Supporting information

Determining the orderliness of carbon materials with nanoparticle imaging and explainable machine learning

Mikhail Yu. Kurbakov[1]
Valentina V. Sulimova[1]
Andrei V. Kopylov[1]
Oleg S. Seredin[1]
Daniil A. Boiko[2]
Alexey S. Galushko[2]
Vera A. Cherepanova[2]
Valentine P. Ananikov[2*]

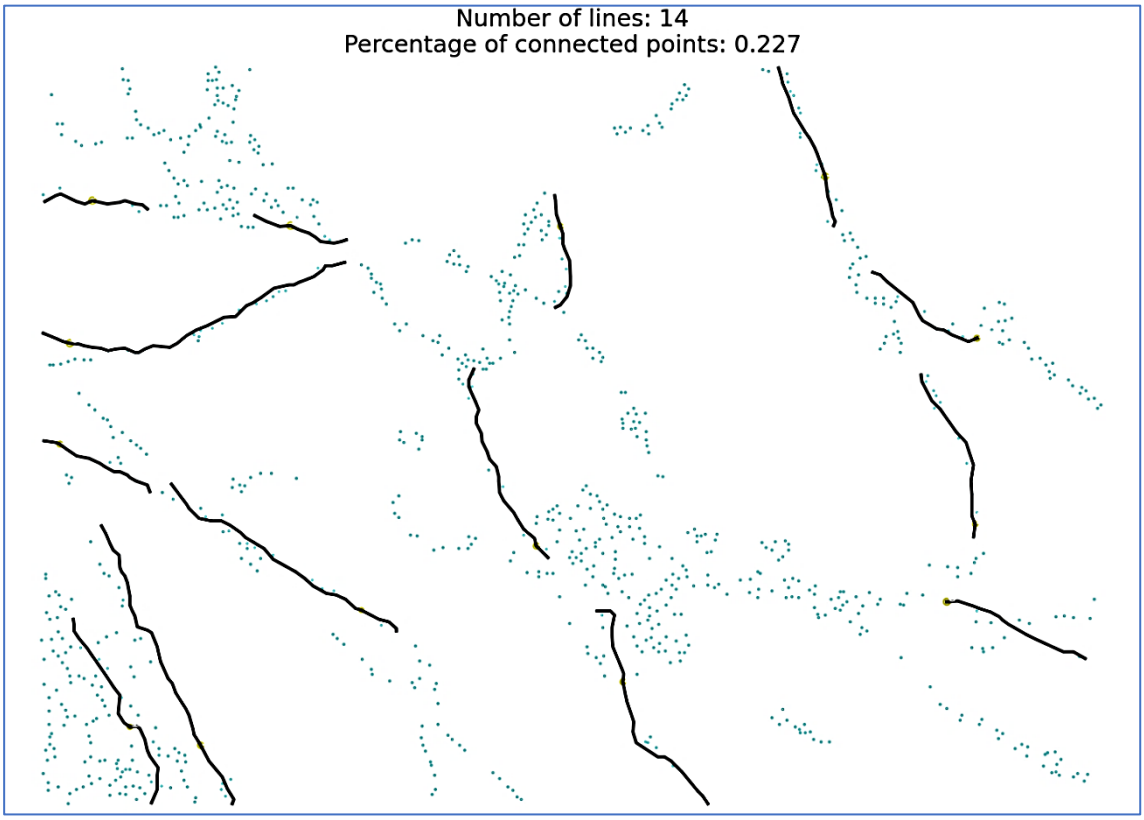
Contents

[1] Tula State University, Lenina Ave. 92, Tula, 300012, Russia.
[2] Zelinsky Institute of Organic Chemistry, Russian Academy of Sciences, Leninsky Prospekt 47, Moscow, 119991, Russia; https://AnanikovLab.ru
* *Corresponding author: val@ioc.ac.ru*

1. Effect of parameters on the construction of lines

Figure 1 shows the results of constructing lines for the parameters that were used for data analysis in the article. Parameter values: $k = 3$; $w_d = 1.5$; $s = 8$; $C = 0.025$; $w_{coax} = 1.75$; $L_{min} = 12$.

a)



b)

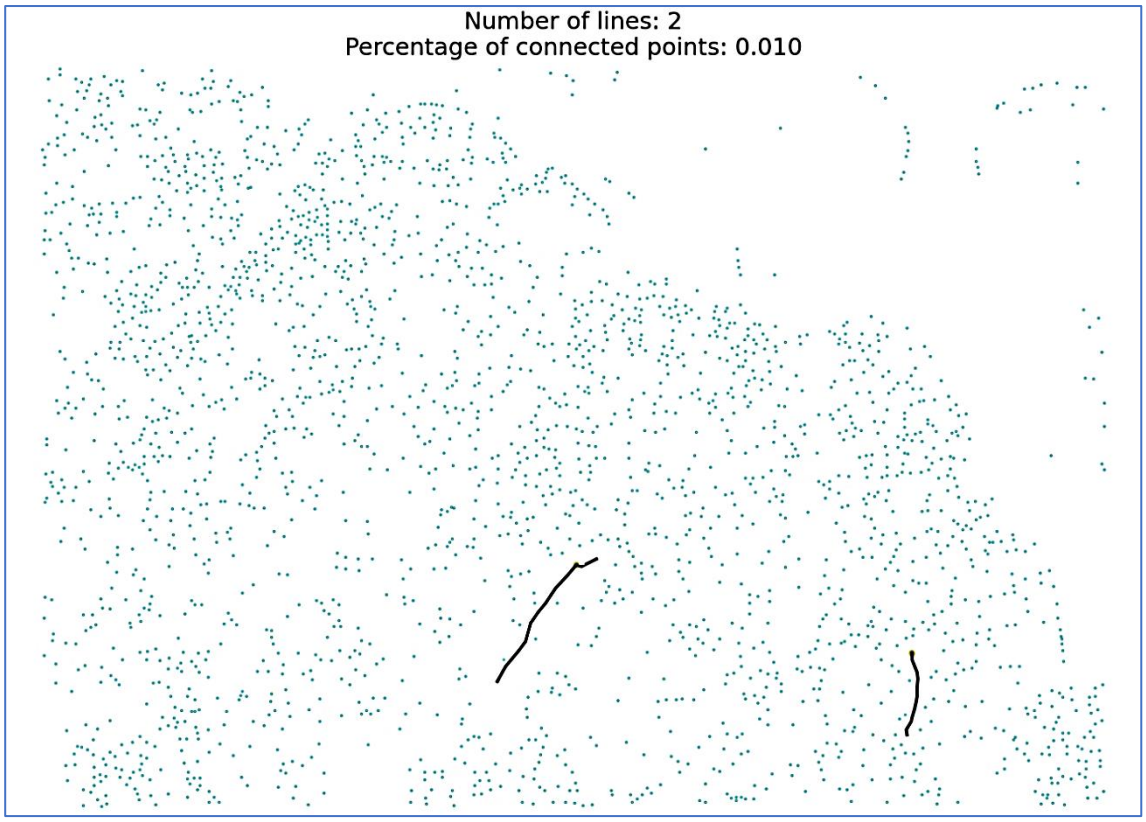
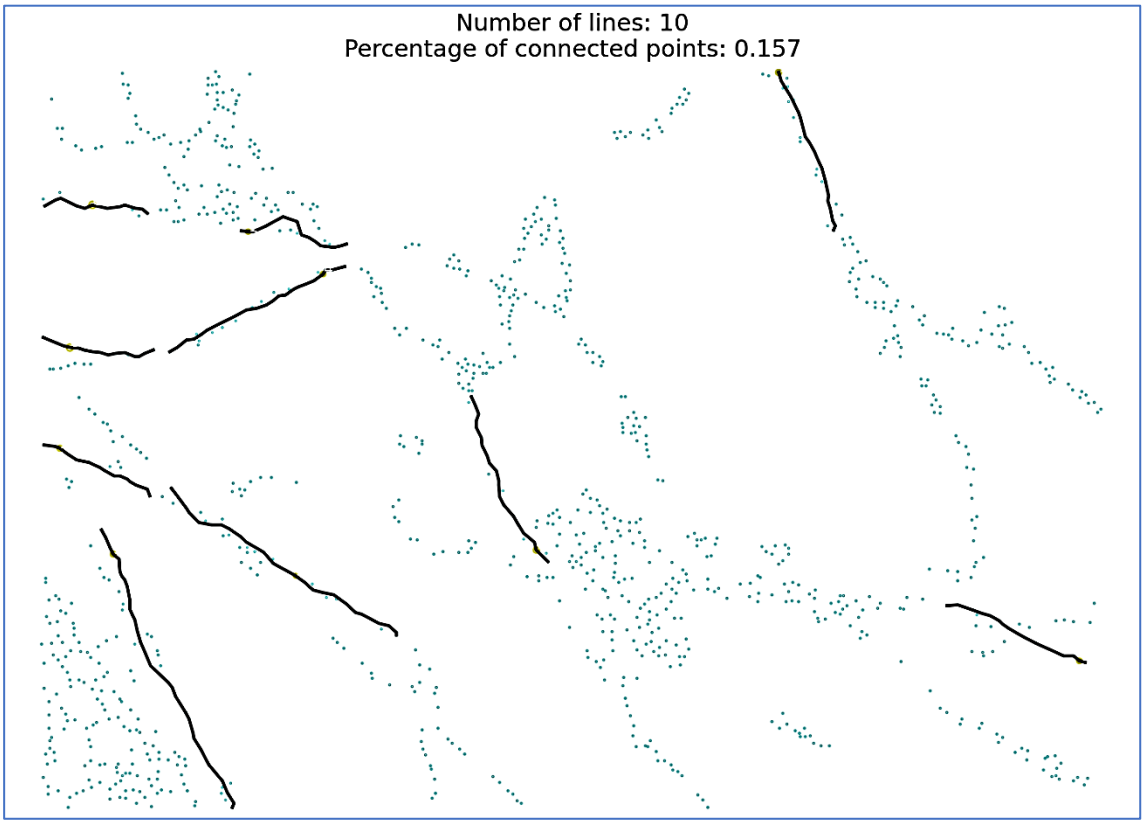


Figure 1 – Results of constructing lines with various approach parameters. The arrangement of the particles in the SEM image: a) ordered (S1-42); b) disordered (S3-157)

Figure 2 shows the results of constructing lines for the proportionality coefficient for early stopping in local groups formation $k = 1$. The other parameters are unchanged.

a)



b)

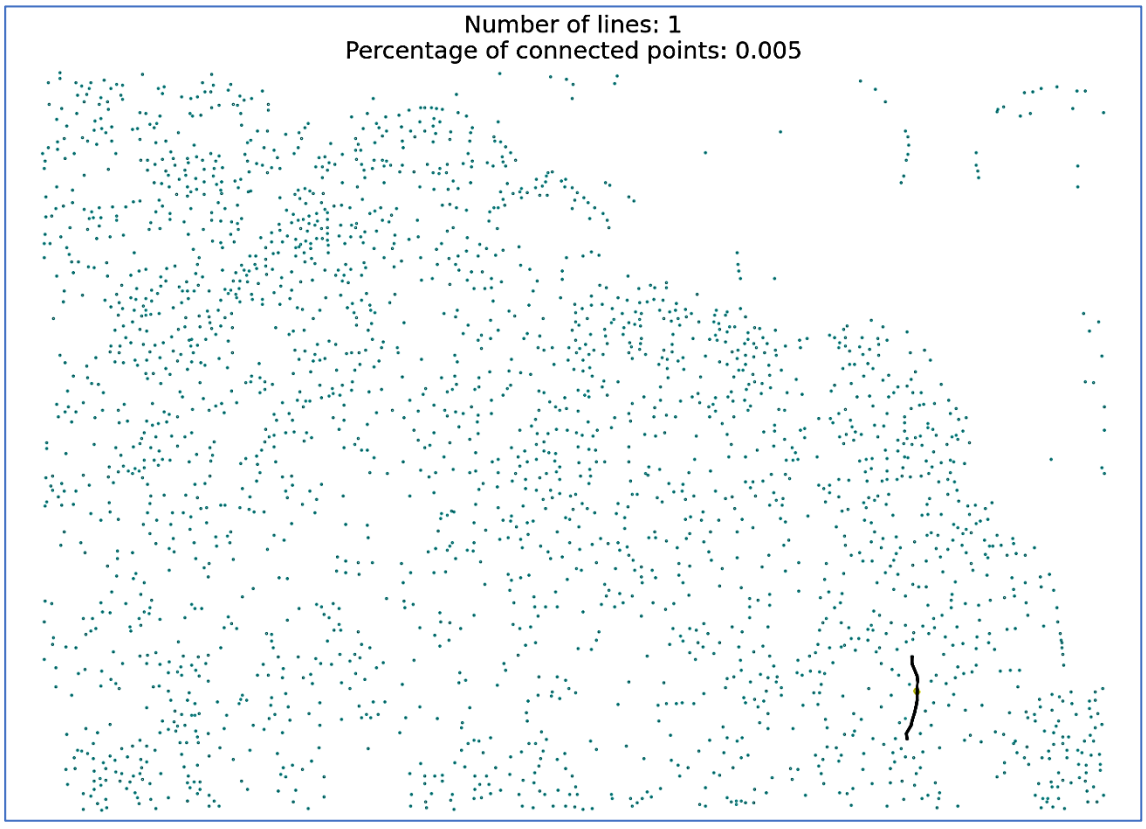
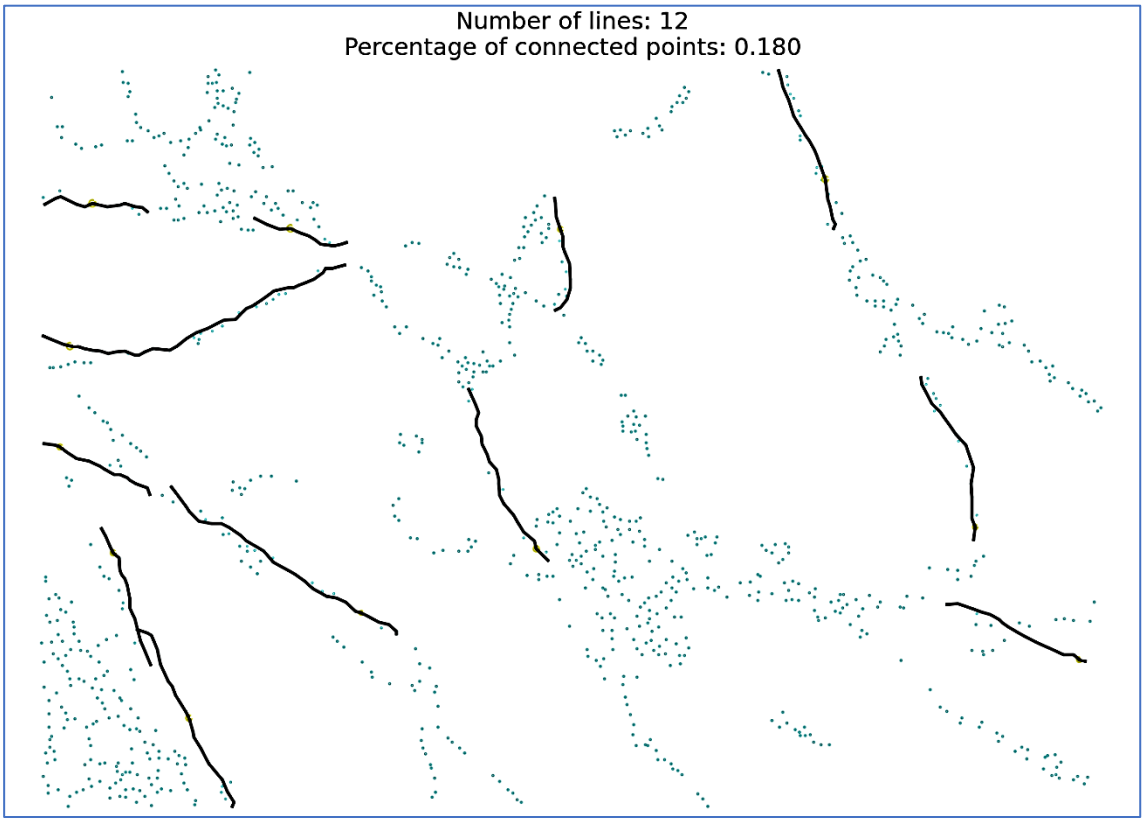


Figure 2 – Results of constructing lines for the proportionality coefficient for early stopping in local groups formation $k = 1$. The arrangement of the particles in the SEM image:
a) ordered (S1-42); b) disordered (S3-157)

Figure 3 shows the results of constructing lines for the proportionality coefficient for early stopping in local groups formation $k = 2$. The other parameters are unchanged.

a)



b)

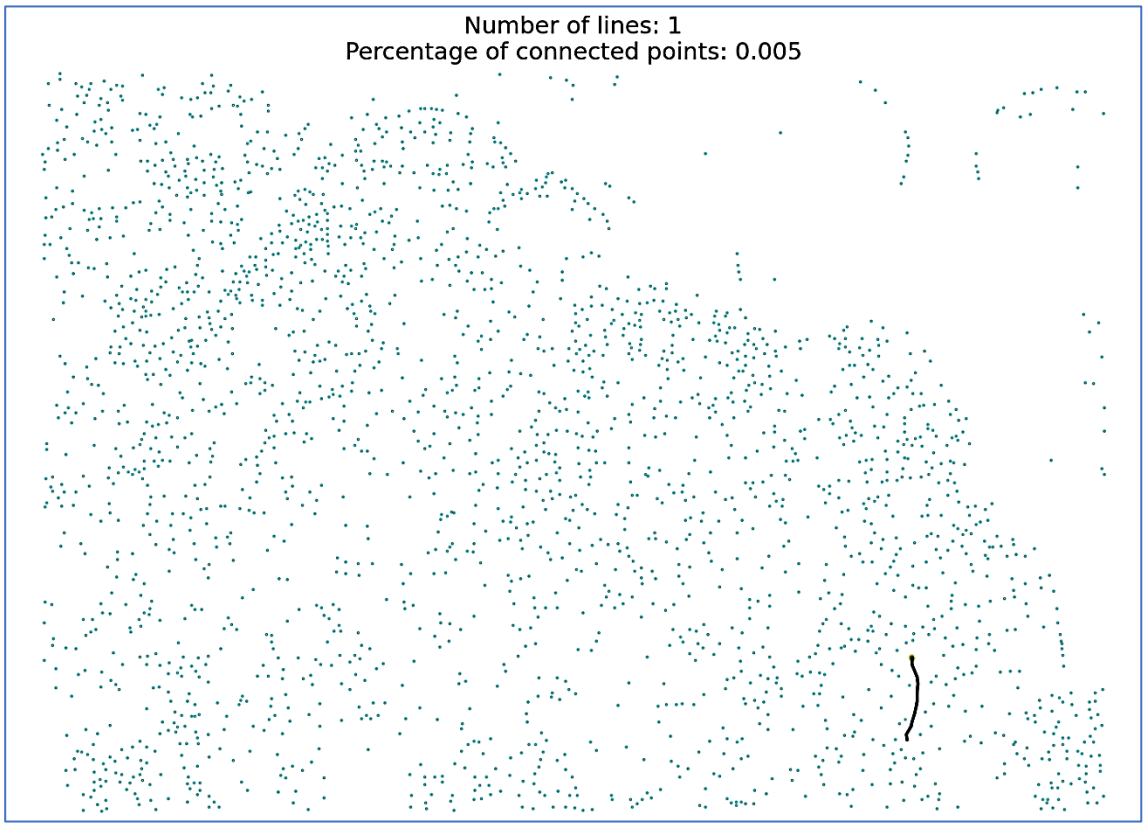


Figure 3 – Results of constructing lines for the proportionality coefficient for early stopping in local groups formation $k = 2$. The arrangement of the particles in the SEM image:
a) ordered (S1-42); b) disordered (S3-157)

Figure 4 shows the results of constructing lines for the proportionality coefficient for early stopping in local groups formation $k = 4$. The other parameters are unchanged.

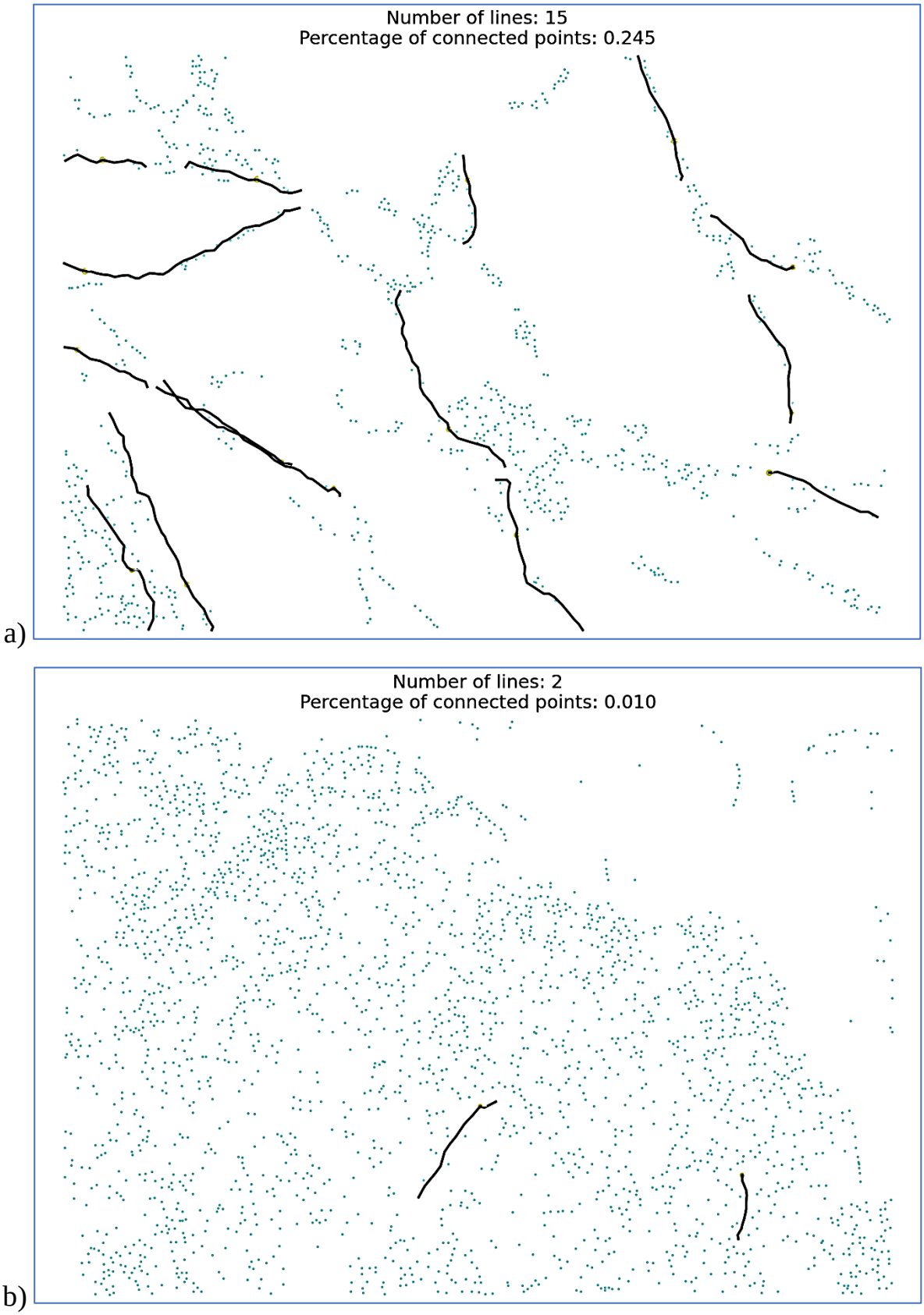
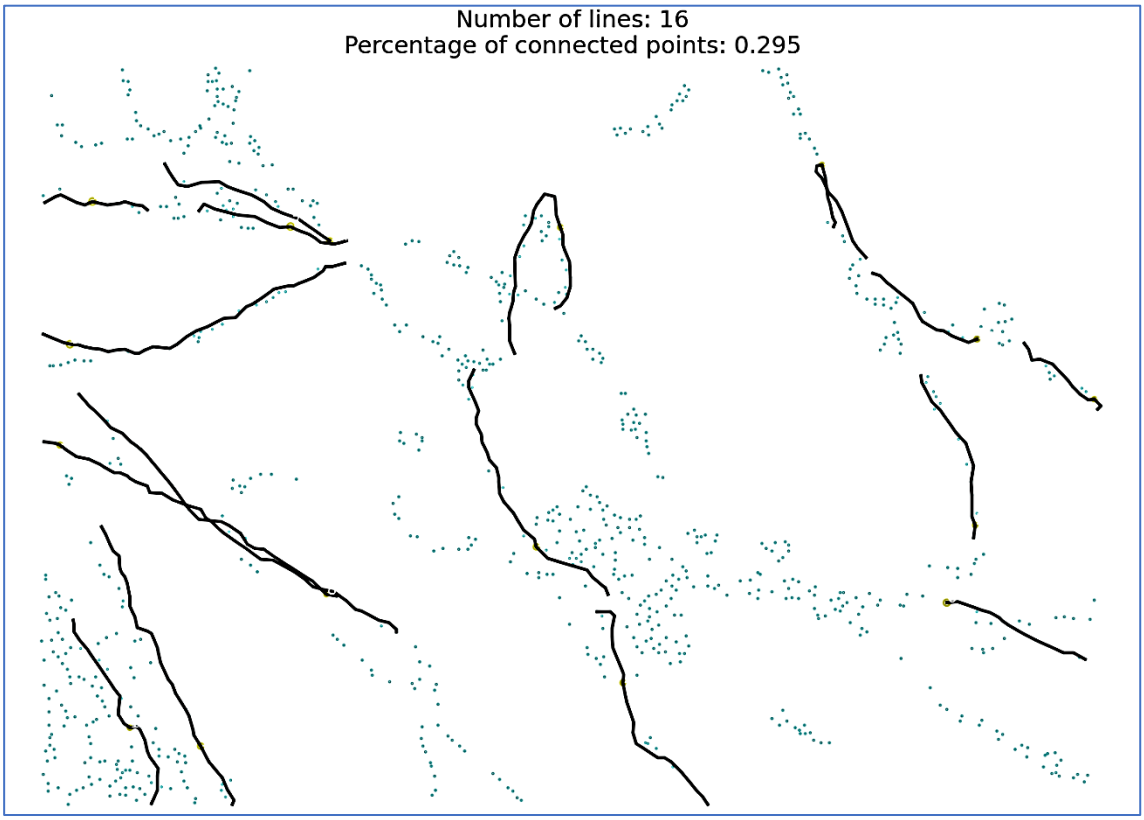


Figure 4 – Results of constructing lines for the proportionality coefficient for early stopping in local groups formation $k = 4$. The arrangement of the particles in the SEM image:
a) ordered (S1-42); b) disordered (S3-157)

Figure 5 shows the results of constructing lines for the proportionality coefficient for early stopping in local groups formation $k = 5$. The other parameters are unchanged.

a)



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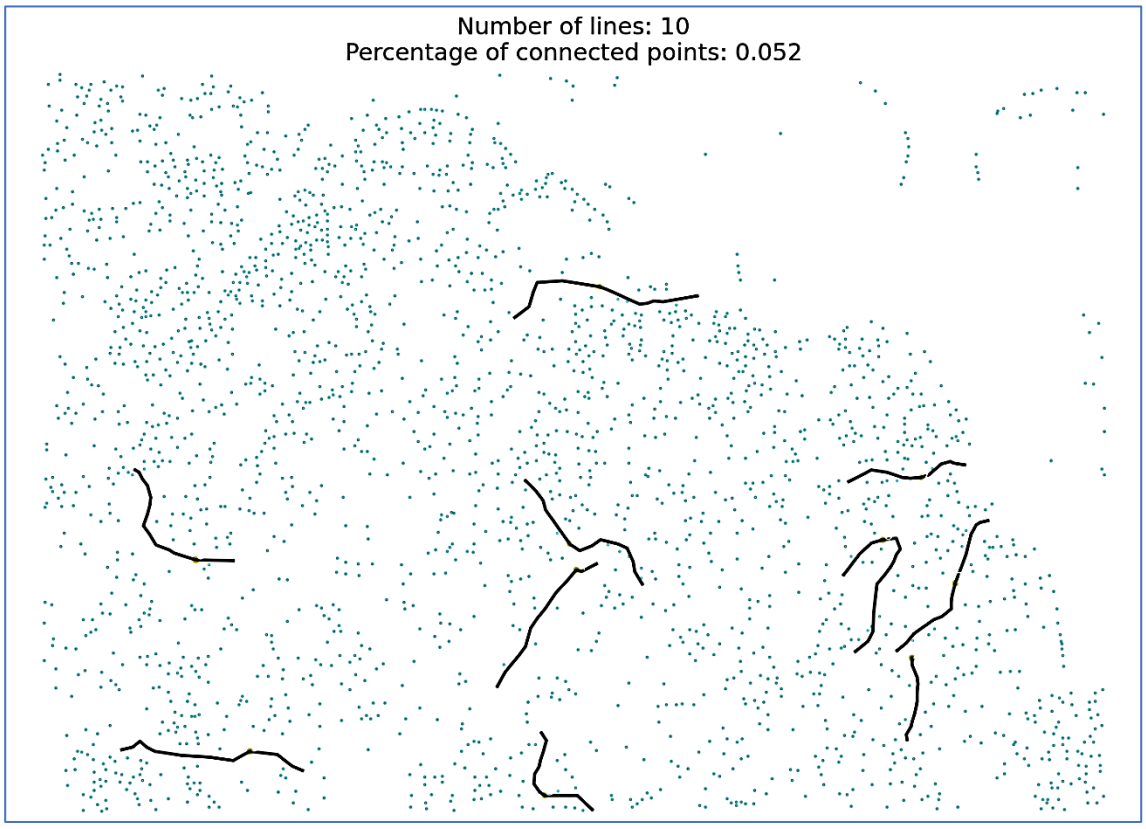
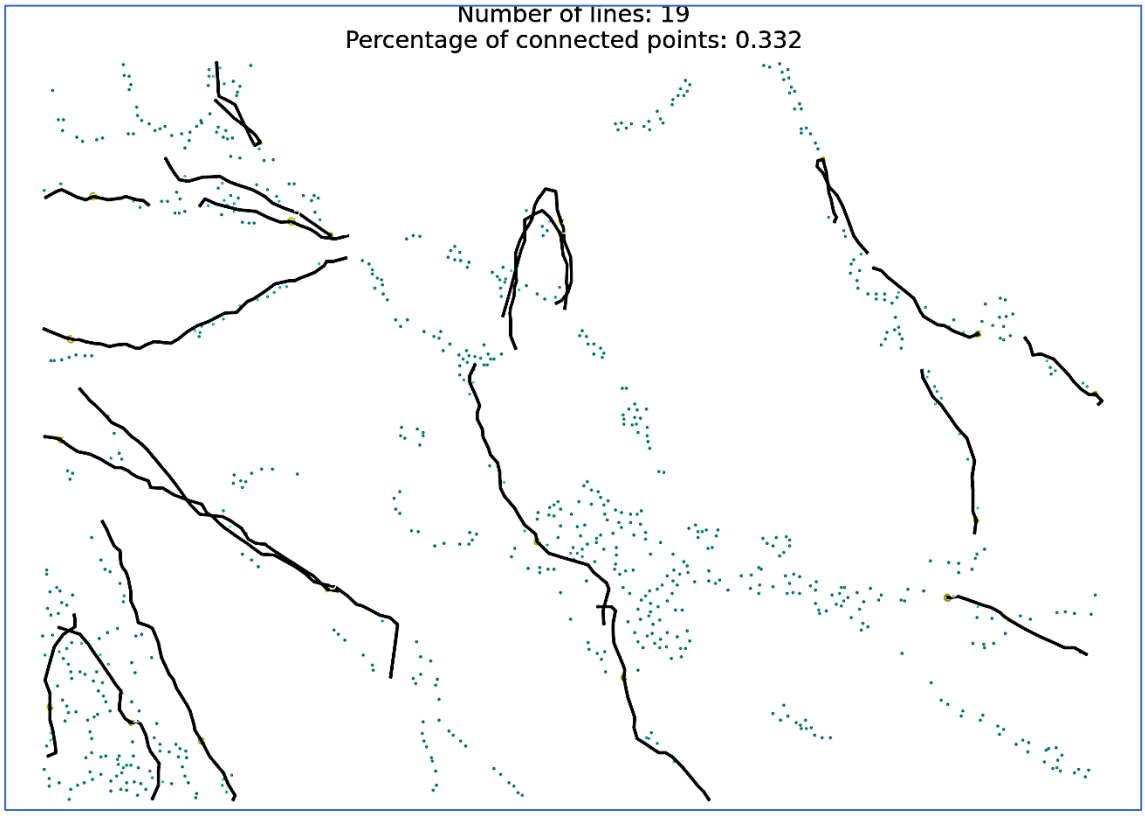


Figure 5 – Results of constructing lines for the proportionality coefficient for early stopping in local groups formation $k = 5$. The arrangement of the particles in the SEM image:
a) ordered (S1-42); b) disordered (S3-157)

Figure 6 shows the results of constructing lines for the proportionality coefficient for early stopping in local groups formation $k = 6$. The other parameters are unchanged.

a)



b)

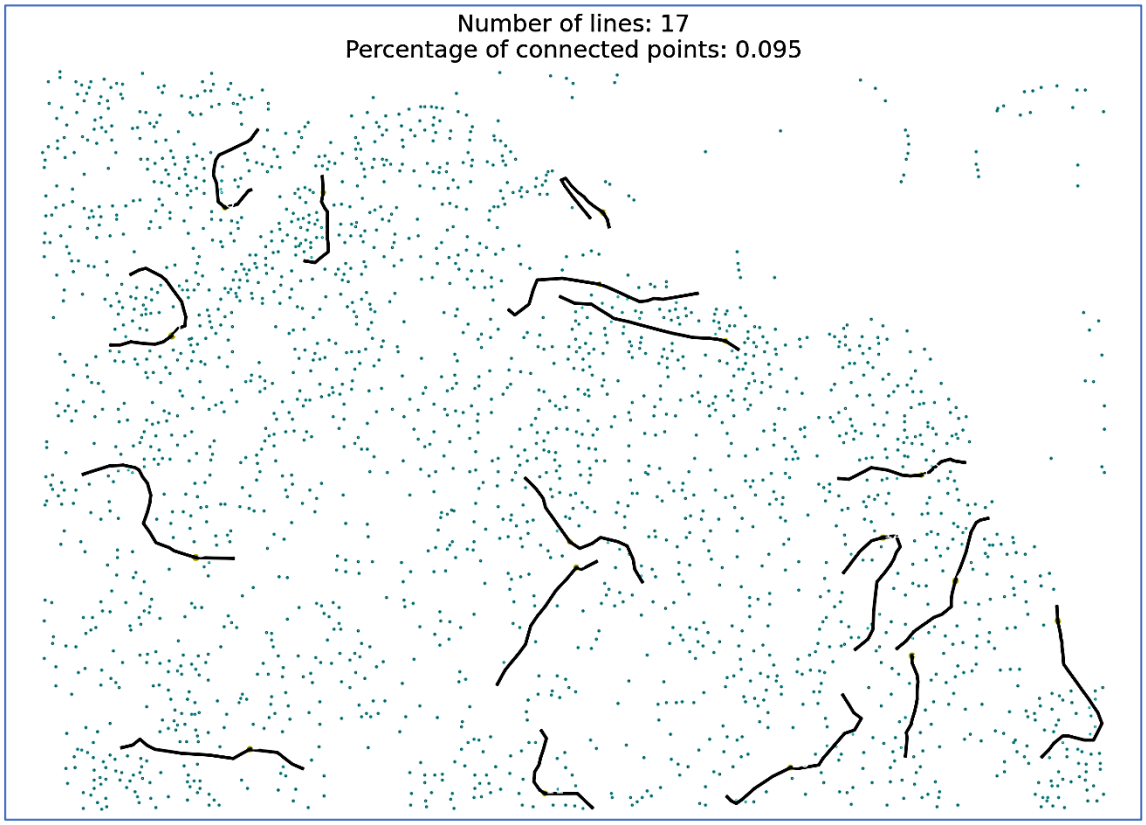


Figure 6 – Results of constructing lines for the proportionality coefficient for early stopping in local groups formation $k = 6$. The arrangement of the particles in the SEM image:
a) ordered (S1-42); b) disordered (S3-157)

Figure 7 shows the results of constructing lines for the weight coefficient for estimating the local nanoparticles density in a SEM image $w_d = 1.0$. The other parameters are unchanged.

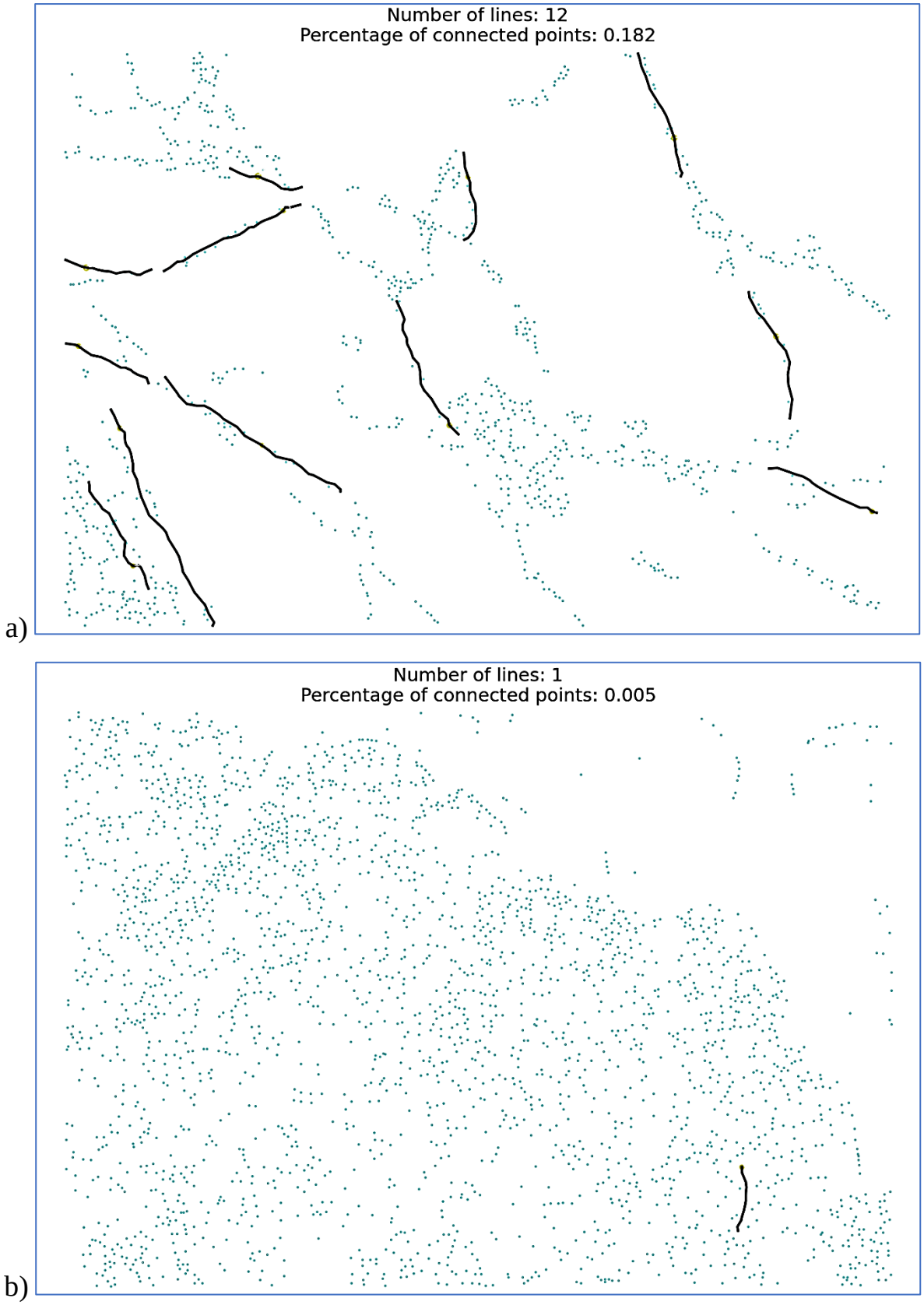


Figure 7 – Results of constructing lines for the weight coefficient for estimating the local nanoparticles density in a SEM image $w_d = 1.0$. The arrangement of the particles in the SEM image: a) ordered (S1-42); b) disordered (S3-157)

Figure 8 shows the results of constructing lines for the weight coefficient for estimating the local nanoparticles density in a SEM image $w_d = 1.25$. The other parameters are unchanged.

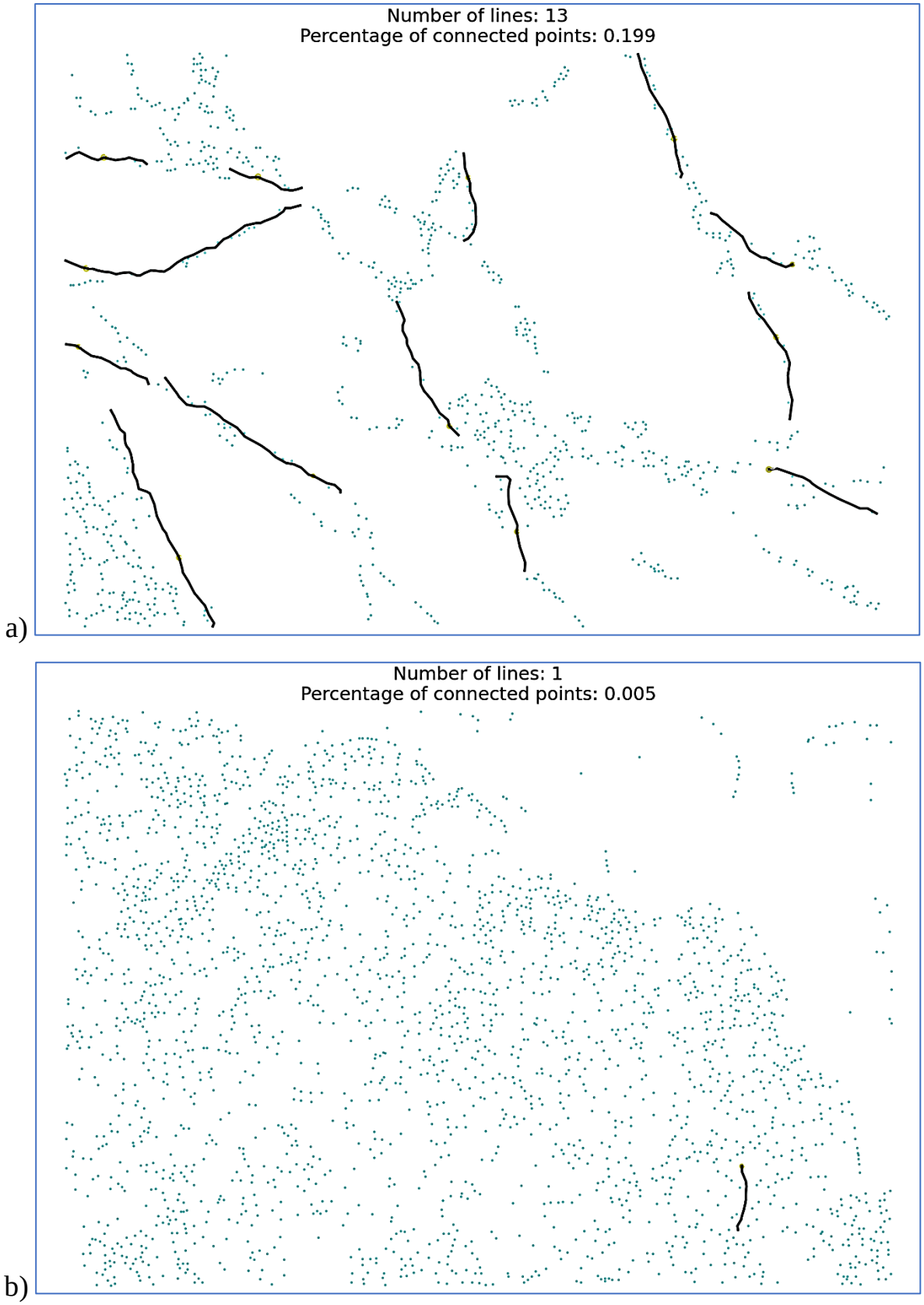


Figure 8 – Results of constructing lines for the weight coefficient for estimating the local nanoparticles density in a SEM image $w_d = 1.25$. The arrangement of the particles in the SEM image: a) ordered (S1-42); b) disordered (S3-157)

Figure 9 shows the results of constructing lines for the weight coefficient for estimating the local nanoparticles density in a SEM image $w_d = 1.75$. The other parameters are unchanged.

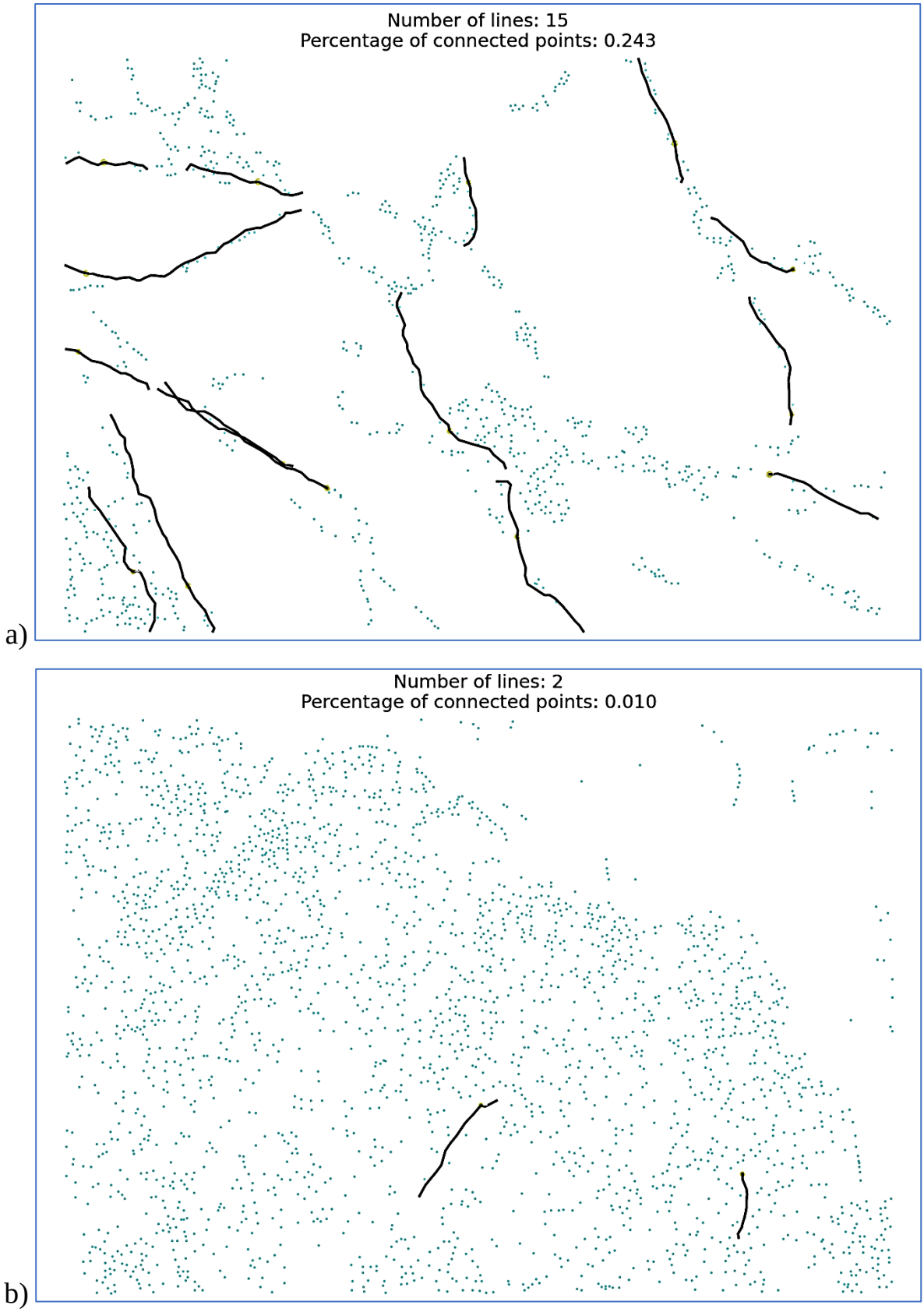
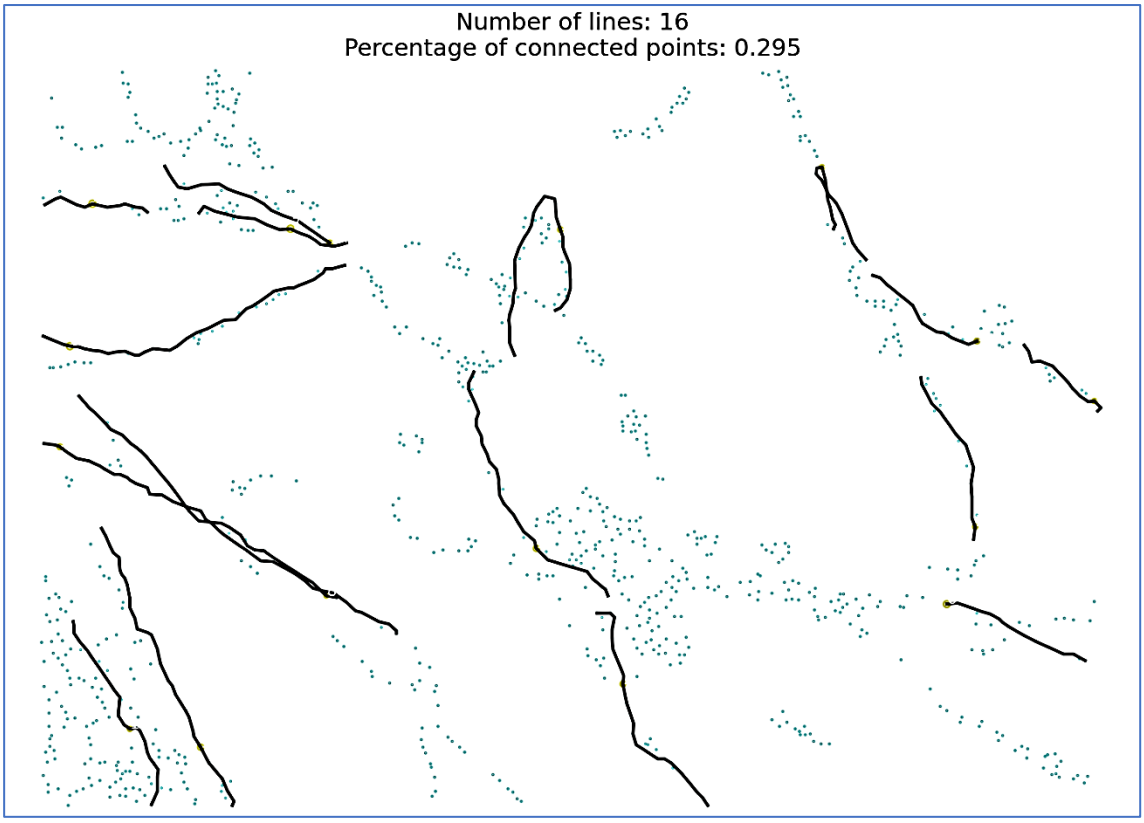


Figure 9 – Results of constructing lines for the weight coefficient for estimating the local nanoparticles density in a SEM image $w_d = 1.75$. The arrangement of the particles in the SEM image: a) ordered (S1-42); b) disordered (S3-157)

Figure 10 shows the results of constructing lines for the weight coefficient for estimating the local nanoparticles density in a SEM image $w_d = 2.0$. The other parameters are unchanged.

a)



b)

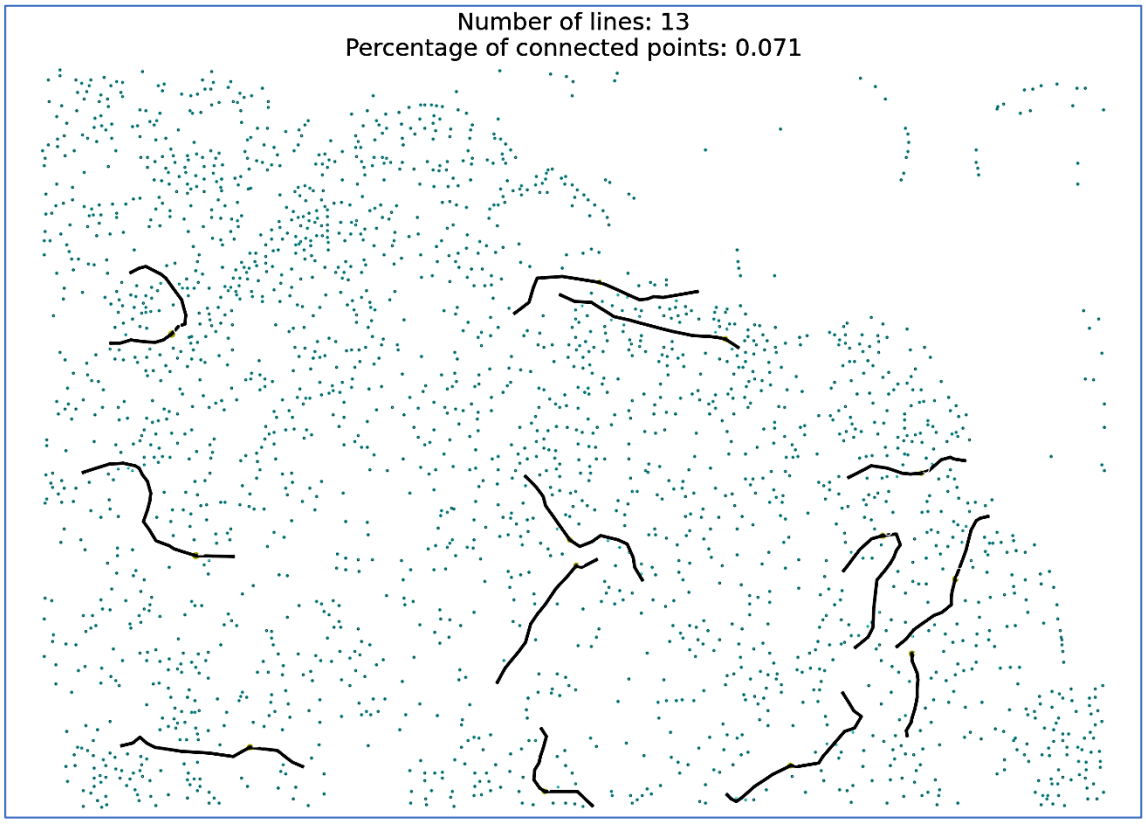
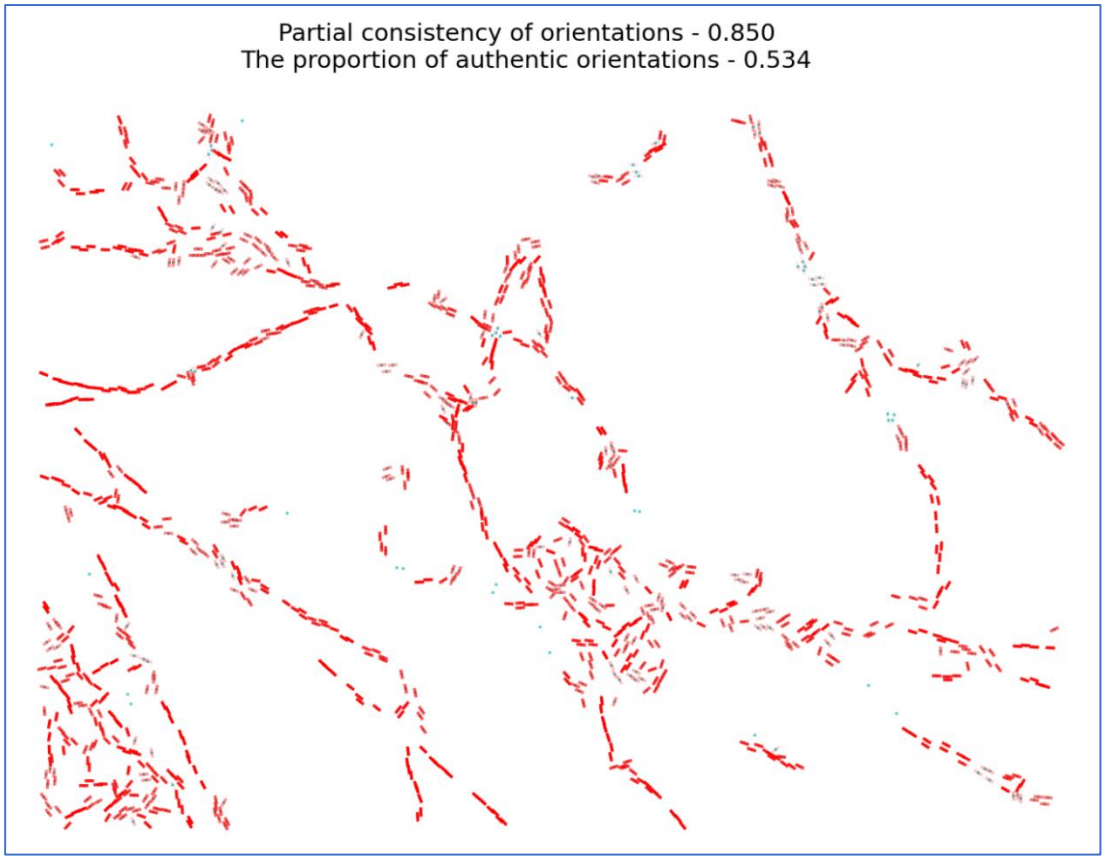
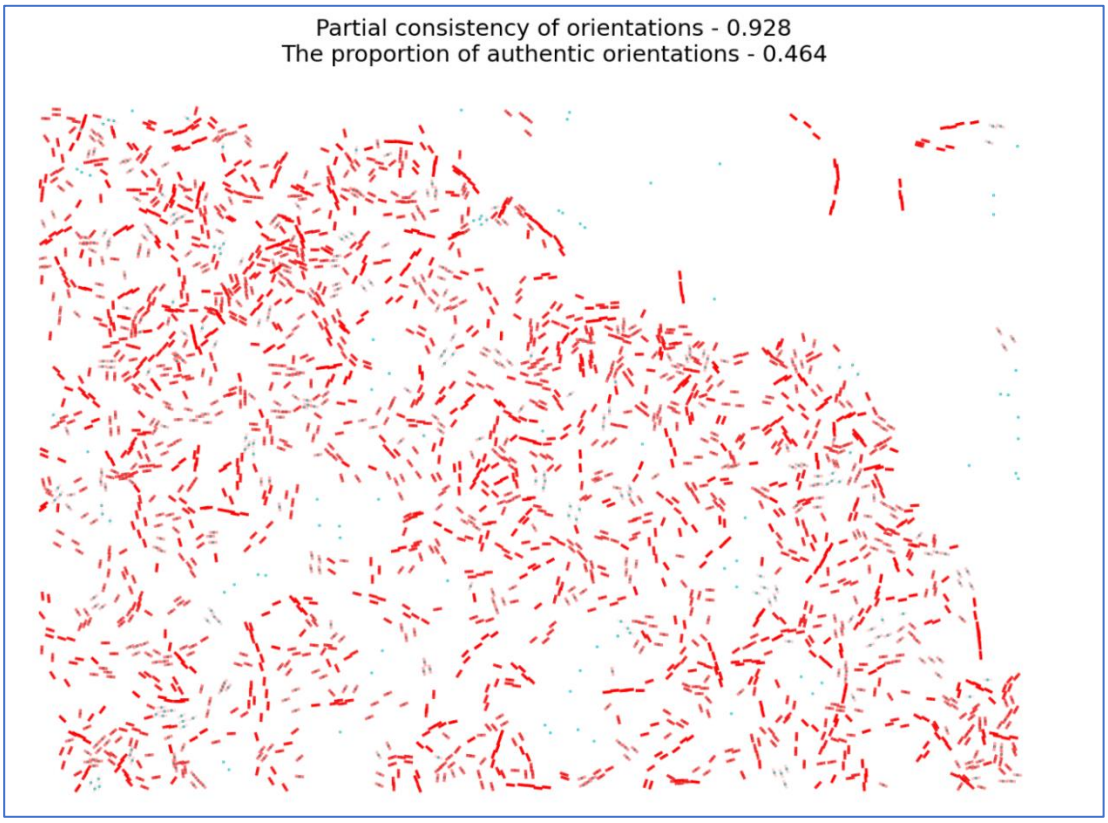


Figure 10 – Results of constructing lines for the weight coefficient for estimating the local nanoparticles density in a SEM image $w_d = 2.0$. The arrangement of the particles in the SEM image: a) ordered (S1-42); b) disordered (S3-157)

Figure 11 shows the results of the calculating of the orientations of local groups for the maximum number of nanoparticles in a local group $s = 4$. The other parameters are unchanged.



a)

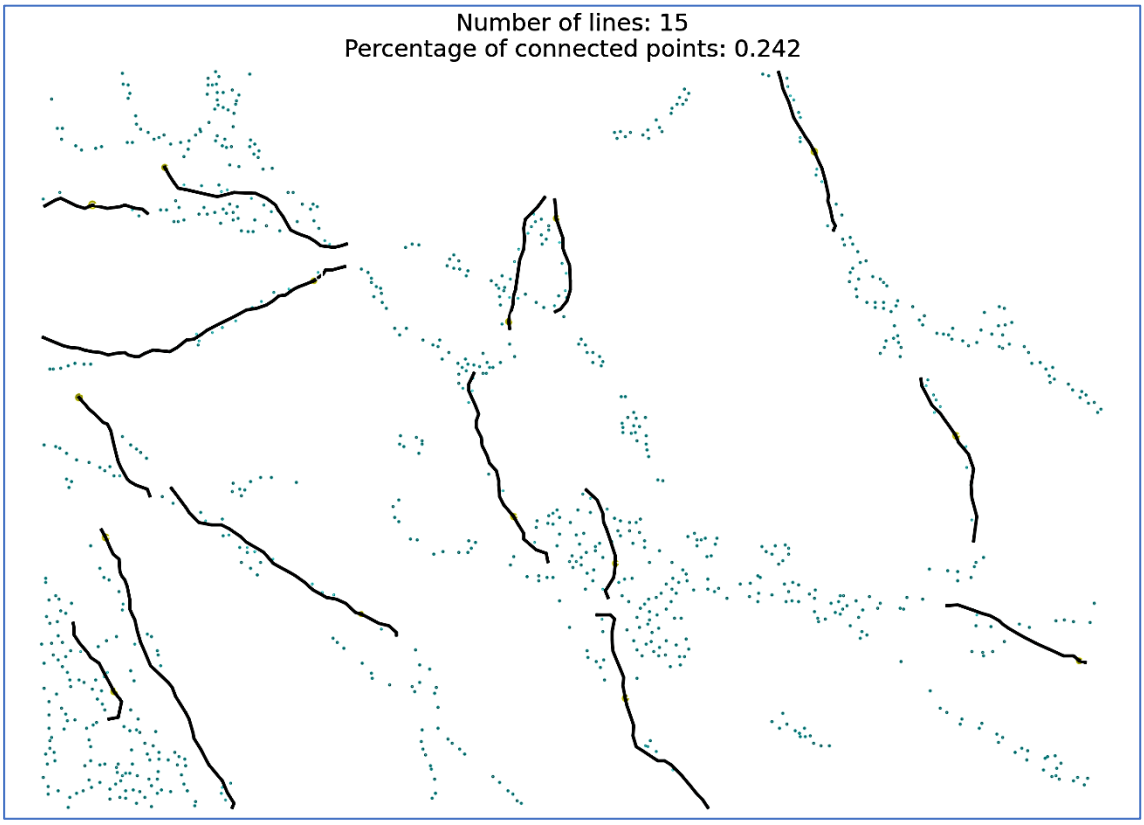


b)

Figure 11 – The results of calculating the orientations of local groups for the maximum number of nanoparticles in a local group $s = 4$. The arrangement of the particles in the SEM image: a) ordered (S1-42); b) disordered (S3-157)

Figure 12 shows the results of constructing lines for the maximum number of nanoparticles in a local group $s = 4$. The other parameters are unchanged.

a)



b)

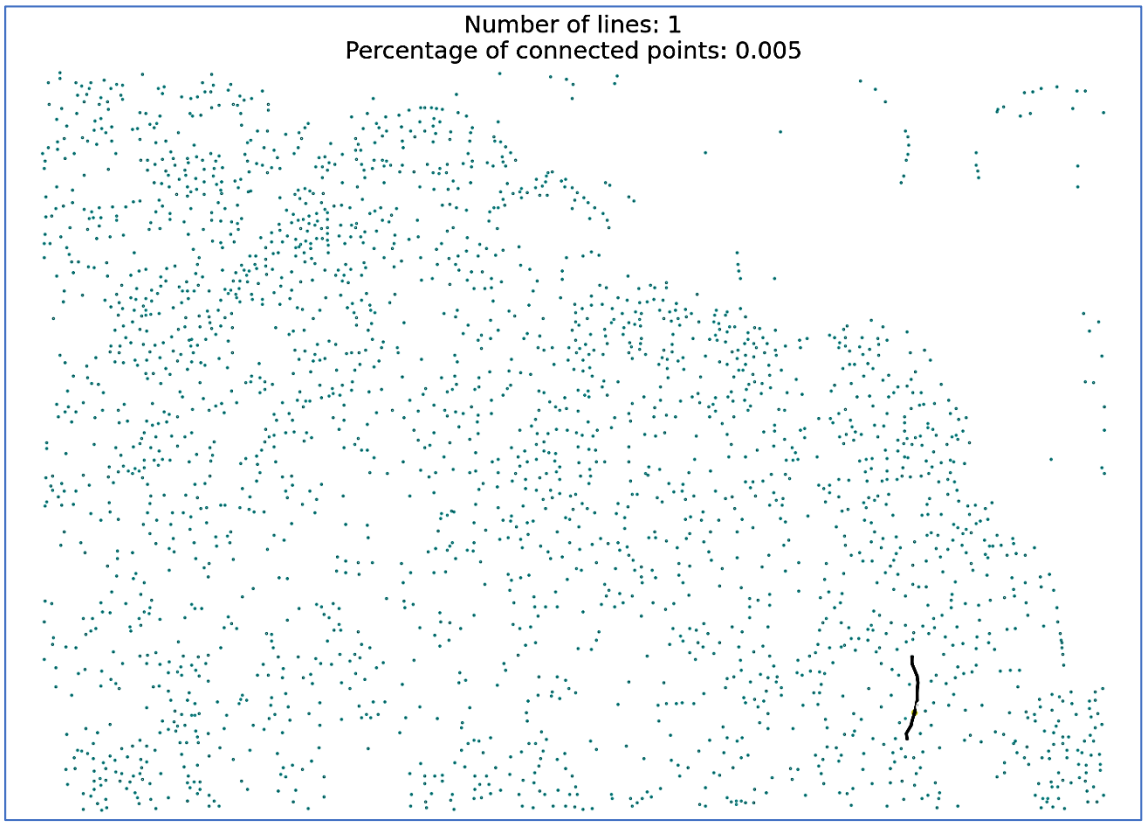


Figure 12 – Results of constructing lines for the maximum number of nanoparticles in a local group $s = 4$. The arrangement of the particles in the SEM image:
a) ordered (S1-42); b) disordered (S3-157)

Figure 13 shows the results of the calculation of the orientations of local groups for the maximum number of nanoparticles in a local group $s = 6$. The other parameters are unchanged.

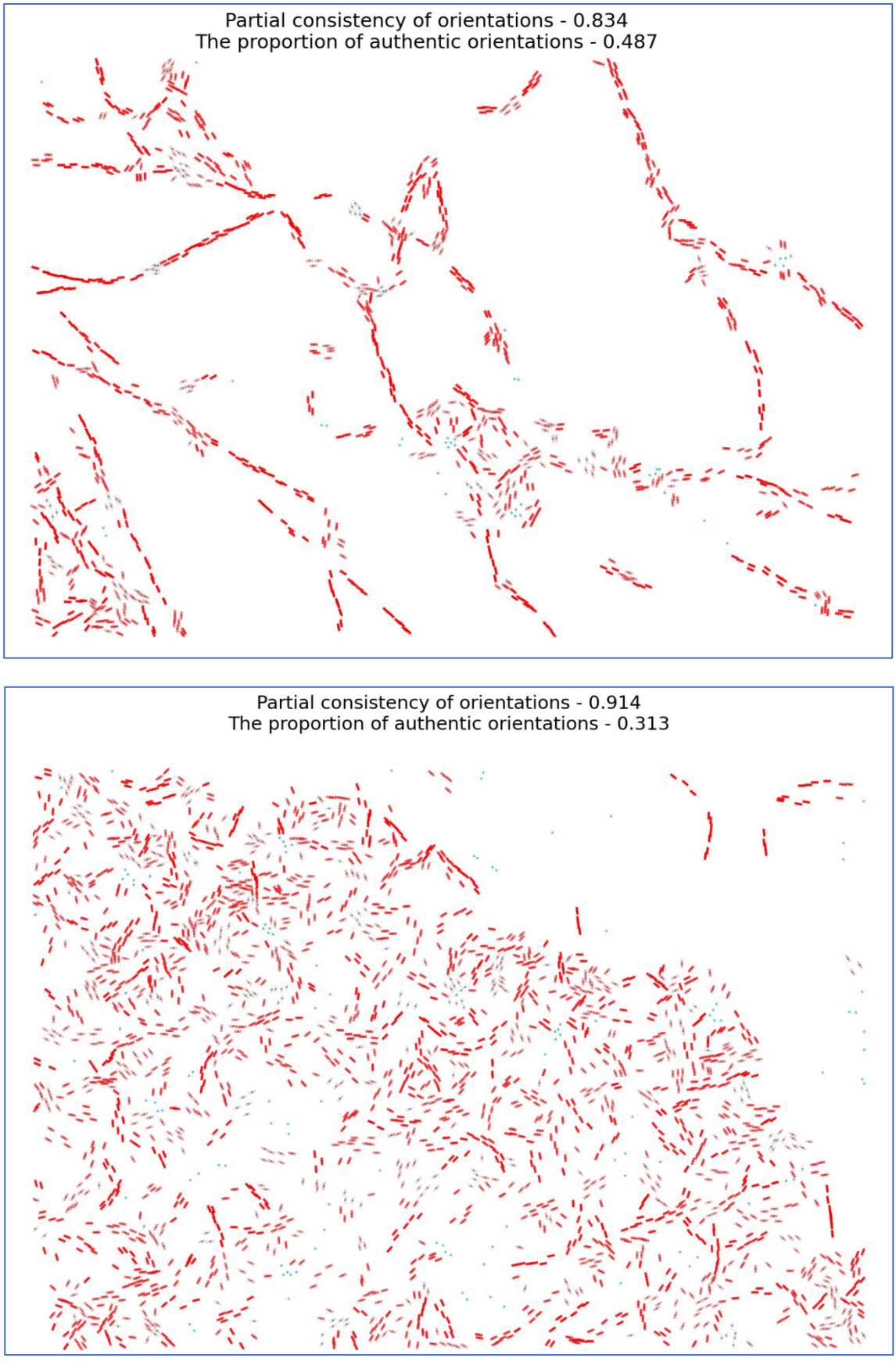


Figure 13 – Results of calculating the orientations of local groups for the maximum number of nanoparticles in a local group $s = 6$. The arrangement of the particles in the SEM image: a) ordered (S1-42); b) disordered (S3-157)

Figure 14 shows the results of constructing lines for the maximum number of nanoparticles in a local group $s = 6$. The other parameters are unchanged.

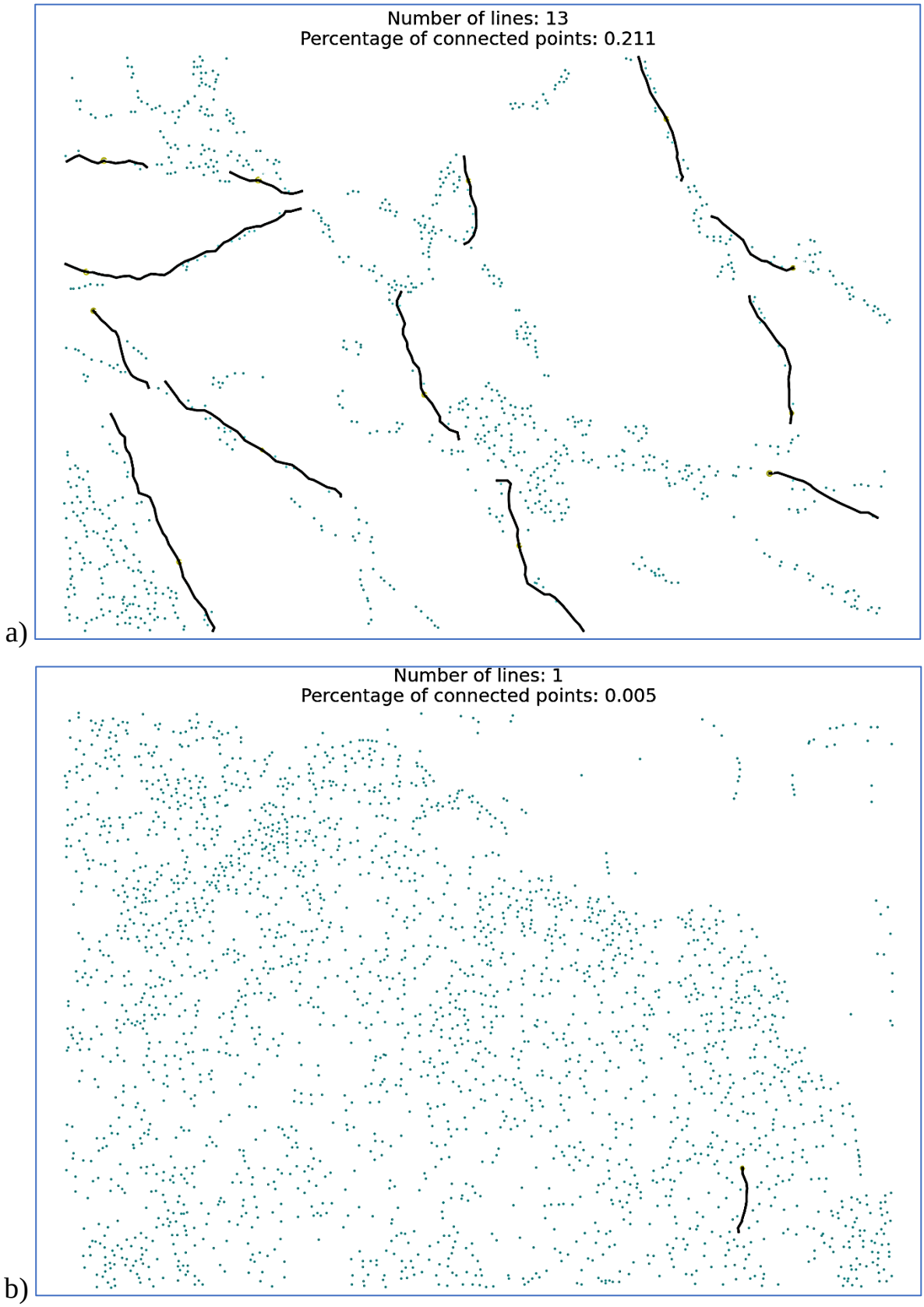
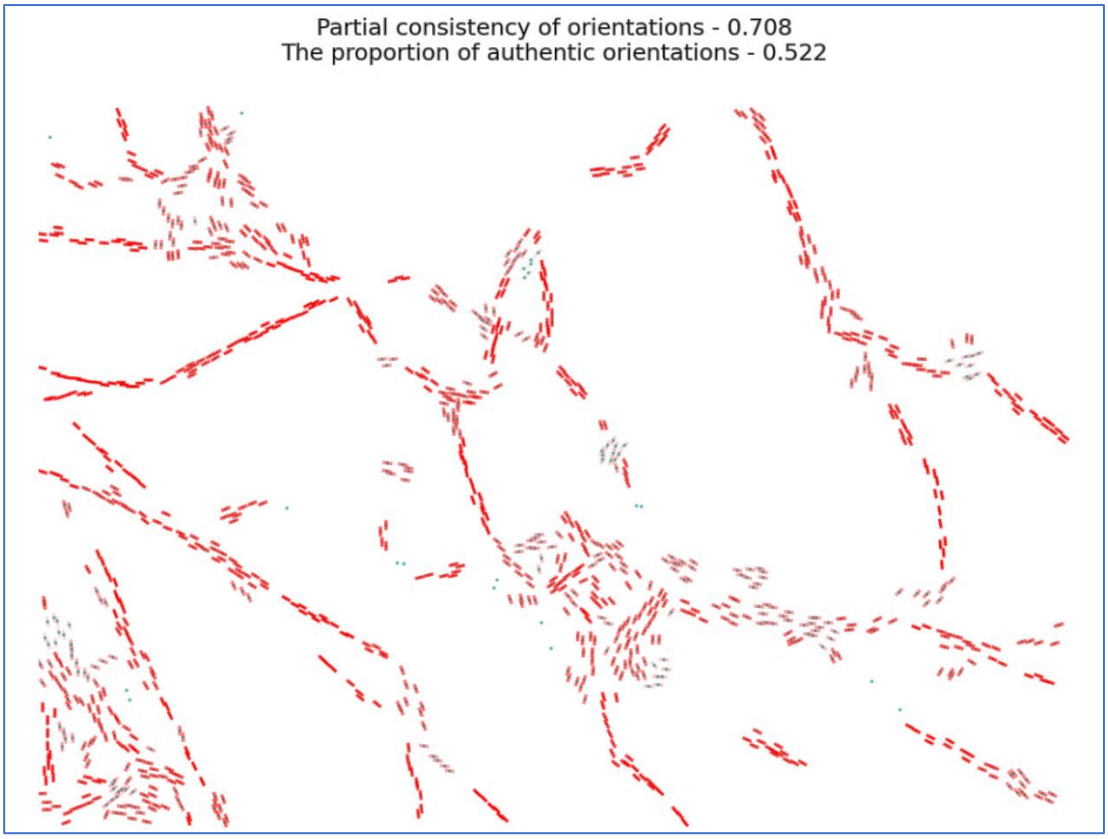


Figure 14 – Results of constructing lines for the maximum number of nanoparticles in a local group $s = 6$. The arrangement of the particles in the SEM image:
a) ordered (S1-42); b) disordered (S3-157)

Figure 15 shows the results of the calculation of the orientations of local groups for the maximum number of nanoparticles in a local group $s = 10$. The other parameters are unchanged.

a)



b)

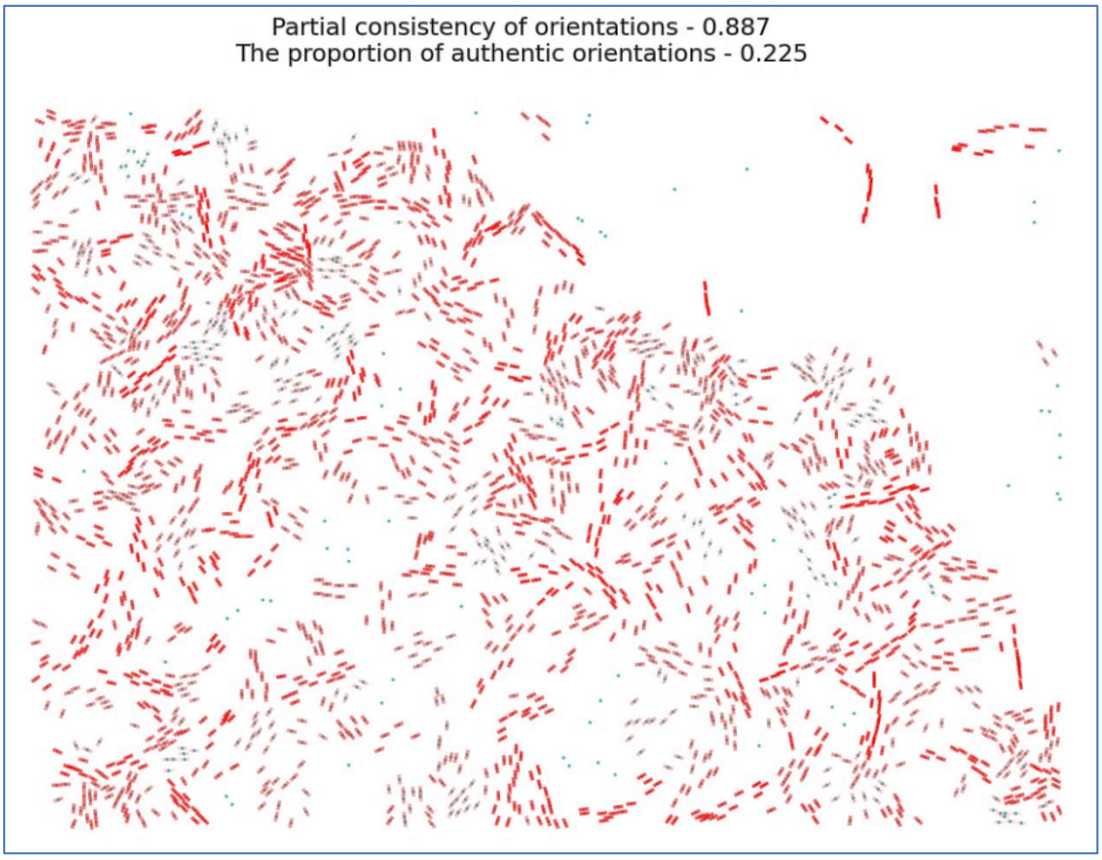


Figure 15 – Results of calculating the orientations of local groups for the maximum number of nanoparticles in a local group $s = 10$. The arrangement of the particles in the SEM image: a) ordered (S1-42); b) disordered (S3-157)

Figure 16 shows the results of the constructing lines for the maximum number of nanoparticles in a local group $s = 10$. The other parameters are unchanged.

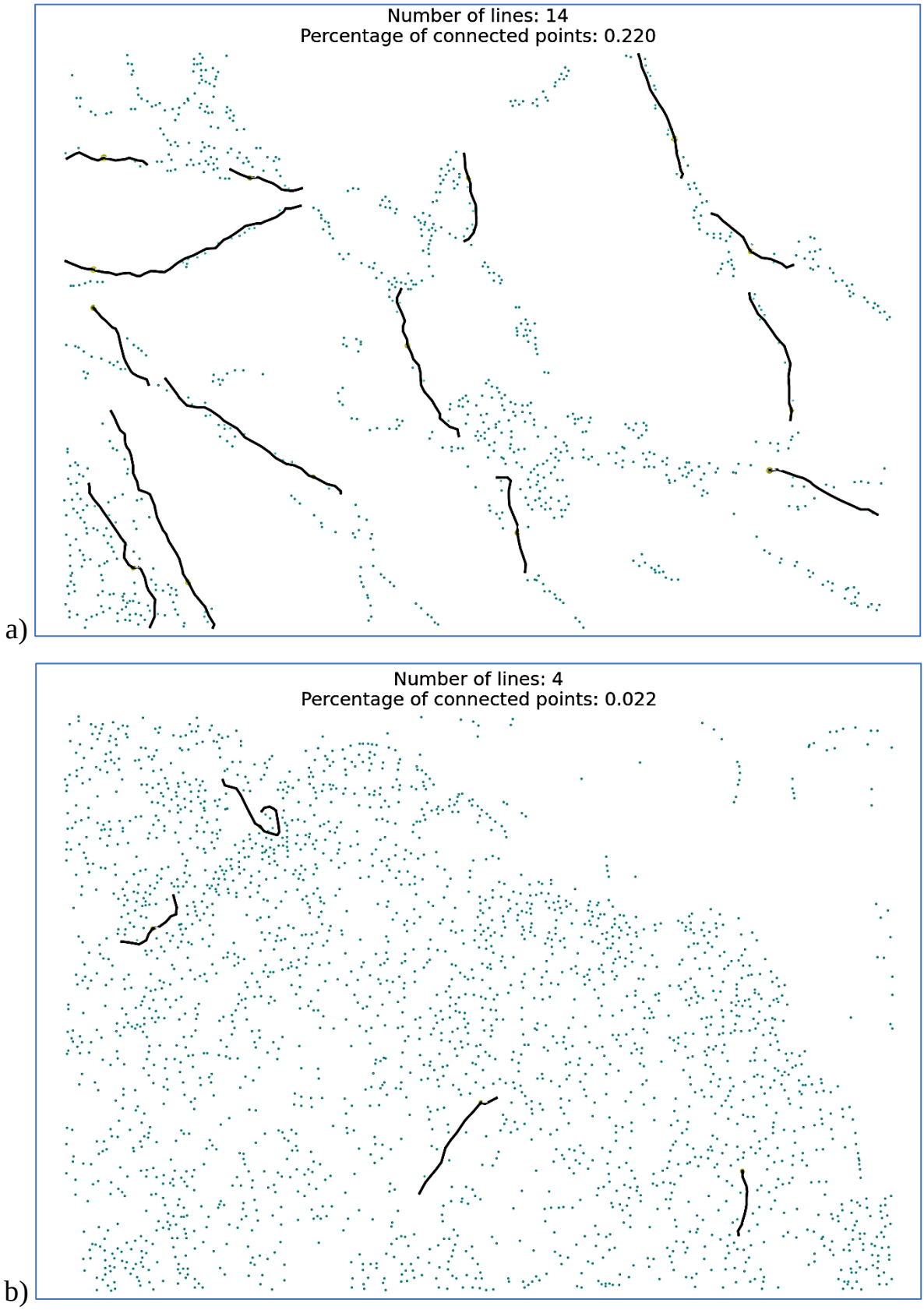
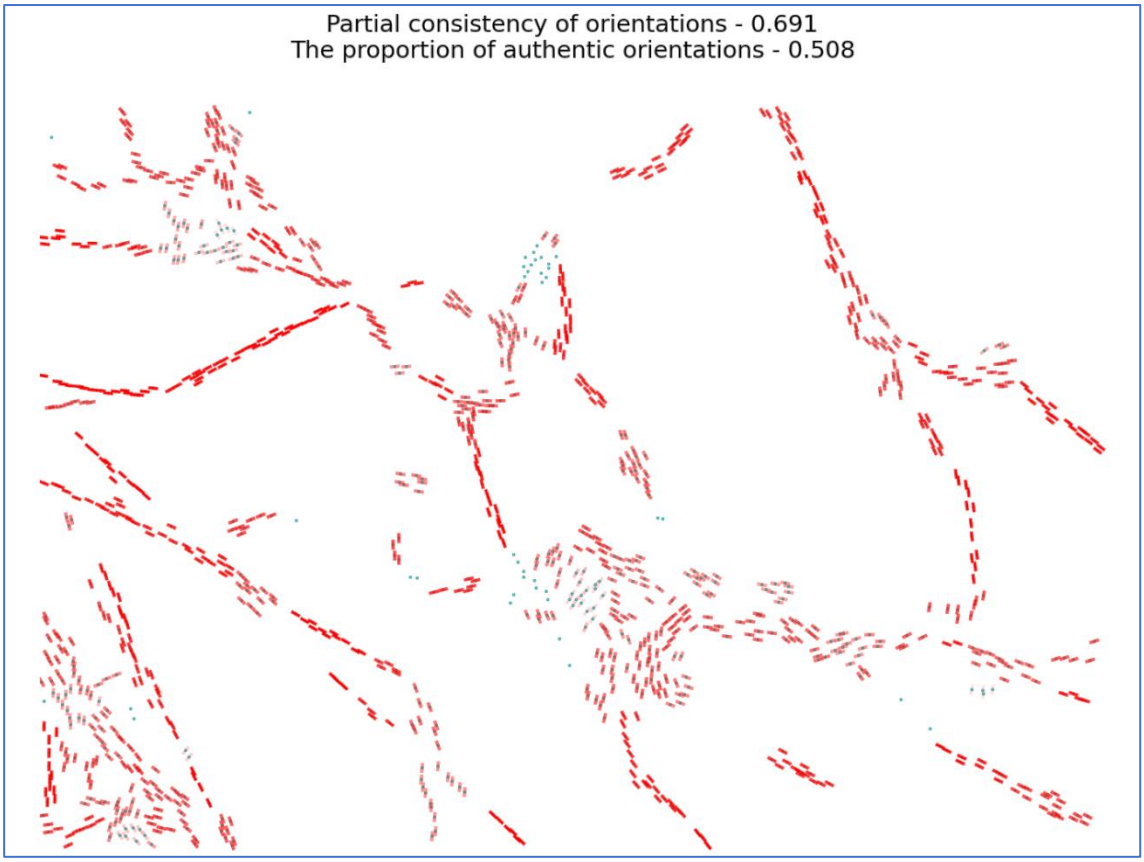


Figure 16 – Results of constructing lines for the maximum number of nanoparticles in a local group $s = 10$. The arrangement of the particles in the SEM image:
a) ordered (S1-42); b) disordered (S3-157)

Figure 17 shows the results of the calculation of the orientations of local groups for the maximum number of nanoparticles in a local group $s = 15$. The other parameters are unchanged.

a)



b)

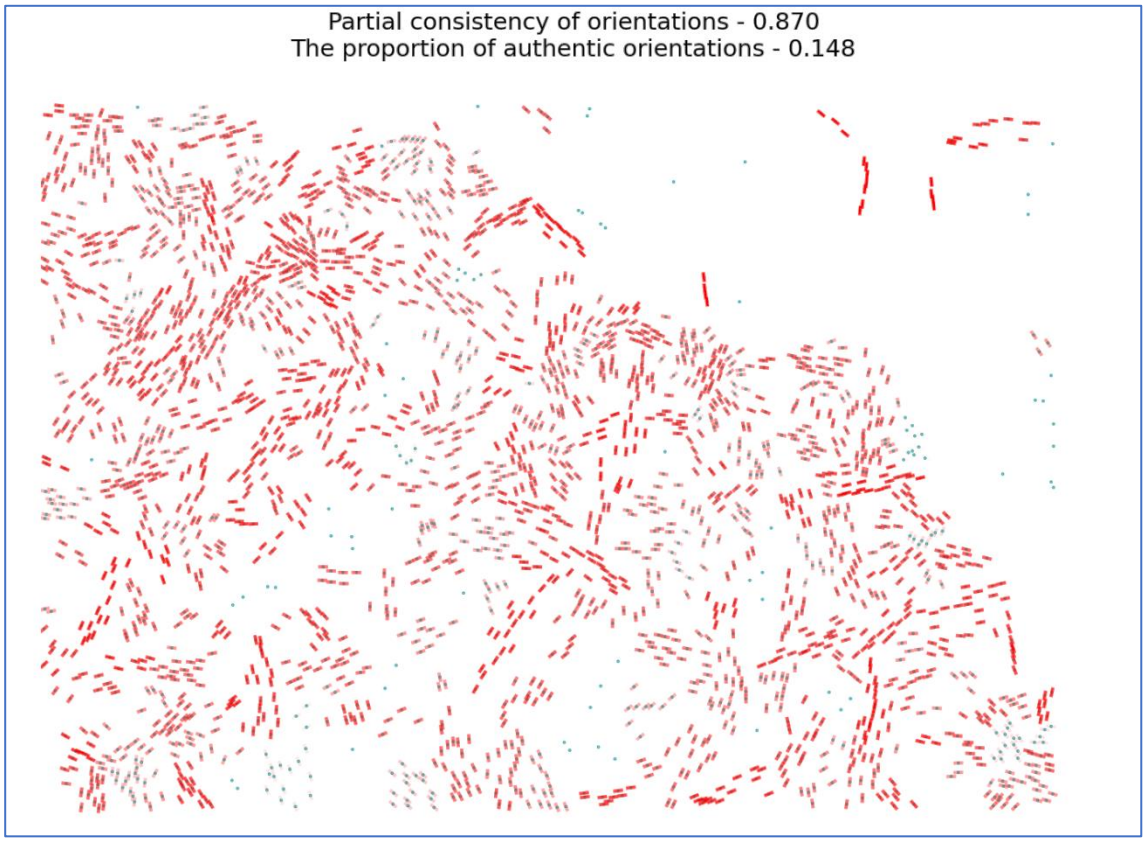


Figure 17 – Results of calculating the orientations of local groups for the maximum number of nanoparticles in a local group $s = 15$. The arrangement of the particles in the SEM image: a) ordered (S1-42); b) disordered (S3-157)

Figure 18 shows the results of constructing lines for the maximum number of nanoparticles in a local group $s = 15$. The other parameters are unchanged.

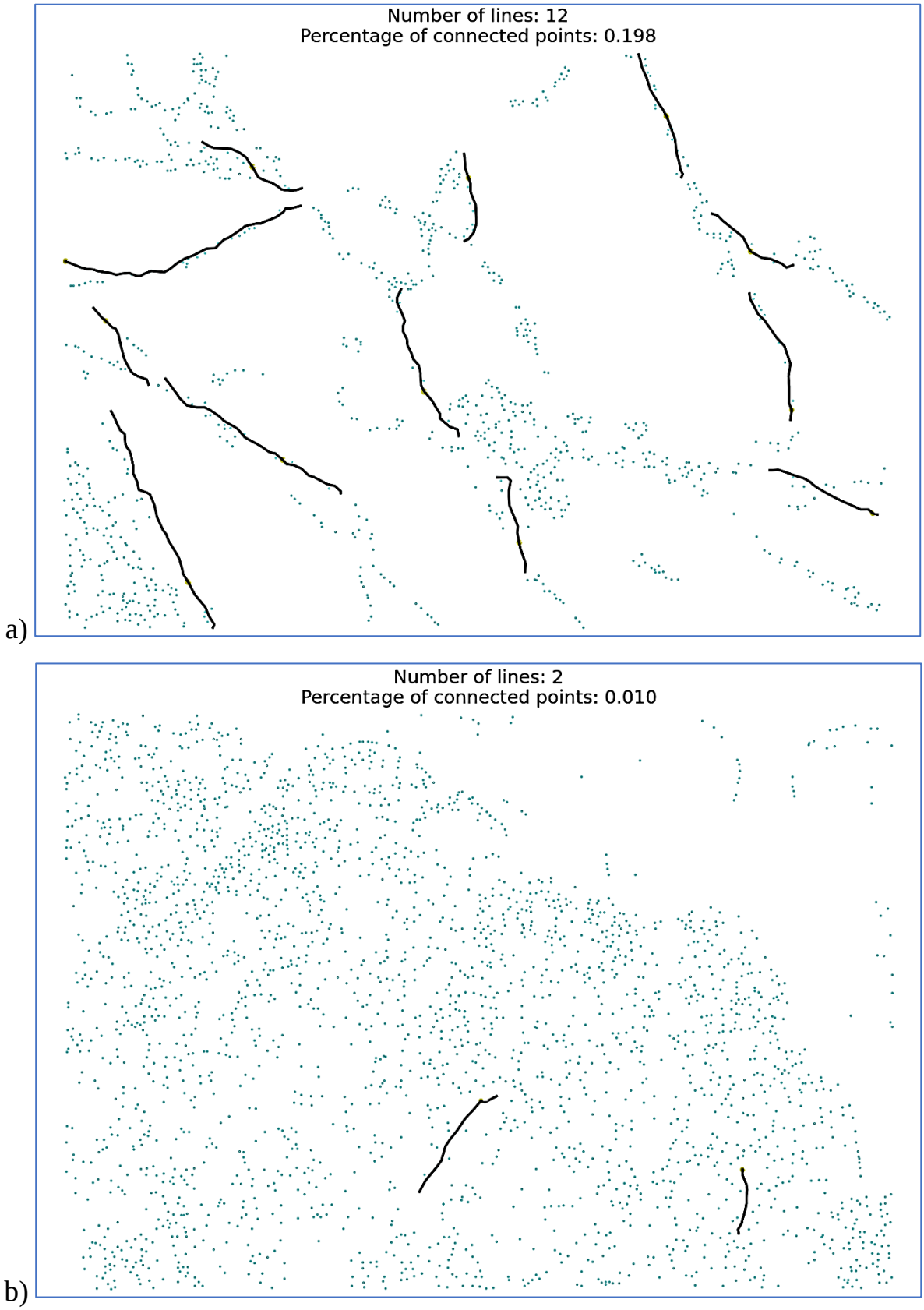
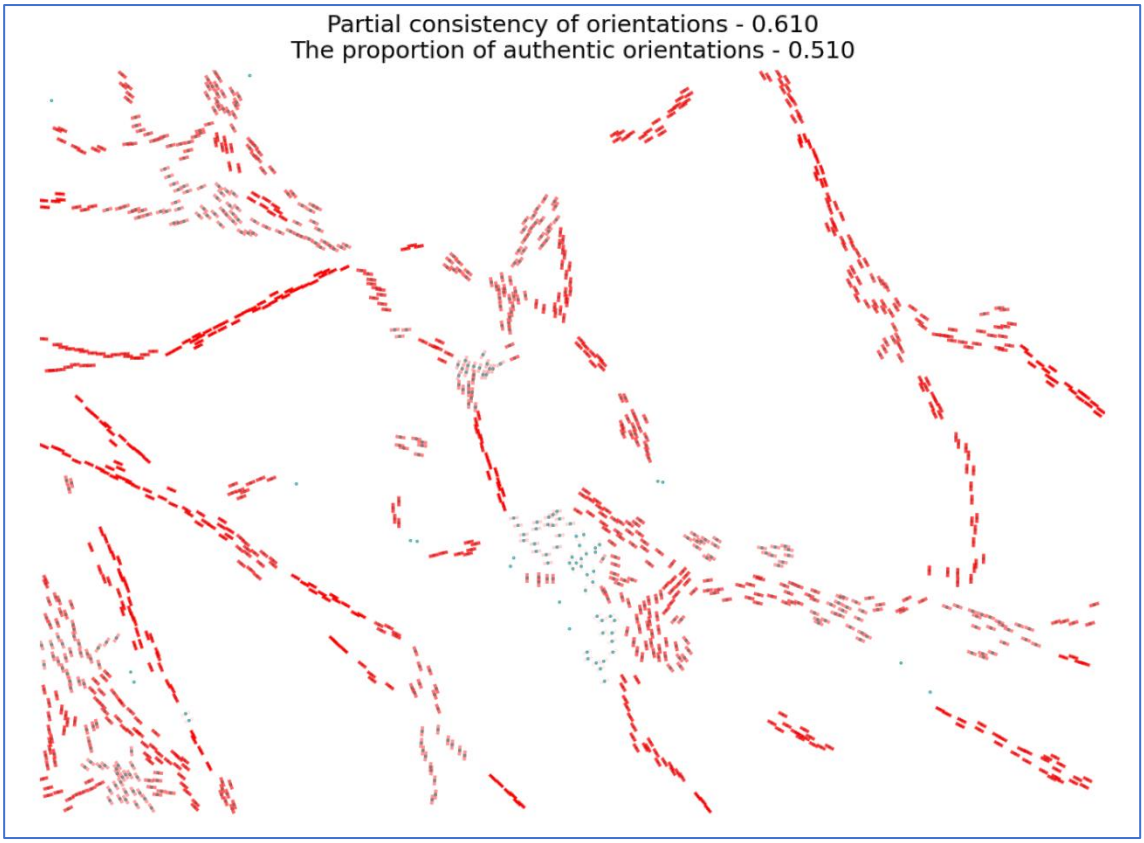


Figure 18 – Results of constructing lines for the maximum number of nanoparticles in a local group $s = 15$. The arrangement of the particles in the SEM image:
a) ordered (S1-42); b) disordered (S3-157)

Figure 19 shows the results of the calculation of the orientations of local groups for the maximum number of nanoparticles in a local group $s = 20$. The other parameters are unchanged.

a)



b)

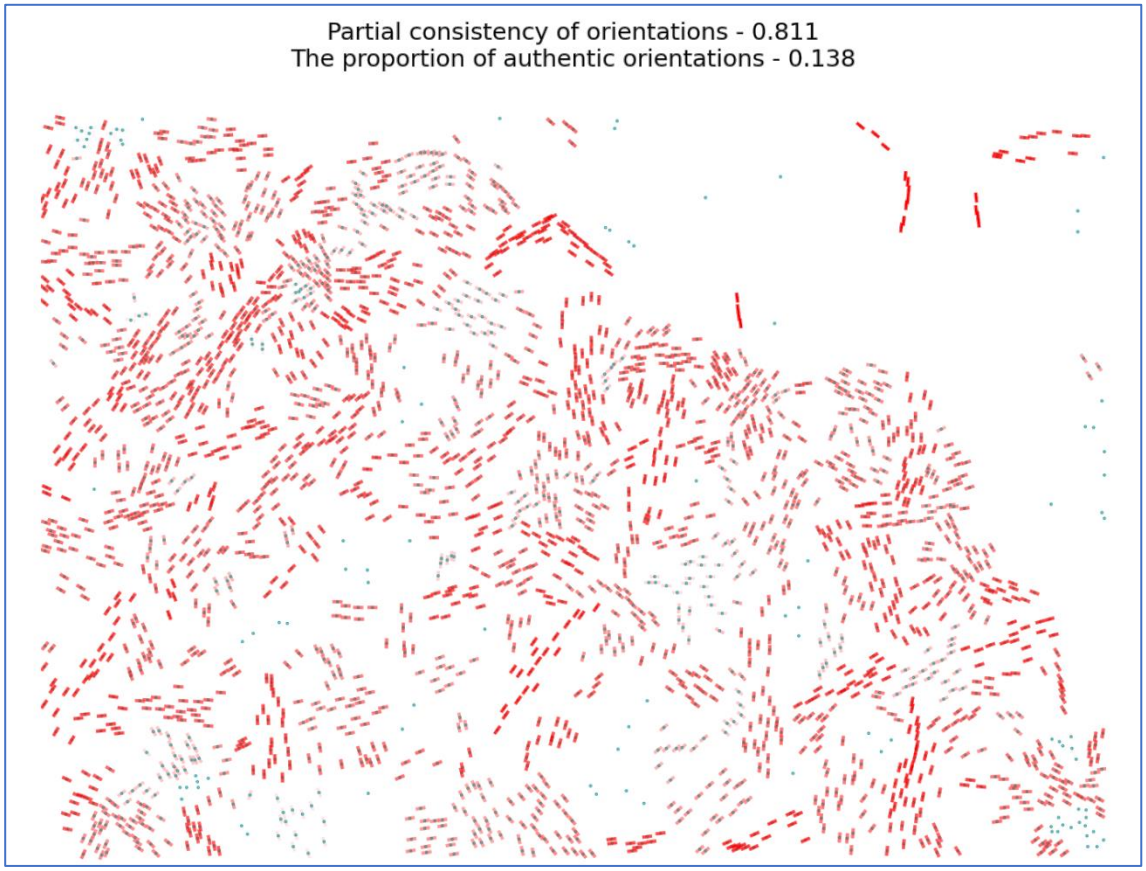
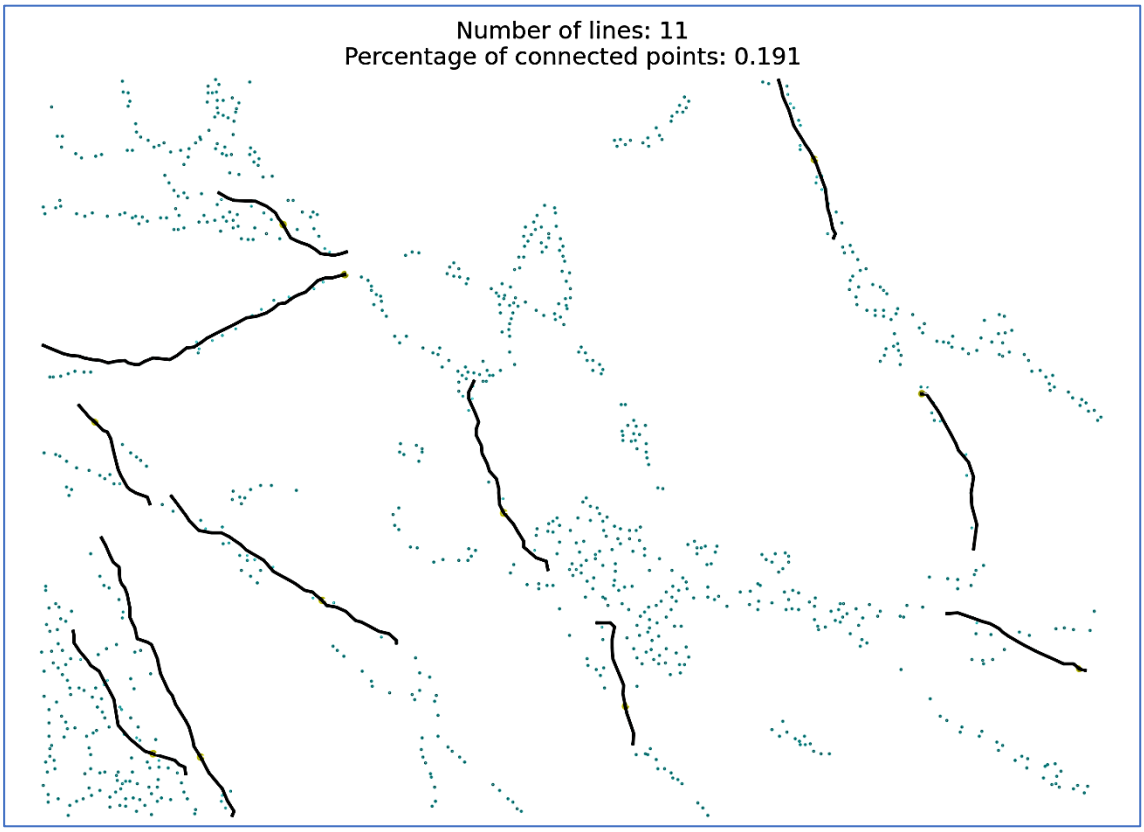


Figure 19 – Results of calculating the orientations of local groups for the maximum number of nanoparticles in a local group $s = 20$. The arrangement of the particles in the SEM image: a) ordered (S1-42); b) disordered (S3-157)

Figure 20 shows the results of the constructing lines for the maximum number of nanoparticles in a local group $s = 20$. The other parameters are unchanged.

a)



b)

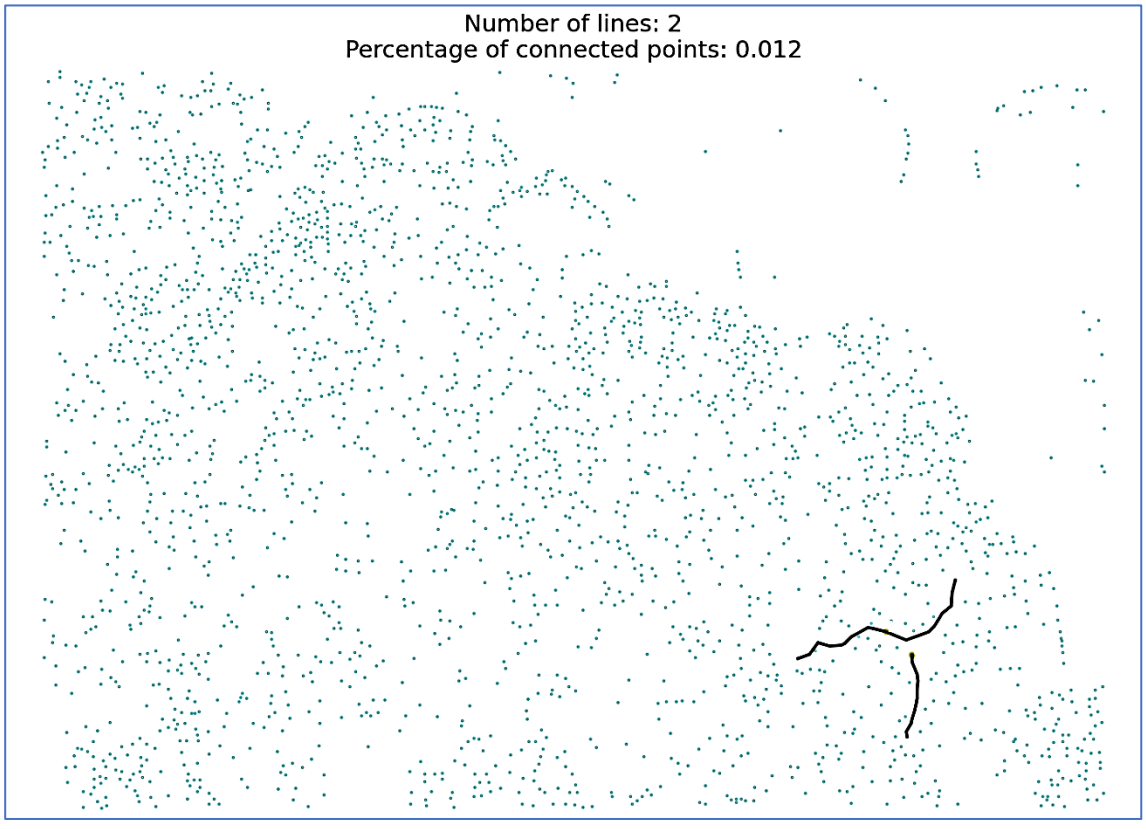
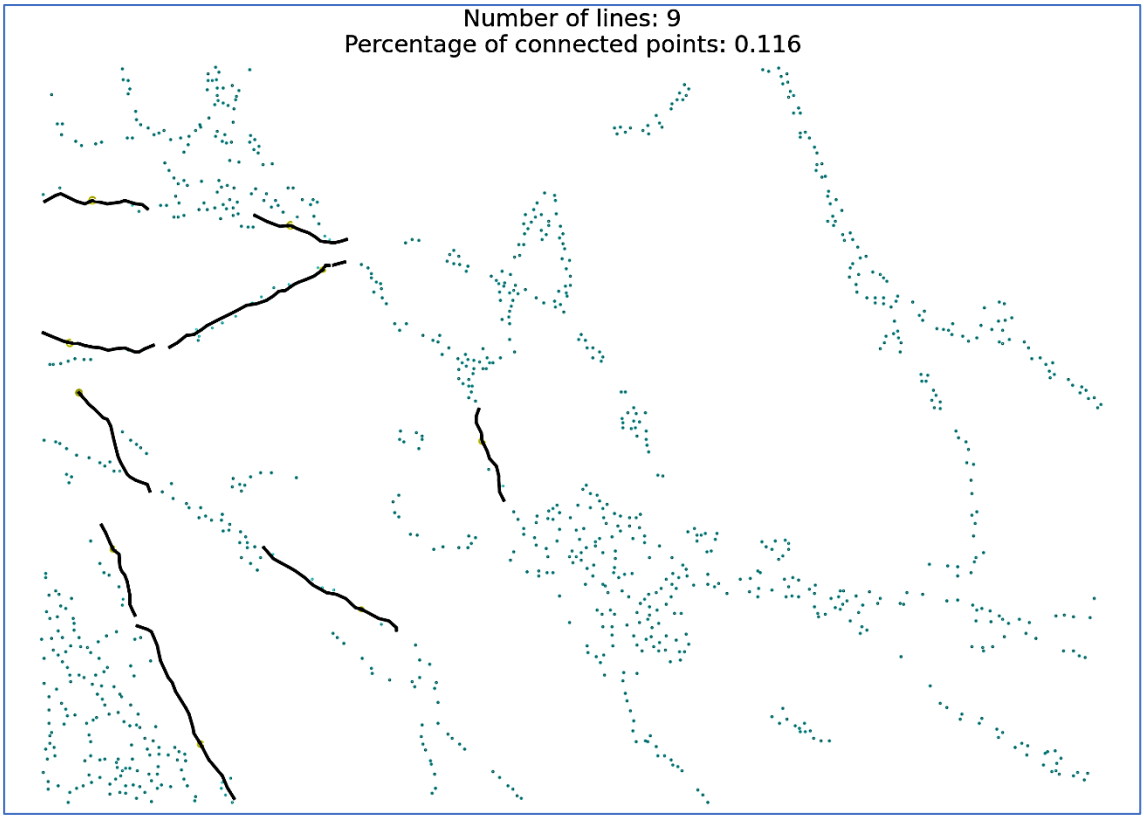


Figure 20 – Results of constructing lines for the maximum number of nanoparticles in a local group $s = 20$. The arrangement of the particles in the SEM image:
a) ordered (S1-42); b) disordered (S3-157)

Figure 21 shows the results of constructing lines for the proportionality coefficient of the proposed metric of prevailing directions $C = 0.005$. The other parameters are unchanged.

a)



b)

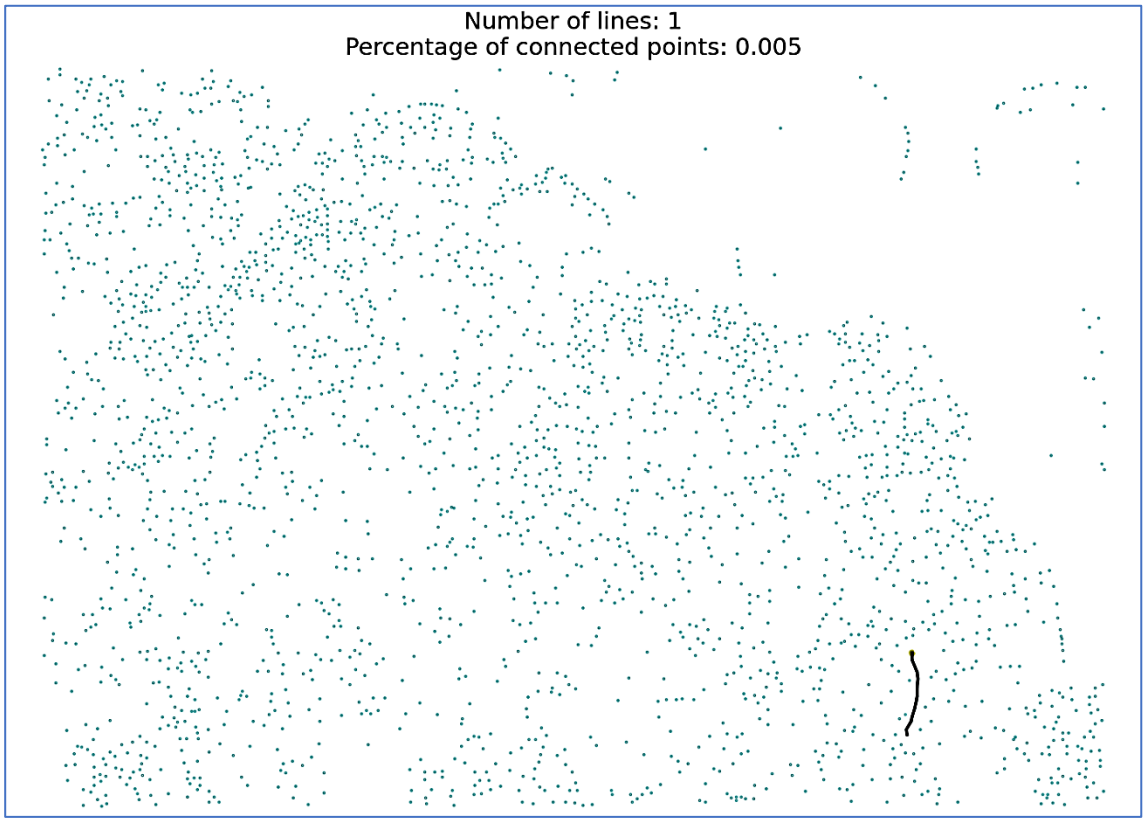
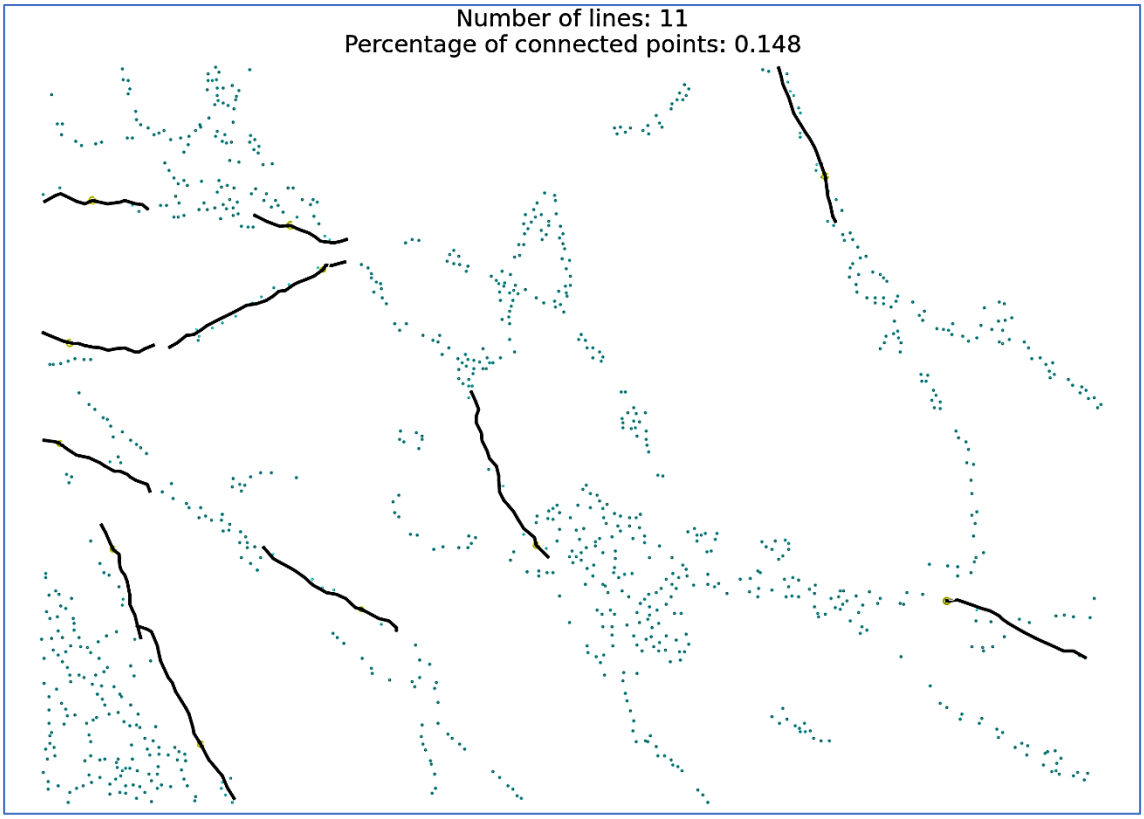


Figure 21 – Results of constructing lines for the proportionality coefficient of the proposed metric of prevailing directions $C = 0.005$. The arrangement of the particles in the SEM image: a) ordered (S1-42); b) disordered (S3-157)

Figure 22 shows the results of constructing lines for the proportionality coefficient of the proposed metric of prevailing directions $C = 0.01$. The other parameters are unchanged.

a)



b)

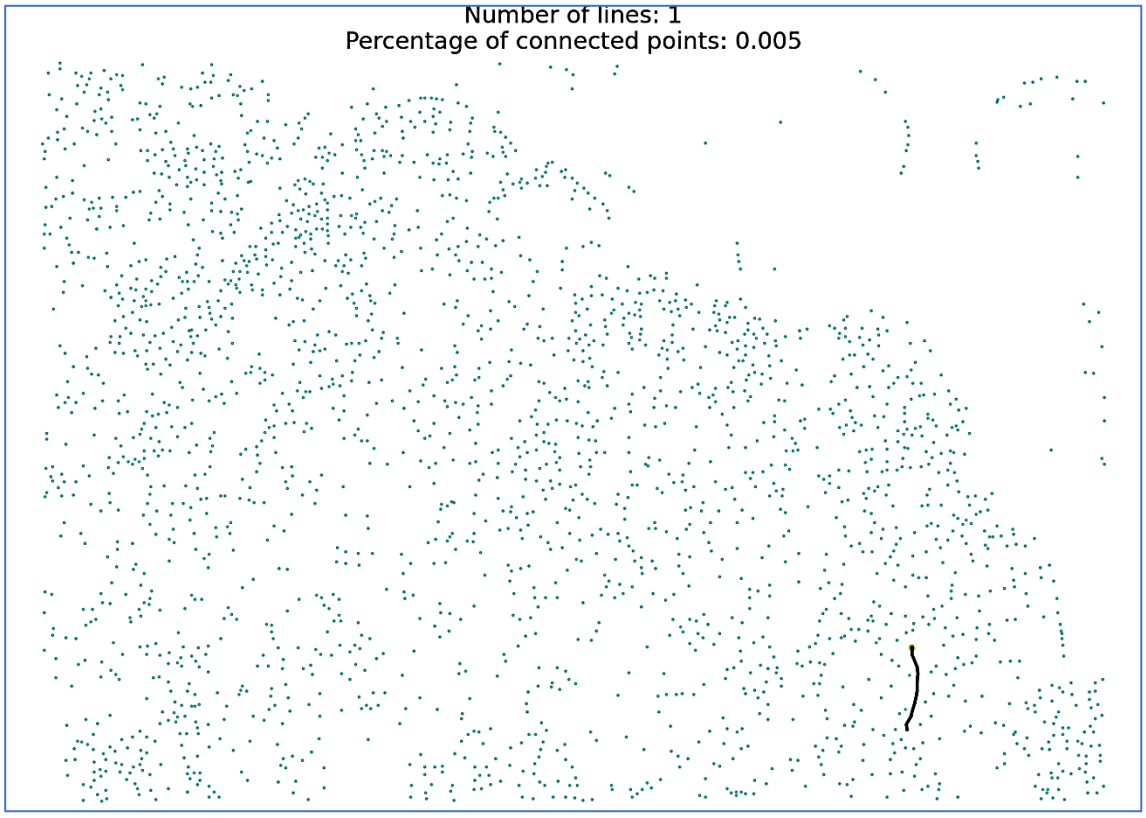


Figure 22 – Results of constructing lines for the proportionality coefficient of the proposed metric of prevailing directions $C = 0.01$. The arrangement of the particles in the SEM image: a) ordered (S1-42); b) disordered (S3-157)

Figure 23 shows the results of constructing lines for the proportionality coefficient of the proposed metric of prevailing directions $C = 0.015$. The other parameters are unchanged.

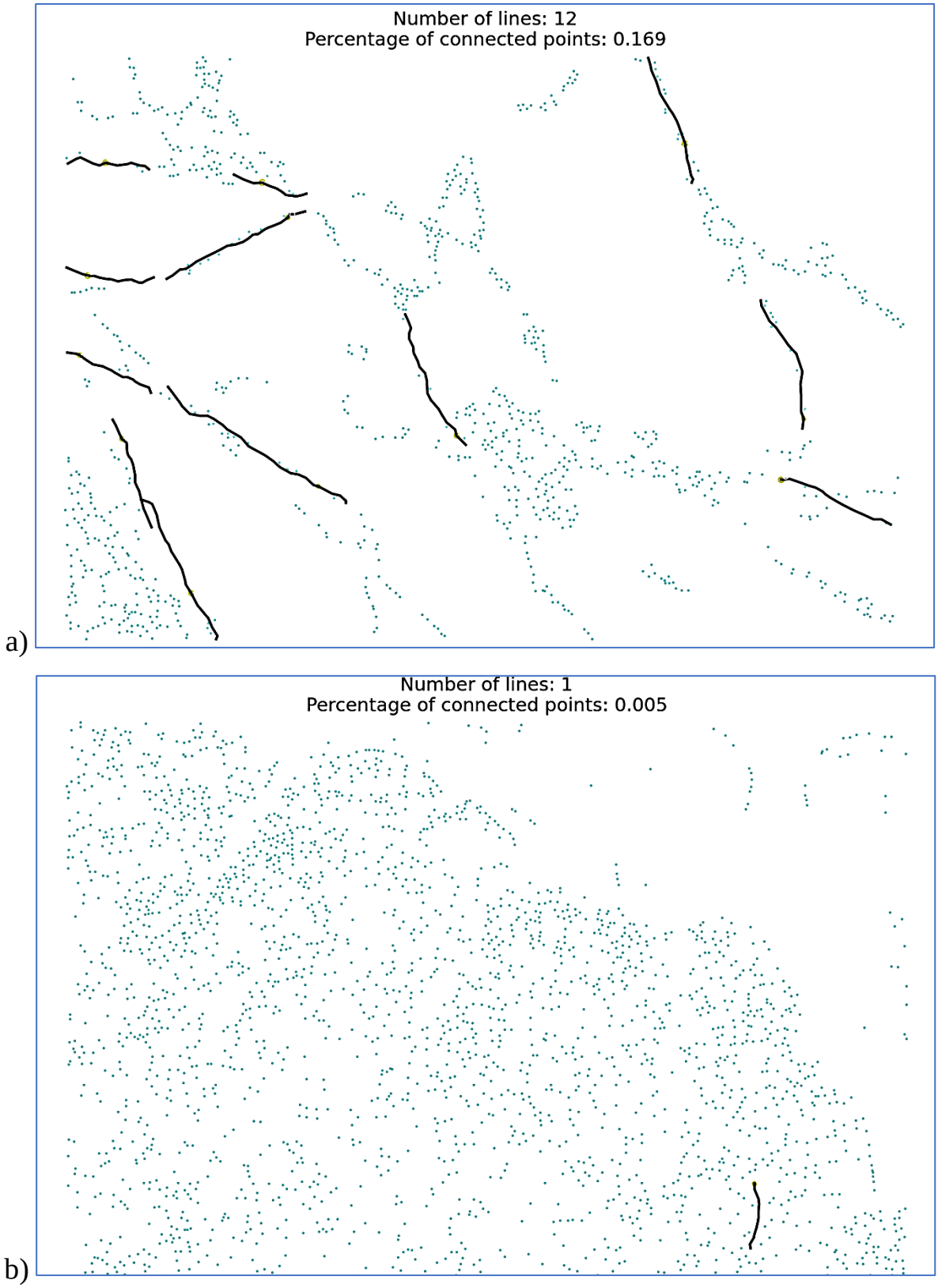
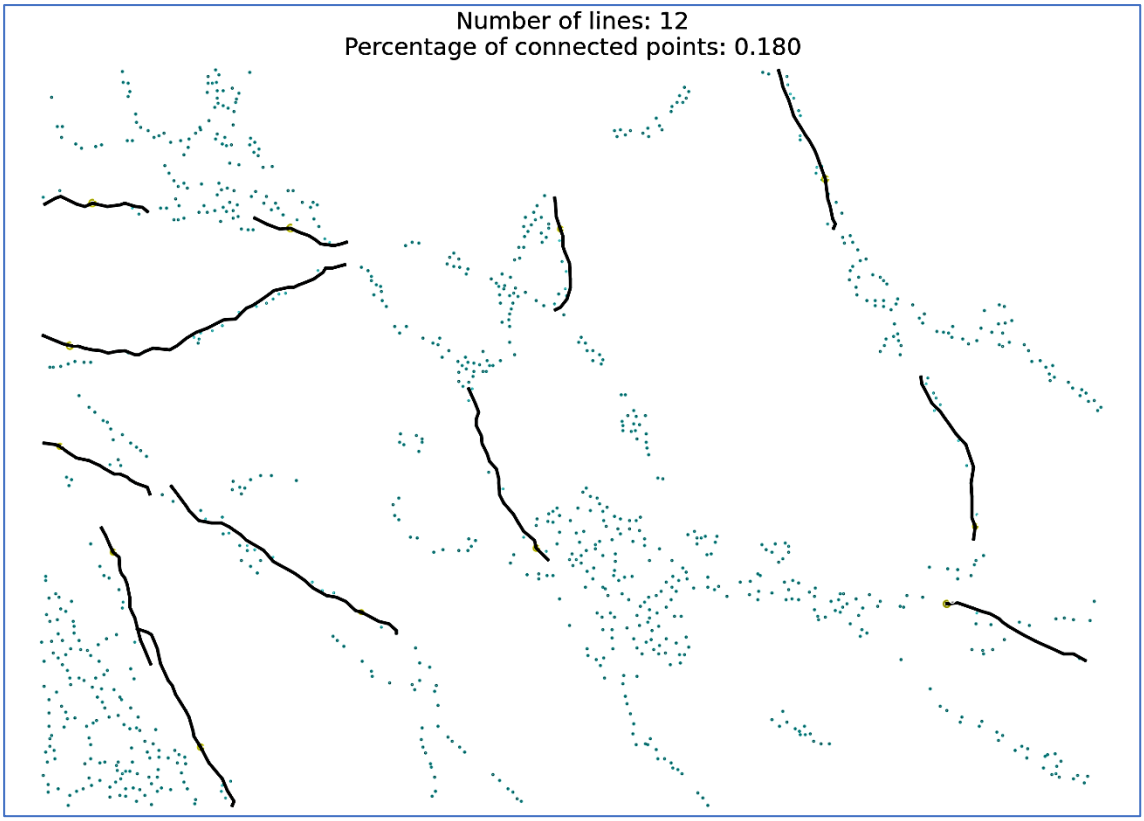


Figure 23 – Results of constructing lines for the proportionality coefficient of the proposed metric of prevailing directions $C = 0.015$. The arrangement of the particles in the SEM image: a) ordered (S1-42); b) disordered (S3-157)

Figure 24 shows the results of constructing lines for the proportionality coefficient of the proposed metric of prevailing directions $C = 0.02$. The other parameters are unchanged.

a)



b)

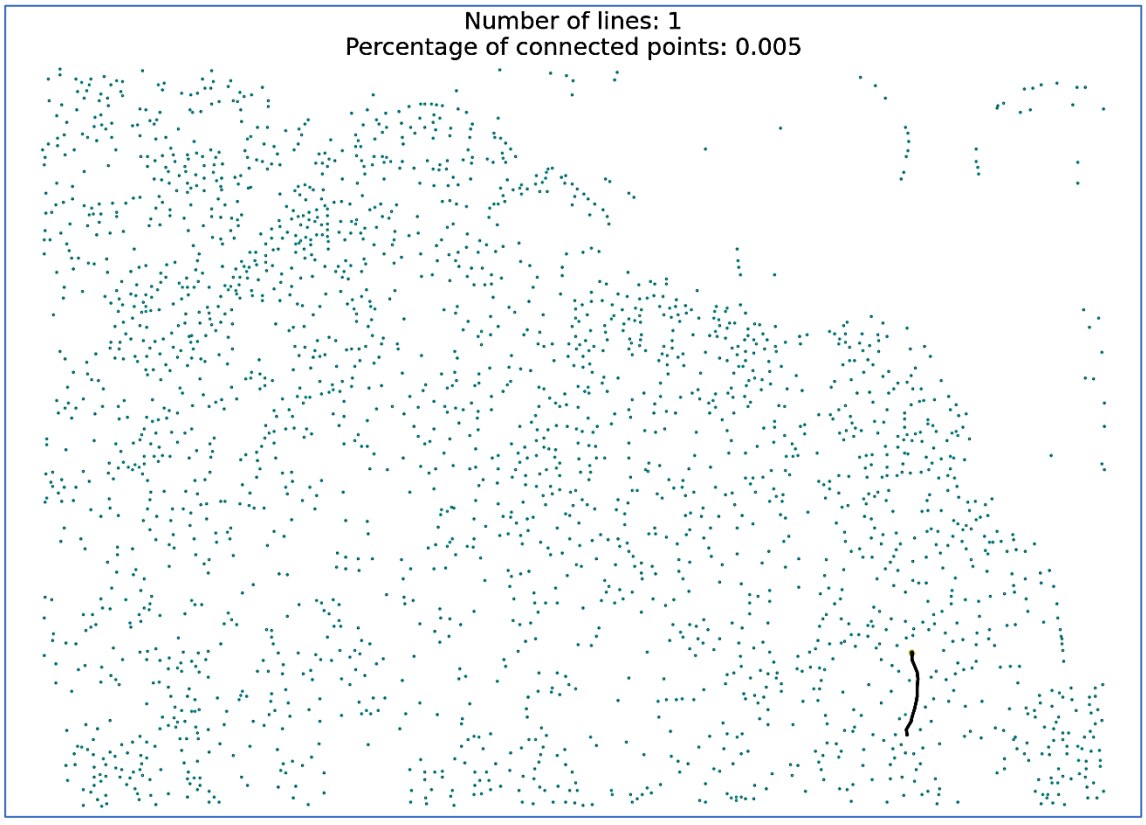
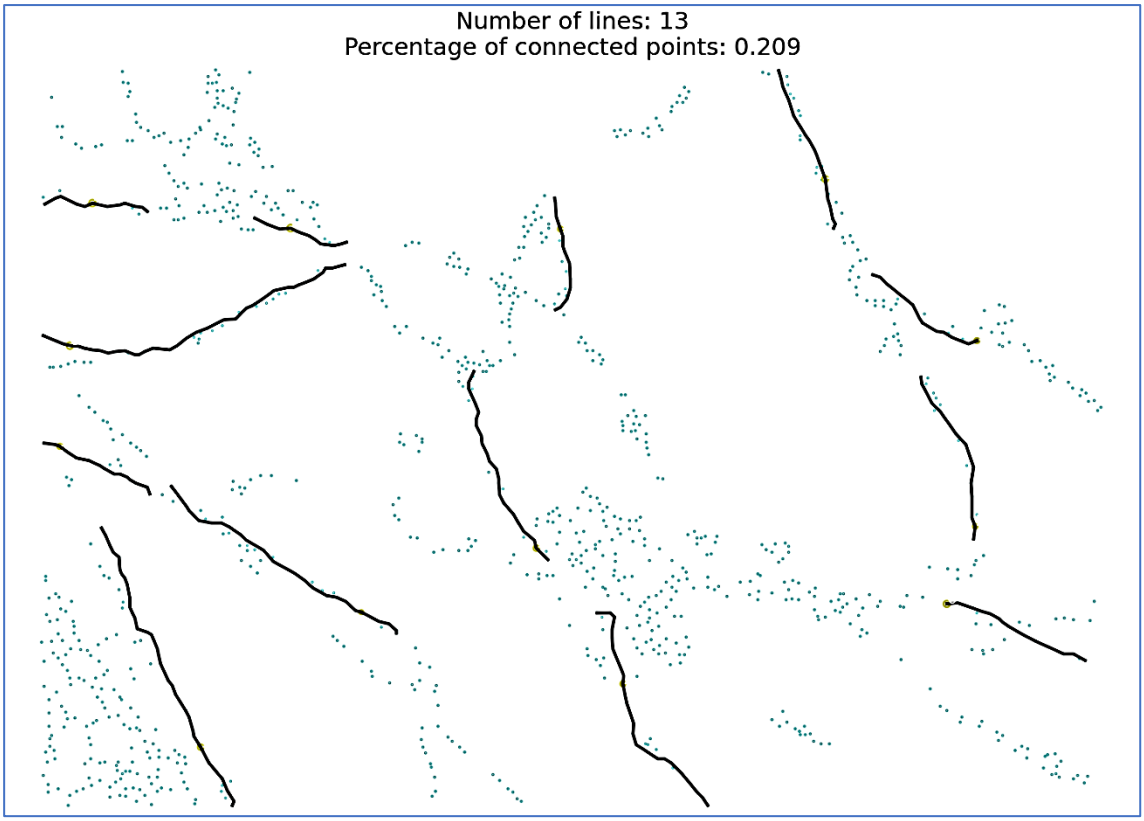


Figure 24 – Results of constructing lines for the proportionality coefficient of the proposed metric of prevailing directions $C = 0.02$. The arrangement of the particles in the SEM image: a) ordered (S1-42); b) disordered (S3-157)

Figure 25 shows the results of constructing lines for the proportionality coefficient of the proposed metric of prevailing directions $C = 0.0225$. The other parameters are unchanged.

a)



b)

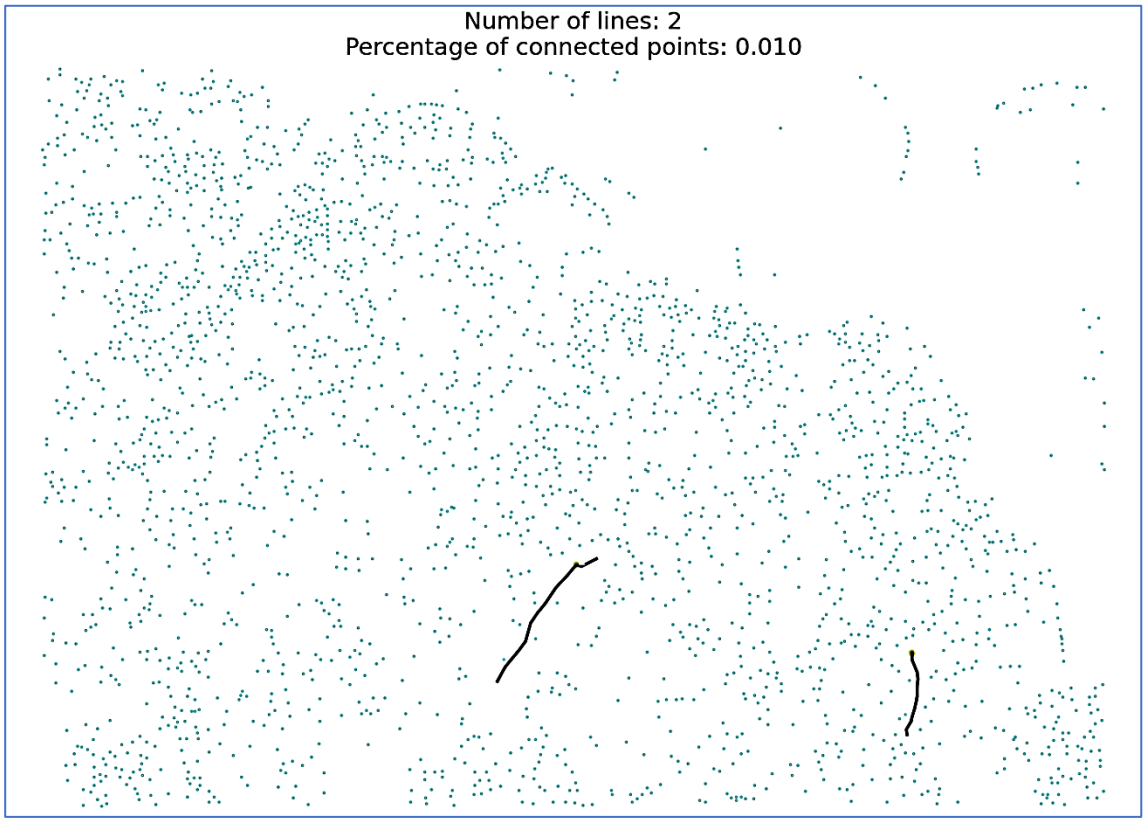
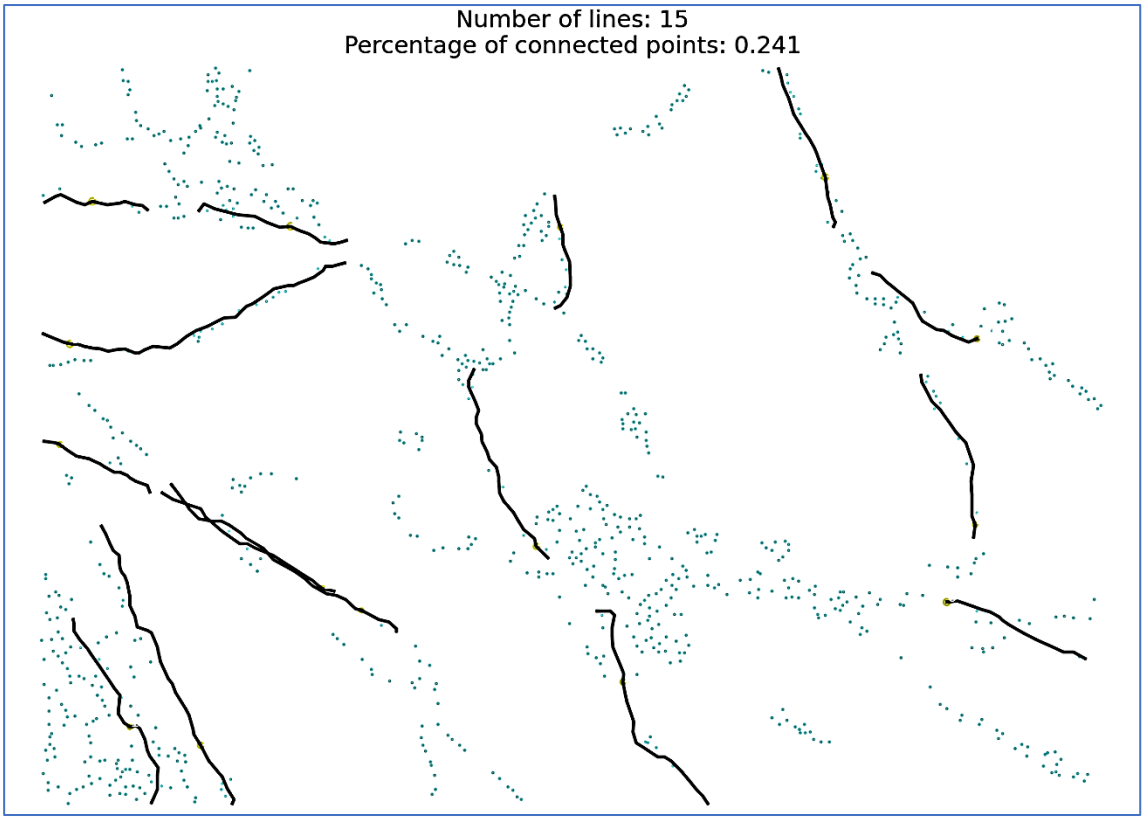


Figure 25 – Results of constructing lines for the proportionality coefficient of the proposed metric of prevailing directions $C = 0.0225$. The arrangement of the particles in the SEM image: a) ordered (S1-42); b) disordered (S3-157)

Figure 26 shows the results of constructing lines for the proportionality coefficient of the proposed metric of prevailing directions $C = 0.0275$. The other parameters are unchanged.

a)



b)

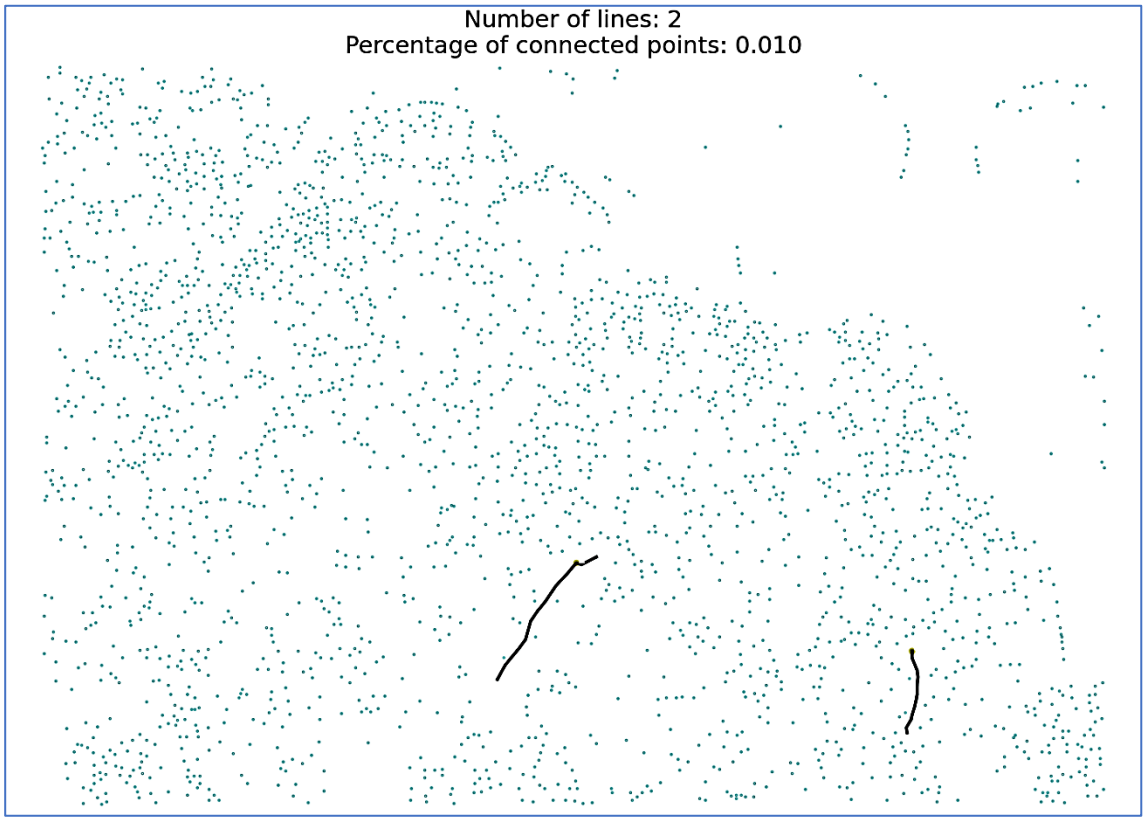
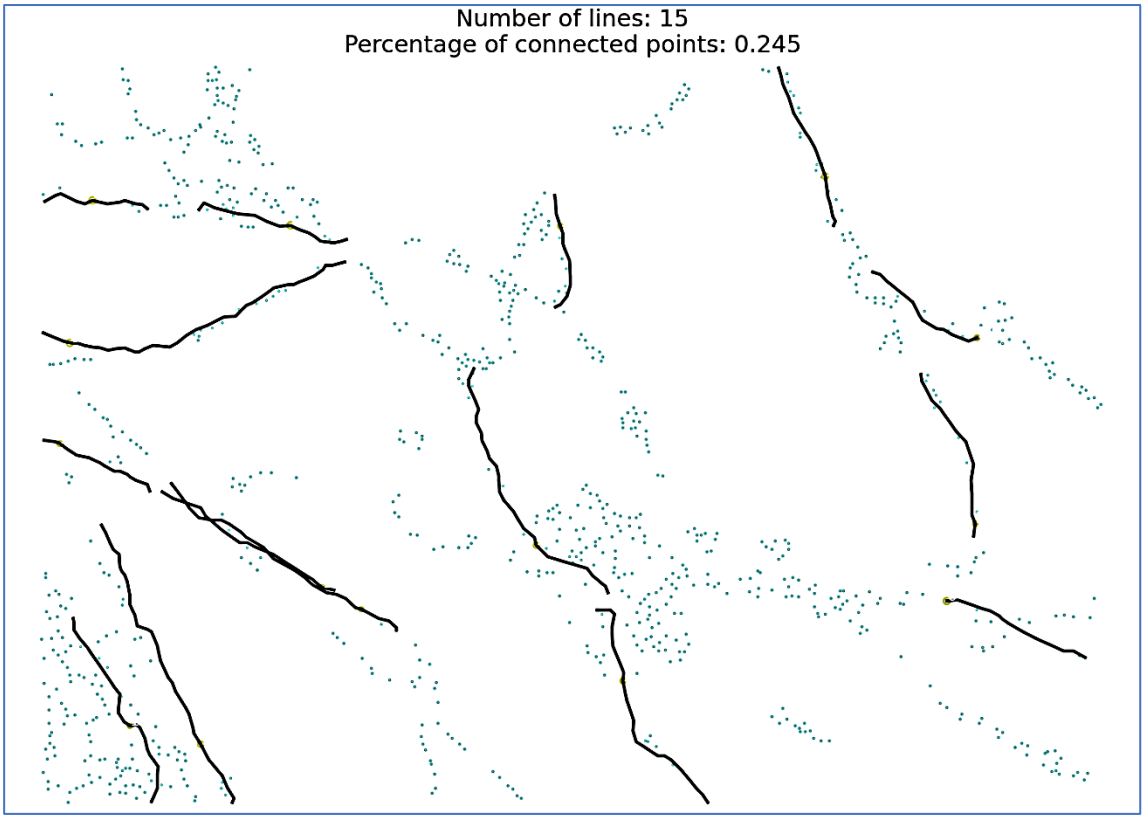


Figure 26 – Results of constructing lines for the proportionality coefficient of the proposed metric of prevailing directions $C = 0.0275$. The arrangement of the particles in the SEM image: a) ordered (S1-42); b) disordered (S3-157)

Figure 27 shows the results of constructing lines for the proportionality coefficient of the proposed metric of prevailing directions $C = 0.03$. The other parameters are unchanged.

a)



b)

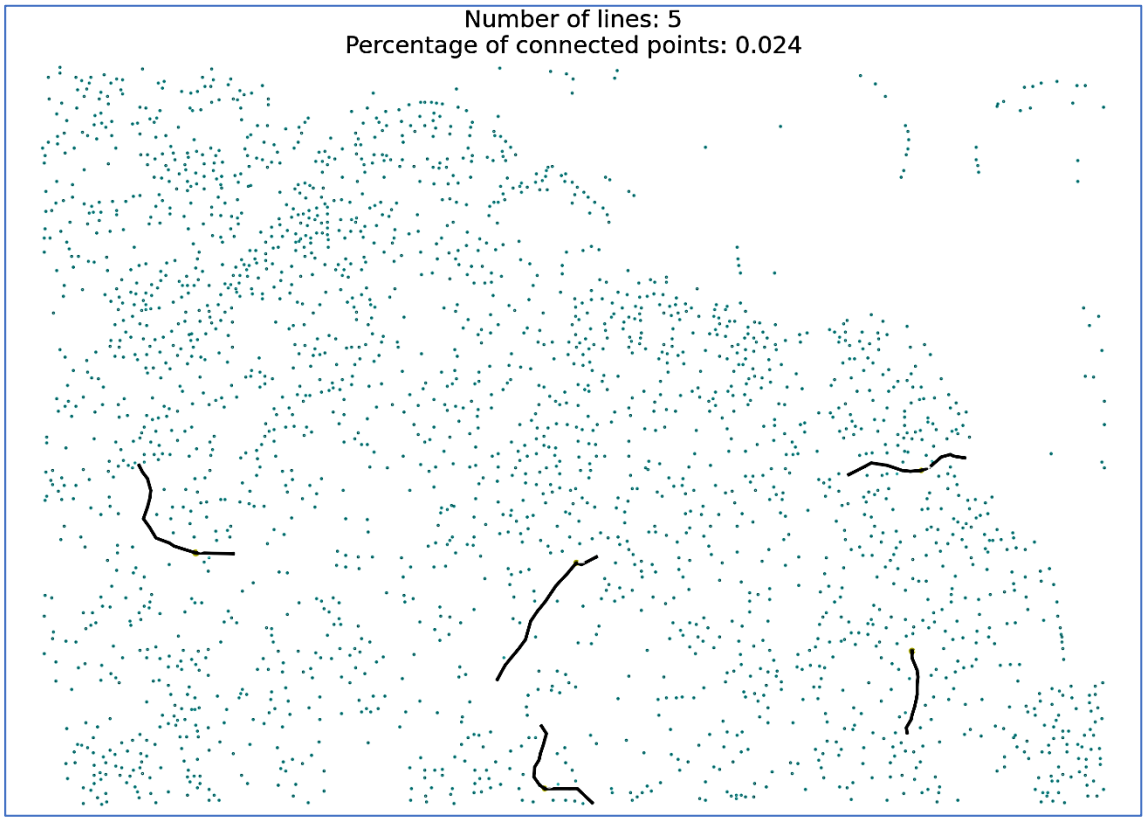
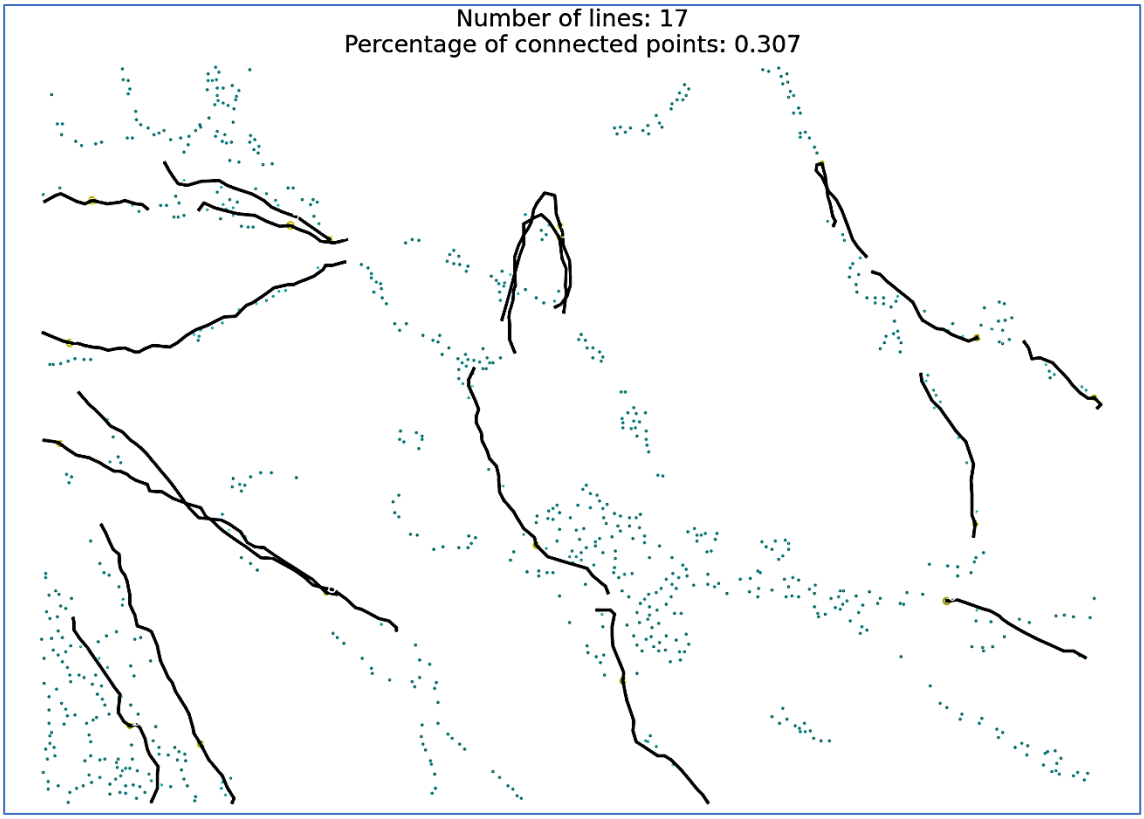


Figure 27 – Results of constructing lines for the proportionality coefficient of the proposed metric of prevailing directions $C = 0.03$. The arrangement of the particles in the SEM image: a) ordered (S1-42); b) disordered (S3-157)

Figure 28 shows the results of constructing lines for the proportionality coefficient of the proposed metric of prevailing directions $C = 0.035$. The other parameters are unchanged.

a)



b)

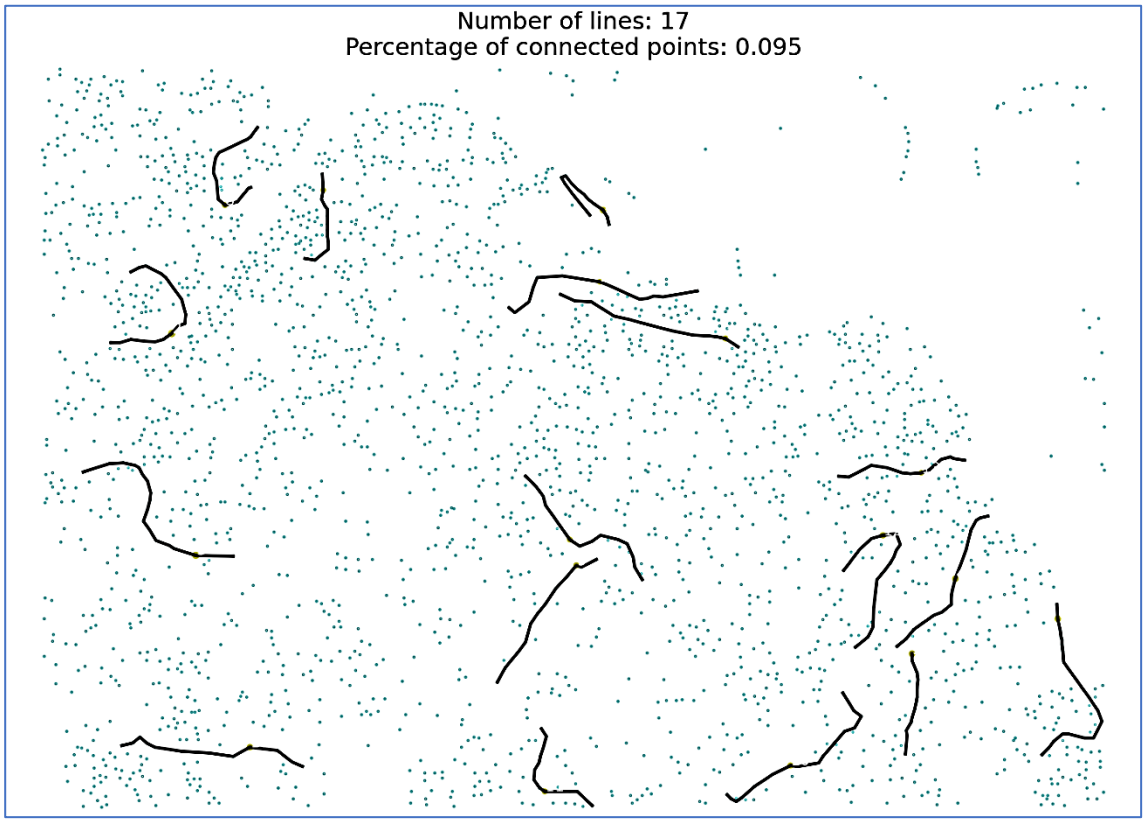
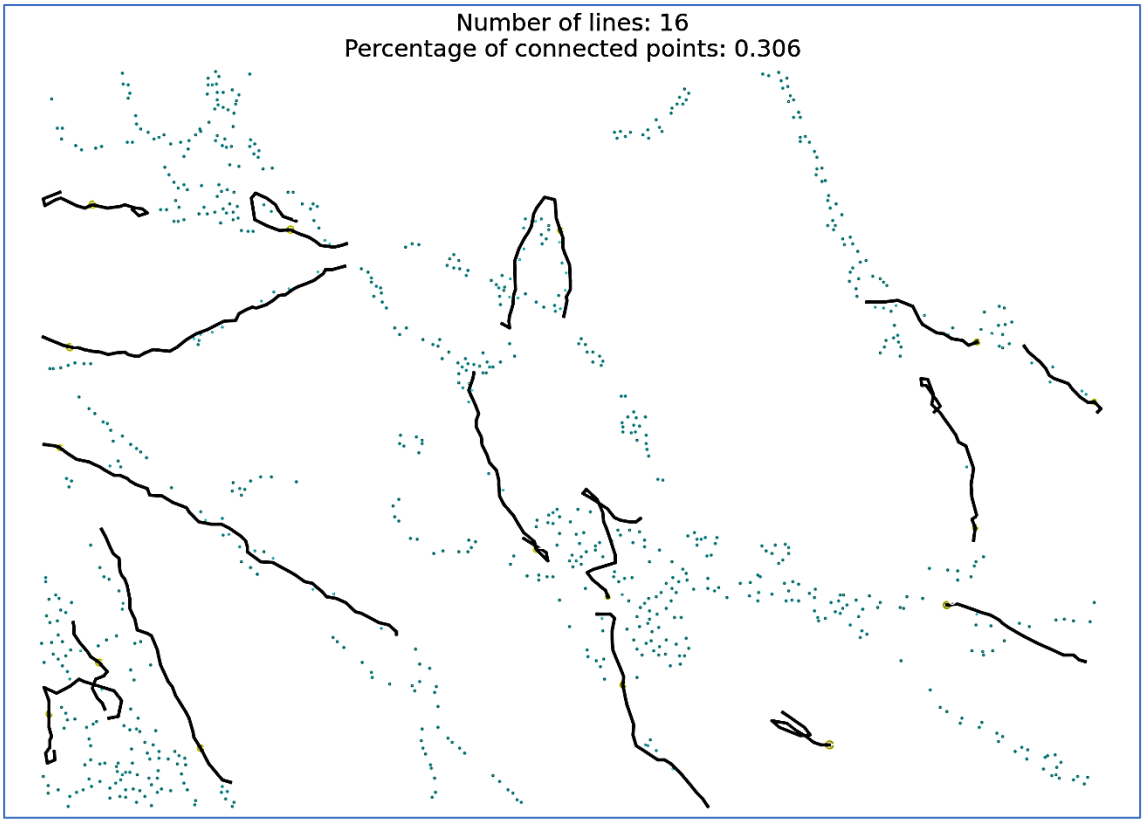


Figure 28 – Results of constructing lines for the proportionality coefficient of the proposed metric of prevailing directions $C = 0.035$. The arrangement of the particles in the SEM image: a) ordered (S1-42); b) disordered (S3-157)

Figure 29 shows the results of constructing lines for the weight coefficient of the angular coaxiality in the metric of prevailing directions to ensure line smoothness $w_{coax} = 1.0$. The other parameters are unchanged.

a)



b)

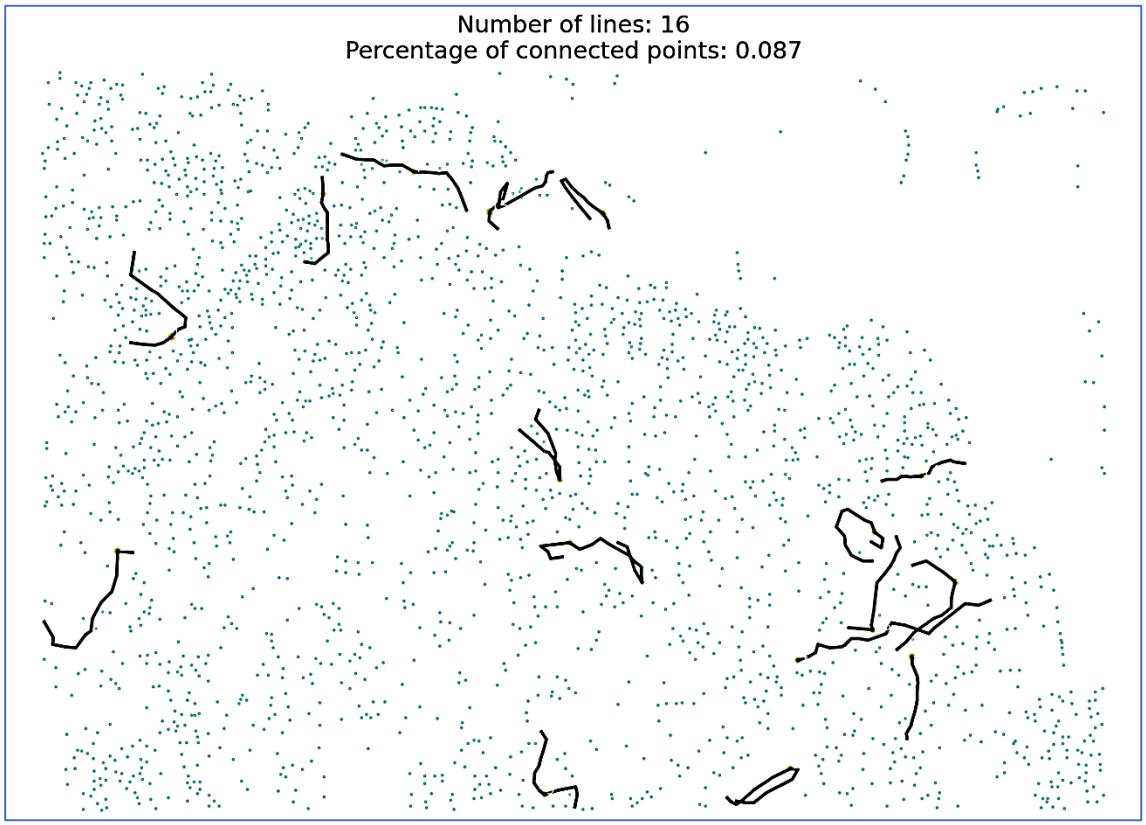
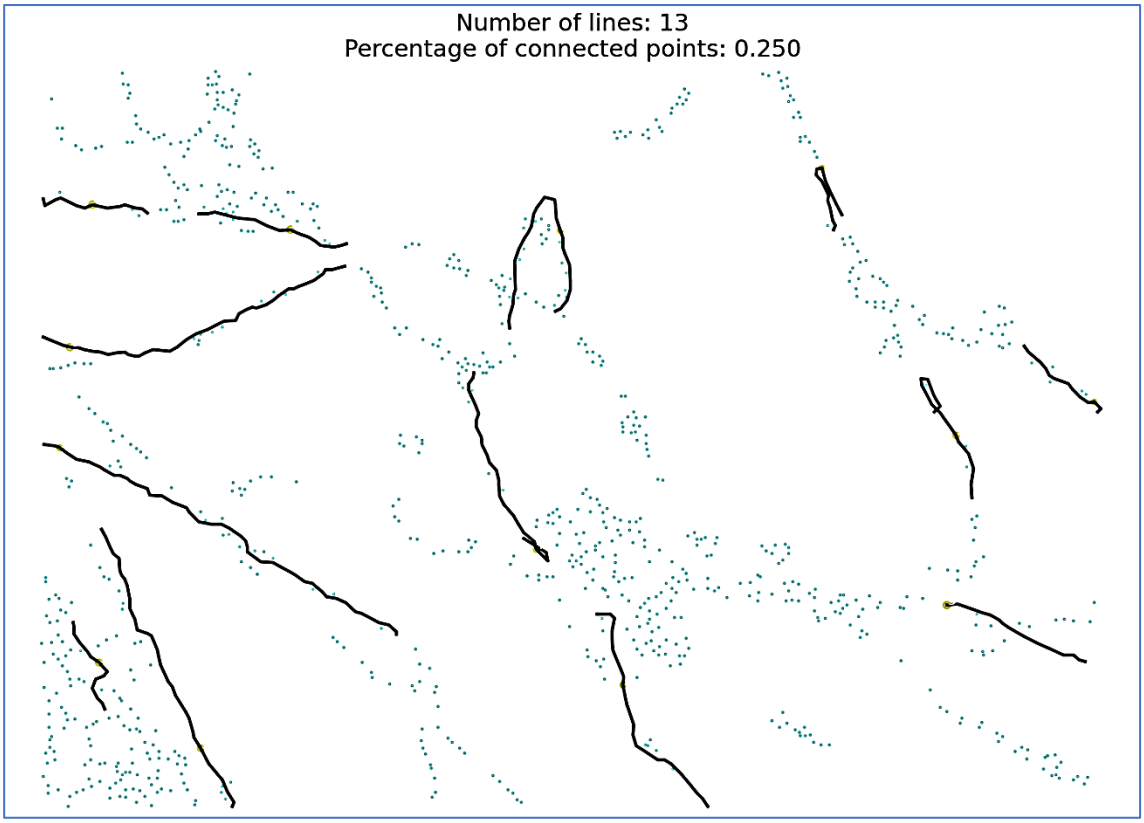


Figure 29 – Results of constructing lines for the weight coefficient of the angular coaxiality in the metric of prevailing directions to ensure line smoothness $w_{coax} = 1.0$. The arrangement of the particles in the SEM image: a) ordered (S1-42); b) disordered (S3-157)

Figure 30 shows the results of constructing lines for the weight coefficient of the angular coaxiality in the metric of prevailing directions to ensure line smoothness $w_{coax} = 1.25$. The other parameters are unchanged.

a)



b)

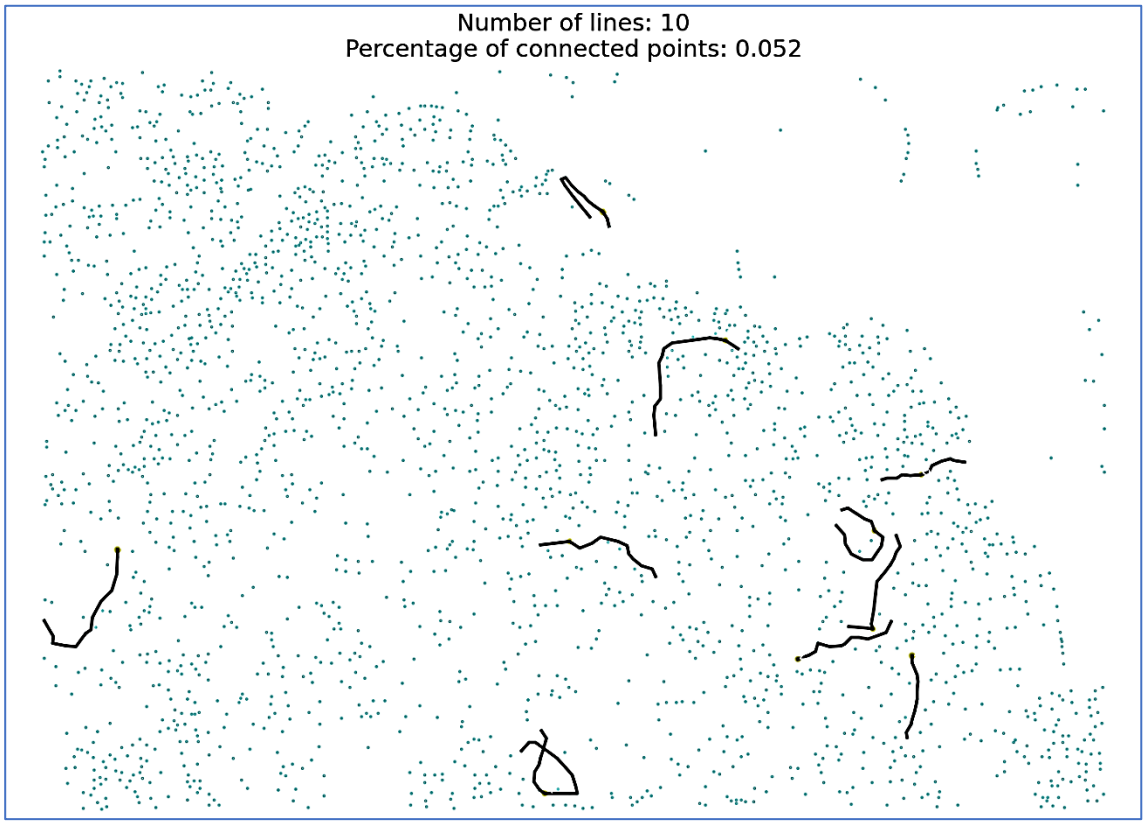


Figure 30 – Results of constructing lines for the weight coefficient of the angular coaxiality in the metric of prevailing directions to ensure line smoothness $w_{coax} = 1.25$. The arrangement of the particles in the SEM image: a) ordered (S1-42); b) disordered (S3-157)

Figure 31 shows the results of constructing lines for the weight coefficient of the angular coaxiality in the metric of prevailing directions to ensure line smoothness $w_{coax} = 1.5$. The other parameters are unchanged.

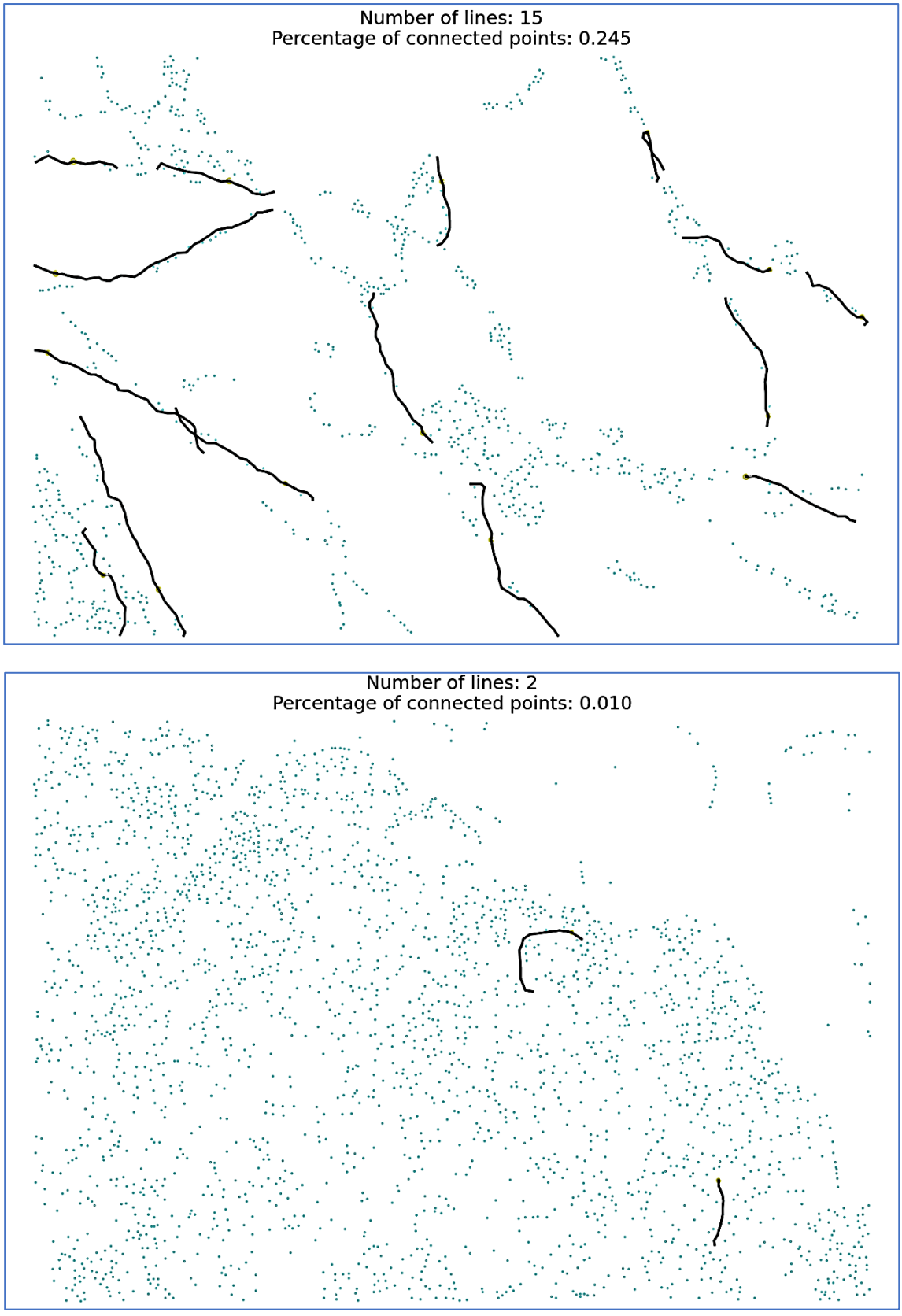


Figure 31 – Results of constructing lines for the weight coefficient of the angular coaxiality in the metric of prevailing directions to ensure line smoothness $w_{coax} = 1.5$. The arrangement of the particles in the SEM image: a) ordered (S1-42); b) disordered (S3-157)

Figure 32 shows the results of constructing lines for the weight coefficient of the angular coaxiality in the metric of prevailing directions to ensure line smoothness $w_{coax} = 2.0$. The other parameters are unchanged.

Figure 32 – Results of constructing lines for the weight coefficient of the angular coaxiality in the metric of prevailing directions to ensure line smoothness $w_{coax} = 2.0$. The arrangement of the particles in the SEM image: a) ordered (S1-42); b) disordered (S3-157)

Figure 33 shows the results of constructing lines for the weight coefficient of the angular coaxiality in the metric of prevailing directions to ensure line smoothness $w_{coax} = 2.5$. The other parameters are unchanged.

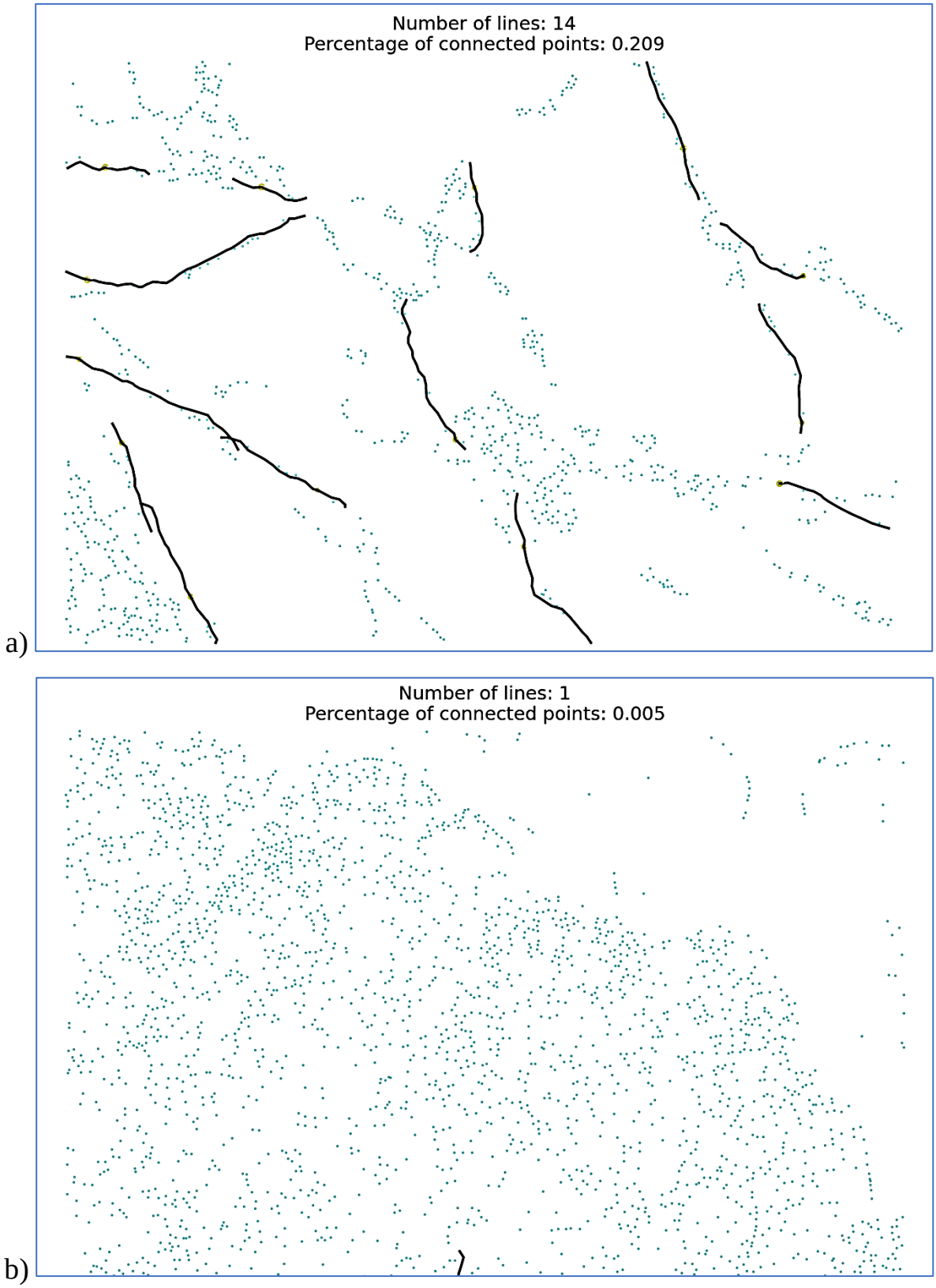


Figure 33 – Results of constructing lines for the weight coefficient of the angular coaxiality in the metric of prevailing directions to ensure line smoothness $w_{coax} = 2.5$. The arrangement of the particles in the SEM image: a) ordered (S1-42); b) disordered (S3-157)

Figure 34 shows the results of constructing lines for the weight coefficient of the angular coaxiality in the metric of prevailing directions to ensure line smoothness $w_{coax} = 3.0$. The other parameters are unchanged.

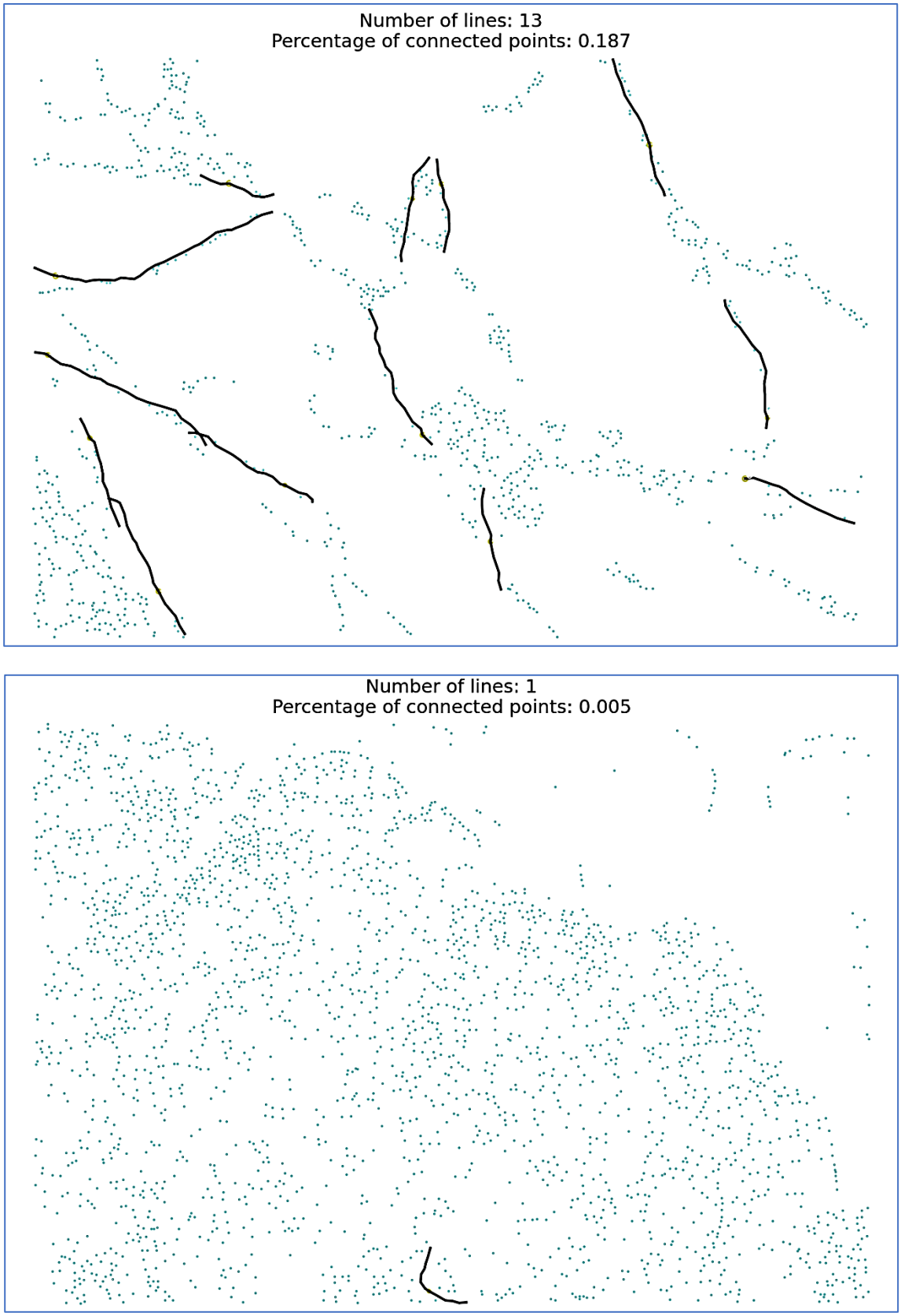
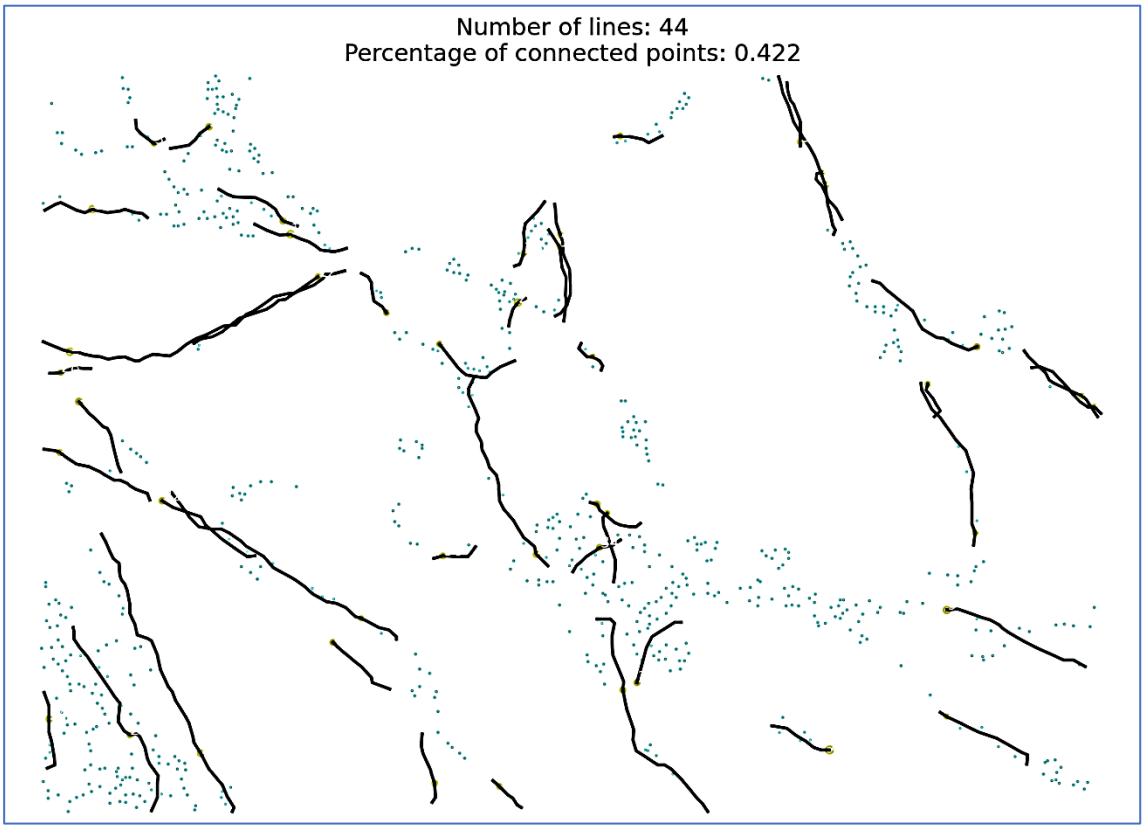


Figure 34 – Results of constructing lines for the weight coefficient of the angular coaxiality in the metric of prevailing directions to ensure line smoothness $w_{coax} = 3.0$. The arrangement of the particles in the SEM image: a) ordered (S1-42); b) disordered (S3-157)

Figure 35 shows the results of the constructing lines for the minimum line length in the nanoparticles $L_{min} = 6$. The other parameters are unchanged.

a)



b)

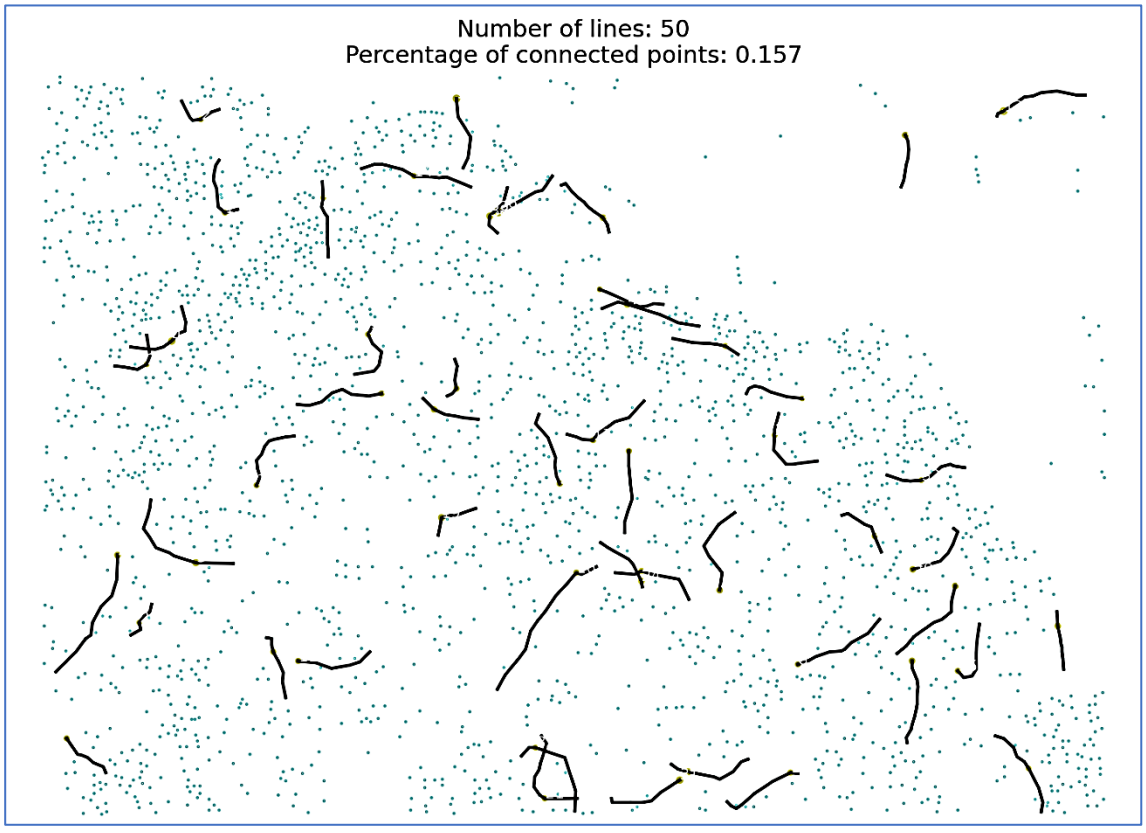
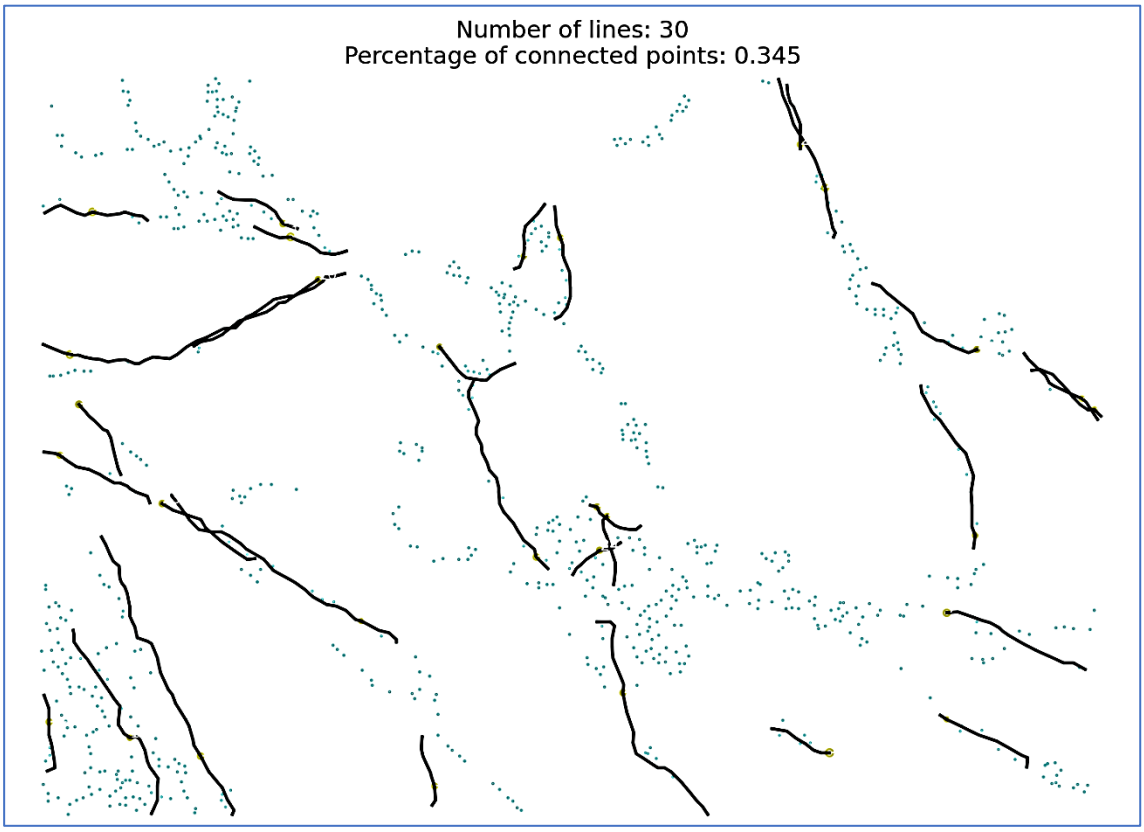


Figure 35 – Results of constructing lines for the minimum line length in the nanoparticles $L_{min} = 6$. The arrangement of the particles in the SEM image: a) ordered (S1-42); b) disordered (S3-157)

Figure 36 shows the results of the constructing lines for the minimum line length in the nanoparticles $L_{min} = 8$. The other parameters are unchanged.

a)



b)

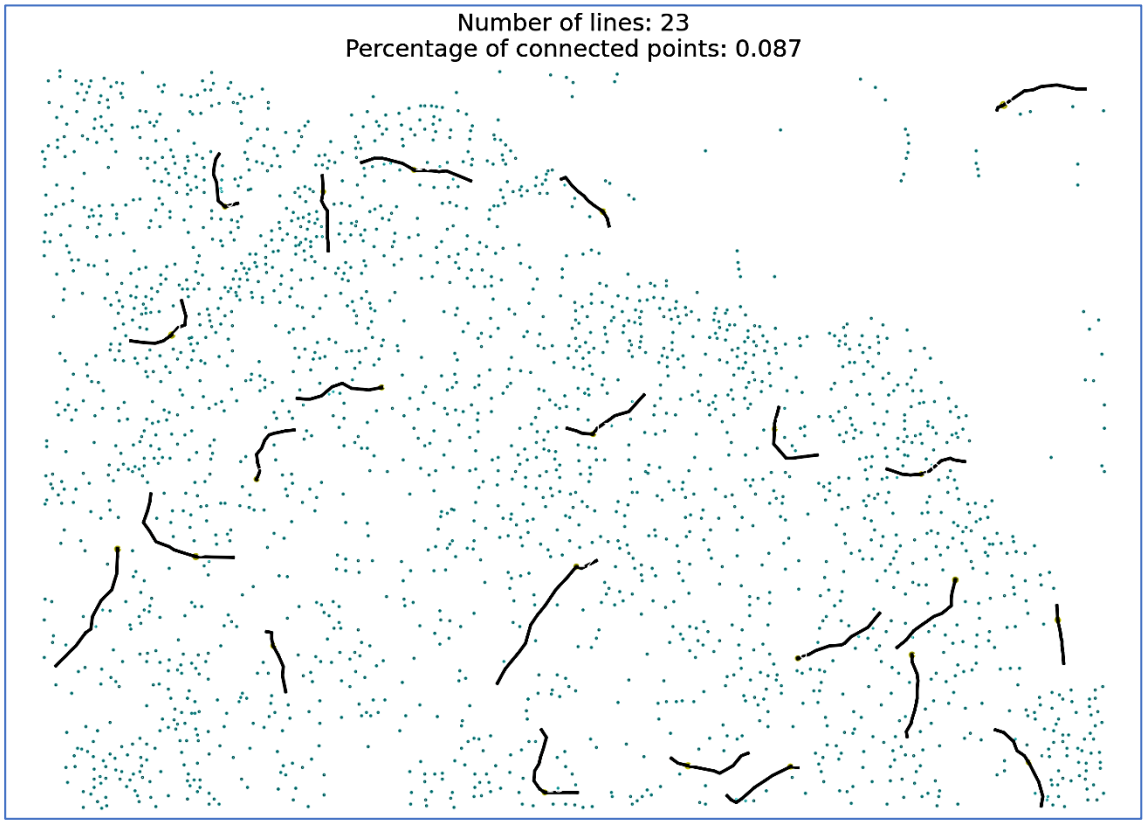
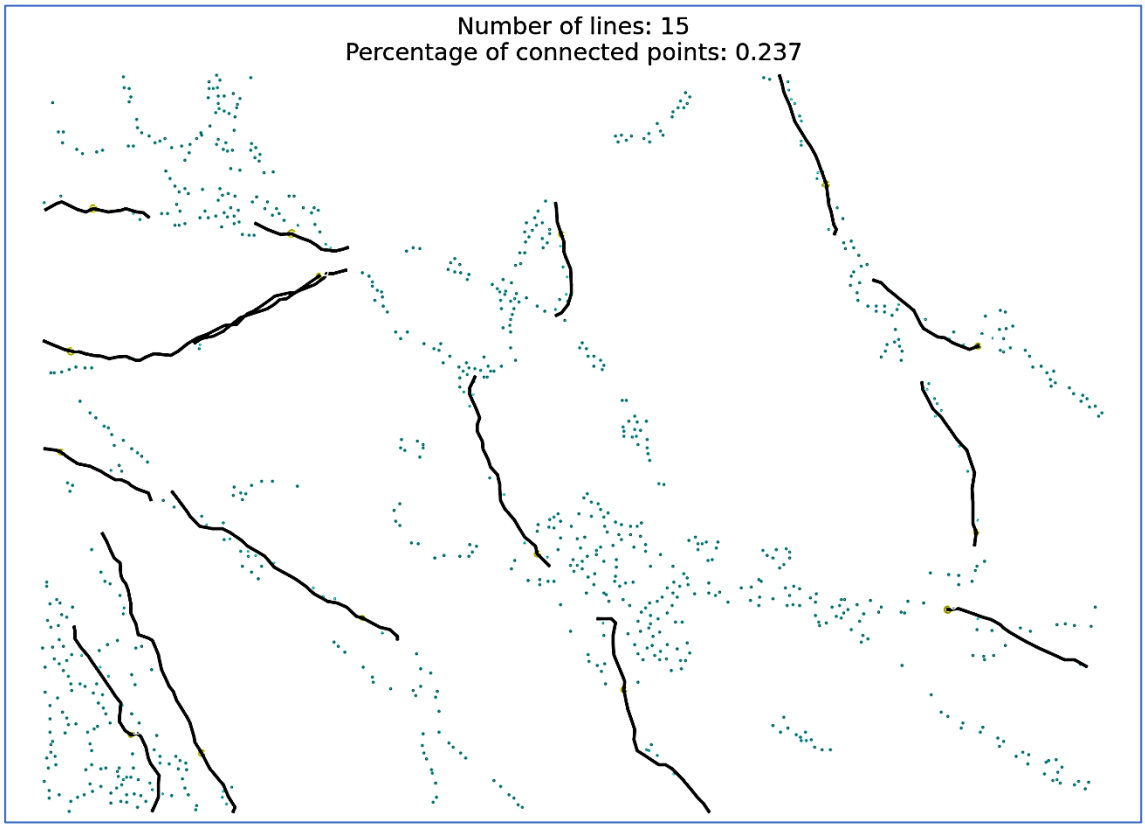


Figure 36 – Results of constructing lines for the minimum line length in the nanoparticles $L_{min} = 8$. The arrangement of the particles in the SEM image: a) ordered (S1-42); b) disordered (S3-157)

Figure 37 shows the results of the constructing lines for the minimum line length in the nanoparticles $L_{min} = 10$. The other parameters are unchanged.

a)



b)

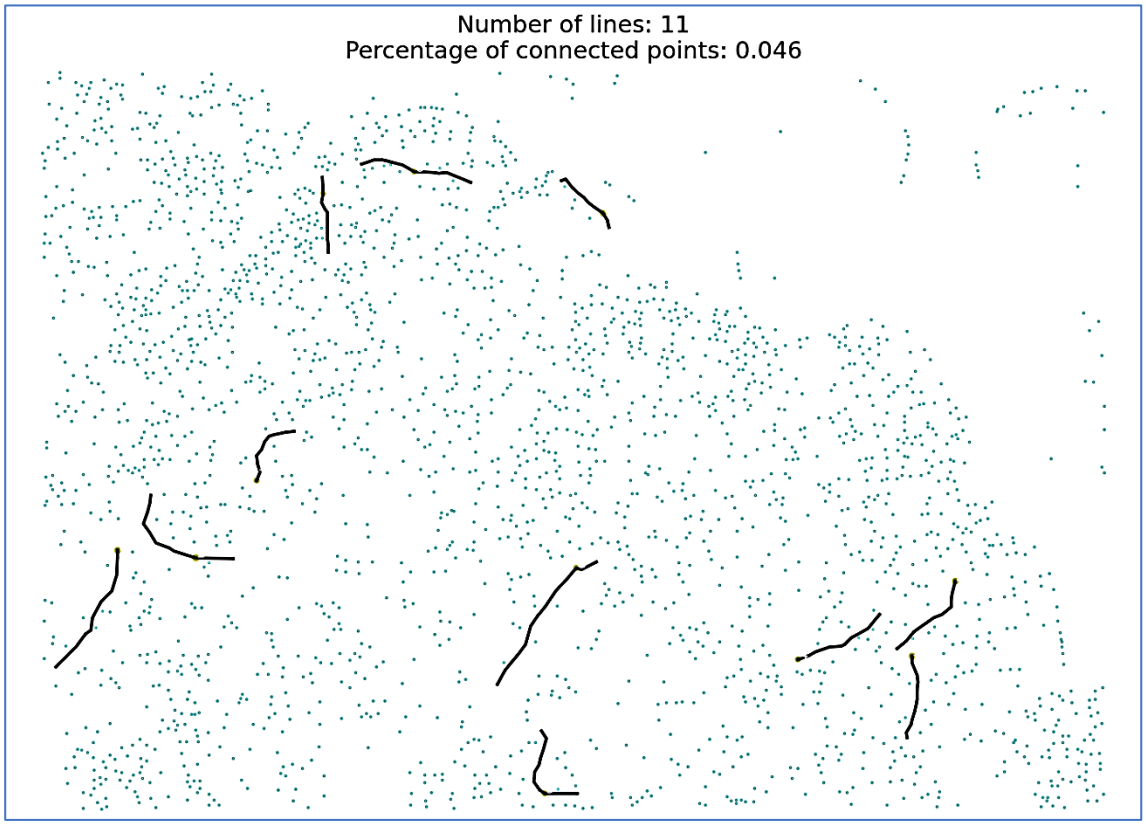
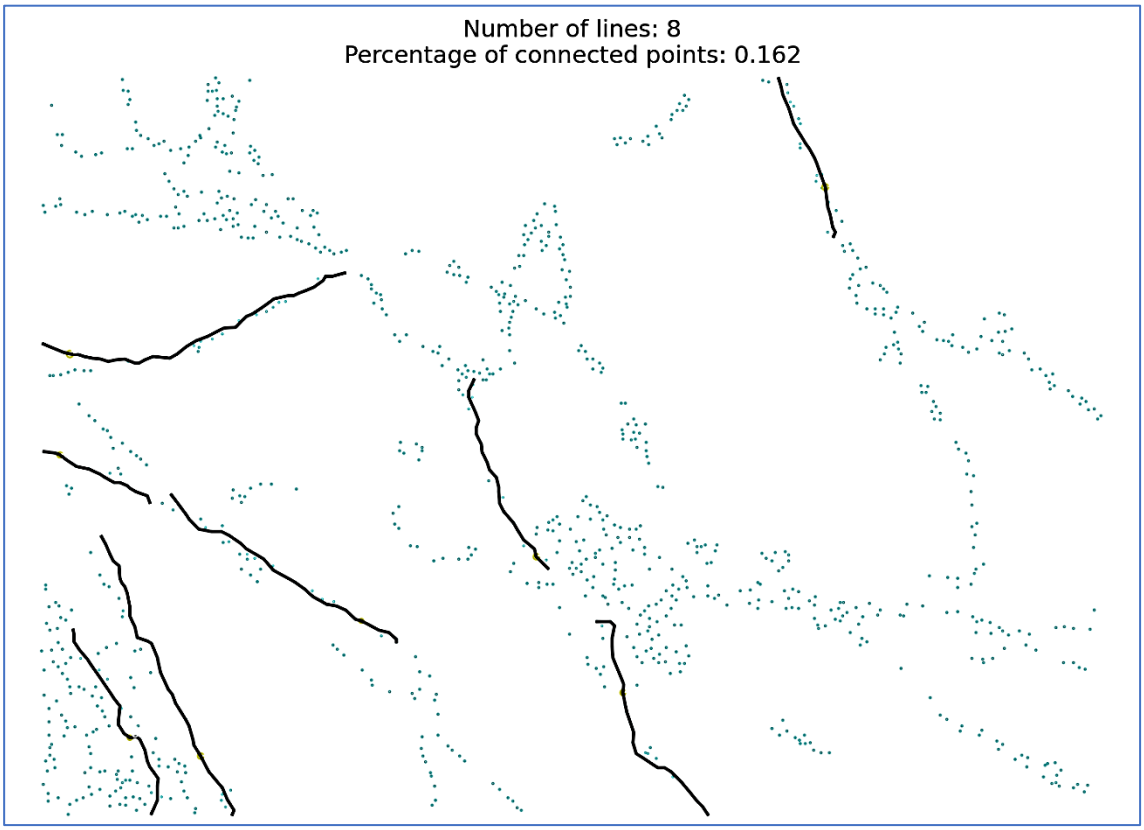


Figure 37 – Results of constructing lines for the minimum line length in the nanoparticles $L_{min} = 10$. The arrangement of the particles in the SEM image: a) ordered (S1-42); b) disordered (S3-157)

Figure 38 shows the results of the constructing lines for the minimum line length in the nanoparticles $L_{min} = 14$. The other parameters are unchanged.

a)



b)

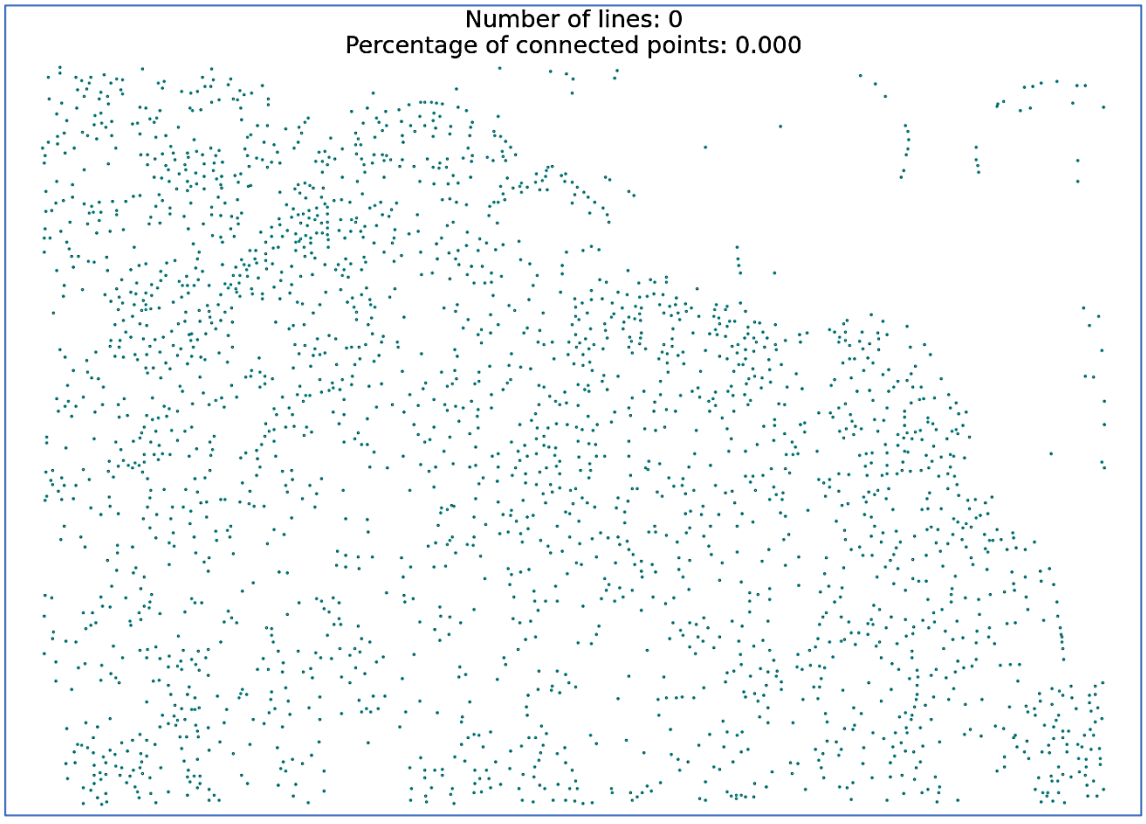
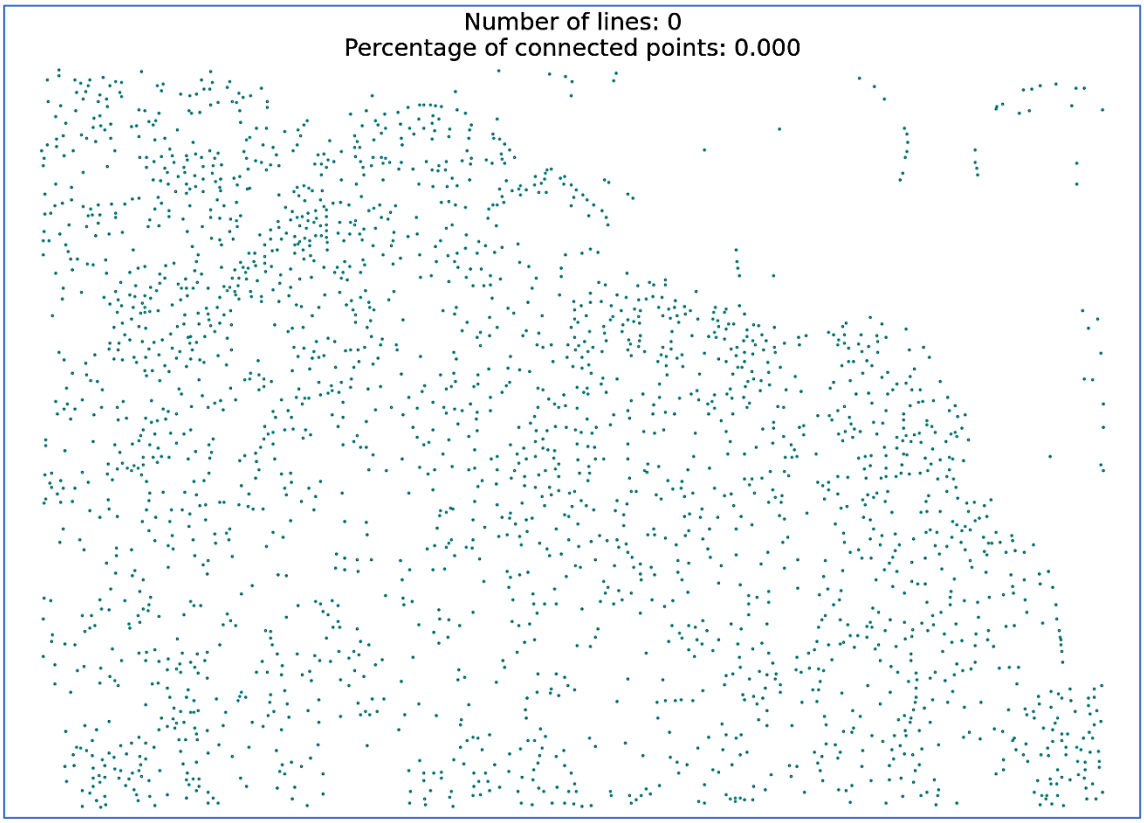


Figure 38 – Results of constructing lines for the minimum line length in the nanoparticles $L_{min} = 14$. The arrangement of the particles in the SEM image: a) ordered (S1-42); b) disordered (S3-157)

Figure 39 shows the results of constructing lines for the minimum line length in the nanoparticles $L_{min} = 16$. The other parameters are unchanged.

a)



b)

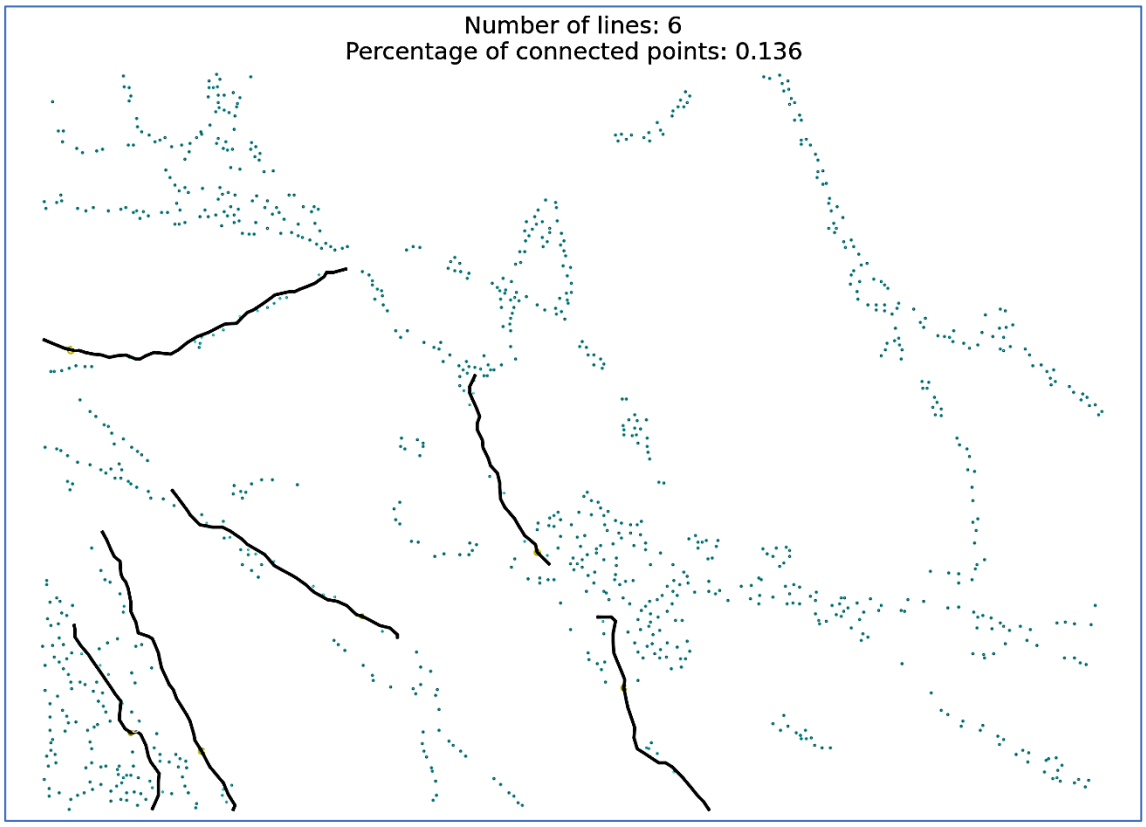
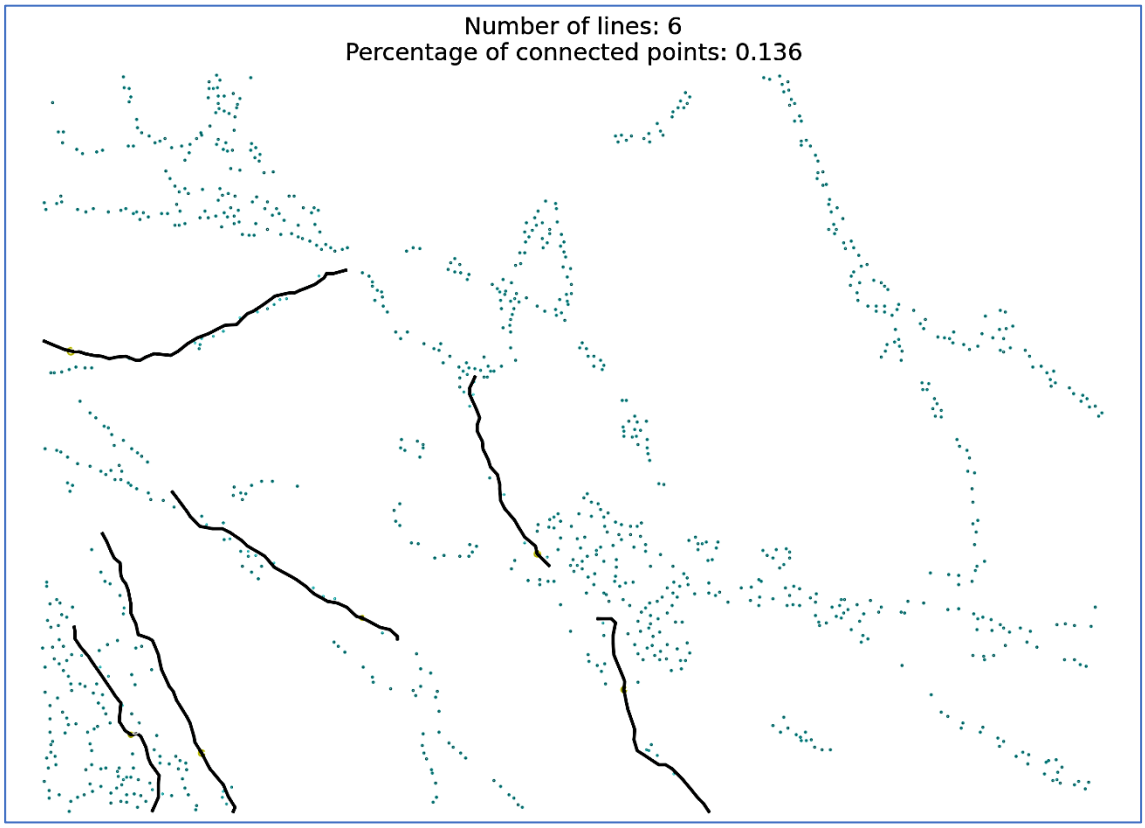


Figure 39 – Results of constructing lines for the minimum line length in the nanoparticles $L_{min} = 16$. The arrangement of the particles in the SEM image: a) ordered (S1-42); b) disordered (S3-157)

Figure 40 shows the results of the constructing lines for the minimum line length in the nanoparticles $L_{min} = 20$. The other parameters are unchanged.

a)



b)

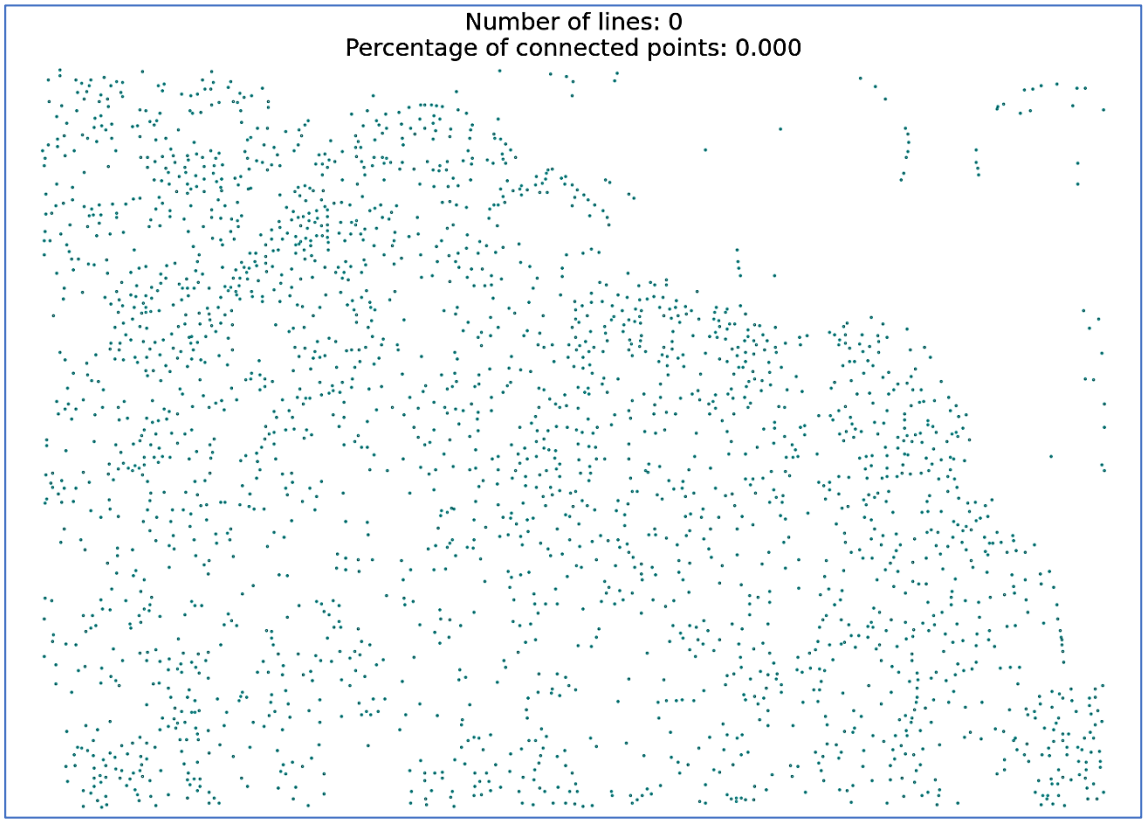


Figure 40 – Results of constructing lines for the minimum line length in the nanoparticles $L_{min} = 20$. The arrangement of the particles in the SEM image: a) ordered (S1-42); b) disordered (S3-157)

2. Values of the interpretable features for SEM images

As a result of the application of the proposed approach, an interpretable feature description was obtained, containing seven ordering features for each SEM image of the dataset*.

- (O1) General consistency of orientations;
- (O2) Partial consistency of orientations;
- (O3) The fraction of reliable orientations;
- (L1) Number of lines constructed
- (L2) Smoothness of the constructed lines;
- (L3) Rectilinearity of the constructed lines;
- (L4) The fraction of connected nanoparticles.

When calculating the proposed features of the SEM images, the following parameter values were set:

- The proportionality coefficient for early stopping in local groups formation: $k = 3$;
- The weight coefficient for estimating the local nanoparticles density in a SEM image: $w_d = 1.5$;
- The maximum number of nanoparticles in a local group: $s = 8$;
- The reliability threshold for computing the partial consistency of orientations: $q_{min} = 0.85$;
- Proportionality coefficient to adjust the degree of influence of individual parts of the proposed metric of prevailing directions: $C = 0.025$;
- Weight coefficient of the angular coaxiality in the metric of prevailing directions to ensure line smoothness: $w_{coax} = 1.75$;
- Minimum line length in nanoparticles: $L_{min} = 12$;
- The size of a polyline local fragment is used to estimate the smoothness of the constructed lines: $f_{size} = 6$.

Table 1 shows the values of the proposed features for each SEM image in the dataset* based on the given parameters.

Table 1 – Calculated values of the proposed features for each SEM image

ID	Material	Scales	Class	Features						
				O1	O2	O3	L1	L2	L3	L4
1	S1	50k	ordered	0.398	0.991	0.949	75	0.946	0.882	0.137
1	S4	50k	disordered	0.348	0.992	0.970	62	0.935	0.869	0.086
2	S1	100k	ordered	0.449	0.973	0.904	21	0.936	0.871	0.146
2	S4	100k	disordered	0.300	0.975	0.904	10	0.954	0.919	0.050
3	S1	100k	ordered	0.452	0.976	0.881	20	0.920	0.844	0.141
3	S4	50k	disordered	0.349	0.993	0.973	58	0.935	0.878	0.084
4	S1	100k	ordered	0.497	0.961	0.825	18	0.947	0.886	0.195
4	S4	100k	disordered	0.309	0.972	0.890	10	0.960	0.936	0.061
5	S1	100k	ordered	0.447	0.963	0.855	22	0.953	0.909	0.147
5	S4	50k	disordered	0.341	0.992	0.975	38	0.942	0.895	0.069

** Boiko, D.A., Pentsak, E.O., Cherepanova, V.A. et al. Electron microscopy dataset for the recognition of nanoscale ordering effects and location of nanoparticles. Sci Data 7, 101 (2020). https://doi.org/10.1038/s41597-020-0439-1*

ID	Material	Scales	Class	O1	O2	O3	L1	L2	L3	L4
6	S1	100k	ordered	0.374	0.980	0.894	15	0.946	0.897	0.098
6	S4	100k	disordered	0.293	0.956	0.865	4	0.973	0.963	0.027
7	S1	100k	ordered	0.358	0.982	0.907	17	0.943	0.897	0.094
7	S4	50k	disordered	0.344	0.994	0.976	71	0.937	0.880	0.102
8	S1	100k	ordered	0.395	0.974	0.875	23	0.949	0.913	0.130
8	S4	100k	disordered	0.345	0.980	0.913	17	0.956	0.925	0.096
9	S1	50k	ordered	0.335	0.989	0.961	56	0.941	0.889	0.089
9	S4	50k	disordered	0.345	0.989	0.962	60	0.936	0.870	0.094
10	S1	100k	ordered	0.387	0.978	0.906	16	0.957	0.930	0.094
10	S4	50k	disordered	0.282	0.992	0.973	35	0.939	0.871	0.050
11	S1	100k	ordered	0.346	0.967	0.856	12	0.943	0.912	0.093
11	S4	100k	disordered	0.281	0.980	0.910	12	0.939	0.878	0.055
12	S1	100k	ordered	0.467	0.958	0.810	27	0.957	0.876	0.207
12	S4	50k	disordered	0.304	0.993	0.975	32	0.934	0.874	0.053
13	S1	100k	ordered	0.442	0.976	0.862	30	0.955	0.901	0.172
13	S4	100k	disordered	0.273	0.978	0.923	6	0.936	0.878	0.033
14	S1	100k	ordered	0.379	0.953	0.858	28	0.959	0.930	0.133
14	S4	50k	disordered	0.304	0.995	0.977	43	0.941	0.865	0.059
15	S1	100k	ordered	0.316	0.960	0.830	20	0.960	0.918	0.123
15	S4	100k	disordered	0.280	0.972	0.897	11	0.895	0.808	0.059
16	S1	50k	ordered	0.351	0.982	0.936	86	0.951	0.911	0.132
16	S4	50k	disordered	0.295	0.992	0.970	40	0.926	0.845	0.067
17	S1	100k	ordered	0.297	0.983	0.923	24	0.957	0.914	0.100
17	S4	100k	disordered	0.300	0.979	0.894	9	0.926	0.767	0.052
18	S1	50k	ordered	0.410	0.993	0.973	89	0.952	0.899	0.146
18	S4	50k	disordered	0.316	0.992	0.968	30	0.936	0.867	0.049
19	S1	100k	ordered	0.429	0.980	0.891	22	0.935	0.835	0.117
19	S4	100k	disordered	0.328	0.973	0.869	8	0.916	0.839	0.043
20	S1	100k	ordered	0.419	0.971	0.881	20	0.953	0.919	0.130
20	S4	100k	disordered	0.293	0.980	0.901	13	0.936	0.862	0.066
21	S1	100k	ordered	0.430	0.982	0.916	24	0.950	0.911	0.132
21	S4	100k	disordered	0.310	0.980	0.910	15	0.938	0.903	0.067
22	S1	100k	ordered	0.394	0.971	0.902	18	0.952	0.896	0.126
22	S4	50k	disordered	0.303	0.994	0.980	59	0.934	0.868	0.078
23	S1	50k	ordered	0.374	0.984	0.947	101	0.946	0.876	0.137
23	S4	100k	disordered	0.308	0.979	0.913	10	0.957	0.904	0.045
24	S1	100k	ordered	0.354	0.968	0.866	23	0.957	0.918	0.129
24	S4	50k	disordered	0.284	0.993	0.973	53	0.939	0.875	0.082
25	S1	100k	disordered	0.483	0.958	0.838	21	0.958	0.919	0.212
25	S4	100k	ordered	0.279	0.979	0.914	14	0.938	0.871	0.084
26	S1	50k	ordered	0.466	0.991	0.958	78	0.945	0.878	0.150
26	S5	100k	disordered	0.228	0.985	0.946	11	0.925	0.867	0.036
27	S1	100k	ordered	0.466	0.909	0.761	32	0.951	0.876	0.215
27	S5	100k	disordered	0.253	0.987	0.913	14	0.898	0.785	0.060
28	S1	50k	ordered	0.420	0.989	0.951	74	0.938	0.880	0.148
28	S5	50k	disordered	0.253	0.995	0.981	38	0.896	0.798	0.043
29	S1	50k	ordered	0.497	0.988	0.943	68	0.954	0.893	0.187
29	S5	100k	disordered	0.268	0.983	0.929	7	0.875	0.768	0.028
30	S1	100k	ordered	0.507	0.954	0.782	18	0.966	0.931	0.170
30	S5	50k	disordered	0.249	0.996	0.983	50	0.922	0.851	0.049
31	S1	50k	ordered	0.453	0.980	0.923	81	0.952	0.915	0.200

ID	Material	Scales	Class	O1	O2	O3	L1	L2	L3	L4
31	S5	100k	disordered	0.237	0.985	0.940	15	0.938	0.887	0.050
32	S1	50k	ordered	0.416	0.985	0.939	66	0.941	0.854	0.145
32	S5	50k	disordered	0.234	0.997	0.984	56	0.924	0.856	0.045
33	S1	50k	ordered	0.457	0.973	0.891	86	0.956	0.924	0.187
33	S5	100k	disordered	0.209	0.985	0.956	13	0.926	0.859	0.032
34	S1	100k	ordered	0.321	0.952	0.839	11	0.957	0.946	0.090
34	S5	100k	disordered	0.210	0.990	0.960	16	0.880	0.726	0.045
35	S1	100k	ordered	0.455	0.959	0.832	25	0.962	0.932	0.191
35	S5	100k	disordered	0.178	0.990	0.960	13	0.917	0.808	0.032
36	S1	50k	ordered	0.475	0.984	0.927	76	0.949	0.903	0.194
36	S5	50k	disordered	0.203	0.997	0.988	55	0.912	0.830	0.039
37	S1	100k	ordered	0.440	0.945	0.770	12	0.959	0.803	0.195
37	S5	100k	disordered	0.213	0.989	0.941	12	0.906	0.804	0.032
38	S1	100k	ordered	0.402	0.966	0.866	26	0.968	0.939	0.152
38	S5	100k	disordered	0.246	0.988	0.942	12	0.908	0.783	0.036
39	S1	100k	ordered	0.487	0.968	0.843	24	0.962	0.938	0.198
39	S5	100k	disordered	0.191	0.988	0.953	10	0.916	0.825	0.024
40	S1	50k	ordered	0.492	0.988	0.947	74	0.951	0.897	0.191
40	S5	100k	disordered	0.241	0.988	0.929	10	0.902	0.740	0.032
41	S1	100k	ordered	0.381	0.984	0.904	16	0.945	0.885	0.087
41	S4	100k	disordered	0.281	0.980	0.918	11	0.911	0.786	0.054
42	S1	100k	ordered	0.520	0.935	0.795	15	0.969	0.943	0.220
42	S4	50k	disordered	0.291	0.996	0.982	41	0.932	0.870	0.053
43	S1	100k	ordered	0.489	0.962	0.850	27	0.957	0.926	0.194
43	S4	100k	disordered	0.274	0.986	0.926	4	0.900	0.811	0.015
44	S1	100k	ordered	0.381	0.987	0.905	20	0.939	0.878	0.091
44	S4	50k	disordered	0.318	0.995	0.980	99	0.927	0.832	0.080
45	S1	100k	disordered	0.383	0.974	0.896	17	0.945	0.886	0.099
45	S4	50k	ordered	0.294	0.991	0.963	43	0.936	0.859	0.059
46	S1	100k	ordered	0.446	0.941	0.789	38	0.952	0.910	0.232
46	S4	100k	disordered	0.260	0.976	0.894	9	0.920	0.801	0.047
47	S1	100k	ordered	0.394	0.977	0.893	24	0.957	0.931	0.117
47	S4	50k	disordered	0.302	0.994	0.971	68	0.941	0.892	0.084
48	S1	100k	ordered	0.490	0.957	0.833	45	0.936	0.863	0.245
48	S4	100k	disordered	0.329	0.979	0.904	17	0.918	0.850	0.080
49	S1	100k	ordered	0.332	0.951	0.809	37	0.953	0.889	0.147
49	S4	50k	disordered	0.400	0.984	0.936	30	0.961	0.928	0.098
50	S1	50k	ordered	0.320	0.961	0.868	129	0.943	0.888	0.151
50	S4	100k	disordered	0.381	0.965	0.852	8	0.962	0.930	0.060
51	S1	100k	ordered	0.373	0.978	0.921	32	0.950	0.896	0.149
51	S4	50k	disordered	0.289	0.989	0.951	18	0.961	0.917	0.038
52	S1	50k	ordered	0.354	0.991	0.967	96	0.932	0.869	0.105
52	S4	100k	disordered	0.253	0.971	0.873	1	0.962	0.953	0.006
53	S1	100k	ordered	0.448	0.971	0.878	25	0.928	0.826	0.167
53	S4	50k	disordered	0.291	0.992	0.970	25	0.934	0.857	0.036
54	S1	100k	ordered	0.483	0.926	0.834	30	0.957	0.923	0.236
54	S4	100k	disordered	0.252	0.972	0.909	13	0.919	0.851	0.067
55	S1	100k	ordered	0.543	0.937	0.785	28	0.959	0.913	0.240
55	S4	50k	disordered	0.318	0.992	0.961	54	0.931	0.865	0.073
56	S1	100k	ordered	0.476	0.970	0.849	25	0.955	0.904	0.188
56	S4	100k	disordered	0.286	0.977	0.908	12	0.926	0.909	0.057

ID	Material	Scales	Class	O1	O2	O3	L1	L2	L3	L4
57	S1	100k	ordered	0.568	0.945	0.795	17	0.945	0.887	0.196
57	S4	100k	disordered	0.272	0.972	0.882	3	0.932	0.906	0.022
58	S1	100k	ordered	0.555	0.970	0.895	31	0.950	0.884	0.242
58	S3	100k	disordered	0.222	0.986	0.950	13	0.913	0.840	0.044
59	S1	100k	ordered	0.458	0.972	0.895	30	0.958	0.907	0.202
59	S3	200k	disordered	0.206	0.951	0.821	5	0.921	0.869	0.049
60	S1	100k	ordered	0.317	0.966	0.897	23	0.940	0.855	0.095
60	S3	50k	disordered	0.278	0.991	0.960	31	0.924	0.839	0.069
61	S1	100k	ordered	0.329	0.975	0.900	13	0.935	0.898	0.072
61	S3	50k	disordered	0.250	0.996	0.980	32	0.914	0.840	0.036
62	S1	100k	ordered	0.532	0.976	0.868	25	0.944	0.892	0.158
62	S3	100k	disordered	0.204	0.984	0.949	7	0.919	0.897	0.019
63	S1	100k	ordered	0.592	0.961	0.855	27	0.948	0.913	0.211
63	S3	200k	disordered	0.204	0.934	0.789	2	0.976	0.954	0.024
64	S1	100k	ordered	0.520	0.926	0.766	30	0.956	0.908	0.260
64	S3	50k	disordered	0.232	0.997	0.979	46	0.917	0.798	0.047
65	S1	100k	ordered	0.485	0.960	0.814	22	0.940	0.893	0.176
65	S3	100k	disordered	0.214	0.990	0.966	17	0.914	0.856	0.042
66	S1	50k	ordered	0.500	0.976	0.909	117	0.962	0.921	0.232
66	S3	200k	disordered	0.164	0.963	0.881	2	0.945	0.945	0.016
67	S1	100k	ordered	0.350	0.974	0.878	20	0.934	0.858	0.111
67	S3	50k	disordered	0.306	0.993	0.963	38	0.937	0.867	0.066
68	S1	100k	disordered	0.443	0.955	0.798	11	0.955	0.924	0.128
68	S3	100k	ordered	0.231	0.990	0.953	14	0.929	0.838	0.040
69	S1	100k	ordered	0.454	0.947	0.816	21	0.960	0.927	0.146
69	S3	200k	disordered	0.208	0.963	0.850	6	0.919	0.842	0.056
70	S1	100k	ordered	0.464	0.947	0.778	21	0.957	0.919	0.198
70	S3	50k	disordered	0.405	0.980	0.894	23	0.959	0.899	0.087
71	S1	100k	ordered	0.416	0.977	0.874	14	0.962	0.932	0.113
71	S3	50k	disordered	0.262	0.995	0.979	45	0.917	0.808	0.052
72	S1	100k	ordered	0.431	0.976	0.883	19	0.958	0.914	0.127
72	S3	100k	disordered	0.208	0.988	0.947	5	0.910	0.867	0.019
73	S1	100k	ordered	0.358	0.964	0.864	14	0.962	0.926	0.101
73	S3	200k	disordered	0.167	0.969	0.842	4	0.914	0.783	0.043
74	S1	100k	ordered	0.316	0.940	0.810	18	0.955	0.929	0.145
74	S3	200k	disordered	0.257	0.956	0.831	1	0.828	0.668	0.008
75	S1	100k	ordered	0.361	0.965	0.860	15	0.955	0.907	0.106
75	S3	100k	disordered	0.262	0.981	0.923	10	0.921	0.813	0.045
76	S1	100k	ordered	0.472	0.953	0.816	24	0.962	0.922	0.219
76	S3	50k	disordered	0.247	0.994	0.973	22	0.922	0.849	0.035
77	S1	50k	ordered	0.465	0.985	0.947	33	0.942	0.857	0.136
77	S3	200k	disordered	0.240	0.957	0.835	2	0.928	0.784	0.019
78	S1	100k	ordered	0.432	0.947	0.803	15	0.962	0.948	0.153
78	S3	100k	disordered	0.240	0.982	0.938	10	0.911	0.732	0.046
79	S1	50k	ordered	0.412	0.993	0.969	59	0.952	0.896	0.119
79	S3	50k	disordered	0.269	0.992	0.971	32	0.938	0.853	0.051
80	S1	100k	ordered	0.497	0.945	0.835	28	0.949	0.914	0.205
80	S3	200k	disordered	0.344	0.931	0.768	3	0.925	0.837	0.053
81	S1	100k	ordered	0.484	0.940	0.809	20	0.958	0.887	0.246
81	S3	100k	disordered	0.264	0.974	0.898	7	0.950	0.878	0.049
82	S1	100k	ordered	0.487	0.912	0.750	31	0.952	0.914	0.216

ID	Material	Scales	Class	O1	O2	O3	L1	L2	L3	L4
82	S3	50k	disordered	0.269	0.990	0.962	20	0.904	0.785	0.048
83	S1	100k	disordered	0.409	0.976	0.885	15	0.957	0.916	0.088
83	S3	200k	ordered	0.248	0.952	0.838	4	0.931	0.920	0.038
84	S1	100k	ordered	0.440	0.969	0.870	20	0.941	0.914	0.124
84	S3	100k	disordered	0.245	0.982	0.916	11	0.910	0.812	0.052
85	S1	100k	ordered	0.410	0.973	0.864	17	0.953	0.899	0.107
85	S3	50k	disordered	0.283	0.993	0.972	18	0.912	0.828	0.037
86	S1	100k	ordered	0.383	0.941	0.792	8	0.973	0.947	0.105
86	S3	200k	disordered	0.237	0.954	0.813	1	0.789	0.542	0.010
87	S1	100k	ordered	0.500	0.964	0.826	20	0.965	0.932	0.188
87	S3	100k	disordered	0.235	0.988	0.940	6	0.895	0.835	0.020
88	S1	100k	ordered	0.606	0.947	0.763	23	0.970	0.951	0.315
88	S3	50k	disordered	0.277	0.990	0.971	28	0.908	0.788	0.051
89	S1	100k	ordered	0.392	0.960	0.868	22	0.946	0.866	0.158
89	S3	200k	disordered	0.210	0.939	0.817	5	0.922	0.833	0.072
90	S1	100k	ordered	0.417	0.969	0.836	19	0.957	0.927	0.150
90	S3	100k	disordered	0.212	0.981	0.908	8	0.919	0.870	0.040
91	S1	100k	ordered	0.513	0.945	0.812	22	0.950	0.902	0.211
91	S3	200k	disordered	0.209	0.951	0.856	3	0.905	0.860	0.031
92	S1	100k	ordered	0.447	0.972	0.859	22	0.949	0.902	0.175
92	S3	100k	disordered	0.223	0.985	0.938	8	0.894	0.822	0.027
93	S1	100k	ordered	0.463	0.963	0.872	26	0.942	0.861	0.161
93	S3	50k	disordered	0.289	0.990	0.969	23	0.925	0.847	0.051
94	S1	100k	ordered	0.399	0.974	0.895	19	0.962	0.926	0.127
94	S3	200k	disordered	0.238	0.940	0.727	2	0.847	0.672	0.043
95	S1	100k	ordered	0.404	0.936	0.817	39	0.955	0.912	0.226
95	S3	100k	disordered	0.290	0.970	0.872	6	0.942	0.853	0.044
96	S1	100k	ordered	0.479	0.973	0.858	29	0.939	0.869	0.168
96	S3	50k	disordered	0.323	0.985	0.929	17	0.951	0.871	0.055
97	S1	100k	ordered	0.344	0.966	0.862	22	0.946	0.901	0.106
97	S3	200k	disordered	0.170	0.956	0.807	2	0.848	0.799	0.018
98	S1	100k	ordered	0.451	0.974	0.893	21	0.939	0.883	0.127
98	S3	100k	disordered	0.221	0.982	0.940	8	0.865	0.703	0.040
99	S1	50k	ordered	0.455	0.993	0.967	73	0.952	0.908	0.150
99	S3	50k	disordered	0.246	0.991	0.973	17	0.930	0.868	0.029
100	S1	100k	ordered	0.482	0.888	0.717	24	0.966	0.941	0.230
100	S3	50k	disordered	0.268	0.991	0.967	26	0.934	0.847	0.049
101	S1	100k	ordered	0.466	0.881	0.688	17	0.956	0.897	0.247
101	S3	100k	disordered	0.252	0.985	0.907	10	0.940	0.892	0.045
102	S1	100k	ordered	0.490	0.930	0.805	25	0.959	0.936	0.203
102	S3	200k	disordered	0.171	0.956	0.813	6	0.932	0.822	0.062
103	S1	100k	ordered	0.441	0.912	0.710	24	0.943	0.875	0.215
103	S3	50k	disordered	0.287	0.982	0.929	16	0.927	0.748	0.055
104	S1	100k	ordered	0.380	0.948	0.785	16	0.952	0.910	0.102
104	S3	100k	disordered	0.252	0.976	0.918	6	0.937	0.898	0.027
105	S1	100k	ordered	0.450	0.872	0.673	18	0.959	0.918	0.155
105	S3	200k	disordered	0.219	0.952	0.816	4	0.926	0.901	0.042
106	S1	100k	ordered	0.406	0.948	0.848	35	0.945	0.907	0.181
106	S3	50k	disordered	0.285	0.993	0.971	28	0.916	0.832	0.054
107	S1	100k	ordered	0.382	0.968	0.876	14	0.960	0.936	0.113
107	S3	100k	disordered	0.266	0.986	0.939	9	0.947	0.918	0.032

ID	Material	Scales	Class	O1	O2	O3	L1	L2	L3	L4
108	S1	100k	ordered	0.316	0.951	0.813	20	0.953	0.893	0.106
108	S3	200k	disordered	0.177	0.958	0.871	4	0.868	0.678	0.033
109	S1	100k	ordered	0.472	0.957	0.862	16	0.970	0.948	0.166
109	S3	50k	disordered	0.241	0.989	0.969	25	0.914	0.807	0.043
110	S1	100k	ordered	0.420	0.964	0.849	26	0.931	0.860	0.159
110	S3	100k	disordered	0.231	0.985	0.945	9	0.936	0.876	0.031
111	S1	100k	ordered	0.315	0.959	0.854	21	0.923	0.793	0.114
111	S3	200k	disordered	0.232	0.944	0.786	0	0.000	0.000	0.000
112	S1	100k	ordered	0.522	0.959	0.826	25	0.967	0.926	0.246
112	S3	50k	disordered	0.285	0.989	0.956	17	0.908	0.802	0.042
113	S1	100k	ordered	0.353	0.983	0.899	14	0.948	0.908	0.078
113	S3	100k	disordered	0.229	0.979	0.906	6	0.923	0.902	0.040
114	S1	100k	ordered	0.381	0.967	0.868	16	0.950	0.927	0.105
114	S3	200k	disordered	0.239	0.911	0.697	3	0.926	0.836	0.071
115	S1	100k	ordered	0.367	0.944	0.840	23	0.940	0.875	0.128
115	S3	50k	disordered	0.445	0.980	0.905	23	0.943	0.849	0.106
116	S1	100k	ordered	0.355	0.982	0.905	15	0.930	0.870	0.072
116	S3	100k	disordered	0.293	0.976	0.903	9	0.900	0.812	0.049
117	S1	100k	ordered	0.402	0.962	0.854	14	0.944	0.852	0.105
117	S3	200k	disordered	0.291	0.940	0.807	3	0.918	0.885	0.036
118	S1	100k	ordered	0.465	0.898	0.695	38	0.940	0.808	0.262
118	S3	50k	disordered	0.323	0.978	0.916	6	0.923	0.846	0.028
119	S1	100k	ordered	0.359	0.967	0.866	20	0.946	0.901	0.092
119	S3	100k	disordered	0.279	0.960	0.853	3	0.918	0.816	0.025
120	S1	50k	ordered	0.410	0.983	0.938	88	0.946	0.876	0.176
120	S3	200k	disordered	0.323	0.926	0.725	0	0.000	0.000	0.000
121	S1	50k	ordered	0.353	0.967	0.907	65	0.939	0.874	0.125
121	S3	50k	disordered	0.311	0.994	0.970	40	0.942	0.874	0.064
122	S1	50k	ordered	0.558	0.944	0.825	90	0.958	0.904	0.280
122	S3	100k	disordered	0.206	0.990	0.945	12	0.931	0.885	0.038
123	S1	100k	disordered	0.385	0.961	0.879	23	0.946	0.904	0.132
123	S3	50k	ordered	0.301	0.992	0.960	22	0.936	0.854	0.044
124	S1	100k	ordered	0.530	0.930	0.761	39	0.954	0.908	0.265
124	S3	100k	disordered	0.258	0.984	0.909	9	0.942	0.830	0.039
125	S1	100k	ordered	0.363	0.977	0.902	29	0.933	0.853	0.126
125	S3	200k	disordered	0.189	0.959	0.845	3	0.950	0.922	0.027
126	S1	100k	ordered	0.457	0.973	0.885	23	0.951	0.897	0.174
126	S3	50k	disordered	0.340	0.990	0.963	19	0.944	0.889	0.047
127	S1	100k	ordered	0.446	0.972	0.846	19	0.946	0.879	0.151
127	S3	100k	disordered	0.260	0.982	0.897	8	0.947	0.868	0.050
128	S1	100k	ordered	0.374	0.975	0.866	17	0.944	0.901	0.105
128	S3	200k	disordered	0.247	0.917	0.757	3	0.924	0.868	0.058
129	S1	100k	ordered	0.454	0.971	0.846	18	0.940	0.870	0.124
129	S3	50k	disordered	0.344	0.986	0.928	15	0.907	0.791	0.058
130	S1	100k	ordered	0.368	0.973	0.892	13	0.962	0.943	0.092
130	S3	100k	disordered	0.276	0.972	0.892	6	0.913	0.850	0.037
131	S1	50k	ordered	0.386	0.982	0.947	77	0.953	0.869	0.137
131	S3	200k	disordered	0.280	0.881	0.633	1	0.840	0.805	0.032
132	S1	100k	ordered	0.486	0.967	0.854	25	0.966	0.945	0.191
132	S3	200k	disordered	0.251	0.939	0.763	1	0.962	0.950	0.013
133	S1	100k	ordered	0.415	0.954	0.846	13	0.954	0.899	0.112

ID	Material	Scales	Class	O1	O2	O3	L1	L2	L3	L4
133	S3	100k	disordered	0.286	0.973	0.894	6	0.915	0.873	0.041
134	S1	100k	ordered	0.427	0.933	0.777	27	0.941	0.826	0.178
134	S3	50k	disordered	0.327	0.989	0.956	23	0.921	0.825	0.061
135	S1	100k	ordered	0.476	0.972	0.871	28	0.949	0.914	0.166
135	S3	200k	disordered	0.257	0.938	0.739	2	0.928	0.900	0.034
136	S1	100k	ordered	0.498	0.951	0.816	29	0.961	0.935	0.195
136	S3	100k	disordered	0.202	0.984	0.924	6	0.917	0.879	0.027
137	S1	100k	ordered	0.538	0.975	0.850	27	0.953	0.913	0.201
137	S3	50k	disordered	0.309	0.993	0.970	43	0.949	0.885	0.075
138	S1	100k	ordered	0.392	0.973	0.879	13	0.957	0.940	0.079
138	S3	200k	disordered	0.224	0.943	0.808	3	0.884	0.796	0.040
139	S1	100k	ordered	0.406	0.965	0.850	17	0.944	0.893	0.136
139	S3	100k	disordered	0.240	0.982	0.915	3	0.928	0.846	0.013
140	S1	100k	ordered	0.539	0.949	0.818	23	0.960	0.915	0.221
140	S3	50k	disordered	0.293	0.992	0.970	32	0.914	0.830	0.052
141	S1	100k	ordered	0.378	0.959	0.818	11	0.945	0.905	0.099
141	S3	200k	disordered	0.186	0.946	0.831	1	0.912	0.939	0.008
142	S1	100k	ordered	0.489	0.953	0.807	17	0.938	0.872	0.193
142	S3	100k	disordered	0.211	0.987	0.934	12	0.901	0.825	0.045
143	S1	100k	ordered	0.569	0.954	0.821	26	0.969	0.930	0.298
143	S3	50k	disordered	0.266	0.992	0.963	29	0.919	0.840	0.053
144	S1	100k	ordered	0.616	0.952	0.793	18	0.975	0.956	0.222
144	S3	50k	disordered	0.309	0.992	0.961	22	0.928	0.831	0.048
145	S1	100k	ordered	0.538	0.963	0.878	20	0.969	0.935	0.203
145	S3	100k	disordered	0.263	0.979	0.890	9	0.942	0.880	0.054
146	S1	100k	ordered	0.537	0.951	0.817	24	0.960	0.932	0.243
146	S3	200k	disordered	0.237	0.944	0.778	4	0.927	0.846	0.050
147	S1	100k	ordered	0.464	0.947	0.800	29	0.945	0.884	0.206
147	S3	50k	disordered	0.428	0.980	0.918	17	0.948	0.858	0.083
148	S1	100k	ordered	0.381	0.971	0.859	15	0.951	0.895	0.098
148	S3	100k	disordered	0.305	0.964	0.860	10	0.878	0.753	0.091
149	S1	100k	ordered	0.361	0.961	0.833	10	0.966	0.925	0.082
149	S3	200k	disordered	0.261	0.864	0.669	1	0.825	0.710	0.043
150	S1	100k	ordered	0.393	0.965	0.832	19	0.956	0.910	0.150
150	S3	50k	disordered	0.265	0.992	0.975	13	0.930	0.876	0.024
151	S1	100k	ordered	0.407	0.956	0.814	17	0.952	0.900	0.158
151	S3	100k	disordered	0.304	0.980	0.894	7	0.937	0.894	0.043
152	S1	50k	ordered	0.571	0.985	0.932	73	0.964	0.934	0.261
152	S3	200k	disordered	0.236	0.920	0.725	0	0.000	0.000	0.000
153	S1	50k	ordered	0.563	0.984	0.922	58	0.951	0.893	0.207
153	S3	50k	disordered	0.297	0.993	0.966	22	0.932	0.859	0.038
154	S1	100k	ordered	0.494	0.959	0.784	17	0.950	0.859	0.198
154	S3	100k	disordered	0.213	0.985	0.922	5	0.924	0.870	0.016
155	S1	100k	disordered	0.447	0.965	0.826	18	0.957	0.926	0.119
155	S3	200k	ordered	0.197	0.966	0.887	6	0.901	0.824	0.045
156	S1	100k	ordered	0.537	0.959	0.840	24	0.963	0.940	0.252
156	S3	50k	disordered	0.268	0.992	0.964	18	0.908	0.801	0.032
157	S1	100k	ordered	0.423	0.972	0.843	17	0.956	0.868	0.149
157	S3	100k	disordered	0.258	0.976	0.892	2	0.980	0.961	0.010
158	S1	100k	ordered	0.452	0.973	0.890	20	0.956	0.877	0.120
158	S3	200k	disordered	0.313	0.920	0.746	3	0.882	0.707	0.058

ID	Material	Scales	Class	O1	O2	O3	L1	L2	L3	L4
159	S1	50k	ordered	0.414	0.991	0.969	58	0.942	0.883	0.124
159	S3	50k	disordered	0.369	0.987	0.937	39	0.948	0.878	0.096
160	S1	100k	ordered	0.436	0.962	0.858	22	0.950	0.903	0.180
160	S3	100k	disordered	0.304	0.960	0.835	5	0.948	0.903	0.042
161	S1	100k	ordered	0.516	0.962	0.834	22	0.951	0.906	0.192
161	S3	200k	disordered	0.253	0.832	0.584	0	0.000	0.000	0.000
162	S1	100k	ordered	0.346	0.981	0.893	19	0.936	0.829	0.100
162	S3	50k	disordered	0.316	0.990	0.961	22	0.938	0.880	0.053
163	S1	100k	ordered	0.449	0.959	0.860	25	0.940	0.864	0.175
163	S3	100k	disordered	0.283	0.982	0.903	10	0.899	0.688	0.053
164	S1	100k	ordered	0.480	0.955	0.807	25	0.961	0.922	0.188
164	S3	200k	disordered	0.252	0.930	0.763	3	0.842	0.662	0.045
165	S1	100k	ordered	0.446	0.936	0.797	12	0.954	0.922	0.210
165	S3	200k	disordered	0.205	0.910	0.602	2	0.933	0.898	0.049
166	S1	100k	ordered	0.421	0.970	0.865	19	0.951	0.893	0.144
166	S3	100k	disordered	0.252	0.961	0.839	3	0.897	0.859	0.033
167	S1	100k	ordered	0.553	0.958	0.811	31	0.965	0.939	0.297
167	S3	50k	disordered	0.282	0.984	0.937	12	0.928	0.865	0.043
168	S1	100k	ordered	0.510	0.955	0.788	13	0.957	0.847	0.167
168	S3	50k	disordered	0.341	0.990	0.942	17	0.902	0.774	0.047
169	S1	50k	ordered	0.430	0.964	0.877	111	0.942	0.885	0.183
169	S3	100k	disordered	0.240	0.964	0.839	2	0.738	0.521	0.019
170	S1	100k	ordered	0.463	0.969	0.850	25	0.964	0.935	0.197
170	S3	200k	disordered	0.213	0.913	0.709	1	0.955	0.907	0.027
171	S1	50k	ordered	0.391	0.993	0.970	81	0.943	0.873	0.131
171	S3	50k	disordered	0.263	0.993	0.973	33	0.913	0.817	0.056
172	S1	50k	ordered	0.377	0.987	0.954	96	0.940	0.861	0.141
172	S3	100k	disordered	0.246	0.974	0.887	9	0.919	0.806	0.049
173	S1	100k	ordered	0.374	0.969	0.872	25	0.950	0.882	0.142
173	S3	50k	disordered	0.308	0.992	0.966	38	0.922	0.865	0.067
174	S1	50k	ordered	0.405	0.989	0.956	74	0.940	0.867	0.144
174	S3	100k	disordered	0.272	0.985	0.915	5	0.864	0.722	0.028
175	S1	100k	ordered	0.335	0.970	0.887	19	0.958	0.927	0.115
175	S3	200k	disordered	0.228	0.931	0.771	2	0.957	0.925	0.045
176	S1	50k	ordered	0.402	0.994	0.969	67	0.947	0.886	0.114
176	S3	50k	disordered	0.303	0.991	0.961	24	0.904	0.775	0.052
177	S1	100k	ordered	0.403	0.972	0.886	21	0.947	0.904	0.107
177	S3	100k	disordered	0.255	0.967	0.859	4	0.840	0.581	0.029
178	S1	50k	ordered	0.370	0.994	0.976	97	0.949	0.904	0.132
178	S3	200k	disordered	0.283	0.915	0.709	3	0.906	0.833	0.055
179	S1	100k	ordered	0.354	0.981	0.904	21	0.939	0.880	0.091
179	S3	50k	disordered	0.317	0.984	0.933	14	0.928	0.866	0.052
180	S1	50k	ordered	0.360	0.991	0.968	80	0.942	0.877	0.116
180	S3	100k	disordered	0.264	0.972	0.859	5	0.925	0.790	0.042
181	S1	100k	ordered	0.417	0.979	0.892	25	0.955	0.921	0.147
181	S3	200k	disordered	0.234	0.942	0.774	2	0.852	0.656	0.033
182	S1	50k	ordered	0.480	0.990	0.964	88	0.948	0.894	0.174
182	S3	50k	disordered	0.277	0.991	0.960	24	0.919	0.771	0.060
183	S1	100k	ordered	0.503	0.962	0.865	14	0.959	0.886	0.151
183	S3	100k	disordered	0.248	0.983	0.905	9	0.901	0.837	0.046
184	S1	50k	ordered	0.380	0.995	0.978	81	0.946	0.895	0.114

ID	Material	Scales	Class	O1	O2	O3	L1	L2	L3	L4
184	S3	200k	disordered	0.174	0.931	0.814	2	0.765	0.627	0.029
185	S1	100k	ordered	0.428	0.972	0.865	24	0.946	0.912	0.158
185	S3	50k	disordered	0.278	0.992	0.965	14	0.930	0.860	0.029
186	S1	50k	ordered	0.493	0.979	0.929	81	0.962	0.934	0.232
186	S3	100k	disordered	0.248	0.977	0.905	4	0.869	0.767	0.022
187	S1	100k	disordered	0.451	0.961	0.838	22	0.962	0.906	0.227
187	S3	50k	ordered	0.348	0.988	0.943	15	0.942	0.882	0.048
188	S1	50k	ordered	0.473	0.986	0.959	83	0.950	0.897	0.178
188	S3	100k	disordered	0.294	0.973	0.879	6	0.936	0.911	0.050
189	S1	100k	ordered	0.543	0.952	0.831	18	0.969	0.948	0.165
189	S3	200k	disordered	0.186	0.900	0.679	1	0.874	0.687	0.027
190	S1	50k	ordered	0.490	0.981	0.927	90	0.956	0.909	0.215
190	S3	100k	disordered	0.308	0.971	0.822	5	0.945	0.929	0.043
191	S1	100k	ordered	0.511	0.925	0.765	24	0.938	0.890	0.174
191	S3	50k	disordered	0.362	0.980	0.916	8	0.946	0.861	0.036
192	S1	50k	ordered	0.468	0.992	0.951	75	0.956	0.915	0.164
192	S3	200k	disordered	0.178	0.931	0.747	2	0.896	0.820	0.041
193	S1	100k	ordered	0.501	0.971	0.853	25	0.963	0.935	0.213
193	S3	50k	disordered	0.268	0.991	0.961	24	0.940	0.819	0.044
194	S1	50k	ordered	0.454	0.989	0.949	91	0.949	0.892	0.186
194	S3	100k	disordered	0.212	0.987	0.936	10	0.901	0.805	0.038
195	S1	100k	ordered	0.455	0.952	0.856	19	0.946	0.879	0.145
195	S3	200k	disordered	0.205	0.922	0.753	3	0.867	0.705	0.057
196	S1	50k	ordered	0.398	0.994	0.972	87	0.950	0.903	0.135
196	S3	50k	disordered	0.288	0.982	0.934	13	0.922	0.837	0.042
197	S1	100k	ordered	0.370	0.976	0.898	15	0.938	0.874	0.087
197	S3	100k	disordered	0.303	0.958	0.847	4	0.871	0.756	0.031
198	S1	50k	ordered	0.393	0.993	0.966	67	0.945	0.883	0.132
198	S3	200k	disordered	0.293	0.938	0.761	3	0.920	0.872	0.056
199	S1	100k	ordered	0.460	0.971	0.879	13	0.934	0.863	0.092
199	S3	50k	disordered	0.275	0.993	0.965	25	0.903	0.812	0.050
200	S1	50k	ordered	0.357	0.992	0.962	69	0.936	0.875	0.095
200	S3	100k	disordered	0.281	0.978	0.906	10	0.891	0.737	0.050
201	S1	100k	ordered	0.475	0.965	0.852	22	0.956	0.929	0.157
201	S3	200k	disordered	0.220	0.931	0.798	3	0.921	0.799	0.063
202	S1	50k	ordered	0.449	0.993	0.966	81	0.943	0.896	0.115
202	S3	50k	disordered	0.250	0.994	0.974	29	0.892	0.774	0.040
203	S1	100k	ordered	0.407	0.974	0.900	22	0.952	0.923	0.123
203	S3	100k	disordered	0.237	0.980	0.929	4	0.946	0.919	0.017
204	S1	50k	ordered	0.397	0.992	0.965	81	0.937	0.887	0.107
204	S3	200k	disordered	0.194	0.946	0.794	4	0.936	0.901	0.045
205	S1	100k	ordered	0.421	0.979	0.898	22	0.945	0.908	0.108
205	S3	50k	disordered	0.292	0.990	0.962	15	0.913	0.820	0.036
206	S1	50k	ordered	0.434	0.990	0.957	102	0.936	0.859	0.144
206	S3	100k	disordered	0.264	0.974	0.874	4	0.968	0.868	0.031
207	S1	100k	ordered	0.409	0.973	0.865	23	0.952	0.914	0.129
207	S3	200k	disordered	0.253	0.925	0.782	1	0.804	0.707	0.014
208	S1	50k	ordered	0.400	0.990	0.969	95	0.952	0.911	0.132
208	S3	50k	disordered	0.252	0.995	0.981	26	0.916	0.864	0.038
209	S1	100k	ordered	0.425	0.984	0.925	26	0.945	0.913	0.117
209	S3	100k	disordered	0.229	0.986	0.932	7	0.941	0.874	0.028

ID	Material	Scales	Class	O1	O2	O3	L1	L2	L3	L4
210	S1	100k	ordered	0.406	0.975	0.891	23	0.946	0.880	0.105
210	S3	200k	disordered	0.227	0.924	0.786	0	0.000	0.000	0.000
211	S1	50k	ordered	0.473	0.974	0.893	82	0.941	0.865	0.151
211	S3	50k	disordered	0.267	0.993	0.979	18	0.921	0.807	0.026
212	S1	100k	ordered	0.437	0.969	0.883	18	0.936	0.875	0.103
212	S3	100k	disordered	0.250	0.981	0.922	9	0.899	0.841	0.035
213	S1	50k	ordered	0.443	0.987	0.947	94	0.939	0.872	0.134
213	S3	200k	disordered	0.224	0.965	0.868	5	0.919	0.835	0.049
214	S1	100k	ordered	0.414	0.980	0.893	21	0.936	0.903	0.097
214	S4	50k	disordered	0.336	0.987	0.953	59	0.938	0.867	0.093
215	S1	50k	ordered	0.451	0.995	0.975	76	0.941	0.879	0.118
215	S4	50k	disordered	0.330	0.992	0.972	73	0.939	0.880	0.103
216	S1	100k	ordered	0.420	0.975	0.899	23	0.945	0.901	0.119
216	S4	100k	disordered	0.356	0.969	0.868	15	0.942	0.890	0.094
217	S1	50k	ordered	0.490	0.992	0.963	79	0.951	0.907	0.180
217	S4	50k	disordered	0.333	0.992	0.970	52	0.951	0.907	0.077
218	S1	100k	disordered	0.499	0.974	0.870	22	0.964	0.925	0.175
218	S4	50k	ordered	0.300	0.994	0.972	63	0.911	0.800	0.080
219	S1	50k	ordered	0.381	0.994	0.974	73	0.948	0.903	0.113
219	S4	100k	disordered	0.304	0.981	0.909	18	0.931	0.849	0.084
220	S1	100k	ordered	0.393	0.974	0.885	19	0.951	0.915	0.112
220	S4	100k	disordered	0.208	0.966	0.890	0	0.000	0.000	0.000
221	S1	50k	ordered	0.401	0.994	0.972	77	0.949	0.893	0.111
221	S4	50k	disordered	0.356	0.981	0.918	36	0.939	0.896	0.075
222	S1	100k	ordered	0.427	0.979	0.909	24	0.954	0.912	0.137
222	S3	50k	disordered	0.342	0.981	0.917	11	0.907	0.832	0.048
223	S1	50k	ordered	0.422	0.990	0.957	61	0.949	0.888	0.147
223	S3	100k	disordered	0.290	0.953	0.839	6	0.918	0.830	0.056
224	S1	100k	ordered	0.523	0.964	0.830	20	0.953	0.889	0.158
224	S3	200k	disordered	0.206	0.952	0.825	3	0.912	0.790	0.042
225	S1	50k	ordered	0.573	0.974	0.888	56	0.958	0.920	0.212
225	S3	50k	disordered	0.293	0.992	0.968	21	0.919	0.810	0.054
226	S1	100k	ordered	0.509	0.945	0.785	10	0.937	0.873	0.132
226	S3	100k	disordered	0.289	0.976	0.896	2	0.980	0.963	0.012
227	S1	50k	ordered	0.445	0.987	0.950	51	0.947	0.877	0.132
227	S3	200k	disordered	0.313	0.927	0.719	1	0.908	0.747	0.014
228	S1	100k	ordered	0.574	0.940	0.774	13	0.966	0.931	0.164
228	S3	50k	disordered	0.261	0.994	0.976	28	0.928	0.841	0.038
229	S1	50k	ordered	0.443	0.990	0.954	71	0.948	0.888	0.140
229	S3	100k	disordered	0.236	0.983	0.946	10	0.933	0.868	0.044
230	S1	100k	ordered	0.419	0.974	0.886	20	0.958	0.926	0.136
230	S3	200k	disordered	0.227	0.901	0.717	3	0.935	0.874	0.061
231	S1	50k	ordered	0.442	0.993	0.965	61	0.954	0.921	0.115
231	S3	50k	disordered	0.248	0.990	0.969	9	0.827	0.731	0.015
232	S1	100k	ordered	0.439	0.976	0.863	21	0.926	0.828	0.140
232	S3	100k	disordered	0.254	0.976	0.901	4	0.886	0.851	0.021
233	S1	50k	ordered	0.308	0.993	0.974	72	0.945	0.900	0.095
233	S3	200k	disordered	0.229	0.924	0.747	1	0.936	0.917	0.019
234	S1	100k	ordered	0.358	0.980	0.915	23	0.959	0.934	0.096
234	S3	50k	disordered	0.283	0.992	0.955	12	0.931	0.825	0.032
235	S1	100k	ordered	0.274	0.981	0.918	13	0.935	0.862	0.066

ID	Material	Scales	Class	O1	O2	O3	L1	L2	L3	L4
235	S3	100k	disordered	0.289	0.961	0.841	5	0.912	0.773	0.045
236	S1	50k	ordered	0.337	0.992	0.963	59	0.936	0.863	0.097
236	S3	200k	disordered	0.228	0.903	0.733	1	0.912	0.787	0.017
237	S1	100k	ordered	0.408	0.971	0.872	23	0.928	0.812	0.138
237	S3	50k	disordered	0.377	0.986	0.935	23	0.926	0.857	0.076
238	S1	100k	ordered	0.302	0.985	0.929	16	0.944	0.888	0.070
238	S3	100k	disordered	0.269	0.938	0.794	4	0.858	0.587	0.068
239	S1	50k	ordered	0.336	0.993	0.962	46	0.942	0.891	0.077
239	S3	200k	disordered	0.196	0.892	0.722	3	0.953	0.956	0.058
240	S1	50k	ordered	0.376	0.930	0.812	144	0.951	0.898	0.172
240	S3	50k	disordered	0.296	0.990	0.965	21	0.919	0.825	0.046
241	S1	100k	ordered	0.351	0.924	0.797	48	0.938	0.888	0.158
241	S3	100k	disordered	0.226	0.987	0.934	4	0.929	0.874	0.015
242	S1	50k	ordered	0.388	0.923	0.792	137	0.943	0.885	0.213
242	S3	200k	disordered	0.218	0.920	0.711	1	0.786	0.442	0.028
243	S1	100k	ordered	0.355	0.947	0.817	34	0.947	0.875	0.159
243	S3	50k	disordered	0.403	0.971	0.896	7	0.887	0.800	0.045
244	S1	50k	ordered	0.360	0.970	0.904	101	0.943	0.897	0.130
244	S3	100k	disordered	0.340	0.954	0.808	8	0.916	0.830	0.100
245	S1	100k	ordered	0.303	0.967	0.878	34	0.927	0.829	0.102
245	S3	200k	disordered	0.145	0.945	0.805	1	0.878	0.763	0.020
246	S1	50k	ordered	0.456	0.987	0.952	90	0.957	0.918	0.183
246	S3	50k	disordered	0.271	0.989	0.943	8	0.840	0.705	0.026
247	S1	100k	ordered	0.444	0.969	0.852	20	0.964	0.928	0.142
247	S3	100k	disordered	0.223	0.984	0.919	6	0.906	0.718	0.028
248	S1	100k	ordered	0.472	0.962	0.861	27	0.955	0.920	0.179
248	S3	200k	disordered	0.238	0.953	0.813	4	0.884	0.678	0.059
249	S1	50k	ordered	0.276	0.988	0.960	48	0.933	0.856	0.066
249	S3	50k	disordered	0.261	0.989	0.962	13	0.933	0.853	0.038
250	S1	100k	ordered	0.260	0.976	0.917	19	0.938	0.905	0.064
250	S3	100k	disordered	0.240	0.965	0.860	6	0.867	0.728	0.048
251	S1	50k	ordered	0.405	0.992	0.968	86	0.952	0.915	0.133
252	S1	100k	ordered	0.347	0.977	0.906	17	0.958	0.921	0.092
253	S1	100k	ordered	0.525	0.944	0.783	19	0.943	0.859	0.167
254	S1	100k	ordered	0.549	0.958	0.824	21	0.966	0.946	0.191
255	S1	100k	ordered	0.560	0.935	0.777	18	0.962	0.920	0.238
256	S1	50k	ordered	0.396	0.994	0.963	58	0.948	0.885	0.114
257	S1	100k	ordered	0.450	0.970	0.901	19	0.956	0.909	0.115
258	S1	50k	ordered	0.424	0.991	0.961	75	0.944	0.890	0.134
259	S1	50k	ordered	0.382	0.992	0.976	80	0.949	0.885	0.131
260	S1	100k	ordered	0.368	0.956	0.859	15	0.960	0.935	0.126
261	S1	50k	ordered	0.410	0.987	0.945	90	0.946	0.904	0.135
262	S1	100k	ordered	0.362	0.980	0.917	20	0.937	0.870	0.095
263	S1	50k	ordered	0.356	0.992	0.959	54	0.945	0.873	0.097
264	S1	100k	ordered	0.360	0.966	0.842	10	0.910	0.786	0.080
265	S1	50k	ordered	0.378	0.989	0.965	64	0.951	0.895	0.093
266	S1	100k	ordered	0.304	0.979	0.903	15	0.962	0.932	0.078
267	S1	50k	ordered	0.413	0.989	0.955	71	0.944	0.896	0.112
268	S1	100k	ordered	0.402	0.981	0.931	23	0.940	0.893	0.100
269	S1	50k	ordered	0.409	0.986	0.947	67	0.946	0.871	0.106
270	S1	100k	ordered	0.366	0.971	0.904	14	0.958	0.942	0.065

ID	Material	Scales	Class	O1	O2	O3	L1	L2	L3	L4
271	S1	50k	ordered	0.415	0.986	0.949	76	0.951	0.897	0.133
272	S1	100k	ordered	0.435	0.976	0.879	21	0.952	0.902	0.099
273	S1	50k	ordered	0.422	0.992	0.962	74	0.949	0.902	0.143
274	S1	50k	ordered	0.376	0.992	0.969	50	0.939	0.837	0.110
275	S1	100k	ordered	0.373	0.965	0.891	26	0.945	0.888	0.175
276	S1	100k	ordered	0.403	0.964	0.838	16	0.959	0.922	0.158
277	S1	50k	ordered	0.417	0.992	0.958	59	0.952	0.911	0.152
278	S1	50k	ordered	0.398	0.993	0.963	56	0.937	0.866	0.110
279	S1	50k	ordered	0.400	0.989	0.954	71	0.945	0.884	0.119
280	S1	50k	ordered	0.439	0.989	0.943	70	0.950	0.898	0.148
281	S1	100k	ordered	0.459	0.951	0.838	23	0.950	0.896	0.210
282	S1	50k	ordered	0.431	0.990	0.966	71	0.944	0.882	0.153
283	S1	100k	ordered	0.372	0.982	0.888	24	0.952	0.930	0.143
284	S1	50k	ordered	0.394	0.993	0.967	73	0.938	0.863	0.127
285	S1	100k	ordered	0.407	0.970	0.872	25	0.934	0.871	0.156
286	S1	50k	ordered	0.403	0.990	0.964	73	0.945	0.892	0.113
287	S1	50k	ordered	0.409	0.994	0.972	80	0.942	0.886	0.127
288	S1	50k	ordered	0.378	0.995	0.978	70	0.949	0.906	0.105
289	S1	100k	ordered	0.391	0.981	0.904	23	0.960	0.917	0.124
290	S1	50k	ordered	0.386	0.992	0.959	54	0.946	0.894	0.095
291	S1	100k	ordered	0.341	0.975	0.895	13	0.944	0.907	0.082
292	S1	50k	ordered	0.405	0.992	0.967	53	0.953	0.893	0.119
293	S1	50k	ordered	0.371	0.992	0.973	79	0.950	0.897	0.114
294	S1	100k	ordered	0.359	0.987	0.917	26	0.924	0.859	0.104
295	S1	50k	ordered	0.437	0.990	0.955	72	0.955	0.920	0.134
296	S1	100k	ordered	0.454	0.974	0.880	24	0.952	0.921	0.139
297	S1	50k	ordered	0.439	0.992	0.962	69	0.951	0.887	0.126
298	S1	100k	ordered	0.375	0.979	0.900	22	0.962	0.936	0.121
299	S1	50k	ordered	0.381	0.994	0.974	72	0.942	0.883	0.104
300	S1	100k	ordered	0.359	0.971	0.876	14	0.950	0.901	0.081
301	S1	50k	ordered	0.343	0.994	0.972	61	0.943	0.884	0.073
302	S1	50k	ordered	0.377	0.993	0.955	54	0.946	0.889	0.104
303	S1	100k	ordered	0.321	0.981	0.917	15	0.968	0.950	0.080
304	S1	50k	ordered	0.311	0.991	0.975	88	0.942	0.867	0.115
305	S1	100k	ordered	0.337	0.969	0.871	26	0.965	0.941	0.134
306	S1	50k	ordered	0.379	0.991	0.967	64	0.942	0.885	0.130
307	S1	100k	ordered	0.440	0.971	0.866	23	0.953	0.919	0.162
308	S1	50k	ordered	0.433	0.989	0.943	54	0.947	0.913	0.160
309	S1	100k	ordered	0.406	0.938	0.784	8	0.965	0.951	0.107
310	S1	50k	ordered	0.414	0.974	0.892	41	0.958	0.885	0.188
311	S1	100k	ordered	0.320	0.933	0.749	7	0.982	0.963	0.111
312	S1	50k	ordered	0.482	0.986	0.943	50	0.951	0.904	0.201
313	S1	100k	ordered	0.525	0.917	0.754	10	0.960	0.932	0.223
314	S1	100k	ordered	0.495	0.965	0.836	20	0.943	0.899	0.186
315	S1	50k	ordered	0.383	0.989	0.949	53	0.935	0.871	0.148
316	S1	100k	ordered	0.587	0.931	0.798	23	0.961	0.936	0.350
317	S1	50k	ordered	0.435	0.980	0.910	42	0.947	0.897	0.167
318	S1	100k	ordered	0.432	0.949	0.837	15	0.942	0.872	0.151
319	S1	50k	ordered	0.462	0.986	0.935	50	0.954	0.878	0.180
320	S1	100k	ordered	0.418	0.942	0.786	3	0.947	0.918	0.038
321	S1	50k	ordered	0.421	0.962	0.881	99	0.946	0.884	0.160

ID	Material	Scales	Class	O1	O2	O3	L1	L2	L3	L4
322	S1	100k	ordered	0.341	0.960	0.862	15	0.946	0.918	0.089
323	S1	50k	ordered	0.449	0.991	0.953	82	0.939	0.869	0.137
324	S1	100k	ordered	0.430	0.974	0.889	17	0.944	0.897	0.121
325	S2	100k	ordered	0.526	0.903	0.675	9	0.958	0.940	0.188
326	S2	50k	ordered	0.401	0.985	0.933	42	0.936	0.865	0.133
327	S2	50k	ordered	0.469	0.979	0.893	35	0.954	0.913	0.152
328	S2	50k	ordered	0.463	0.972	0.861	39	0.943	0.898	0.191
329	S2	100k	ordered	0.531	0.918	0.700	8	0.959	0.930	0.158
330	S2	50k	ordered	0.422	0.964	0.884	53	0.945	0.902	0.160
331	S2	100k	ordered	0.436	0.908	0.760	10	0.958	0.931	0.174
332	S2	50k	ordered	0.426	0.975	0.910	36	0.949	0.913	0.168
333	S2	50k	ordered	0.479	0.940	0.815	83	0.945	0.888	0.222
334	S2	50k	ordered	0.416	0.978	0.917	26	0.939	0.871	0.096
335	S2	50k	ordered	0.496	0.985	0.923	40	0.939	0.880	0.150
336	S2	50k	ordered	0.445	0.982	0.915	42	0.948	0.911	0.166
337	S2	100k	ordered	0.427	0.958	0.839	10	0.967	0.945	0.106
338	S2	50k	ordered	0.484	0.978	0.913	47	0.955	0.924	0.179
339	S2	100k	ordered	0.529	0.948	0.797	16	0.944	0.899	0.183
340	S2	50k	ordered	0.384	0.986	0.951	42	0.930	0.844	0.100
341	S2	100k	ordered	0.388	0.959	0.844	6	0.933	0.893	0.054
342	S2	50k	ordered	0.473	0.974	0.902	42	0.935	0.830	0.165
343	S2	100k	ordered	0.464	0.939	0.778	16	0.954	0.904	0.172
344	S2	50k	ordered	0.388	0.986	0.932	25	0.922	0.818	0.106
345	S2	100k	ordered	0.346	0.957	0.811	10	0.937	0.876	0.099
346	S2	50k	ordered	0.431	0.984	0.941	44	0.949	0.883	0.159
347	S2	50k	ordered	0.518	0.976	0.893	32	0.960	0.921	0.168
348	S2	100k	ordered	0.511	0.928	0.731	8	0.968	0.944	0.129
349	S2	50k	ordered	0.492	0.974	0.878	49	0.952	0.916	0.189
350	S2	100k	ordered	0.594	0.923	0.723	14	0.955	0.928	0.249
351	S2	50k	ordered	0.447	0.973	0.887	34	0.947	0.903	0.143
352	S2	100k	ordered	0.388	0.937	0.747	8	0.947	0.906	0.102
353	S2	50k	ordered	0.497	0.973	0.895	46	0.946	0.896	0.207
354	S2	50k	ordered	0.435	0.982	0.916	42	0.959	0.915	0.165
355	S2	100k	ordered	0.523	0.909	0.629	7	0.958	0.929	0.192
356	S2	100k	ordered	0.628	0.909	0.740	13	0.956	0.879	0.327
357	S2	50k	ordered	0.452	0.988	0.934	34	0.941	0.907	0.116
358	S2	100k	ordered	0.372	0.955	0.835	11	0.913	0.781	0.119
359	S2	50k	ordered	0.443	0.986	0.935	29	0.945	0.902	0.102
360	S2	100k	ordered	0.461	0.937	0.747	8	0.945	0.916	0.142
361	S2	50k	ordered	0.512	0.978	0.909	31	0.951	0.901	0.148
362	S2	100k	ordered	0.463	0.941	0.738	10	0.958	0.925	0.133
363	S2	50k	ordered	0.433	0.988	0.960	46	0.944	0.893	0.137
364	S2	100k	ordered	0.402	0.957	0.833	13	0.949	0.892	0.121
365	S2	50k	ordered	0.471	0.981	0.939	49	0.947	0.869	0.146
366	S2	100k	ordered	0.431	0.944	0.766	9	0.951	0.884	0.118
367	S2	50k	ordered	0.474	0.967	0.896	38	0.938	0.889	0.139
368	S2	100k	ordered	0.454	0.921	0.733	15	0.956	0.936	0.161
369	S2	50k	ordered	0.573	0.976	0.875	36	0.965	0.901	0.271
370	S2	100k	ordered	0.778	0.874	0.625	5	0.976	0.925	0.352
371	S1	100k	ordered	0.303	0.969	0.885	10	0.929	0.868	0.074
372	S1	100k	ordered	0.282	0.976	0.877	9	0.948	0.873	0.074

ID	Material	Scales	Class	O1	O2	O3	L1	L2	L3	L4
373	S1	50k	ordered	0.423	0.979	0.936	53	0.947	0.893	0.126
374	S1	100k	ordered	0.336	0.954	0.847	6	0.975	0.965	0.060
375	S1	50k	ordered	0.410	0.990	0.952	85	0.939	0.882	0.139
376	S1	100k	ordered	0.431	0.974	0.885	18	0.947	0.901	0.111
377	S1	50k	ordered	0.476	0.985	0.936	67	0.939	0.866	0.144
378	S1	100k	ordered	0.429	0.969	0.871	16	0.955	0.917	0.123
379	S1	100k	ordered	0.389	0.971	0.894	22	0.944	0.884	0.119
380	S1	50k	ordered	0.399	0.994	0.978	82	0.935	0.837	0.125
381	S1	50k	ordered	0.452	0.990	0.963	80	0.940	0.881	0.155
382	S1	100k	ordered	0.436	0.973	0.861	21	0.944	0.884	0.150
383	S1	50k	ordered	0.476	0.988	0.955	57	0.947	0.901	0.121
384	S1	100k	ordered	0.393	0.963	0.865	16	0.964	0.936	0.122
385	S1	50k	ordered	0.409	0.992	0.958	63	0.934	0.858	0.117
386	S1	100k	ordered	0.433	0.979	0.888	20	0.948	0.882	0.121
387	S1	50k	ordered	0.428	0.992	0.964	62	0.940	0.879	0.121
388	S1	100k	ordered	0.493	0.964	0.866	20	0.933	0.872	0.153
389	S2	50k	ordered	0.371	0.988	0.941	29	0.929	0.880	0.082
390	S2	100k	ordered	0.487	0.875	0.578	7	0.972	0.965	0.179
391	S2	50k	ordered	0.367	0.989	0.946	29	0.930	0.874	0.079
392	S2	100k	ordered	0.391	0.948	0.826	11	0.945	0.909	0.093
393	S2	50k	ordered	0.360	0.992	0.953	44	0.938	0.893	0.100
394	S2	100k	ordered	0.403	0.961	0.858	12	0.915	0.831	0.100
395	S2	50k	ordered	0.425	0.984	0.931	27	0.948	0.918	0.081
396	S2	100k	ordered	0.364	0.957	0.796	9	0.912	0.811	0.099
397	S2	100k	ordered	0.340	0.943	0.769	8	0.955	0.922	0.133
398	S2	50k	ordered	0.416	0.985	0.940	33	0.937	0.866	0.111
399	S2	100k	ordered	0.402	0.920	0.778	10	0.964	0.936	0.122
400	S2	50k	ordered	0.389	0.987	0.935	18	0.915	0.803	0.053
401	S2	100k	ordered	0.302	0.967	0.836	5	0.956	0.942	0.044
402	S2	50k	ordered	0.430	0.986	0.933	36	0.928	0.875	0.091
403	S2	100k	ordered	0.441	0.963	0.831	7	0.920	0.876	0.074
404	S2	50k	ordered	0.419	0.981	0.930	26	0.902	0.815	0.056
405	S2	100k	ordered	0.372	0.949	0.840	5	0.941	0.885	0.042
406	S1	200k	ordered	0.462	0.903	0.654	7	0.964	0.924	0.190
407	S1	200k	ordered	0.354	0.880	0.682	4	0.908	0.822	0.115
408	S1	200k	ordered	0.452	0.885	0.693	4	0.904	0.824	0.083
409	S1	200k	ordered	0.423	0.788	0.478	2	0.955	0.936	0.123
410	S1	200k	ordered	0.361	0.866	0.631	5	0.959	0.905	0.155
411	S1	200k	ordered	0.256	0.812	0.599	2	0.965	0.917	0.092
412	S1	200k	ordered	0.317	0.870	0.673	4	0.973	0.962	0.084
413	S1	200k	ordered	0.345	0.899	0.686	3	0.968	0.911	0.082
414	S1	200k	ordered	0.325	0.822	0.449	1	0.908	0.868	0.038
415	S1	50k	ordered	0.387	0.968	0.871	67	0.946	0.892	0.151
416	S1	100k	ordered	0.372	0.937	0.772	16	0.950	0.904	0.124
417	S1	200k	ordered	0.361	0.909	0.713	5	0.960	0.922	0.093
418	S1	200k	ordered	0.440	0.865	0.616	4	0.947	0.885	0.112
419	S1	200k	ordered	0.468	0.878	0.634	6	0.969	0.962	0.146
420	S1	200k	ordered	0.457	0.855	0.643	2	0.981	0.968	0.066
421	S1	200k	ordered	0.316	0.843	0.612	1	0.942	0.900	0.038
422	S1	200k	ordered	0.467	0.878	0.666	4	0.969	0.966	0.138
423	S1	200k	ordered	0.413	0.824	0.550	6	0.964	0.943	0.202

ID	Material	Scales	Class	O1	O2	O3	L1	L2	L3	L4
424	S1	200k	ordered	0.434	0.904	0.706	8	0.942	0.906	0.157
425	S1	200k	ordered	0.328	0.918	0.670	3	0.900	0.766	0.060
426	S1	200k	ordered	0.344	0.887	0.668	3	0.971	0.948	0.086
427	S1	200k	ordered	0.450	0.835	0.641	4	0.961	0.939	0.130
428	S1	200k	ordered	0.206	0.876	0.639	2	0.932	0.897	0.043
429	S1	200k	ordered	0.252	0.829	0.617	3	0.970	0.955	0.088
430	S1	200k	ordered	0.289	0.864	0.634	3	0.968	0.956	0.073
431	S1	200k	ordered	0.306	0.868	0.654	5	0.970	0.960	0.107
432	S1	200k	ordered	0.432	0.867	0.569	4	0.981	0.978	0.128
433	S1	200k	ordered	0.374	0.888	0.673	3	0.904	0.793	0.074
434	S1	200k	ordered	0.518	0.812	0.542	6	0.931	0.581	0.254
435	S1	200k	ordered	0.470	0.751	0.488	1	0.964	0.954	0.064
436	S1	200k	ordered	0.390	0.875	0.637	4	0.953	0.923	0.106
437	S1	200k	ordered	0.429	0.841	0.601	2	0.954	0.953	0.078
438	S1	50k	ordered	0.475	0.990	0.943	57	0.959	0.924	0.173
439	S1	100k	ordered	0.446	0.966	0.861	17	0.958	0.928	0.136
440	S1	50k	ordered	0.428	0.984	0.955	69	0.951	0.907	0.151
441	S1	100k	ordered	0.432	0.960	0.879	19	0.959	0.941	0.131
442	S1	100k	ordered	0.389	0.956	0.861	30	0.953	0.921	0.162
443	S1	200k	ordered	0.350	0.870	0.694	5	0.968	0.962	0.086
444	S1	200k	ordered	0.408	0.854	0.633	1	0.964	0.901	0.025
445	S1	200k	ordered	0.406	0.818	0.586	5	0.974	0.965	0.192
446	S1	200k	ordered	0.466	0.810	0.599	4	0.968	0.954	0.187
447	S1	200k	ordered	0.440	0.808	0.552	5	0.961	0.950	0.183
448	S1	200k	ordered	0.411	0.864	0.613	5	0.952	0.934	0.108
449	S1	200k	ordered	0.477	0.881	0.602	5	0.980	0.971	0.153
450	S1	200k	ordered	0.357	0.945	0.780	6	0.933	0.873	0.077
451	S1	200k	ordered	0.226	0.898	0.712	3	0.947	0.925	0.063
452	S1	200k	ordered	0.349	0.891	0.622	5	0.975	0.959	0.143
453	S1	200k	ordered	0.639	0.725	0.552	6	0.972	0.954	0.413
454	S1	200k	ordered	0.413	0.858	0.678	11	0.940	0.894	0.223
455	S1	200k	ordered	0.491	0.806	0.531	3	0.950	0.941	0.183
456	S1	200k	ordered	0.597	0.748	0.579	9	0.960	0.925	0.344
457	S1	50k	ordered	0.436	0.989	0.952	45	0.948	0.908	0.140
458	S1	100k	ordered	0.396	0.973	0.878	18	0.954	0.903	0.105
459	S1	200k	ordered	0.352	0.925	0.702	3	0.950	0.920	0.062
460	S1	200k	ordered	0.545	0.884	0.589	5	0.888	0.733	0.165
461	S1	200k	ordered	0.394	0.870	0.632	4	0.968	0.950	0.110
462	S1	200k	ordered	0.590	0.882	0.675	8	0.964	0.936	0.286
463	S1	200k	ordered	0.327	0.899	0.717	2	0.963	0.931	0.051
464	S1	200k	ordered	0.198	0.874	0.676	0	0.000	0.000	0.000
465	S1	200k	ordered	0.572	0.771	0.532	3	0.945	0.806	0.203
466	S1	200k	ordered	0.554	0.802	0.604	6	0.967	0.949	0.251
467	S1	200k	ordered	0.532	0.821	0.550	7	0.945	0.890	0.257
468	S1	200k	ordered	0.403	0.884	0.675	5	0.963	0.922	0.123
469	S1	200k	ordered	0.511	0.827	0.604	4	0.953	0.939	0.153
470	S1	200k	ordered	0.736	0.602	0.343	4	0.970	0.958	0.460
471	S1	200k	ordered	0.569	0.782	0.482	5	0.947	0.904	0.363
472	S1	200k	ordered	0.497	0.835	0.587	3	0.956	0.944	0.114
473	S1	200k	ordered	0.464	0.839	0.572	4	0.957	0.918	0.165
474	S1	200k	ordered	0.285	0.902	0.717	7	0.959	0.930	0.152

ID	Material	Scales	Class	O1	O2	O3	L1	L2	L3	L4
475	S1	200k	ordered	0.508	0.858	0.627	10	0.957	0.921	0.259
476	S1	200k	ordered	0.566	0.763	0.584	6	0.953	0.905	0.250
477	S1	200k	ordered	0.257	0.865	0.592	2	0.906	0.845	0.057
478	S1	200k	ordered	0.416	0.857	0.602	5	0.962	0.934	0.146
479	S1	200k	ordered	0.524	0.778	0.532	2	0.978	0.973	0.092
480	S1	200k	ordered	0.466	0.904	0.707	7	0.975	0.950	0.149
481	S1	50k	ordered	0.333	0.990	0.968	80	0.934	0.860	0.124
482	S1	100k	ordered	0.334	0.982	0.919	23	0.937	0.869	0.096
483	S1	50k	ordered	0.407	0.988	0.954	78	0.949	0.910	0.139
484	S1	100k	ordered	0.392	0.979	0.904	26	0.956	0.916	0.133
485	S1	200k	ordered	0.454	0.909	0.710	7	0.968	0.936	0.137
486	S1	50k	ordered	0.472	0.988	0.952	78	0.960	0.903	0.192
487	S1	100k	ordered	0.415	0.962	0.814	23	0.959	0.925	0.171
488	S1	200k	ordered	0.400	0.749	0.508	7	0.957	0.931	0.301
489	S1	50k	ordered	0.394	0.989	0.955	55	0.951	0.915	0.116
490	S1	100k	ordered	0.403	0.977	0.891	21	0.953	0.913	0.127
491	S1	200k	ordered	0.429	0.909	0.659	5	0.953	0.883	0.130
492	S1	50k	ordered	0.409	0.985	0.921	44	0.946	0.892	0.137
493	S1	100k	ordered	0.333	0.930	0.730	11	0.966	0.952	0.122
494	S1	200k	ordered	0.413	0.858	0.556	4	0.957	0.942	0.135
495	S1	50k	ordered	0.495	0.972	0.905	73	0.952	0.879	0.197
496	S1	100k	ordered	0.497	0.923	0.781	22	0.966	0.941	0.199
497	S1	200k	ordered	0.548	0.770	0.510	5	0.965	0.957	0.206
498	S1	50k	ordered	0.430	0.937	0.802	136	0.950	0.876	0.205
499	S1	100k	ordered	0.439	0.917	0.691	46	0.951	0.911	0.223
500	S1	200k	ordered	0.410	0.884	0.586	6	0.951	0.897	0.149
501	S1	50k	ordered	0.370	0.990	0.947	55	0.958	0.922	0.151
502	S1	100k	ordered	0.421	0.929	0.723	8	0.960	0.931	0.173
503	S1	200k	ordered	0.428	0.718	0.471	1	0.971	0.965	0.121
504	S1	50k	ordered	0.517	0.980	0.914	80	0.964	0.934	0.256
505	S1	100k	ordered	0.596	0.930	0.719	24	0.972	0.942	0.332
506	S1	200k	ordered	0.484	0.876	0.636	3	0.962	0.911	0.151
507	S1	50k	ordered	0.412	0.993	0.964	94	0.941	0.891	0.147
508	S1	100k	ordered	0.408	0.980	0.883	22	0.959	0.928	0.101
509	S1	200k	ordered	0.364	0.905	0.705	1	0.855	0.331	0.019
510	S1	100k	ordered	0.610	0.907	0.725	22	0.963	0.935	0.277
511	S1	200k	ordered	0.710	0.812	0.576	8	0.974	0.957	0.349
512	S1	200k	ordered	0.512	0.789	0.539	3	0.953	0.917	0.120
513	S1	200k	ordered	0.429	0.855	0.592	4	0.971	0.966	0.134
514	S1	200k	ordered	0.423	0.897	0.653	4	0.939	0.874	0.113
515	S1	200k	ordered	0.469	0.771	0.533	4	0.976	0.966	0.209
516	S1	200k	ordered	0.253	0.828	0.644	3	0.966	0.946	0.112
517	S1	200k	ordered	0.425	0.817	0.605	4	0.957	0.931	0.133
518	S1	200k	ordered	0.479	0.850	0.519	0	0.000	0.000	0.000
519	S1	200k	ordered	0.265	0.921	0.764	9	0.921	0.812	0.101
520	S1	200k	ordered	0.297	0.927	0.732	5	0.924	0.863	0.084
521	S1	200k	ordered	0.367	0.897	0.646	2	0.920	0.879	0.052
522	S1	200k	ordered	0.452	0.910	0.683	4	0.940	0.882	0.155
523	S1	200k	ordered	0.411	0.898	0.681	4	0.940	0.911	0.115
524	S1	200k	ordered	0.419	0.869	0.663	4	0.937	0.870	0.099
525	S1	200k	ordered	0.337	0.865	0.581	5	0.958	0.914	0.161

ID	Material	Scales	Class	O1	O2	O3	L1	L2	L3	L4
526	S1	200k	ordered	0.360	0.861	0.597	3	0.975	0.963	0.084
527	S1	200k	ordered	0.346	0.933	0.751	6	0.920	0.803	0.097
528	S1	200k	ordered	0.588	0.880	0.654	5	0.950	0.922	0.188
529	S1	200k	ordered	0.560	0.885	0.672	6	0.936	0.754	0.180
530	S1	200k	ordered	0.341	0.944	0.746	5	0.933	0.806	0.105
531	S1	200k	ordered	0.361	0.941	0.746	8	0.901	0.817	0.095
532	S1	50k	ordered	0.434	0.990	0.959	70	0.945	0.894	0.138
533	S1	100k	ordered	0.441	0.970	0.848	23	0.952	0.907	0.140
534	S1	200k	ordered	0.408	0.925	0.713	6	0.965	0.952	0.118
535	S1	50k	ordered	0.490	0.989	0.945	65	0.961	0.931	0.188
536	S1	100k	ordered	0.430	0.974	0.851	17	0.948	0.906	0.134
537	S1	50k	ordered	0.501	0.991	0.948	64	0.949	0.901	0.182
538	S1	100k	ordered	0.414	0.955	0.840	11	0.952	0.915	0.116
539	S1	50k	ordered	0.444	0.987	0.947	61	0.953	0.905	0.138
540	S1	50k	ordered	0.445	0.970	0.926	56	0.959	0.926	0.182
541	S1	100k	ordered	0.360	0.959	0.853	27	0.945	0.896	0.160
542	S1	200k	ordered	0.268	0.918	0.751	6	0.939	0.848	0.109
543	S1	50k	ordered	0.561	0.978	0.913	65	0.955	0.927	0.209
544	S1	100k	ordered	0.562	0.946	0.840	19	0.970	0.955	0.194
545	S1	200k	ordered	0.598	0.806	0.574	6	0.973	0.955	0.295
546	S1	50k	ordered	0.444	0.991	0.956	59	0.946	0.877	0.144
547	S1	100k	ordered	0.476	0.969	0.859	18	0.956	0.923	0.143
548	S1	200k	ordered	0.420	0.893	0.622	3	0.952	0.925	0.082
549	S1	50k	ordered	0.369	0.991	0.967	66	0.940	0.887	0.127
550	S1	100k	ordered	0.336	0.965	0.864	12	0.965	0.944	0.071
551	S1	200k	ordered	0.260	0.921	0.739	3	0.887	0.658	0.047
552	S1	50k	ordered	0.406	0.990	0.956	50	0.948	0.903	0.112
553	S1	100k	ordered	0.353	0.981	0.906	14	0.933	0.848	0.088
554	S1	200k	ordered	0.258	0.896	0.717	4	0.957	0.931	0.087
555	S1	50k	ordered	0.458	0.990	0.958	65	0.948	0.896	0.150
556	S1	100k	ordered	0.508	0.957	0.815	18	0.972	0.946	0.219
557	S1	200k	ordered	0.462	0.814	0.513	5	0.962	0.920	0.268
558	S1	50k	ordered	0.467	0.987	0.954	68	0.956	0.924	0.180
559	S1	100k	ordered	0.332	0.934	0.810	14	0.961	0.935	0.125
560	S1	200k	ordered	0.404	0.748	0.457	4	0.960	0.947	0.232
561	S1	50k	ordered	0.489	0.991	0.961	70	0.938	0.877	0.161
562	S1	100k	ordered	0.454	0.977	0.876	20	0.945	0.878	0.143
563	S1	200k	ordered	0.454	0.879	0.645	6	0.938	0.910	0.158
564	S1	50k	ordered	0.454	0.986	0.940	68	0.943	0.889	0.151
565	S1	100k	ordered	0.434	0.970	0.860	21	0.948	0.900	0.125
566	S1	200k	ordered	0.330	0.867	0.685	2	0.955	0.945	0.062
567	S1	50k	ordered	0.481	0.985	0.907	71	0.954	0.887	0.191
568	S1	100k	ordered	0.456	0.955	0.816	20	0.968	0.942	0.154
569	S1	200k	ordered	0.490	0.732	0.495	3	0.971	0.964	0.113
570	S1	50k	ordered	0.348	0.992	0.970	80	0.940	0.893	0.099
571	S1	100k	ordered	0.378	0.981	0.890	22	0.946	0.909	0.116
572	S1	200k	ordered	0.225	0.913	0.772	2	0.941	0.908	0.038
573	S1	50k	ordered	0.444	0.976	0.911	91	0.956	0.926	0.173
574	S1	100k	ordered	0.449	0.967	0.832	27	0.957	0.911	0.148
575	S1	200k	ordered	0.529	0.881	0.659	7	0.950	0.895	0.165
576	S1	50k	ordered	0.431	0.981	0.934	66	0.944	0.891	0.125

ID	Material	Scales	Class	O1	O2	O3	L1	L2	L3	L4
577	S1	100k	ordered	0.437	0.970	0.852	24	0.956	0.921	0.151
578	S1	200k	ordered	0.407	0.901	0.675	3	0.966	0.955	0.087
579	S1	50k	ordered	0.428	0.990	0.949	43	0.945	0.885	0.116
580	S1	100k	ordered	0.454	0.968	0.877	18	0.951	0.916	0.118
581	S1	200k	ordered	0.484	0.927	0.724	3	0.952	0.893	0.070
582	S1	50k	ordered	0.382	0.969	0.917	85	0.950	0.890	0.147
583	S1	100k	ordered	0.404	0.938	0.803	29	0.948	0.895	0.151
584	S1	50k	ordered	0.374	0.981	0.946	74	0.948	0.892	0.129
585	S1	100k	ordered	0.382	0.955	0.876	21	0.948	0.905	0.114
586	S1	200k	ordered	0.361	0.894	0.716	9	0.952	0.928	0.191
587	S1	50k	ordered	0.314	0.983	0.945	81	0.933	0.840	0.100
588	S1	100k	ordered	0.336	0.973	0.876	36	0.933	0.853	0.128
589	S1	200k	ordered	0.328	0.936	0.734	9	0.960	0.904	0.111
590	S1	50k	ordered	0.453	0.984	0.910	58	0.947	0.894	0.159
591	S1	100k	ordered	0.495	0.965	0.825	17	0.946	0.903	0.151
592	S1	200k	ordered	0.615	0.788	0.454	8	0.951	0.935	0.340
593	S1	50k	ordered	0.441	0.987	0.948	57	0.939	0.850	0.141
594	S1	100k	ordered	0.464	0.966	0.856	21	0.953	0.899	0.154
595	S1	200k	ordered	0.339	0.908	0.714	4	0.944	0.898	0.097
596	S1	50k	ordered	0.458	0.990	0.948	77	0.950	0.903	0.176
597	S1	100k	ordered	0.421	0.978	0.892	27	0.954	0.921	0.156
598	S1	200k	ordered	0.474	0.919	0.745	4	0.935	0.853	0.101
599	S1	50k	ordered	0.525	0.983	0.901	54	0.957	0.912	0.171
600	S1	100k	ordered	0.473	0.933	0.736	21	0.963	0.940	0.211
601	S1	200k	ordered	0.444	0.894	0.629	4	0.888	0.726	0.100
602	S1	50k	ordered	0.497	0.986	0.934	70	0.959	0.922	0.211
603	S1	100k	ordered	0.478	0.949	0.805	17	0.949	0.918	0.183
604	S1	200k	ordered	0.349	0.823	0.566	0	0.000	0.000	0.000
605	S1	50k	ordered	0.472	0.978	0.930	78	0.951	0.901	0.218
606	S1	100k	ordered	0.467	0.942	0.830	25	0.959	0.933	0.212
607	S1	200k	ordered	0.583	0.826	0.547	10	0.961	0.939	0.363
608	S1	50k	ordered	0.575	0.975	0.874	63	0.961	0.925	0.256
609	S1	100k	ordered	0.557	0.969	0.833	26	0.957	0.864	0.280
610	S1	200k	ordered	0.551	0.841	0.609	8	0.965	0.928	0.327
611	S1	50k	ordered	0.306	0.996	0.982	72	0.932	0.874	0.071
612	S1	100k	ordered	0.335	0.981	0.919	21	0.921	0.884	0.081
613	S1	200k	ordered	0.409	0.924	0.709	4	0.923	0.856	0.089
614	S1	50k	ordered	0.464	0.981	0.927	70	0.957	0.924	0.189
615	S1	100k	ordered	0.461	0.953	0.851	19	0.962	0.920	0.164
616	S1	200k	ordered	0.466	0.882	0.630	5	0.965	0.926	0.138
617	S1	50k	ordered	0.407	0.968	0.899	59	0.956	0.923	0.146
618	S1	100k	ordered	0.453	0.934	0.812	26	0.960	0.934	0.184
619	S1	200k	ordered	0.492	0.845	0.591	8	0.959	0.911	0.224
620	S1	50k	ordered	0.405	0.990	0.951	59	0.959	0.924	0.135
621	S1	100k	ordered	0.400	0.973	0.868	22	0.939	0.890	0.146
622	S1	50k	ordered	0.323	0.979	0.909	99	0.954	0.914	0.115
623	S1	100k	ordered	0.325	0.947	0.795	31	0.949	0.920	0.126
624	S1	200k	ordered	0.298	0.950	0.798	4	0.939	0.912	0.055
625	S1	50k	ordered	0.365	0.990	0.955	81	0.948	0.882	0.141
626	S1	100k	ordered	0.354	0.982	0.924	27	0.959	0.927	0.141
627	S1	200k	ordered	0.468	0.912	0.669	6	0.924	0.869	0.134

ID	Material	Scales	Class	O1	O2	O3	L1	L2	L3	L4
628	S1	50k	ordered	0.399	0.969	0.902	142	0.950	0.890	0.184
629	S1	100k	ordered	0.362	0.946	0.849	41	0.956	0.920	0.185
630	S1	50k	ordered	0.323	0.974	0.925	104	0.938	0.861	0.133
631	S1	100k	ordered	0.359	0.946	0.814	34	0.958	0.925	0.155
632	S1	50k	ordered	0.463	0.990	0.943	66	0.946	0.887	0.173
633	S1	100k	ordered	0.552	0.949	0.793	19	0.957	0.910	0.232
634	S1	200k	ordered	0.489	0.882	0.630	4	0.950	0.884	0.167
635	S1	50k	ordered	0.444	0.989	0.957	82	0.945	0.885	0.156
636	S1	100k	ordered	0.439	0.966	0.874	17	0.954	0.922	0.101
637	S1	200k	ordered	0.426	0.891	0.695	8	0.963	0.947	0.152
638	S1	50k	ordered	0.420	0.991	0.964	76	0.947	0.892	0.120
639	S1	100k	ordered	0.410	0.979	0.909	23	0.943	0.851	0.117
640	S1	200k	ordered	0.479	0.889	0.681	7	0.960	0.927	0.171
641	S1	50k	ordered	0.413	0.988	0.961	79	0.940	0.885	0.119
642	S1	100k	ordered	0.410	0.971	0.878	20	0.942	0.880	0.112
643	S1	200k	ordered	0.456	0.891	0.705	6	0.958	0.901	0.133
644	S1	50k	ordered	0.431	0.990	0.956	67	0.946	0.902	0.138
645	S1	100k	ordered	0.467	0.972	0.864	25	0.951	0.877	0.196
646	S1	100k	ordered	0.454	0.972	0.879	22	0.952	0.914	0.184
647	S1	200k	ordered	0.506	0.911	0.654	5	0.965	0.943	0.152
648	S1	50k	ordered	0.371	0.989	0.962	92	0.938	0.876	0.118
649	S1	100k	ordered	0.428	0.977	0.908	21	0.954	0.924	0.112
650	S1	200k	ordered	0.485	0.886	0.669	5	0.958	0.922	0.131
651	S1	50k	ordered	0.290	0.996	0.984	81	0.914	0.820	0.076
652	S1	100k	ordered	0.272	0.986	0.930	19	0.949	0.876	0.067
653	S1	200k	ordered	0.325	0.947	0.778	2	0.951	0.880	0.028
654	S1	50k	ordered	0.383	0.985	0.939	84	0.949	0.897	0.130
655	S1	100k	ordered	0.366	0.962	0.867	27	0.958	0.927	0.123
656	S1	200k	ordered	0.320	0.923	0.748	6	0.942	0.872	0.080
657	S1	50k	ordered	0.422	0.993	0.971	94	0.948	0.897	0.156
658	S1	100k	ordered	0.349	0.978	0.902	17	0.942	0.897	0.097
659	S1	200k	ordered	0.309	0.904	0.710	5	0.966	0.932	0.118
660	S1	50k	ordered	0.388	0.987	0.952	82	0.945	0.888	0.145
661	S1	100k	ordered	0.369	0.975	0.877	15	0.950	0.905	0.089
662	S1	200k	ordered	0.394	0.890	0.675	5	0.947	0.923	0.112
663	S1	50k	ordered	0.461	0.994	0.977	71	0.938	0.889	0.128
664	S1	100k	ordered	0.438	0.970	0.864	13	0.963	0.922	0.096
665	S1	200k	ordered	0.457	0.868	0.669	2	0.988	0.975	0.056
666	S1	50k	ordered	0.437	0.993	0.967	62	0.944	0.867	0.134
667	S1	100k	ordered	0.482	0.965	0.859	23	0.971	0.943	0.175
668	S1	200k	ordered	0.473	0.835	0.589	5	0.979	0.954	0.224
669	S1	50k	ordered	0.392	0.944	0.839	162	0.940	0.872	0.196
670	S1	100k	ordered	0.352	0.929	0.800	39	0.946	0.882	0.160
671	S1	200k	ordered	0.419	0.866	0.600	13	0.943	0.844	0.256
672	S1	50k	ordered	0.341	0.965	0.907	146	0.941	0.878	0.159
673	S1	100k	ordered	0.357	0.958	0.855	38	0.932	0.832	0.158
674	S1	50k	ordered	0.486	0.943	0.838	86	0.949	0.907	0.230
675	S1	100k	ordered	0.503	0.904	0.738	23	0.969	0.956	0.231
676	S1	200k	ordered	0.589	0.855	0.610	8	0.957	0.939	0.270
677	S1	50k	ordered	0.471	0.992	0.960	80	0.936	0.871	0.162
678	S1	100k	ordered	0.446	0.967	0.865	19	0.943	0.867	0.121

ID	Material	Scales	Class	O1	O2	O3	L1	L2	L3	L4
679	S1	50k	ordered	0.429	0.993	0.963	70	0.948	0.900	0.140
680	S1	100k	ordered	0.461	0.962	0.842	26	0.955	0.912	0.170
681	S1	200k	ordered	0.452	0.898	0.625	7	0.952	0.917	0.160
682	S1	50k	ordered	0.399	0.994	0.970	66	0.939	0.880	0.105
683	S1	50k	ordered	0.429	0.982	0.941	69	0.946	0.890	0.150
684	S1	100k	ordered	0.360	0.972	0.891	19	0.943	0.888	0.118
685	S1	200k	ordered	0.494	0.885	0.663	3	0.960	0.942	0.088
686	S1	50k	ordered	0.418	0.989	0.946	66	0.946	0.893	0.124
687	S1	100k	ordered	0.489	0.965	0.812	21	0.957	0.933	0.164
688	S1	200k	ordered	0.505	0.888	0.631	5	0.969	0.959	0.114
689	S1	50k	ordered	0.396	0.993	0.961	73	0.935	0.871	0.118
690	S1	100k	ordered	0.429	0.978	0.903	20	0.941	0.861	0.109
691	S1	200k	ordered	0.443	0.881	0.702	3	0.941	0.919	0.057
692	S1	100k	ordered	0.484	0.976	0.893	27	0.946	0.890	0.172
693	S1	200k	ordered	0.560	0.912	0.730	8	0.950	0.936	0.156
694	S1	50k	ordered	0.378	0.995	0.977	75	0.930	0.832	0.108
695	S1	100k	ordered	0.365	0.977	0.890	15	0.953	0.910	0.082
696	S1	50k	ordered	0.397	0.973	0.906	83	0.938	0.846	0.171
697	S1	100k	ordered	0.384	0.949	0.839	19	0.940	0.846	0.131
698	S1	50k	ordered	0.411	0.983	0.941	68	0.944	0.893	0.144
699	S1	100k	ordered	0.382	0.963	0.833	24	0.939	0.862	0.140
700	S1	200k	ordered	0.325	0.906	0.721	3	0.941	0.916	0.053
701	S1	100k	ordered	0.352	0.936	0.788	19	0.949	0.897	0.121
702	S1	200k	ordered	0.460	0.853	0.633	8	0.904	0.762	0.180
703	S1	50k	ordered	0.432	0.926	0.772	105	0.951	0.896	0.236
704	S1	100k	ordered	0.449	0.887	0.699	37	0.941	0.862	0.272
705	S1	200k	ordered	0.462	0.801	0.591	9	0.955	0.922	0.205
706	S1	50k	ordered	0.529	0.968	0.897	82	0.960	0.920	0.241
707	S1	100k	ordered	0.484	0.951	0.840	24	0.957	0.933	0.190
708	S1	200k	ordered	0.476	0.862	0.595	4	0.975	0.947	0.206
709	S1	50k	ordered	0.391	0.989	0.960	72	0.933	0.856	0.123
710	S1	100k	ordered	0.416	0.977	0.903	24	0.943	0.864	0.134
711	S1	200k	ordered	0.415	0.919	0.642	4	0.944	0.918	0.108
712	S1	50k	ordered	0.370	0.985	0.941	74	0.939	0.878	0.120
713	S1	100k	ordered	0.396	0.975	0.894	30	0.947	0.902	0.122
714	S1	200k	ordered	0.359	0.939	0.769	4	0.972	0.953	0.067
715	S1	50k	ordered	0.430	0.975	0.921	54	0.936	0.870	0.136
716	S1	100k	ordered	0.426	0.962	0.852	18	0.959	0.899	0.132
717	S1	200k	ordered	0.398	0.883	0.625	9	0.949	0.863	0.202
718	S1	50k	ordered	0.484	0.987	0.936	77	0.958	0.924	0.190
719	S1	100k	ordered	0.596	0.943	0.787	26	0.954	0.915	0.255
720	S1	200k	ordered	0.458	0.888	0.626	5	0.938	0.911	0.187
721	S1	50k	ordered	0.372	0.982	0.937	79	0.940	0.864	0.125
722	S1	100k	ordered	0.329	0.964	0.856	16	0.946	0.787	0.092
723	S1	200k	ordered	0.291	0.868	0.685	6	0.972	0.954	0.140
724	S1	50k	ordered	0.331	0.995	0.981	64	0.934	0.863	0.075
725	S1	100k	ordered	0.312	0.988	0.933	18	0.944	0.867	0.070
726	S1	200k	ordered	0.313	0.938	0.766	9	0.950	0.904	0.151
727	S1	50k	ordered	0.380	0.987	0.964	85	0.942	0.879	0.109
728	S1	100k	ordered	0.378	0.971	0.887	19	0.946	0.885	0.107
729	S1	200k	ordered	0.318	0.919	0.768	5	0.951	0.850	0.084

ID	Material	Scales	Class	O1	O2	O3	L1	L2	L3	L4
730	S1	50k	ordered	0.393	0.990	0.963	94	0.939	0.879	0.130
731	S1	100k	ordered	0.370	0.976	0.902	19	0.949	0.908	0.103
732	S1	200k	ordered	0.246	0.917	0.742	4	0.963	0.953	0.071
733	S1	50k	ordered	0.381	0.973	0.902	89	0.945	0.897	0.155
734	S1	100k	ordered	0.426	0.936	0.794	38	0.943	0.898	0.177
735	S1	200k	ordered	0.298	0.906	0.733	4	0.963	0.943	0.062
736	S1	50k	ordered	0.300	0.975	0.918	142	0.946	0.892	0.122
737	S1	100k	ordered	0.252	0.966	0.899	31	0.934	0.837	0.093
738	S1	200k	ordered	0.270	0.911	0.762	9	0.926	0.862	0.111
739	S1	50k	ordered	0.443	0.983	0.931	81	0.949	0.904	0.154
740	S1	100k	ordered	0.462	0.925	0.709	16	0.952	0.904	0.155
741	S1	200k	ordered	0.634	0.753	0.528	5	0.977	0.961	0.244
742	S1	50k	ordered	0.375	0.995	0.972	95	0.945	0.876	0.127
743	S1	100k	ordered	0.438	0.978	0.890	24	0.946	0.853	0.165
744	S1	200k	ordered	0.440	0.920	0.678	5	0.969	0.961	0.104
745	S1	50k	ordered	0.382	0.992	0.974	77	0.939	0.890	0.113
746	S1	100k	ordered	0.413	0.978	0.879	22	0.944	0.901	0.135
747	S1	200k	ordered	0.494	0.862	0.647	4	0.955	0.924	0.130
748	S1	50k	ordered	0.388	0.987	0.952	77	0.950	0.906	0.126
749	S1	100k	ordered	0.340	0.953	0.820	22	0.955	0.922	0.132
750	S1	200k	ordered	0.344	0.876	0.681	8	0.960	0.948	0.169

3. SEM-images visualization in the space of interpreted order features

As a result of the application of the proposed approach, an interpretable feature description was obtained, containing seven ordering features for each SEM image of the dataset. To visualize the resulting seven-dimensional feature space, we will use dimensionality reduction methods:

1) **T-distributed Stochastic Neighbor Embedding (TSNE)**

Figure 41 shows a representation of the SEM images after applying the TSNE method to reduce the spatial dimension to three features.

2) **Uniform Manifold Approximation and Projection (UMAP)**

Figure 42 shows a representation of the SEM images after applying the UMAP method to reduce the spatial dimension to three features.

3) **FastMap**

Figure 43 shows a representation of the SEM images after applying the FastMap method to reduce the spatial dimension of the three features.

4) **Manual feature selection**

Based on the empirical observations of the authors, three features of order were selected. Figure 44 shows a graphical representation of each of the SEM images in the space of three features (O2, O3 and L4), the most informative for determining whether ordering occurred.

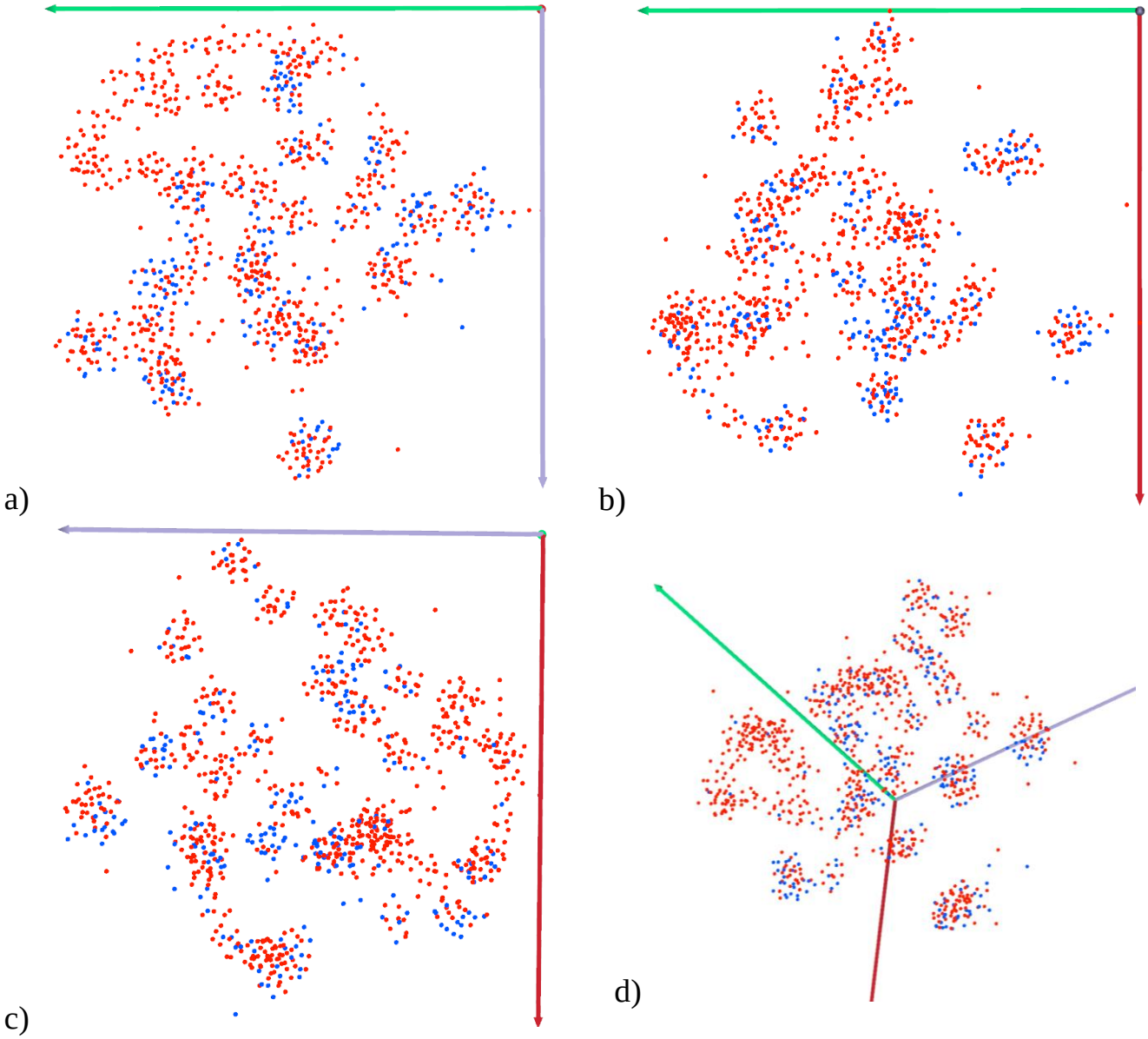


Figure 41 – Representation of SEM images after applying the TSNE method. a-c) Projections of three-dimensional space on two of the three axes; d) three-dimensional representation. The order is red, and the disorder is blue

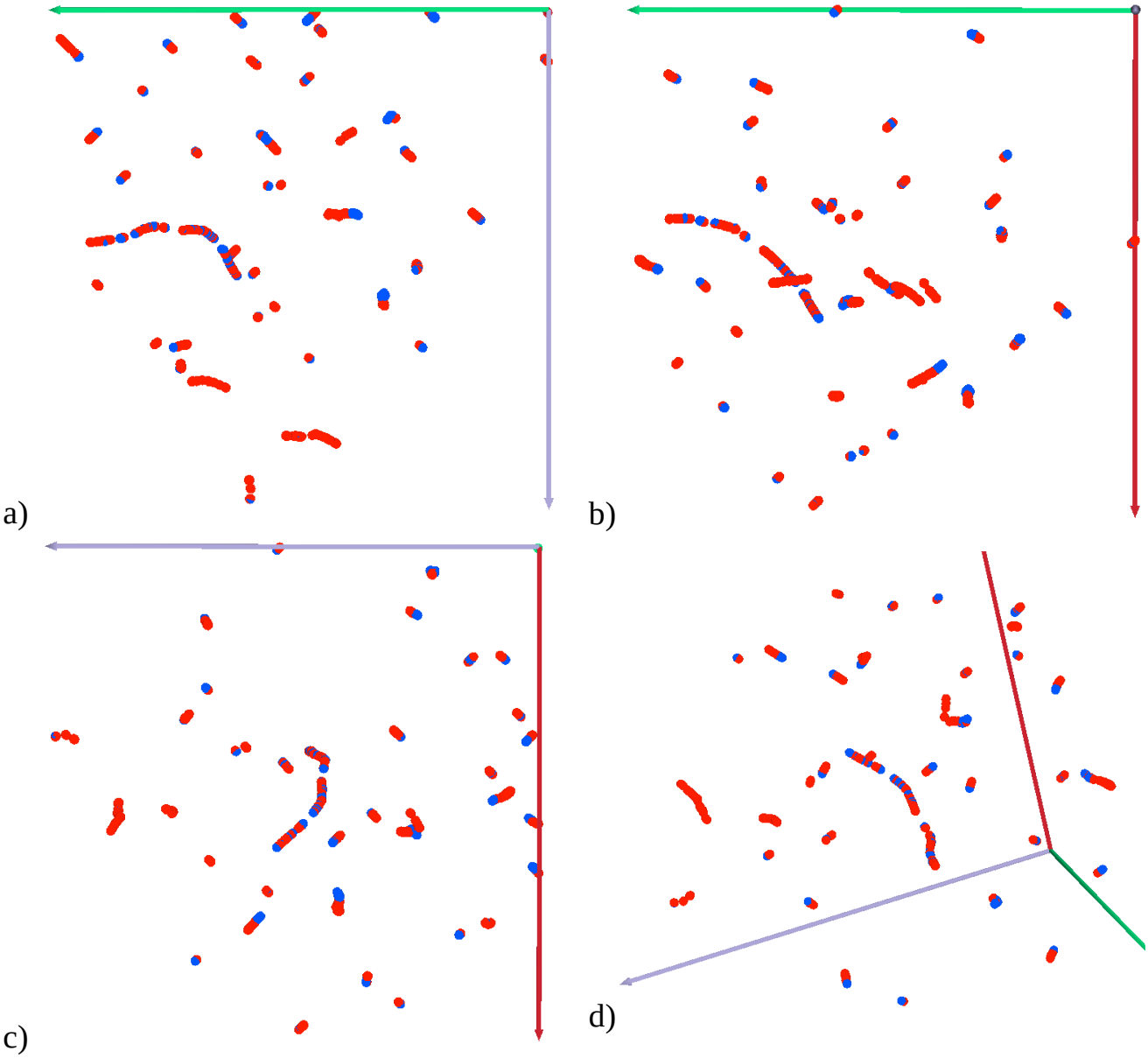


Figure 42 – Representation of SEM images after applying the UMAP method. a-c) Projections of three-dimensional space on two of the three axes; d) three-dimensional representation. The order is red, and the disorder is blue

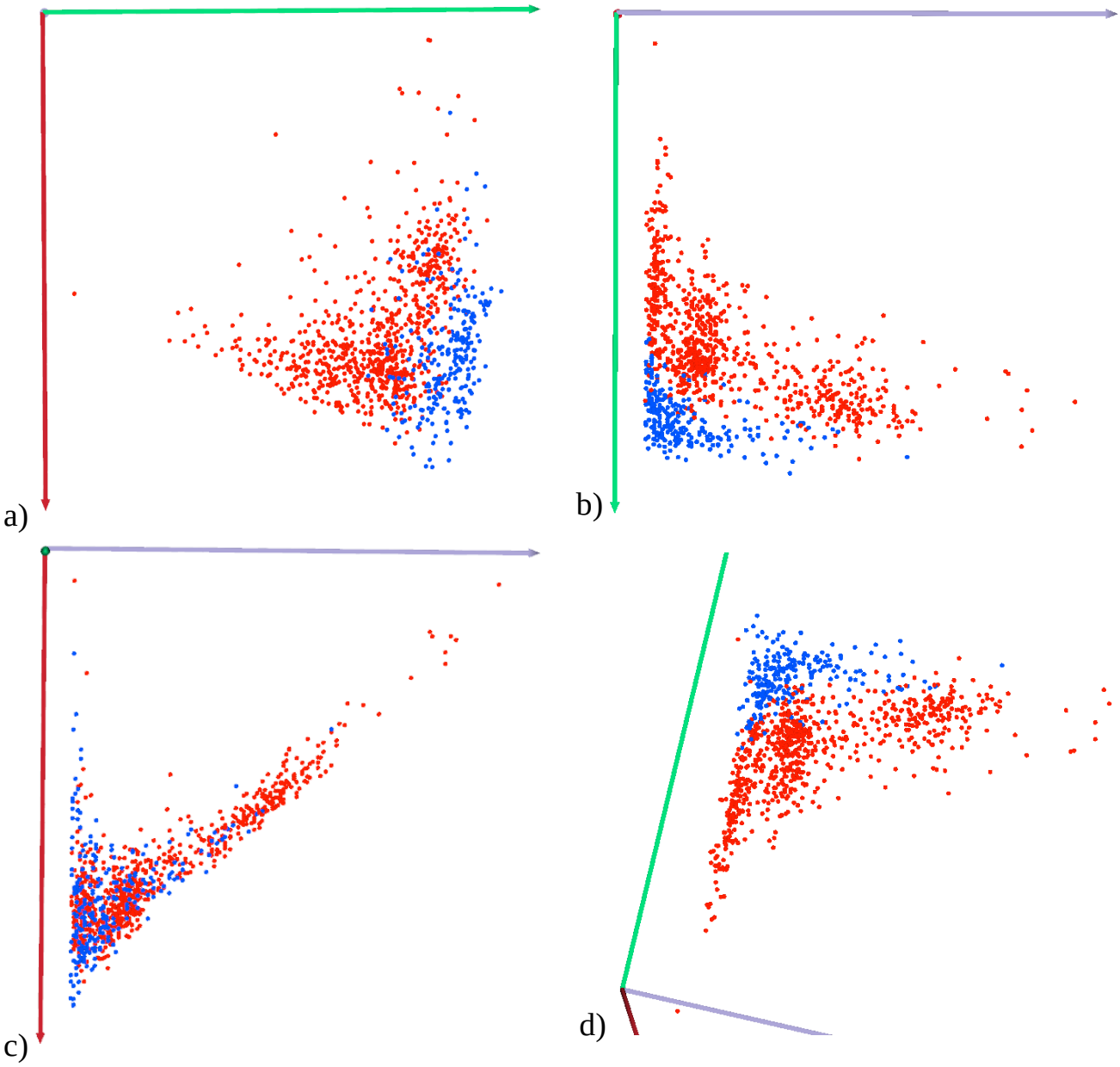


Figure 43 – Representation of SEM images after applying the FastMap method. a-c) Projections of three-dimensional space on two of the three axes; d) three-dimensional representation. The order is red, and the disorder is blue

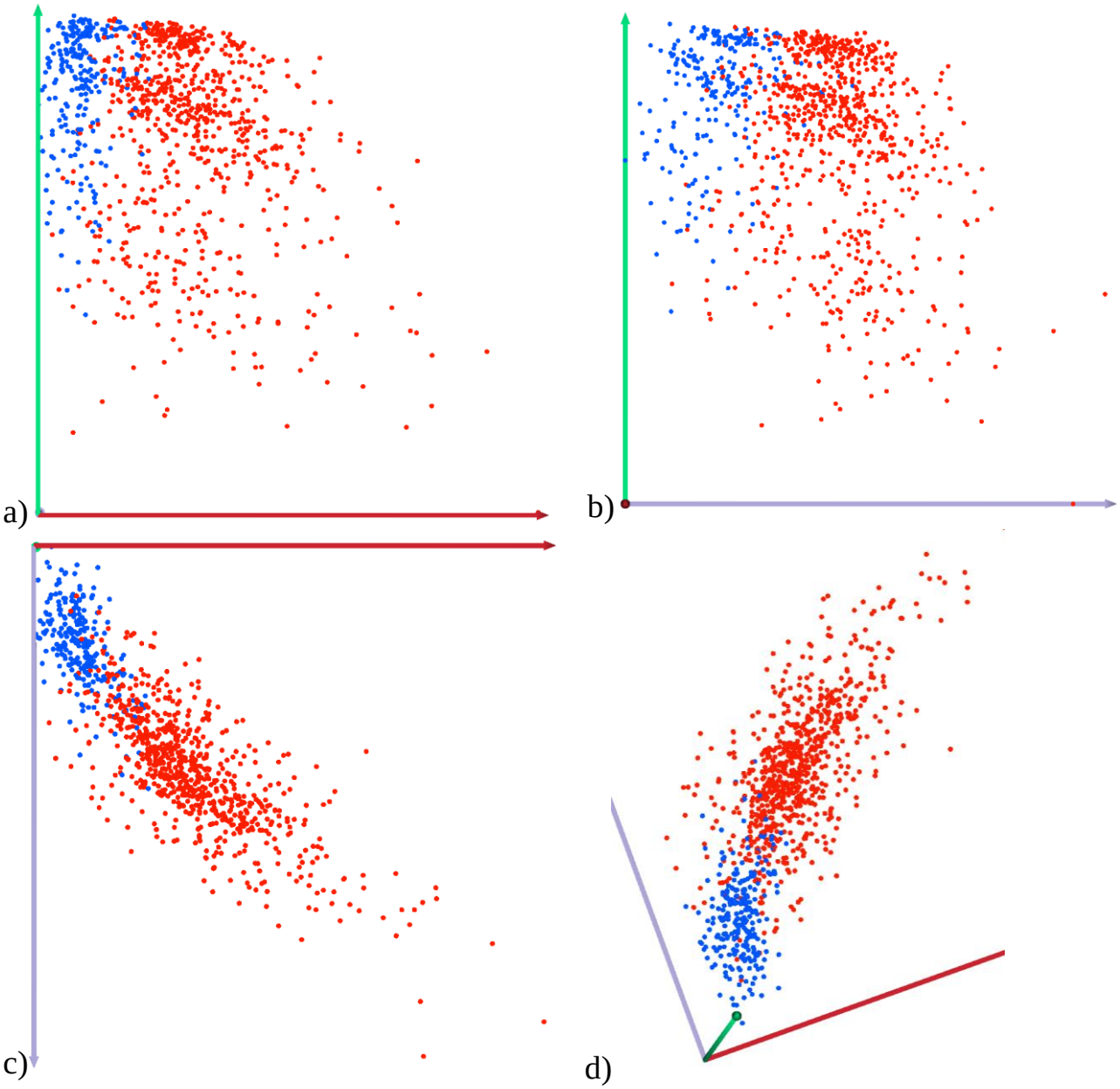


Figure 44 – Representation of SEM images in the space of the three most informative features (O2, O3, and L4). The order is red, and the disorder is blue

The variant with manual feature selection has the best representativeness among the presented visualizations; therefore, another view of Figure 44d was added to the article (section 2.2).

4. Synthetic data to demonstrate the work of the proposed approach

To demonstrate the idea of the proposed approach, a small set of synthetic images was created, including four images. Each image reflects our assumptions about the ordered and disordered arrangement of nanoparticles:

1) ***The ordered arrangement of particles on the grid*** (Figure 45). In this case, the prevailing direction of the local groups of nanoparticles will have two position options: horizontal (the angle of inclination is 0°) and vertical (the angle of inclination is 90° or -90°). This distribution of prevailing directions can be seen in Figure 46. This makes it possible to create long and smooth lines from nanoparticles (Figure 47). Some nanoparticles are not combined in lines because their length is less than the specified threshold value.

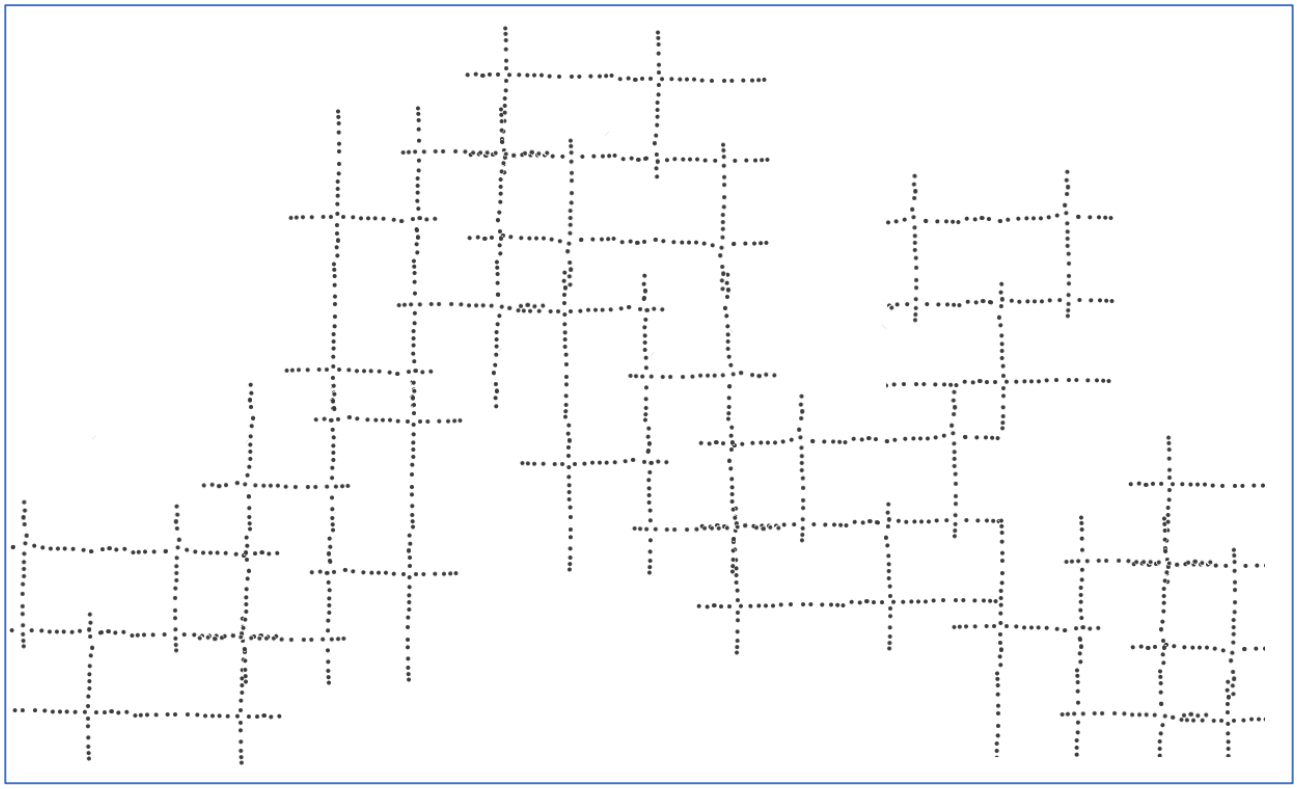


Figure 45 – The ordered arrangement of particles on the grid

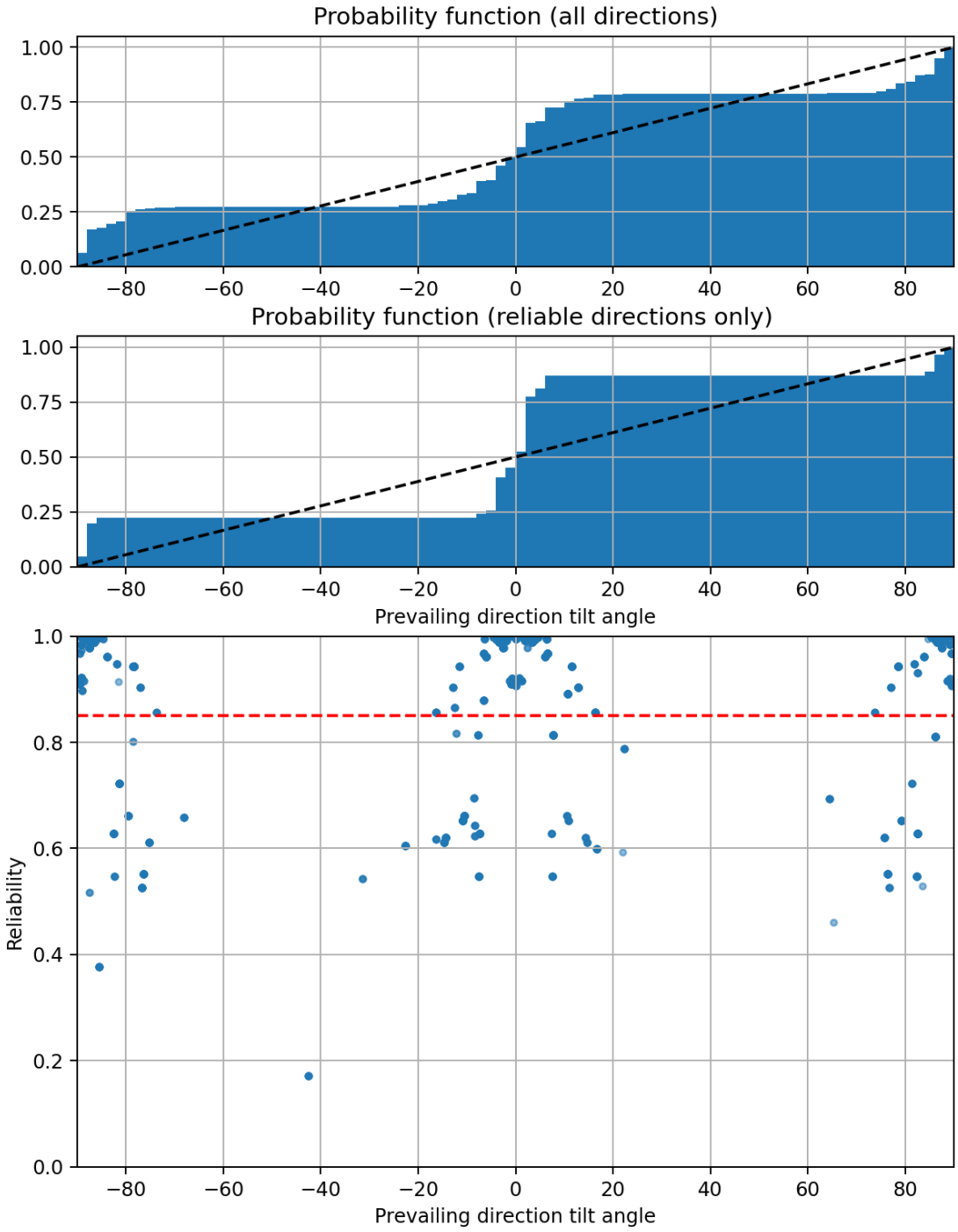


Figure 46 – Distribution of the prevailing direction of the ordered arrangement of particles on the grid

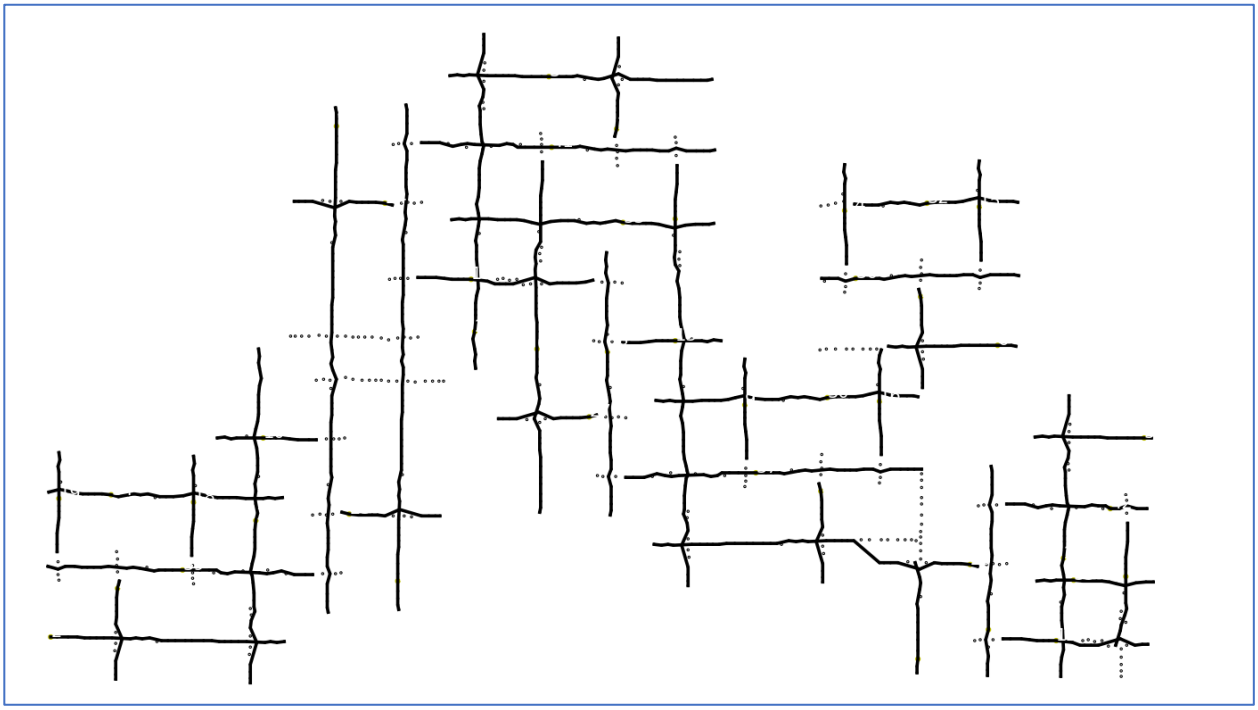


Figure 47 – The results of constructing lines on the ordered arrangement of particles on the grid

2) ***The ordered arrangement of particles on the edges of polygons*** (Figure 48). In this case, the prevailing directions of local groups of nanoparticles will have several pronounced and reliably determined variants. Then, the distribution of the prevailing directions will look like steps (Figure 49, the average chart). This allows you to create long and smooth lines from nanoparticles (Figure 50). However, in places where a large number of edges touch, the reliability of determining the prevailing direction is not high (Figure 51), so some nanoparticles do not unite in a line.

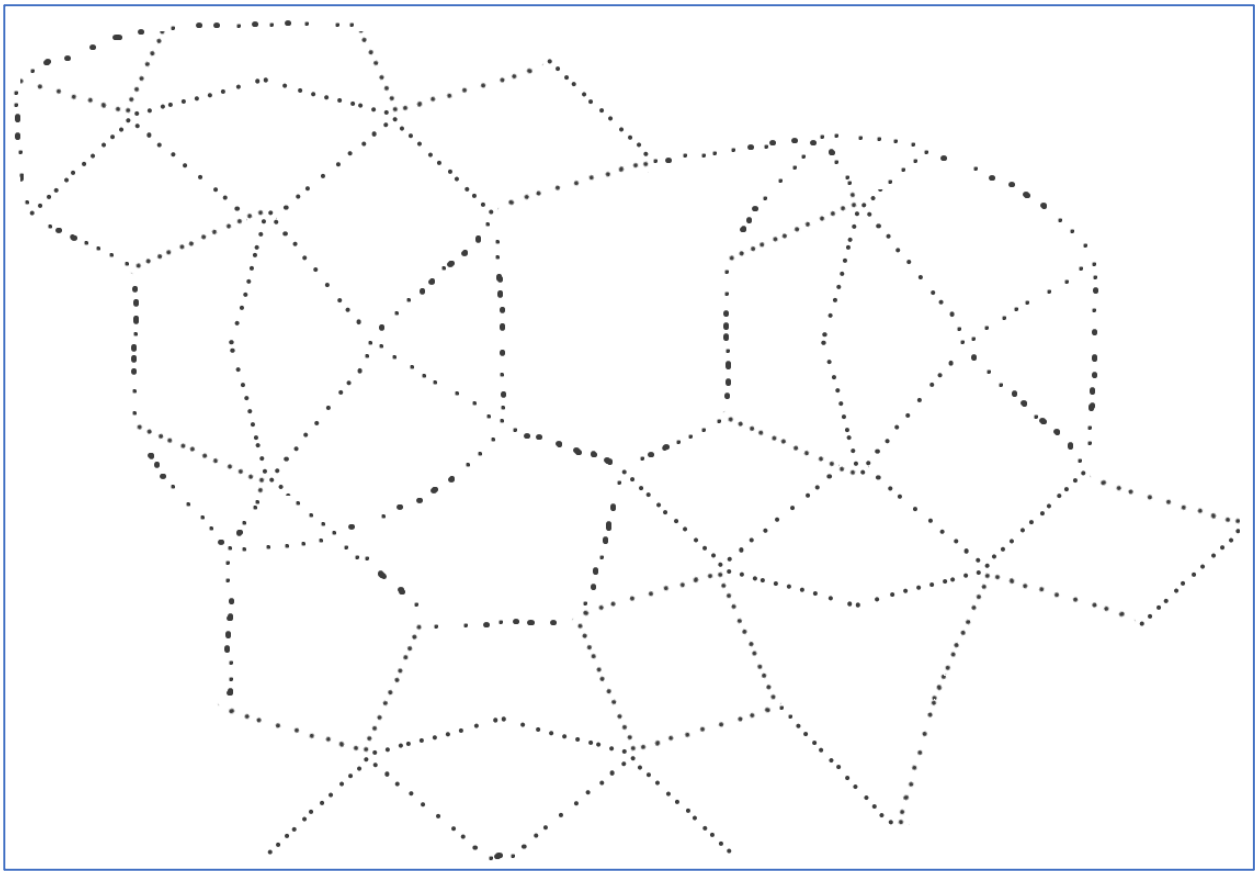


Figure 48 – The ordered arrangement of particles on the edges of polygons

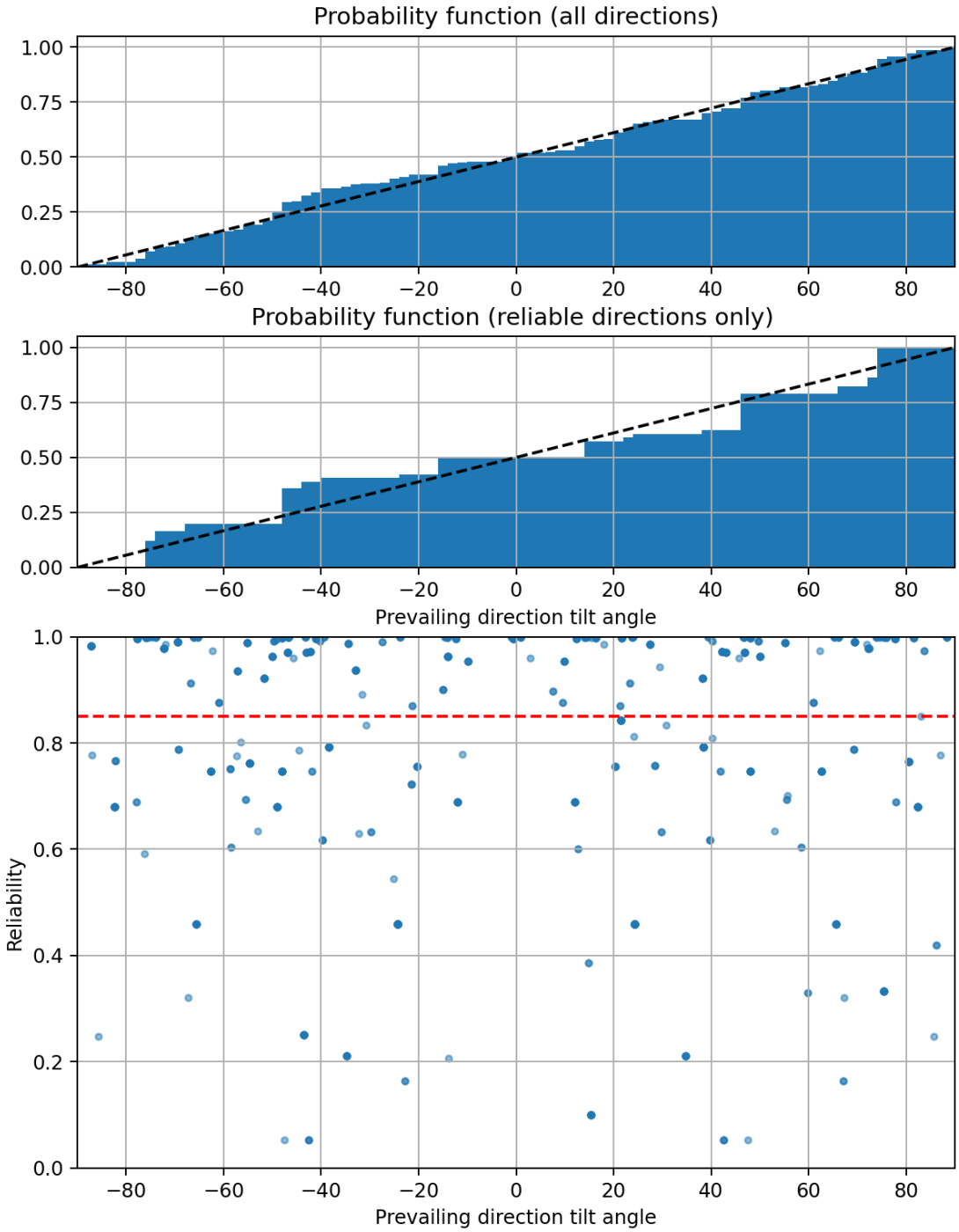


Figure 49 – Distribution of the prevailing direction of the ordered arrangement of particles on the edges of polygons

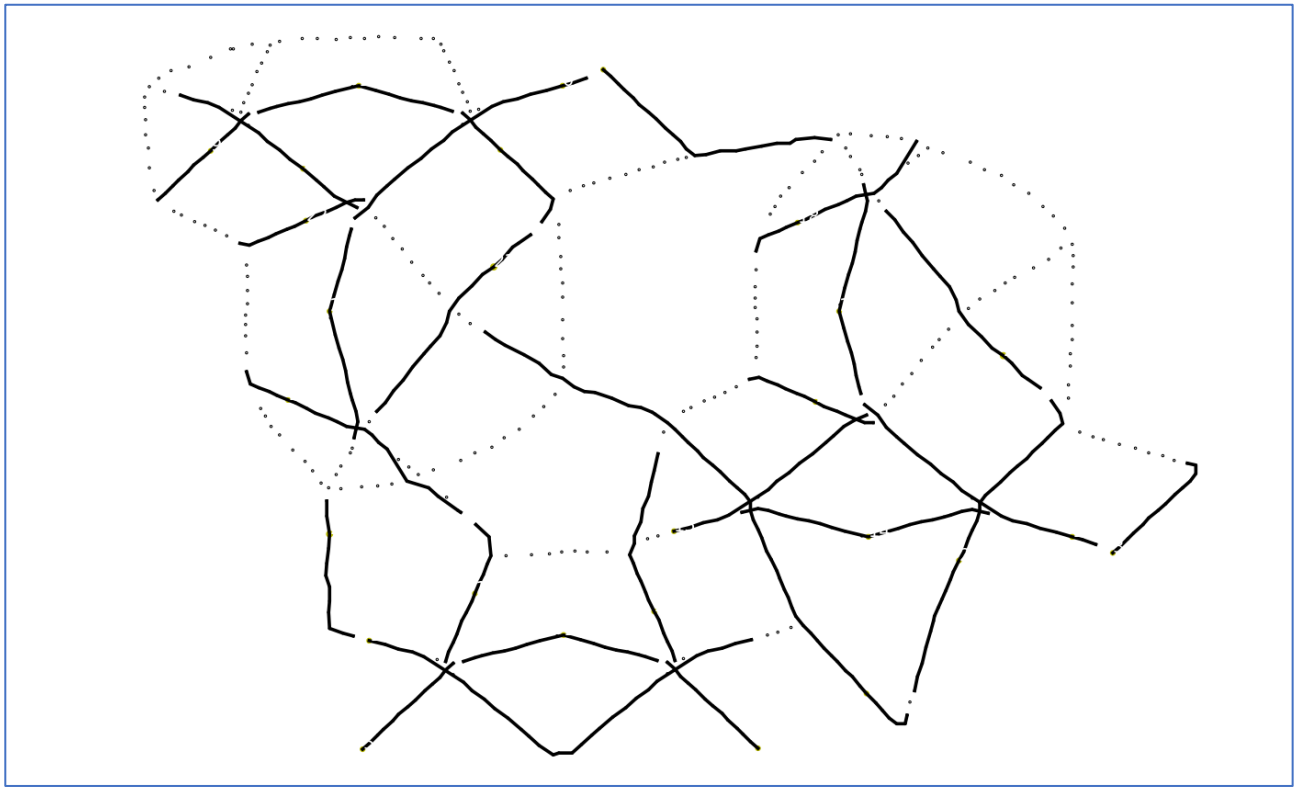


Figure 50 – The results of constructing lines on the ordered arrangement of particles on the edges of polygons

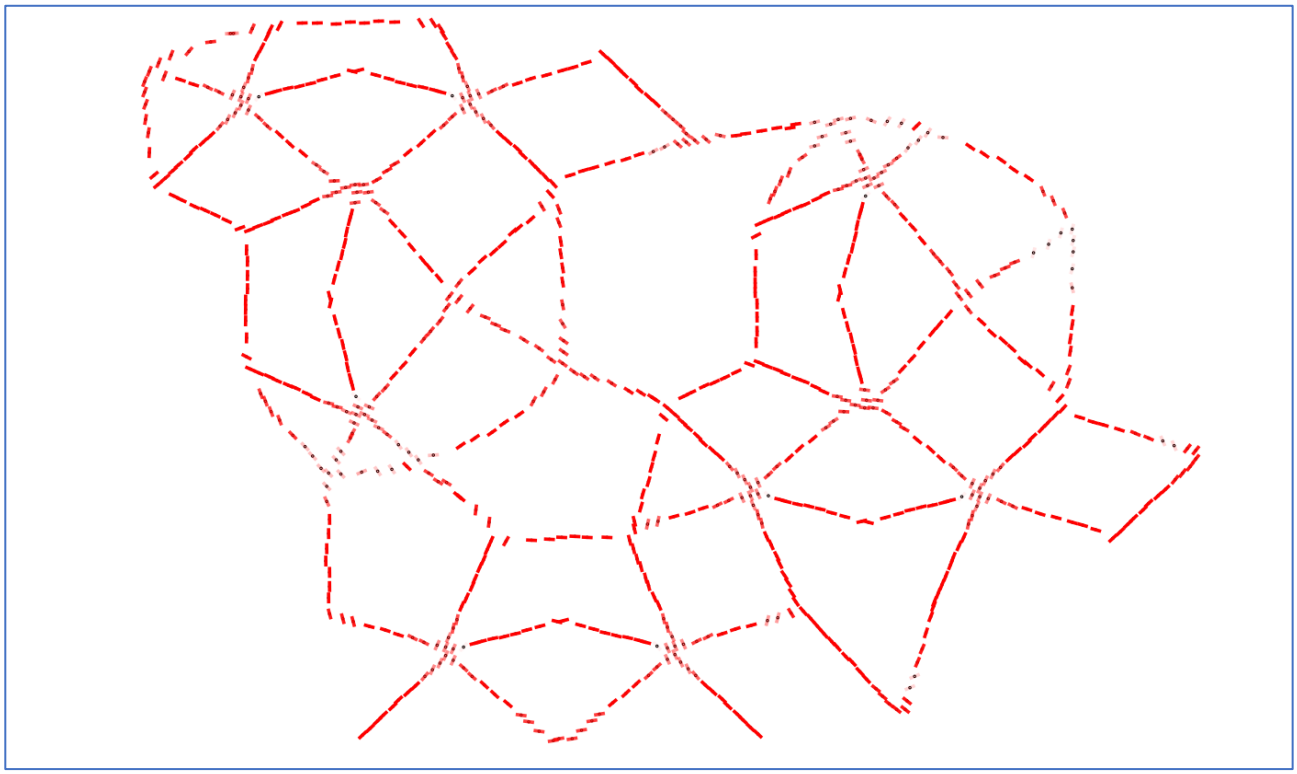


Figure 51 – The results of calculating local group orientations (in red, the brightness indicates the reliability of the definition) for the ordered arrangement of particles on the edges of polygons

3) **The disordered arrangement based on the uniform distribution of nanoparticles** (Figure 52). In this case, the prevailing directions of local groups of nanoparticles may have slightly pronounced variations, but the reliability of their determination will be very low (Figure 53, lower graph). Therefore, it is difficult to create long and smooth lines from nanoparticles (Figure 54).

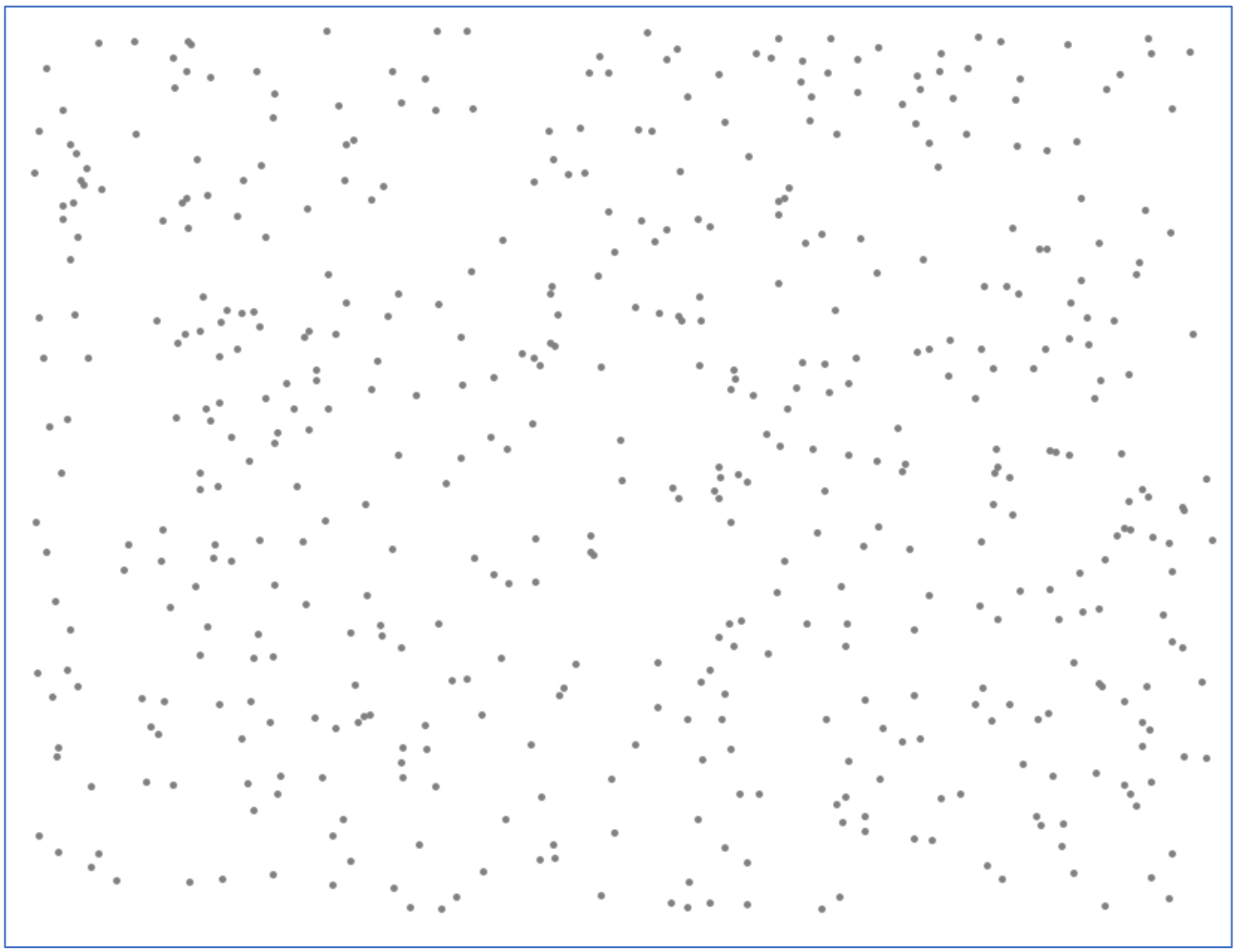


Figure 52 – The disordered arrangement based on the uniform distribution of nanoparticles

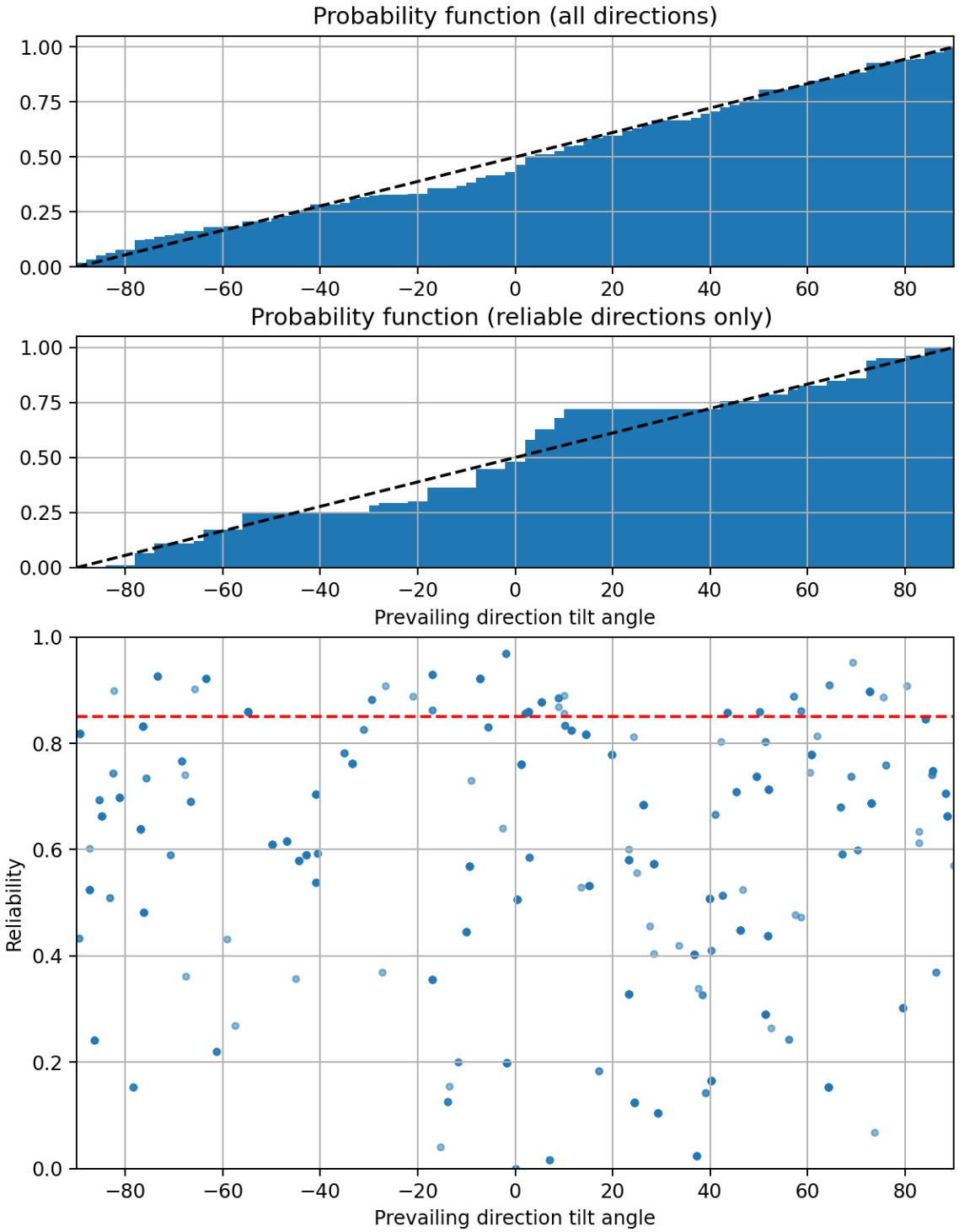


Figure 53 – Distribution of the prevailing direction of the disordered arrangement based on the uniform distribution of nanoparticles

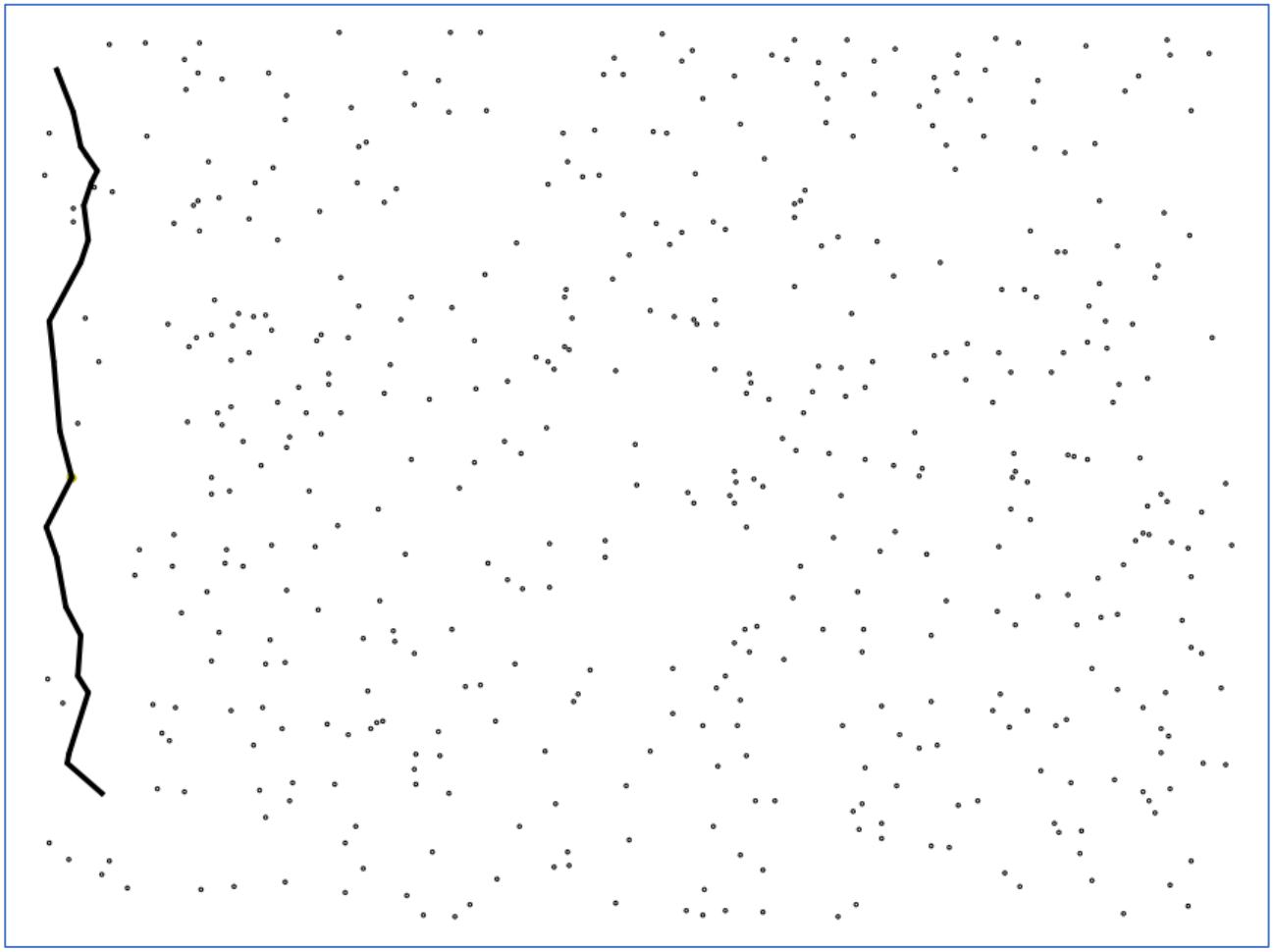


Figure 54 – Results of constructing lines with a disordered arrangement based on a uniform distribution of nanoparticles

4) **The disordered arrangement based on the uniform distribution of a small number of nanoparticles** (Figure 55). This case is a special case of the previous one, when there are few nanoparticles in the image (for example, due to the large magnification of the microscope). Then, the adaptive line break threshold will be large enough (section 4.4.2) for the corresponding density of nanoparticles (section 4.3.1). Thus, more nanoparticles will be combined into a line, but such lines will only be short (in terms of the nanoparticles number) and curved (Figure 56).

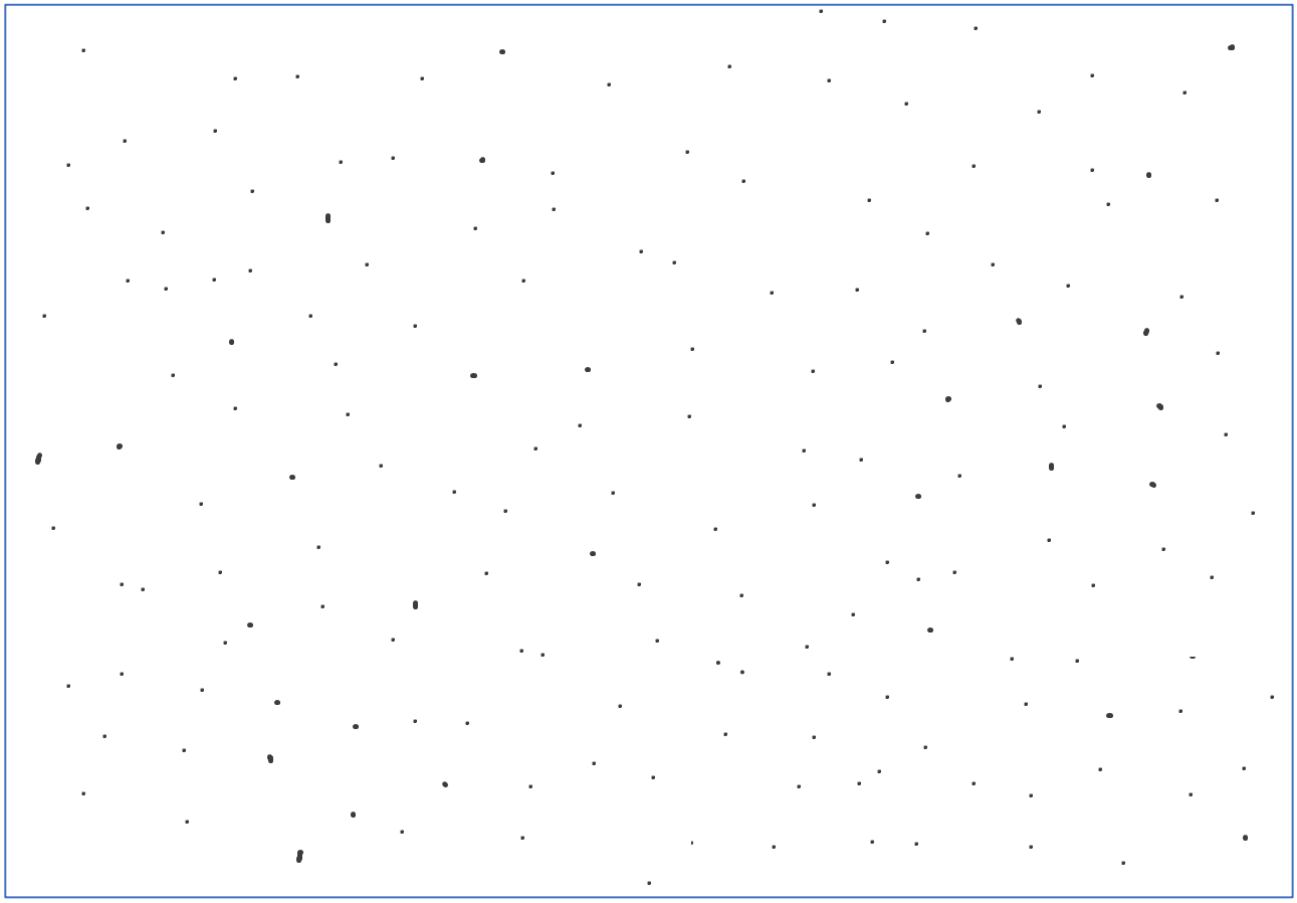


Figure 55 – The disordered arrangement based on the uniform distribution of a small number of nanoparticles

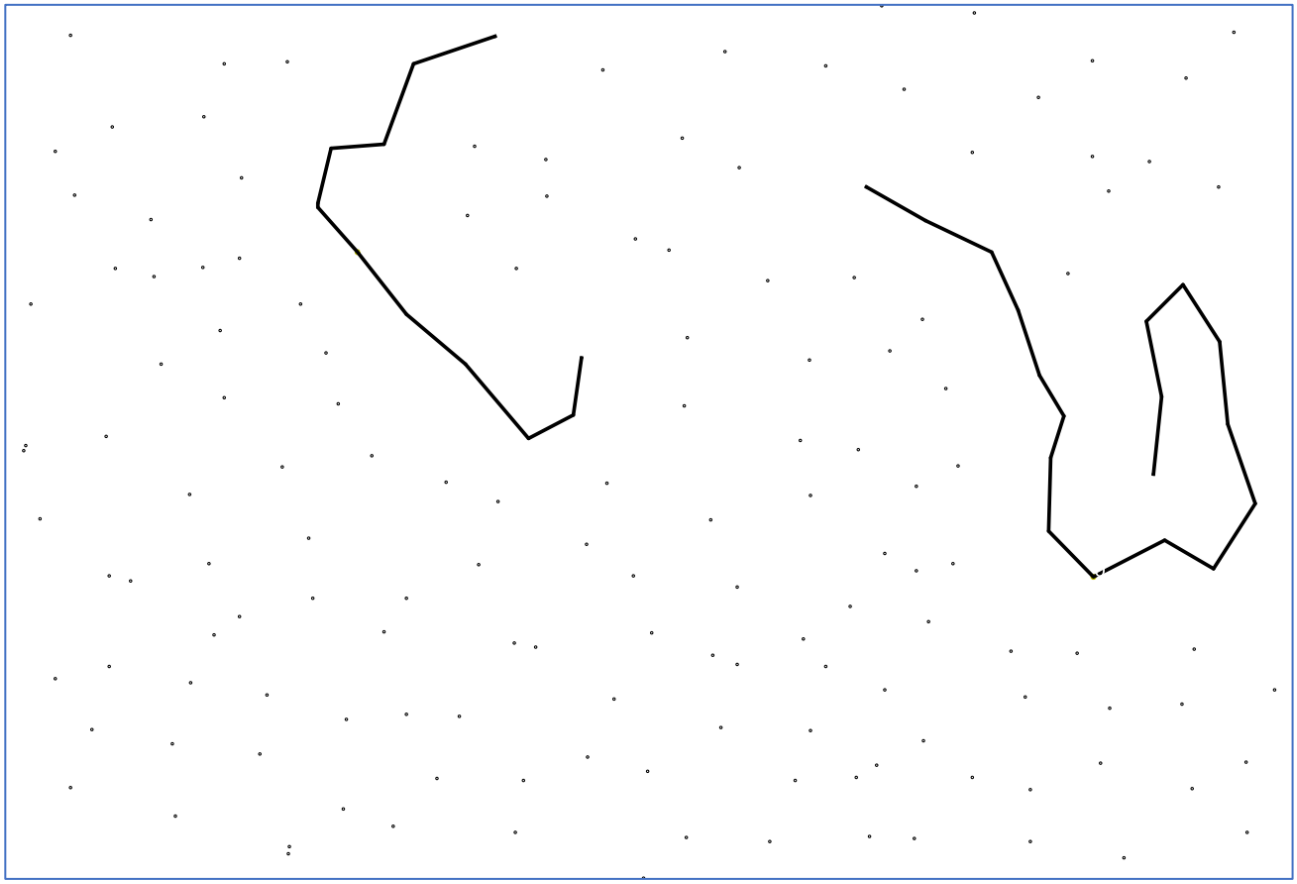


Figure 56 – Results of constructing lines with a disordered arrangement based on the uniform distribution of a small number of nanoparticles

According to the proposed approach, these synthetic images can be represented in the space of the proposed ordering features (O2, O3, and L4) together with real SEM images from the dataset (Figure 57). To process real SEM images and synthetic examples, the same parameter values of the proposed approach were used, as indicated in the article (section 4.5).

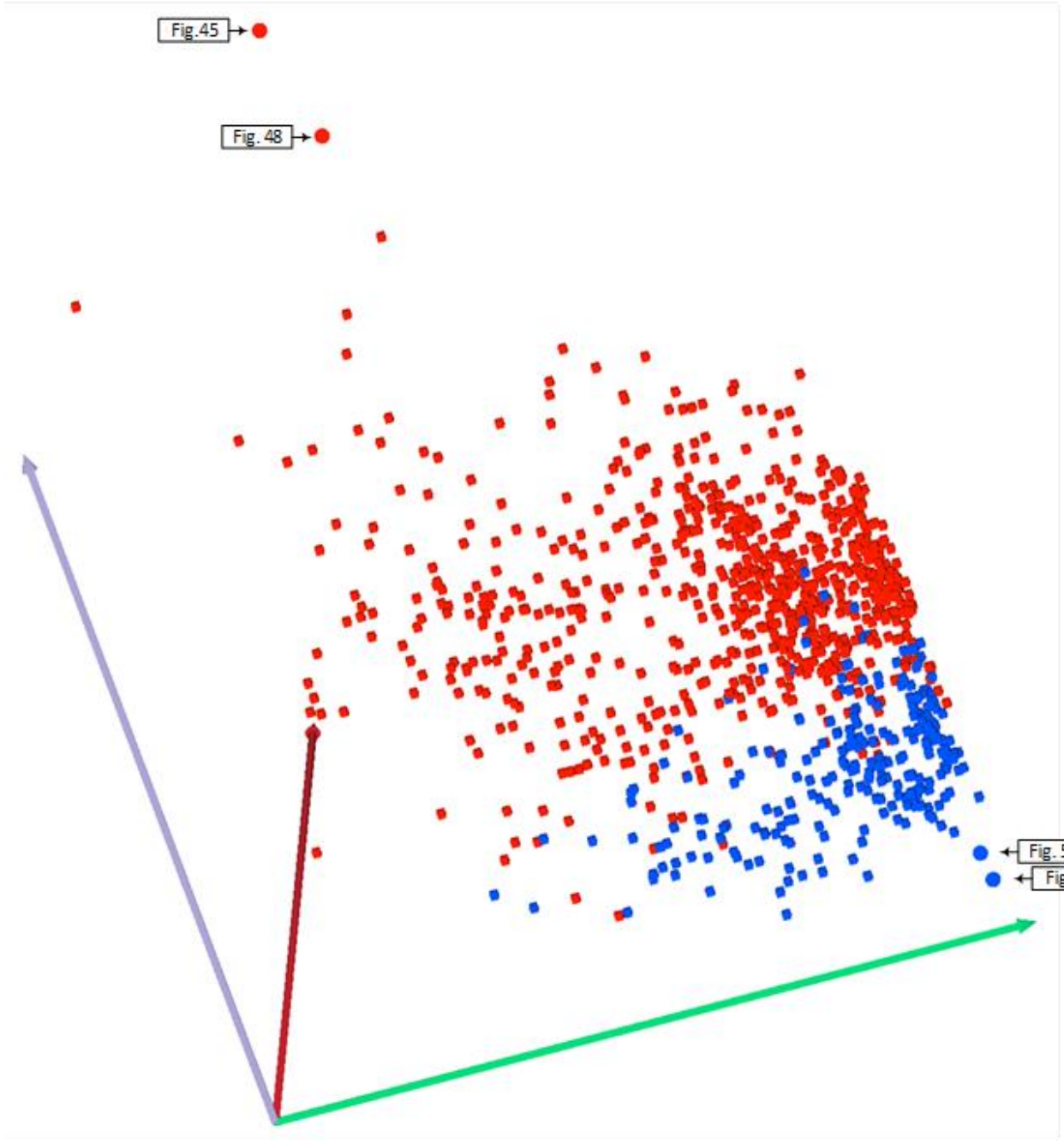


Figure 57 – Synthetic images together with real SEM images in the space of the three most informative features (O2, O3, and L4). The order is red, and the disorder is blue

5. Visual representation of separable objects in an explicable features system

Figure 58 shows the separability of the SEM images in the space of the proposed ordering features (O2, O3, and L4) for the linear SVM.

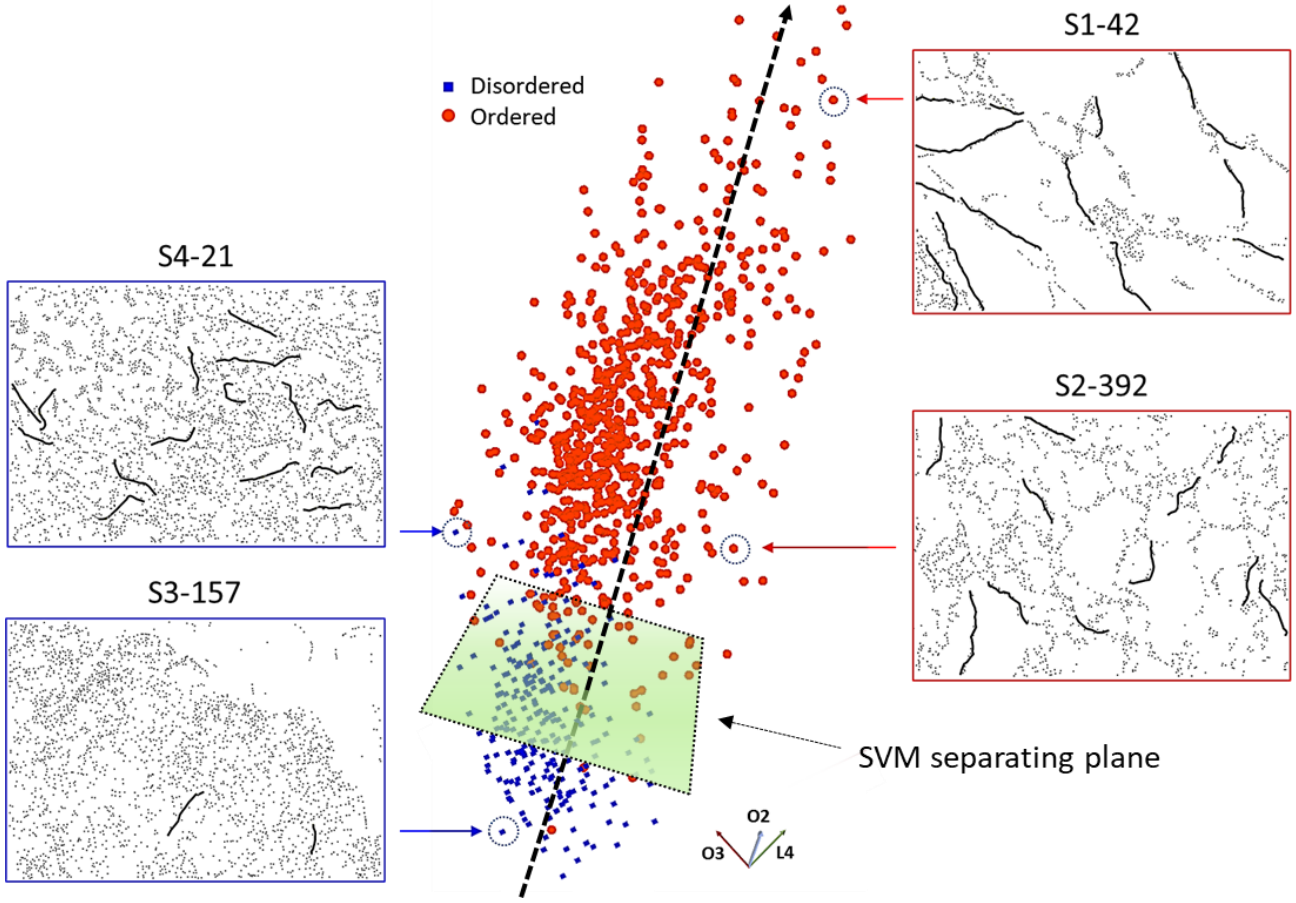


Figure 58 – Visual representation of separable objects in an explainable feature system for a linear SVM

6. The effect of orderliness on the reaction course

To demonstrate the effect of ordering on the course of chemical reactions, a set of SEM images was obtained before and after the reaction. Figures 59-60 show the corresponding images. The proposed approach was applied to each of these images, and its results are presented in Figures 61-70. The proposed ordering signs are also calculated, and their values are presented in Table 2.

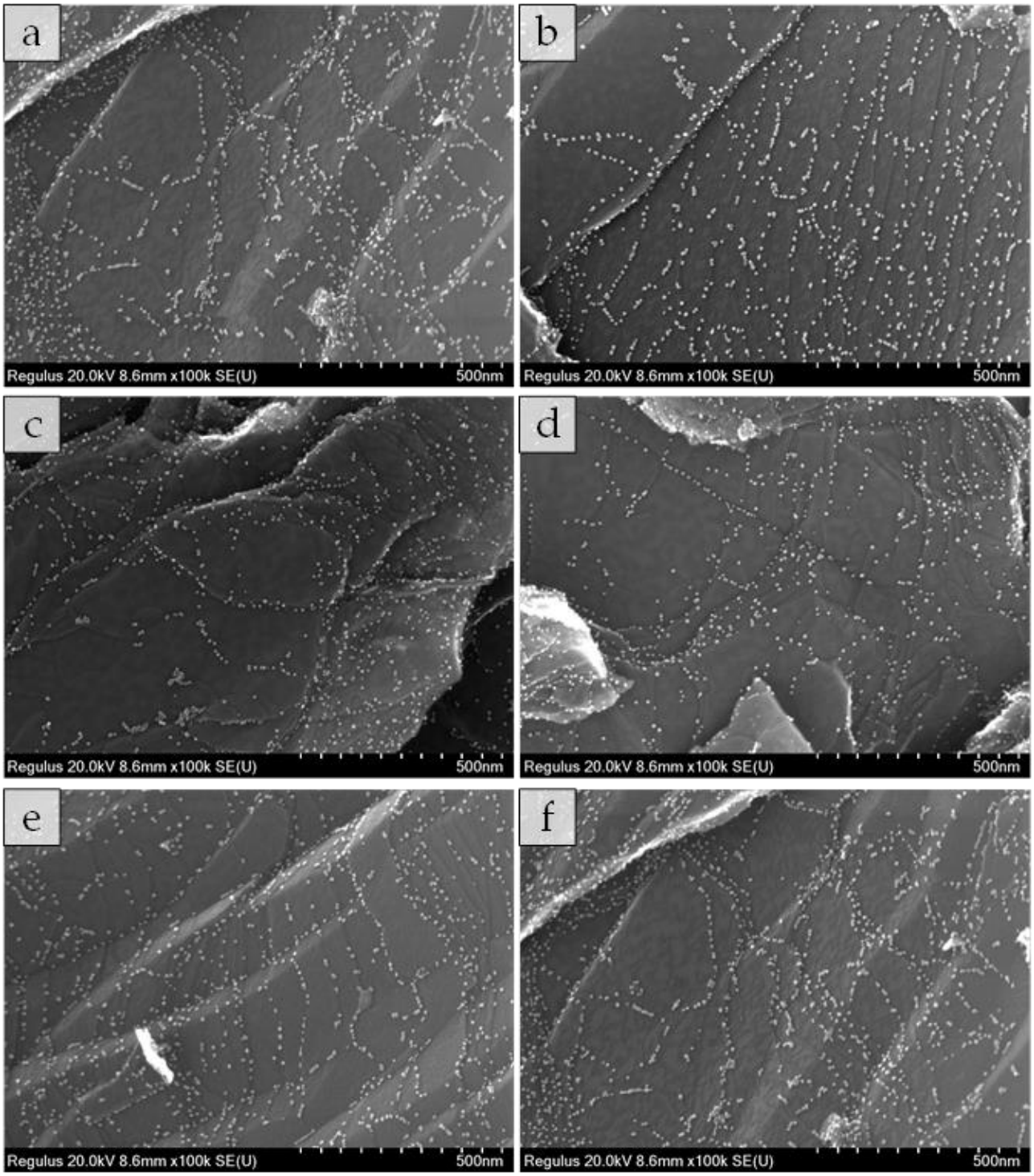


Figure 59 – SEM image before the reaction

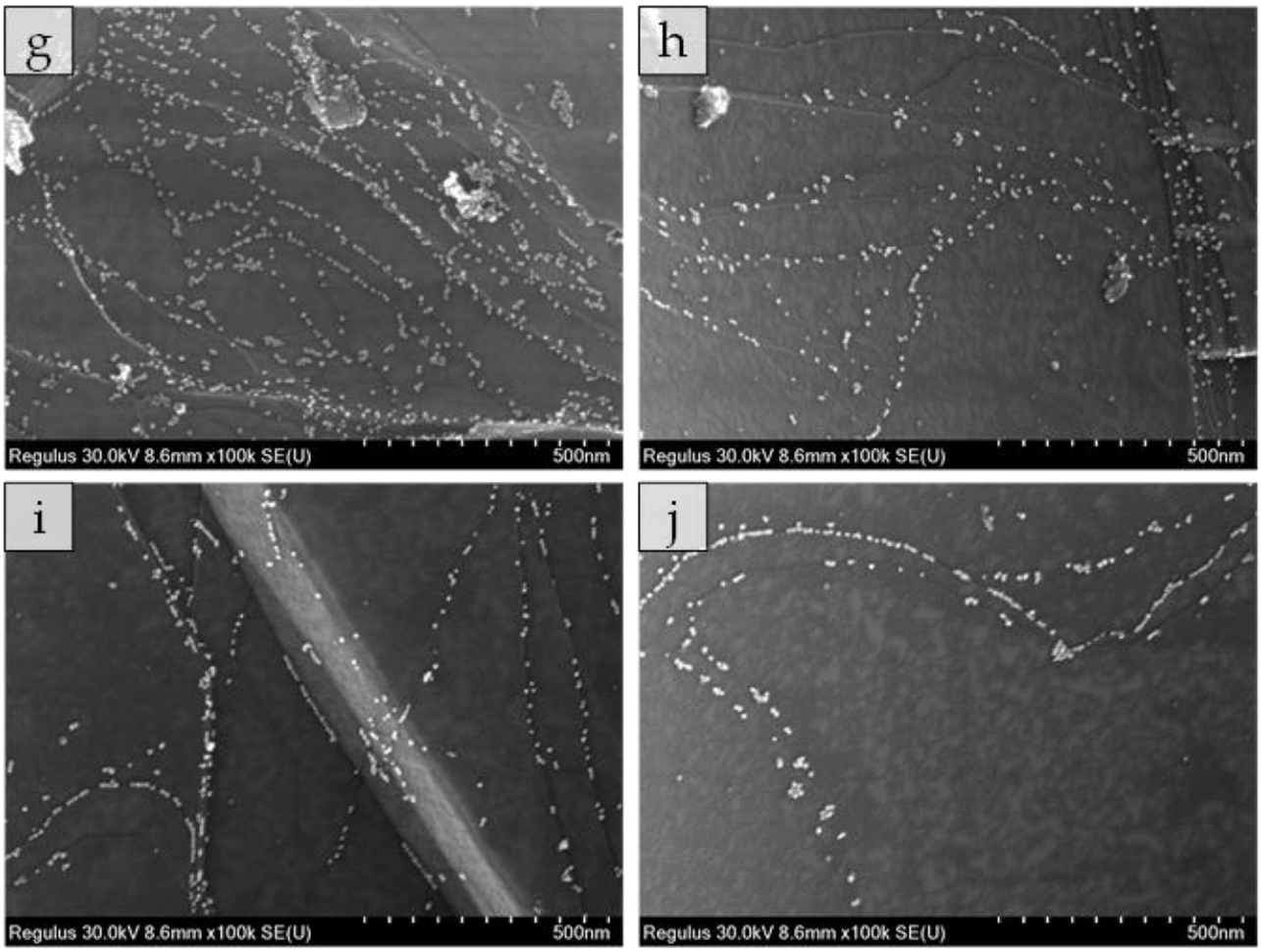


Figure 60 – SEM image after the reaction

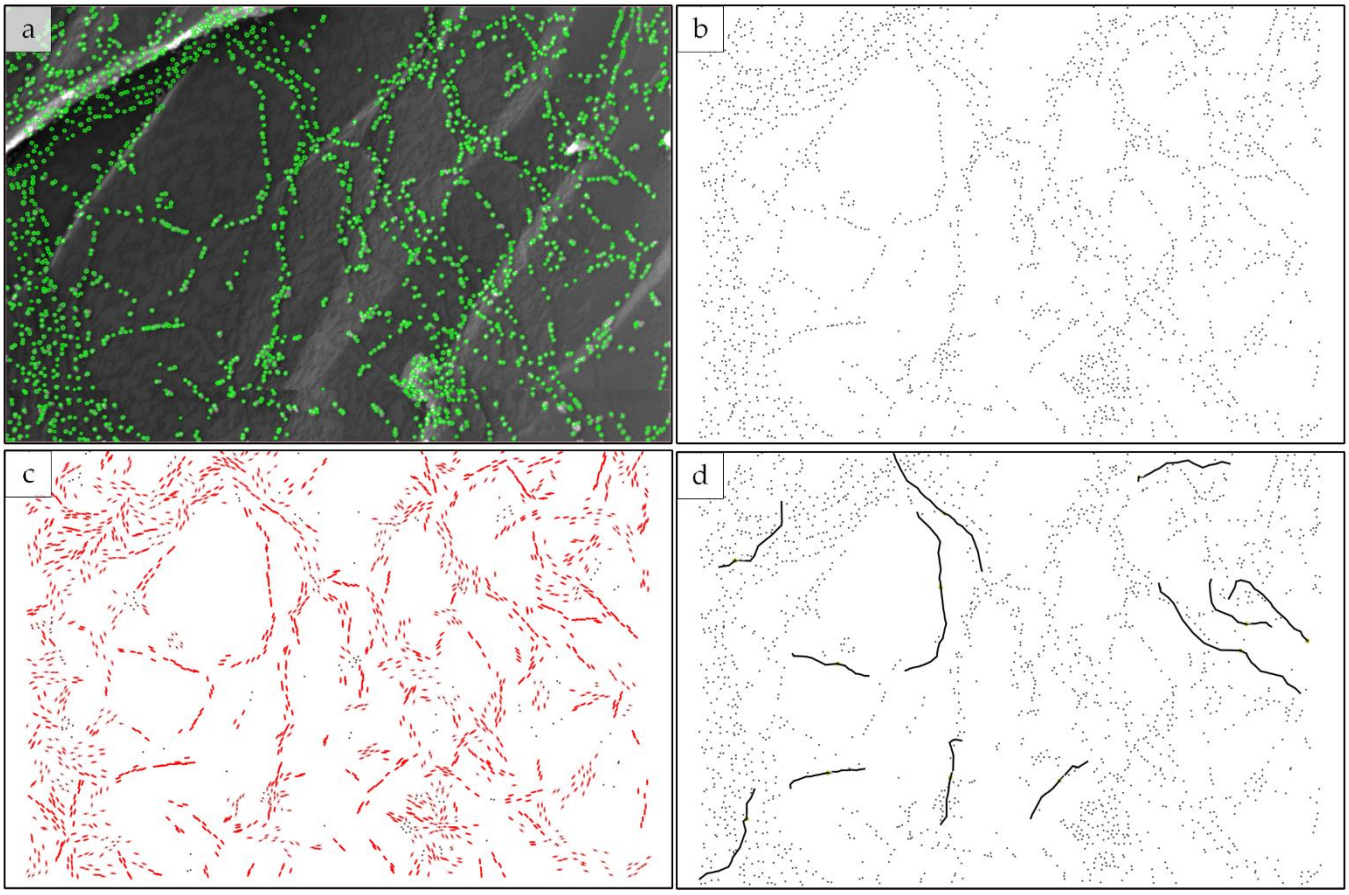


Figure 61 – Results of image processing for Figure 59a: a) detection of nanoparticles; b) location of particles without a substrate; c) prevailing directions; d) constructed lines

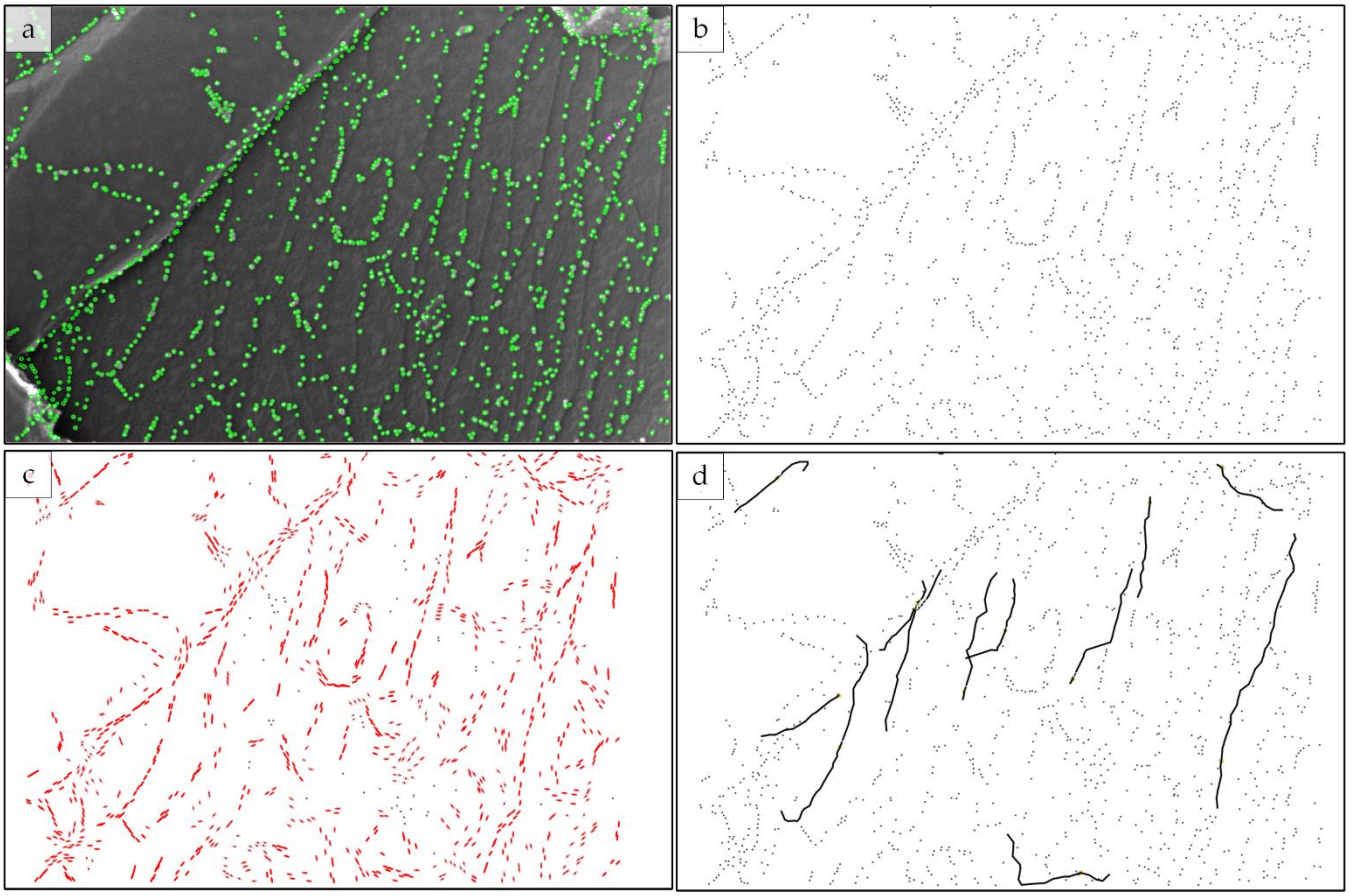


Figure 62 – Results of image processing for Figure 59b: a) detection of nanoparticles; b) location of particles without a substrate; c) prevailing directions; d) constructed lines

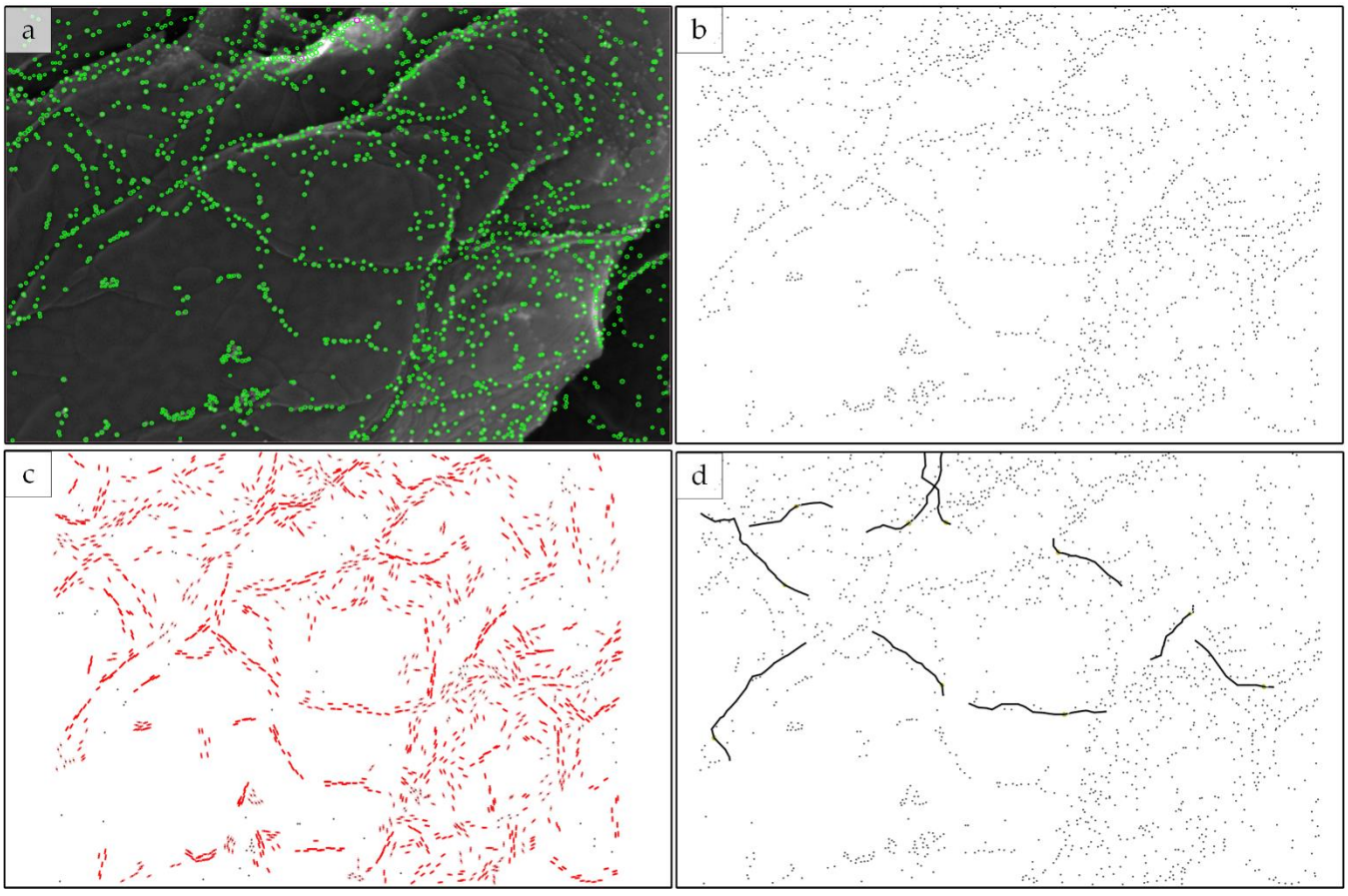


Figure 63 – Results of image processing for Figure 59c: a) detection of nanoparticles; b) location of particles without a substrate; c) prevailing directions; d) constructed lines

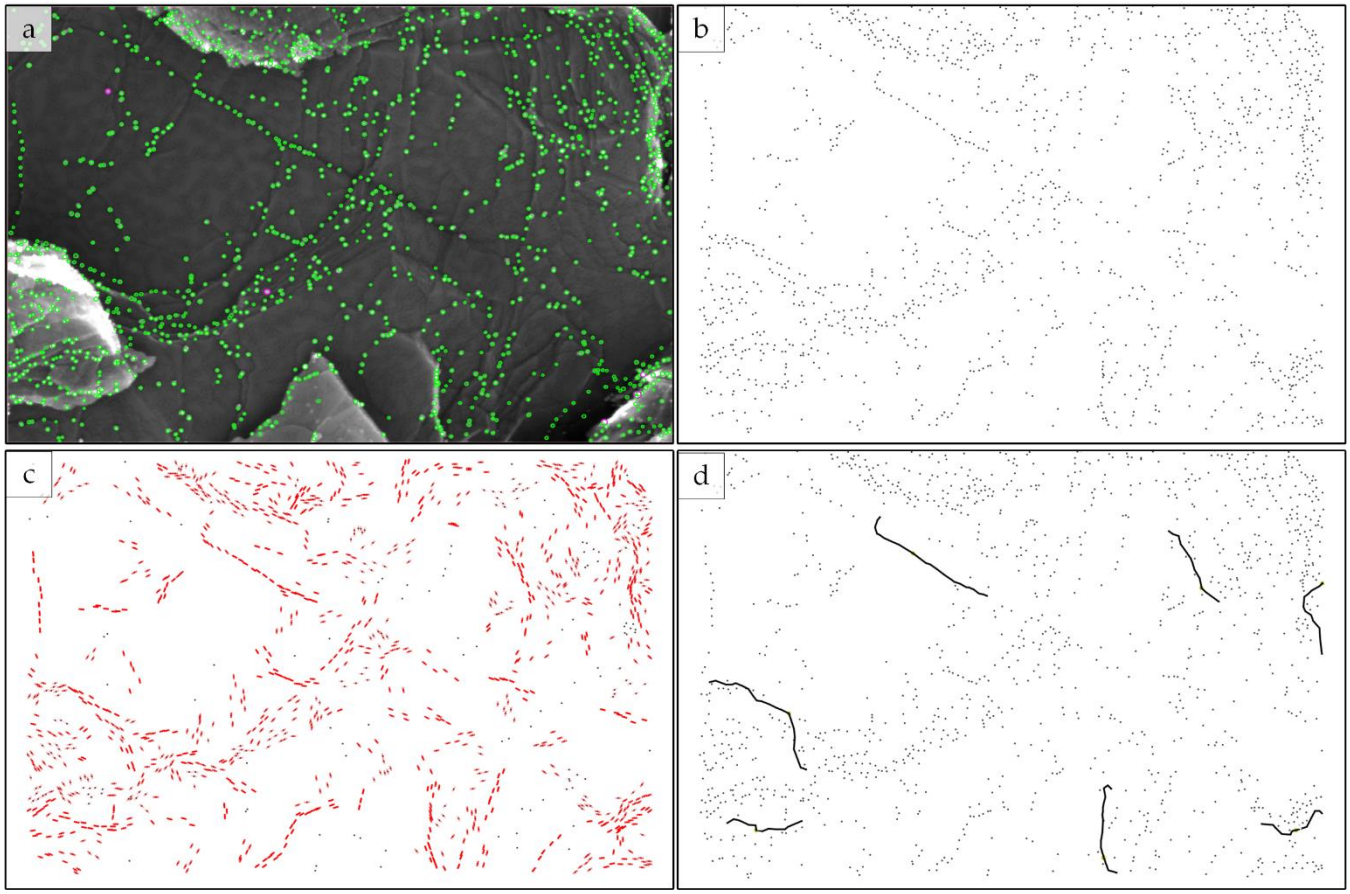


Figure 64 – Results of image processing for Figure 59d: a) detection of nanoparticles; b) location of particles without a substrate; c) prevailing directions; d) constructed lines

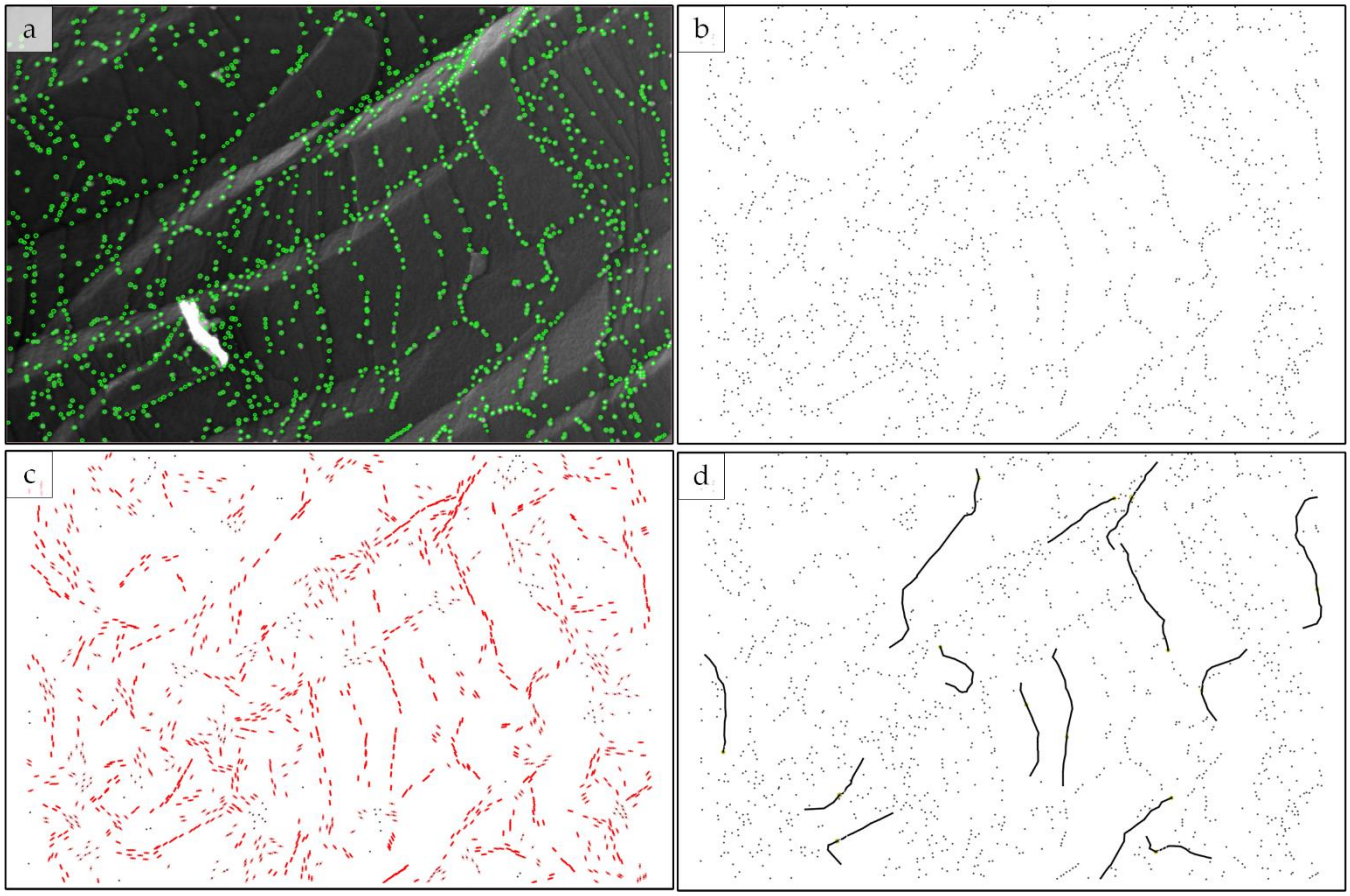


Figure 65 – Results of image processing for Figure 59e: a) detection of nanoparticles; b) location of particles without a substrate; c) prevailing directions; d) constructed lines

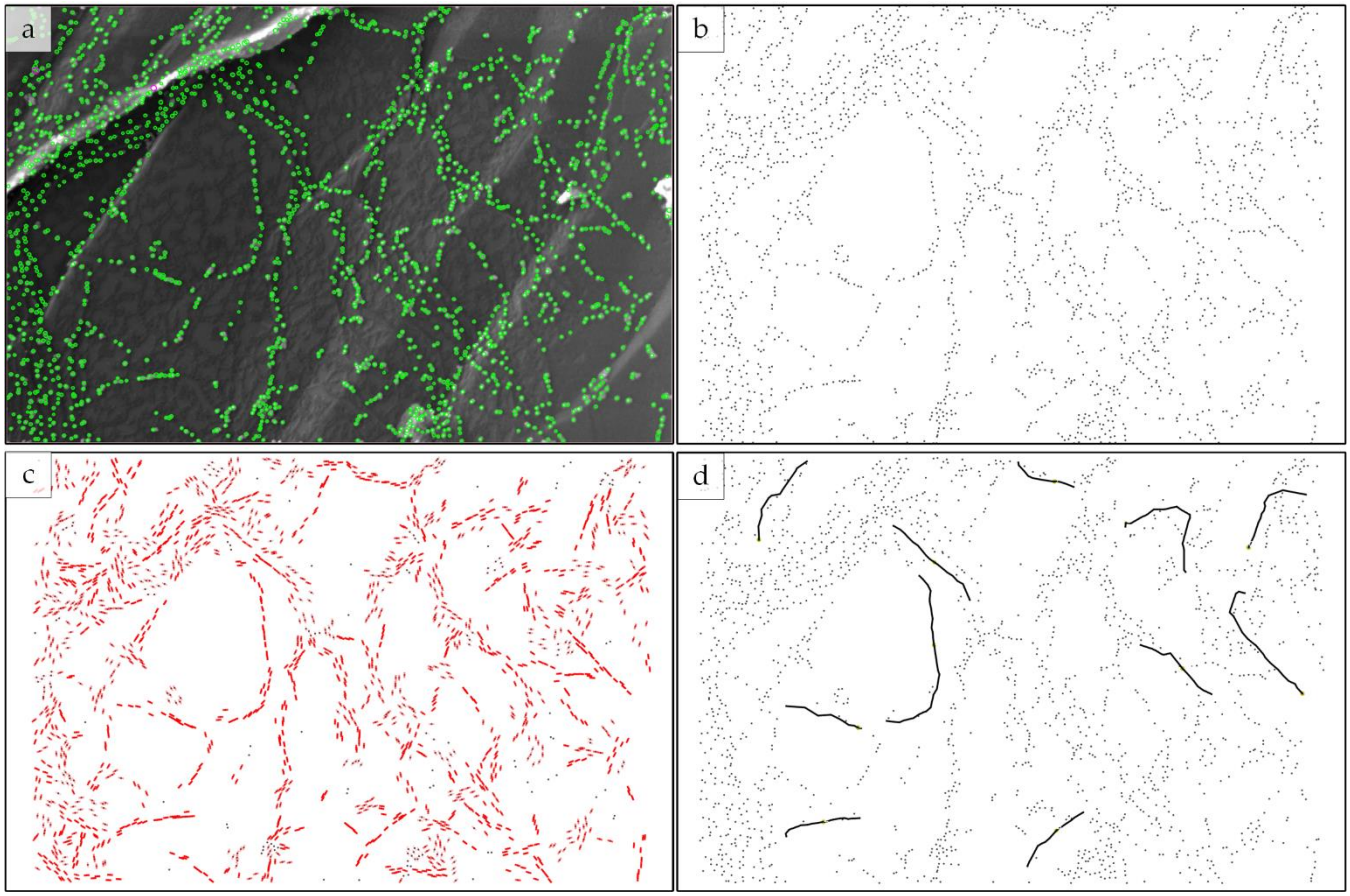


Figure 66 – Results of image processing for Figure 59f: a) detection of nanoparticles; b) location of particles without a substrate; c) prevailing directions; d) constructed lines

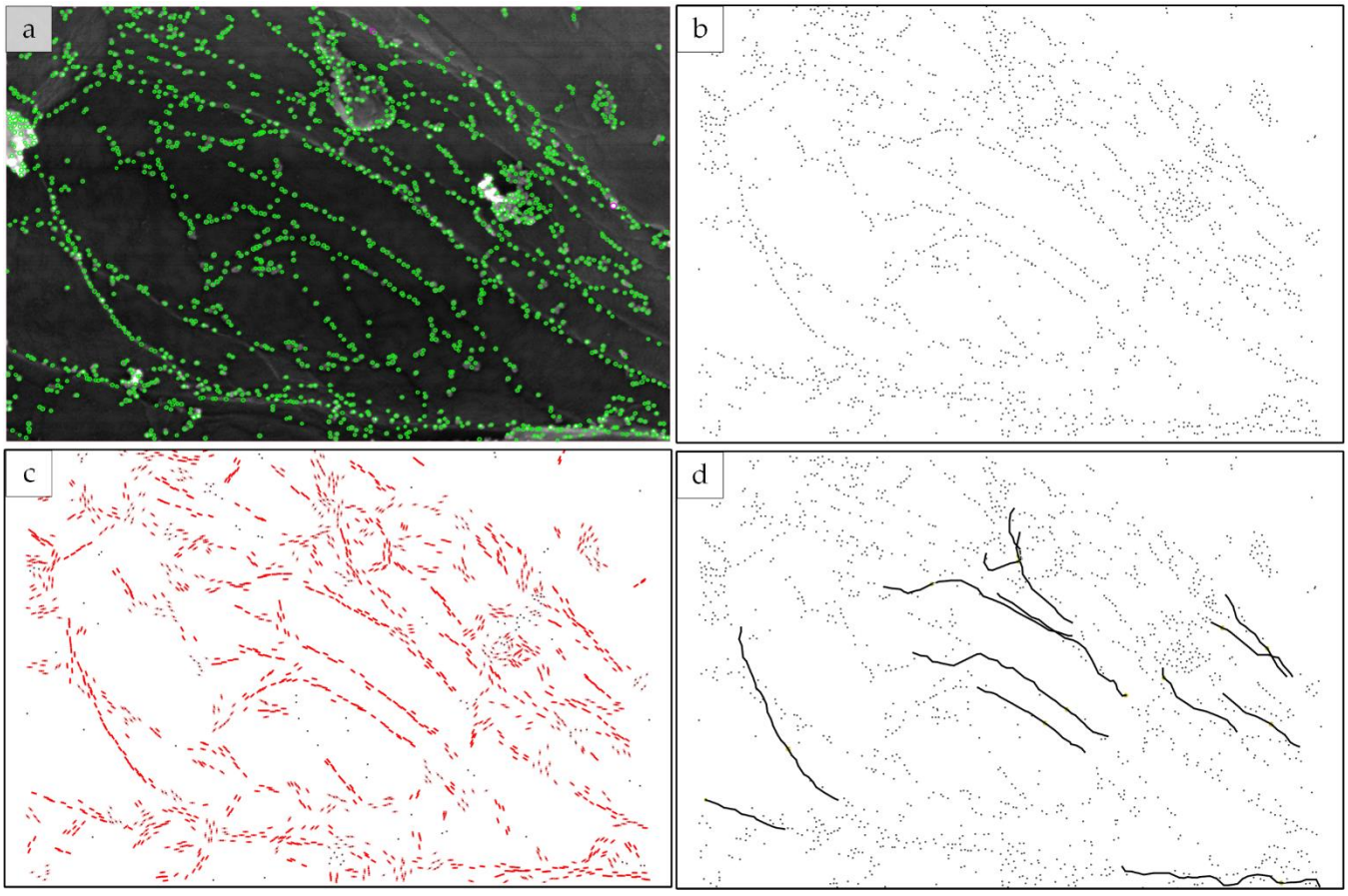


Figure 67 – Results of image processing for Figure 60g: a) detection of nanoparticles; b) location of particles without a substrate; c) prevailing directions; d) constructed lines

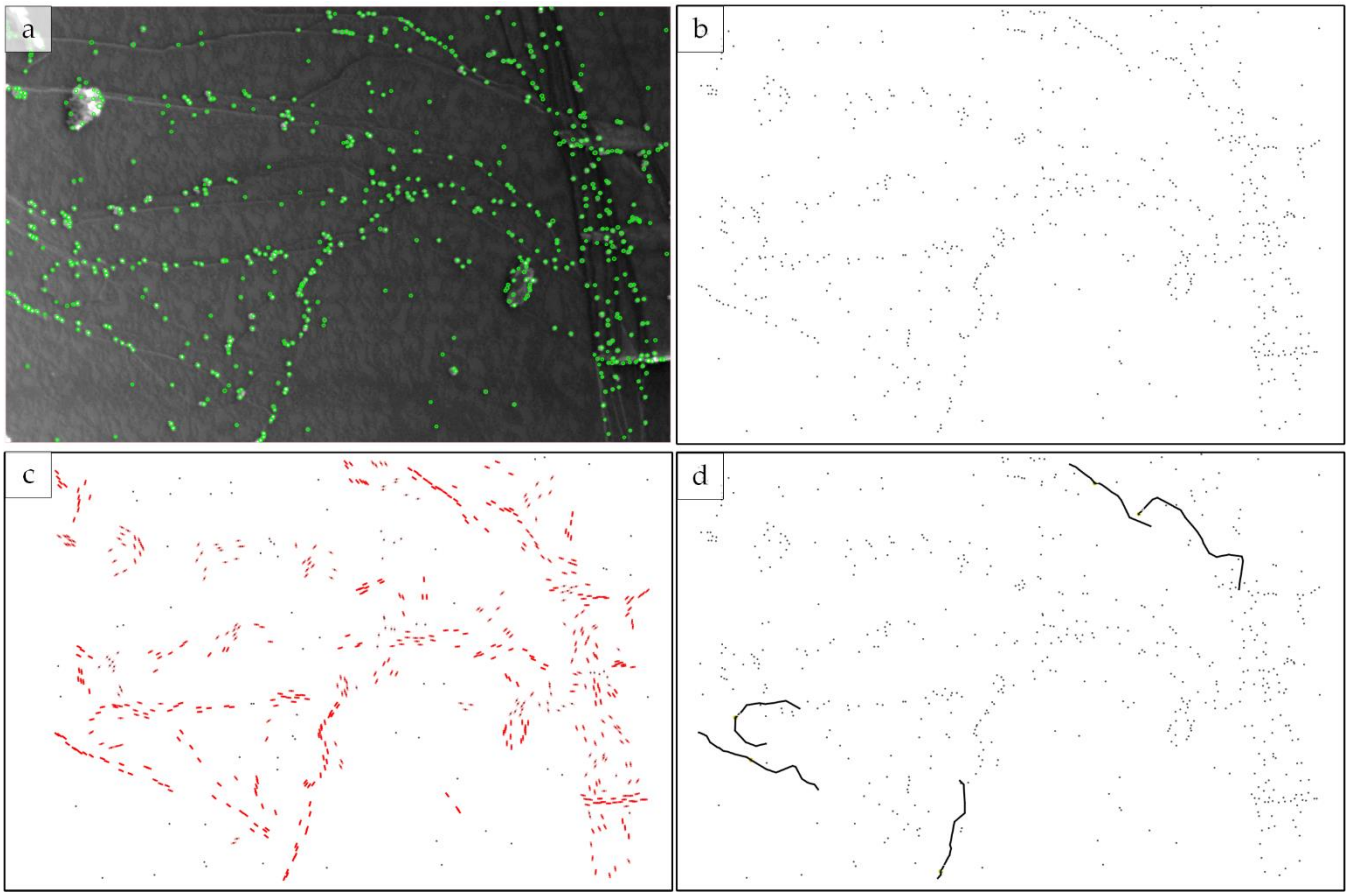


Figure 68 – Results of image processing for Figure 60h: a) detection of nanoparticles; b) location of particles without a substrate; c) prevailing directions; d) constructed lines

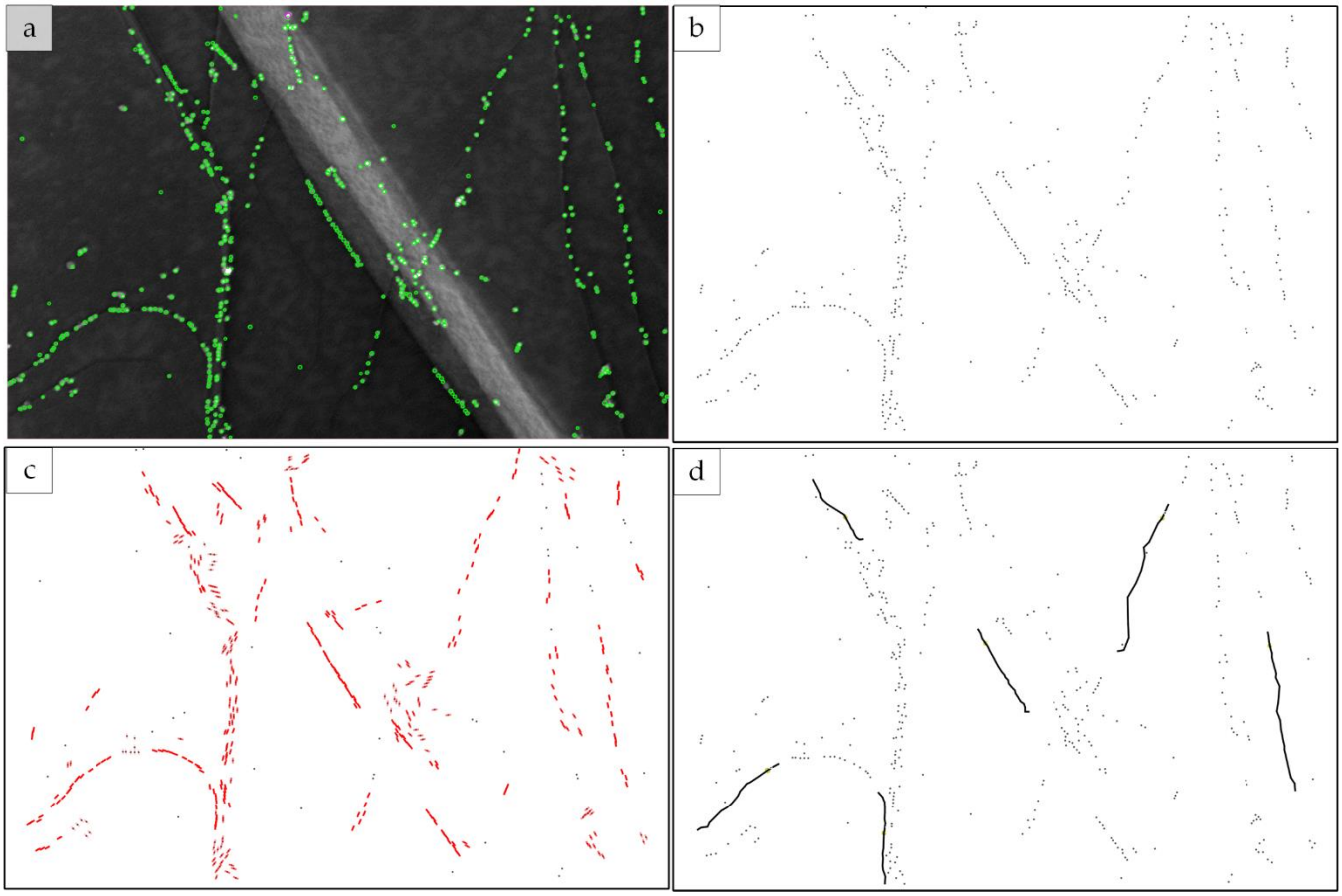


Figure 69 – Results of image processing for Figure 60i: a) detection of nanoparticles; b) location of particles without a substrate; c) prevailing directions; d) constructed lines

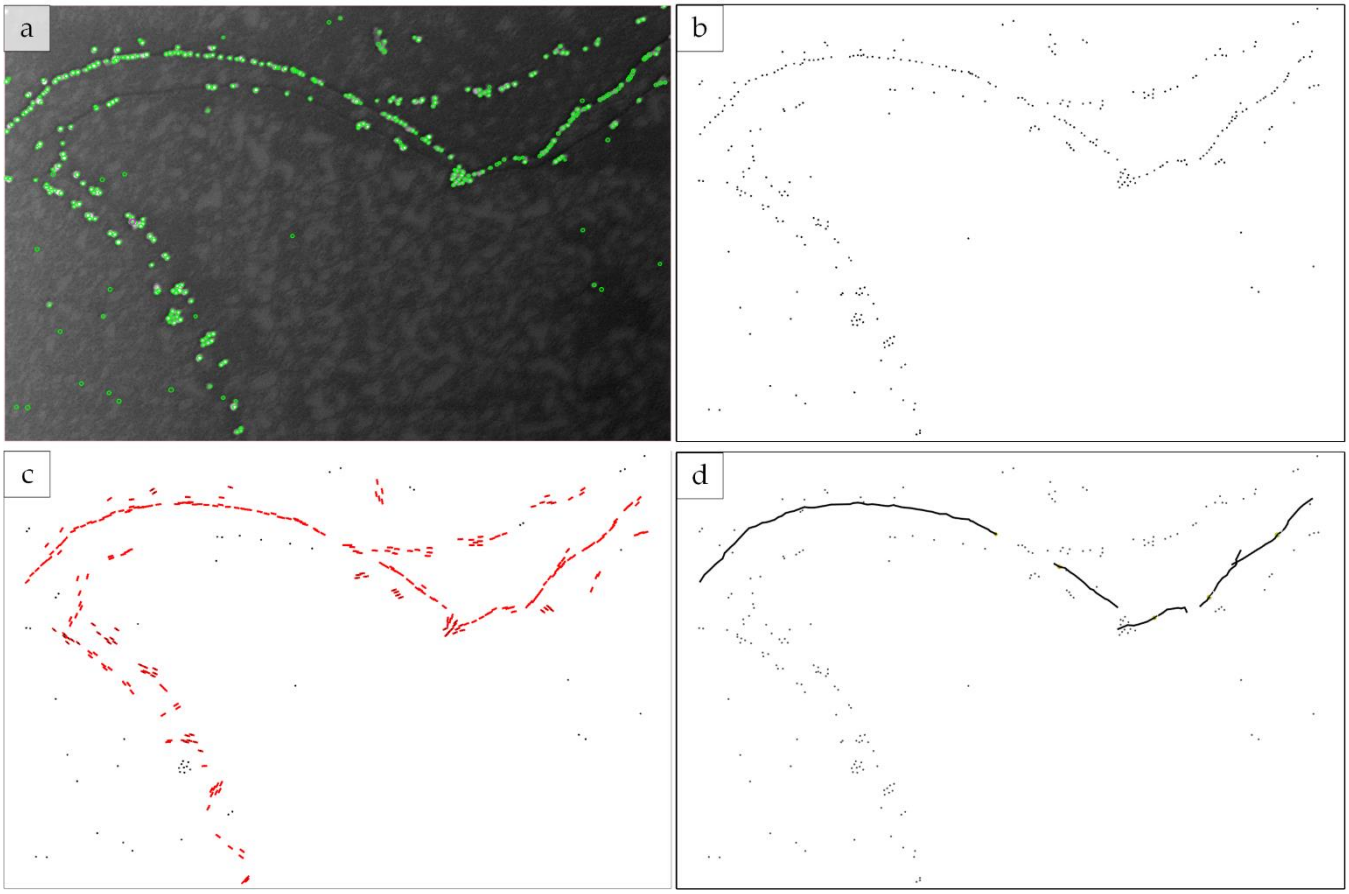


Figure 70 – Results of image processing for Figure 60j: a) detection of nanoparticles; b) location of particles without a substrate; c) prevailing directions; d) constructed lines

Table 2 – Calculated values of the proposed features for the new SEM image

Image	O1	O2	O3	L1	L2	L3	L4
Fig. 58a	0.3975	0.9752	0.8607	14	0.9579	0.9027	0.1114
Fig. 58b	0.4157	0.9674	0.8447	16	0.9538	0.8697	0.1242
Fig. 58c	0.4837	0.9583	0.8357	11	0.9540	0.9172	0.1014
Fig. 58d	0.3764	0.9562	0.8151	5	0.9652	0.9254	0.0560
Fig. 58e	0.4521	0.9458	0.8164	14	0.9476	0.8499	0.1646
Fig. 58f	0.4678	0.9479	0.7964	9	0.9563	0.9153	0.1375
Fig. 59g	0.4206	0.9300	0.7820	13	0.9652	0.9221	0.1635
Fig. 59h	0.4169	0.8823	0.6754	5	0.9161	0.7956	0.1252
Fig. 59i	0.6802	0.8495	0.5876	6	0.9785	0.9653	0.2146
Fig. 59j	0.6991	0.8066	0.5580	5	0.9836	0.9373	0.3500