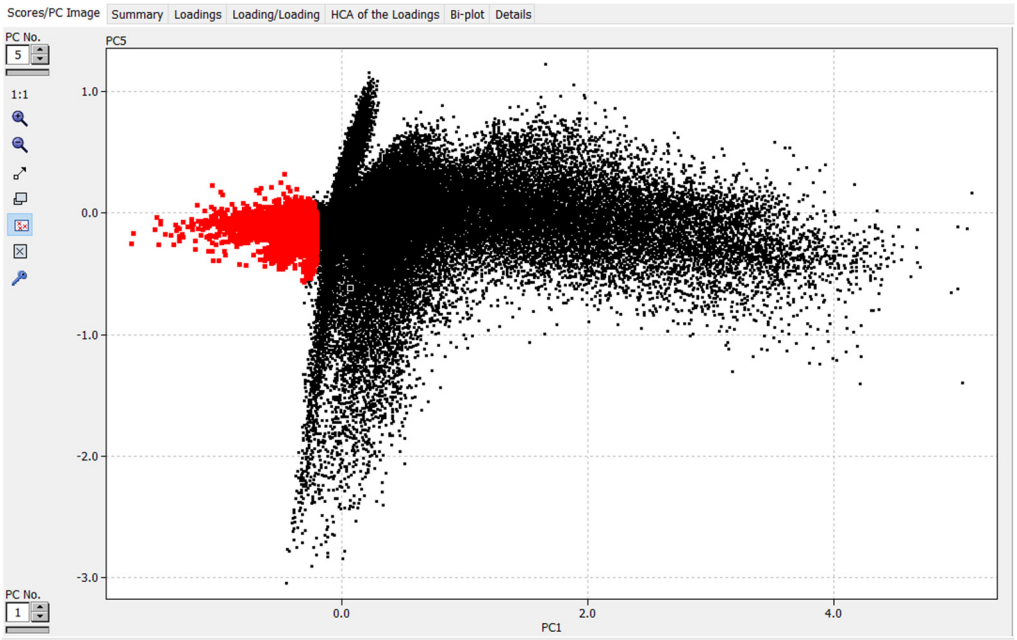


Figure S4. PCA for background pixel masking

S5. Reference spectra

For each class, ten ‘good looking’ spectra were chosen, normalized [0 1] and averaged (black lines in diagrams, grey lines are the corresponding standard deviations). The average spectra served as references for the respective classes. Note that the Anodisc spectrum appears to not be representing a baseline because of the normalization process.

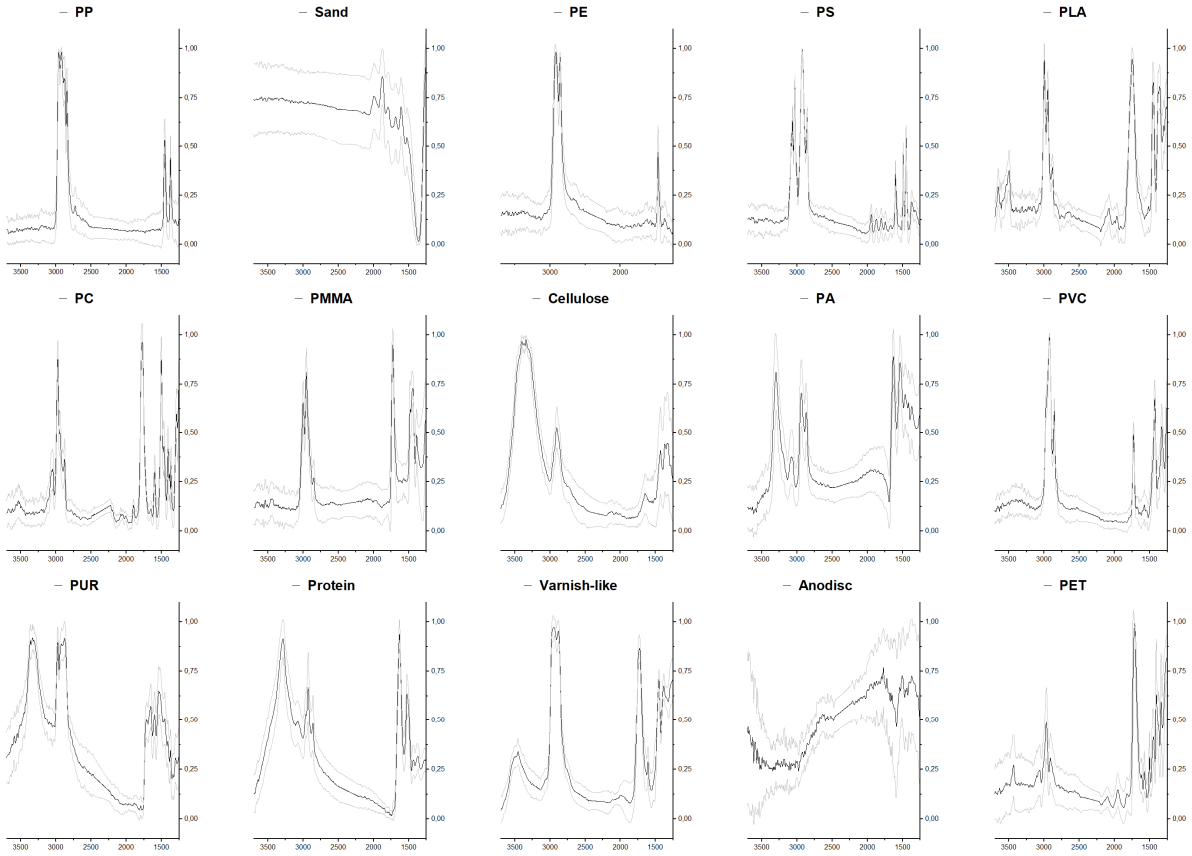


Figure S5. Mean reference spectra with standard deviations

S6. Detailed results from RDF hyperparameter tuning

a. Influence of minimum neighboring correlation

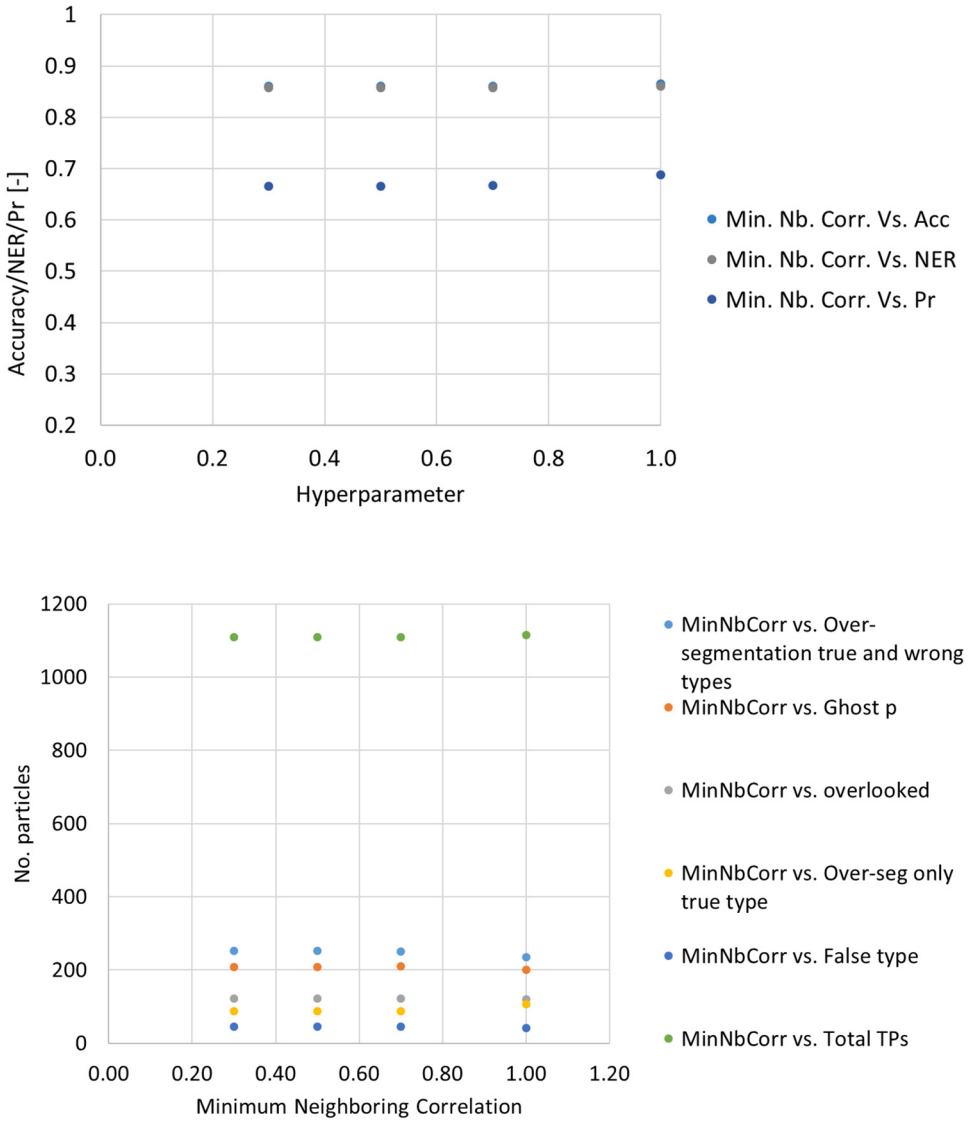


Figure S6.Influence of minimum neighboring correlation on predictions

b. Influence of minimum purity

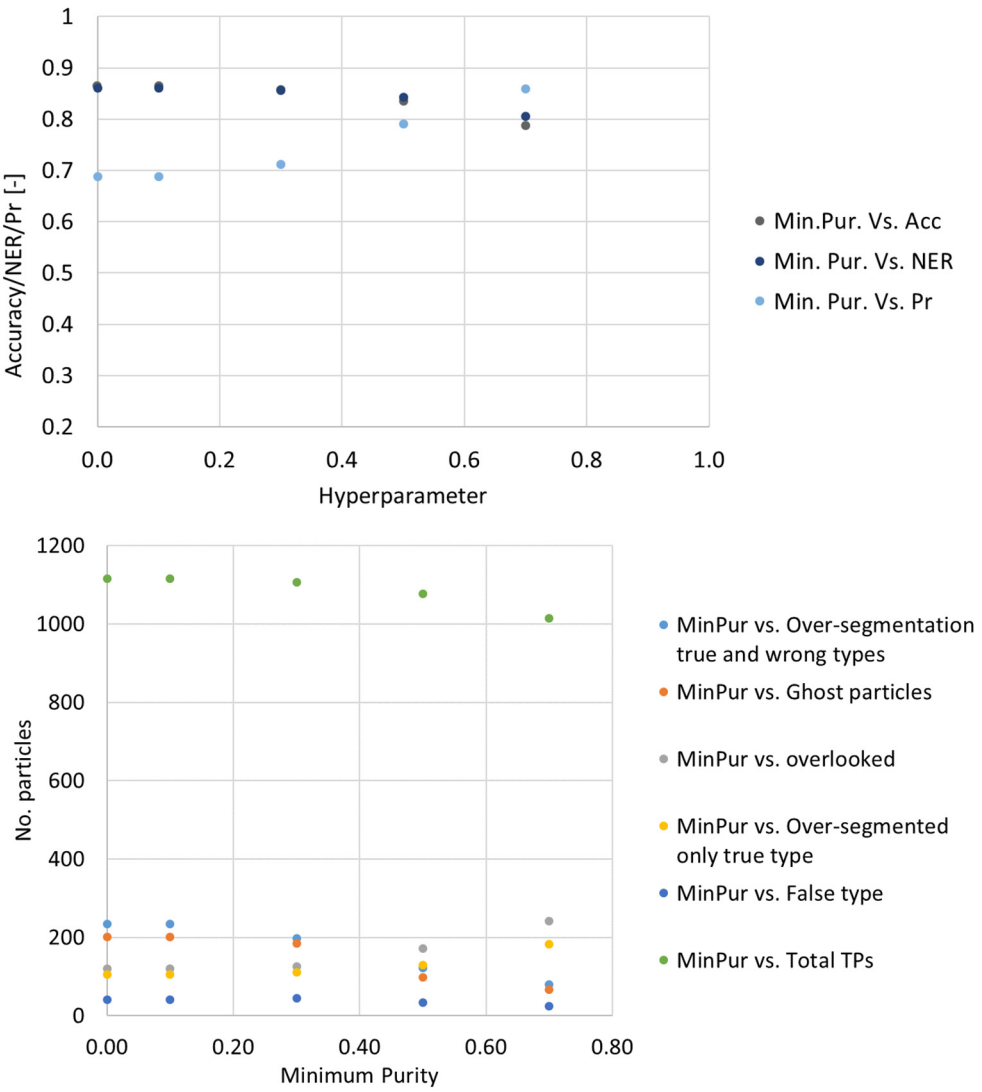


Figure S7. Influence of minimum purity on predictions

c. Influence of minimum distance

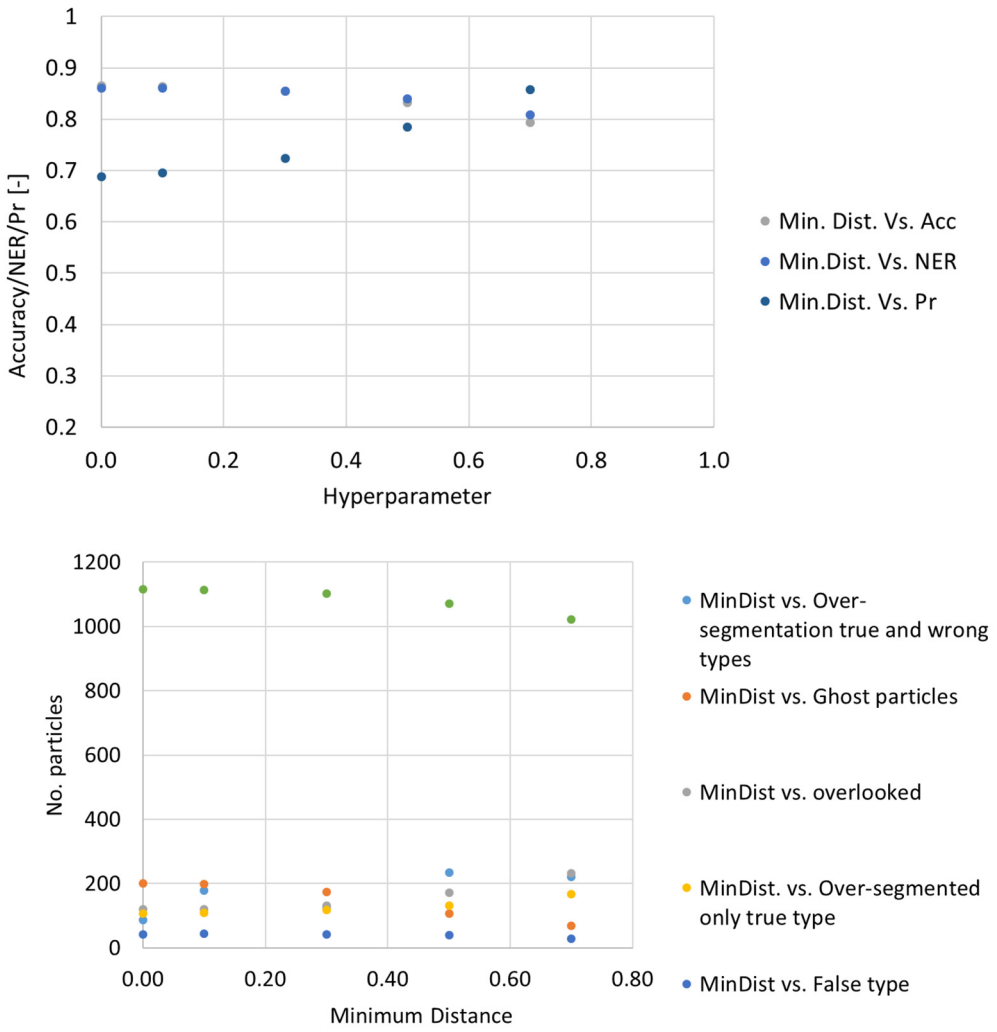


Figure S8. Influence of minimum distance on predictions

d. Influence of classification threshold

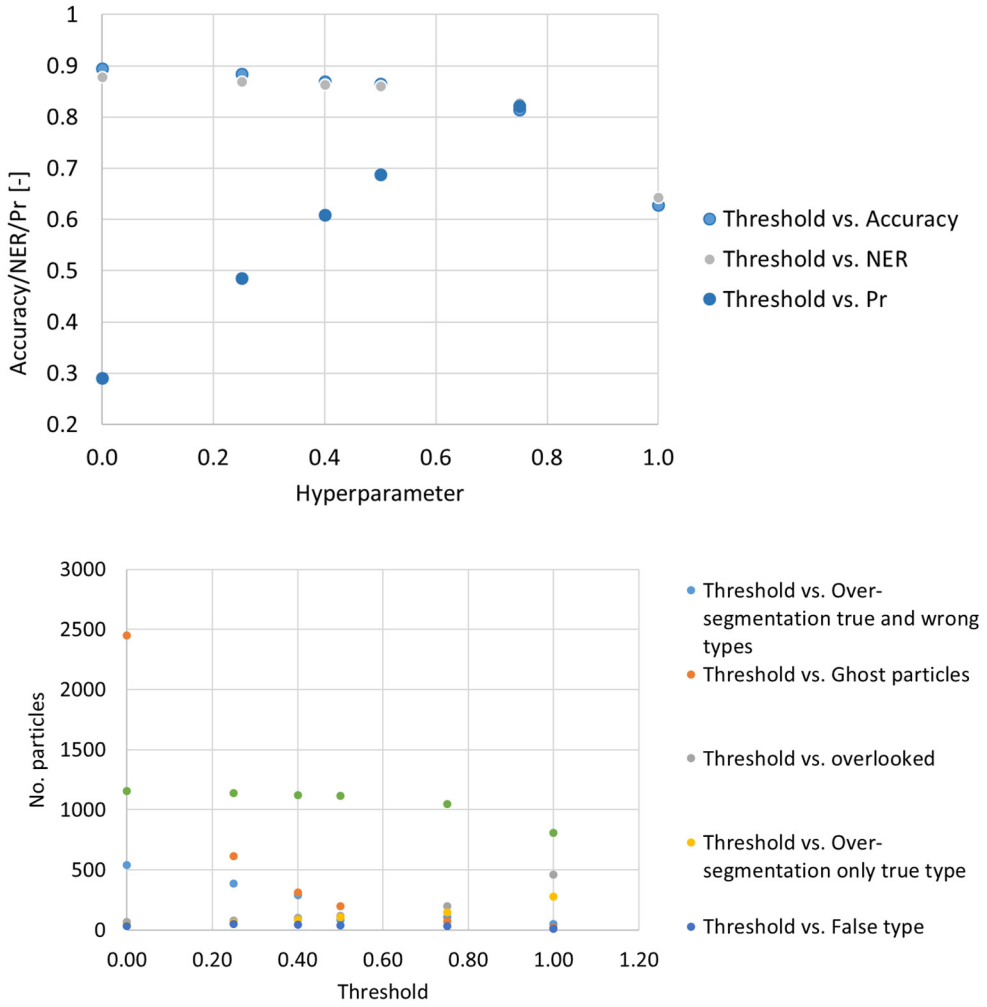


Figure S9. Influence of classification threshold on prediction