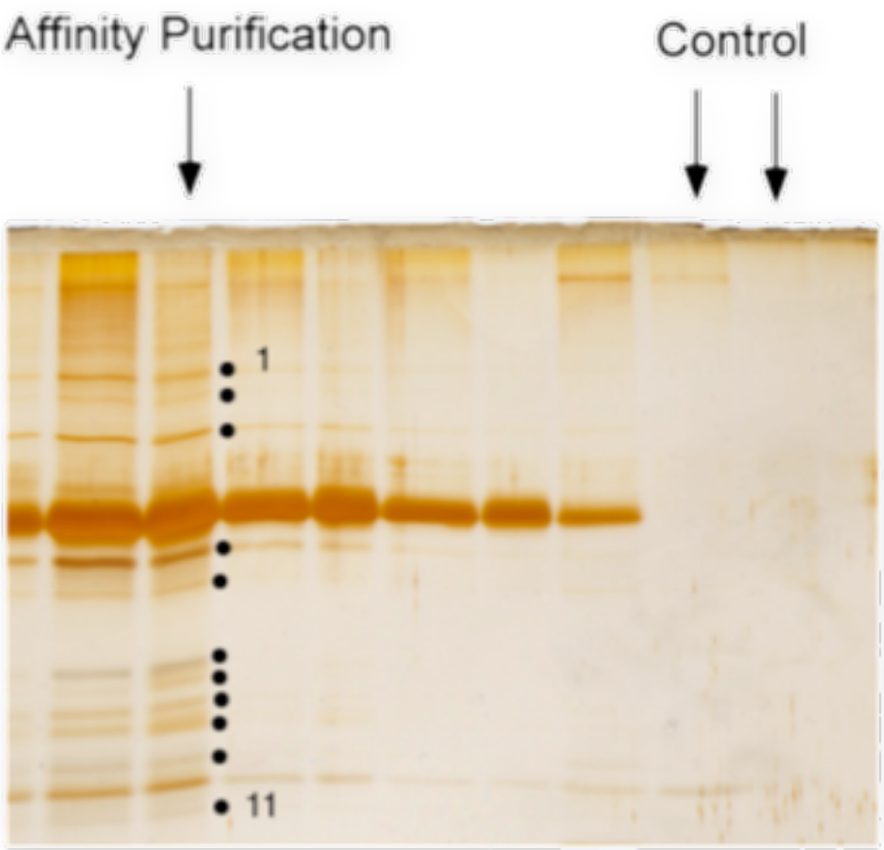
Introduction to Proteomic Data Analysis II

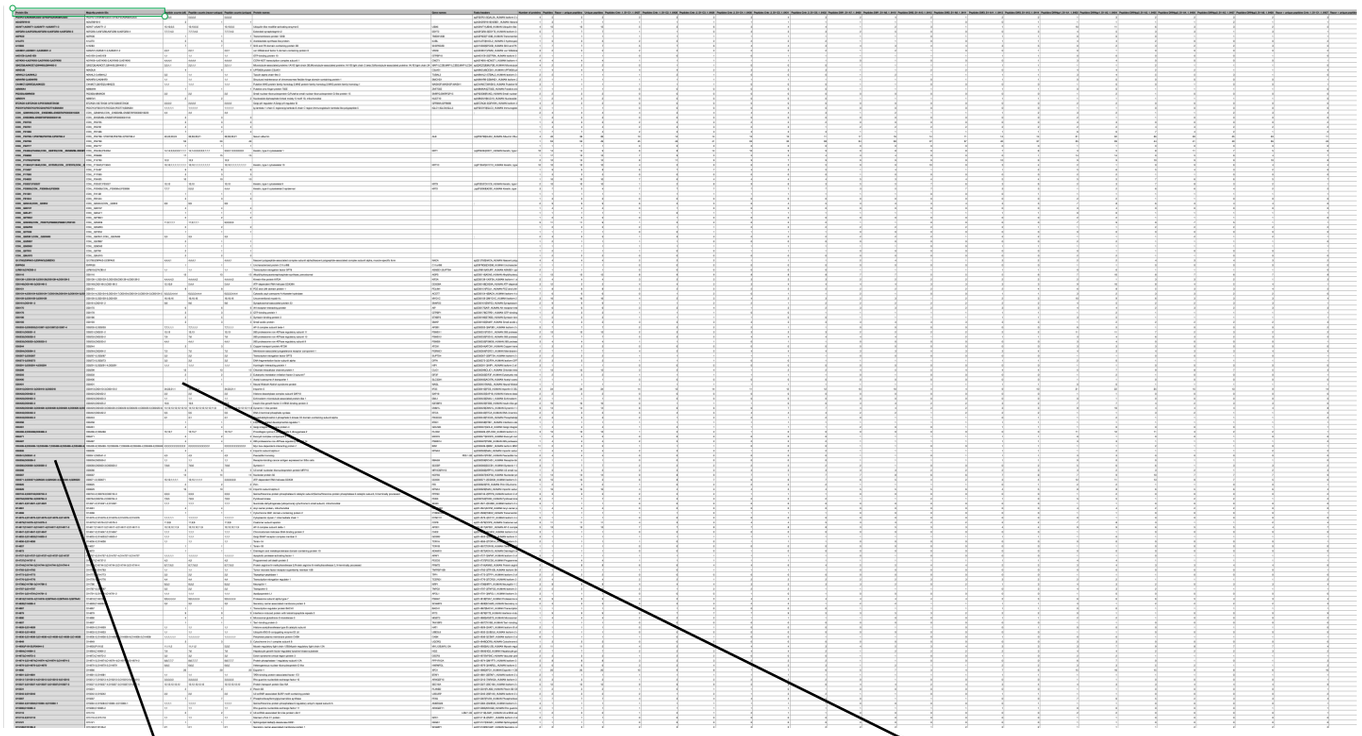
Analysis of Differential Protein Expression

University College Dublin, Conway Institute

Matthias Wilm, MD PhD,
Conway Institute, UCD,
Belfield, Dublin 4

Protein Analysis





O60610-2;O60610-3;O60610	O60610-2;O60610-3;O60610	10;10;
O60613;O60613-2	O60613;O60613-2	4;2
O60645	O60645	
O60664-4;O60664;O60664-3;O60664-2	O60664-4;O60664;O60664-3	17;17;
O60684;O15131	O60684;O15131	7;4
O60701-3;O60701;O60701-2	O60701-3;O60701;O60701-2	6;6;5
O60711;O60711-2	O60711;O60711-2	11;10
O60716;O60716-17;O60716-2;O60716-4;O60716-6;O60716-3;O6	O60716;O60716-17;O60716-2;O60716-4;O60716-6;O60716-3;O60716-5	8;8;8;8
O60725	O60725	
O60739	O60739	
O60749-2;O60749	O60749-2;O60749	6;6
O60762	O60762	
O60763;O60763-2	O60763;O60763-2	25;25
O60784;O60784-4;O60784-2;O60784-3	O60784;O60784-4;O60784-2	5;4;4;2
Q99880;Q99879;Q99877;Q93079;Q5QNW6;P62807;P58876;O60	Q99880;Q99879;Q99877;Q93079;Q5QNW6;P62807;P58876;O60814;Q5	9;9;9;9
O60826	O60826	
O60828-2;O60828;O60828-5;O60828-4;O60828-6;O60828-3	O60828-2;O60828;O60828-5;O60828-4	3;3;2;2
O60832;O60832-2	O60832;O60832-2	8;6
O60841	O60841	

Protein Analysis

MaxQuant

- Protein Identification
- Quantification

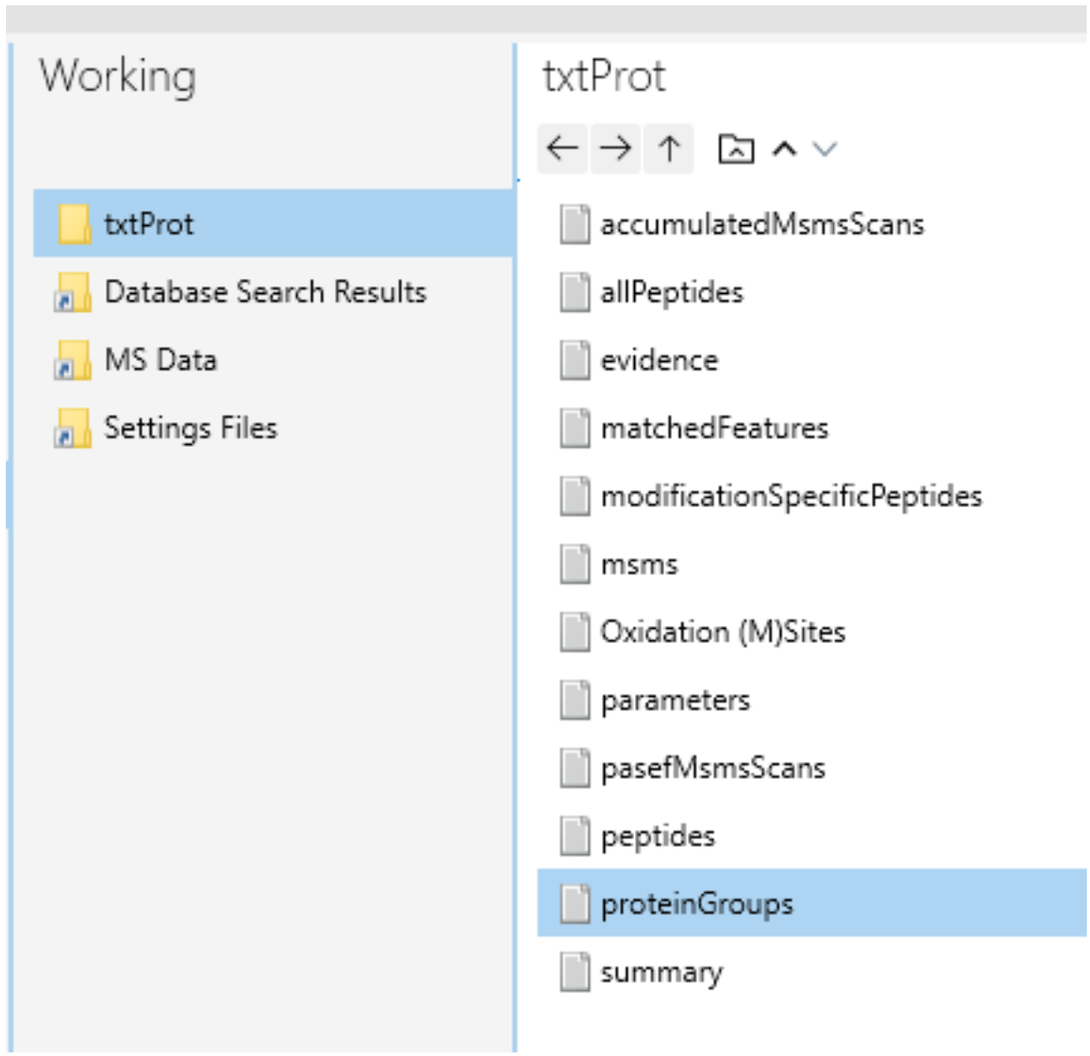
Perseus

- Statistical Analysis of Quantitative Results

String

- Protein Network & Pathway Analysis

Data Organization: Move the txt folder to the Working Folder



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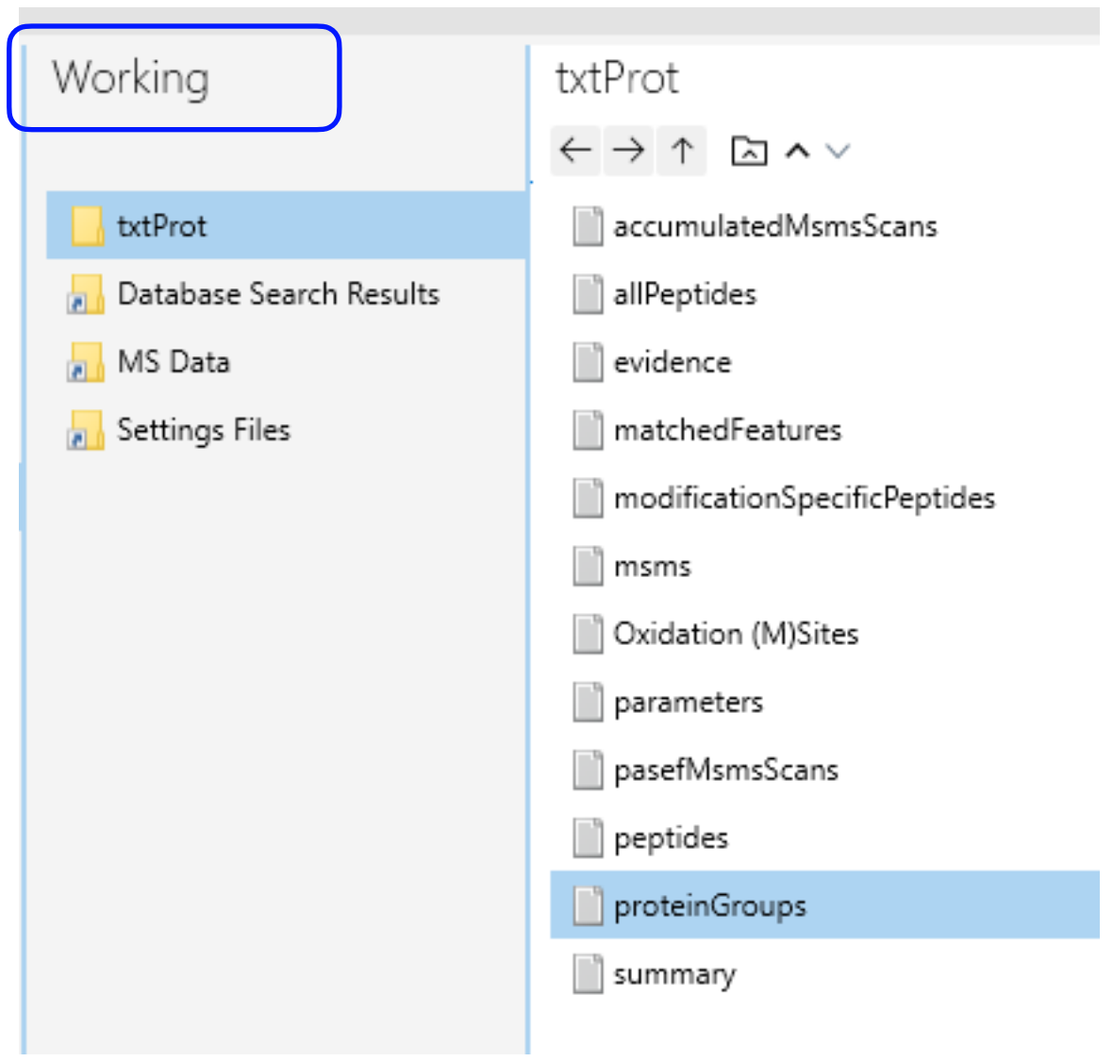

Data Organization: Generate Sample Meta-Data File

summary

Raw file	Experiment	Sample Type
211111kw_Simeng_Cntr_1_S1-C1_1_6427	Cntr_1_S1-C1_1_6427	S1 B1 T1
211111kw_Simeng_Cntr_1_S1-C2_1_6428	Cntr_1_S1-C2_1_6428	S1 B1 T2
211111kw_Simeng_Cntr_2_S1-C3_1_6429	Cntr_2_S1-C3_1_6429	S1 B2 T1
211111kw_Simeng_Cntr_2_S1-C4_1_6430	Cntr_2_S1-C4_1_6430	S1 B2 T2
211111kw_Simeng_Cntr_3_S1-C5_1_6431	Cntr_3_S1-C5_1_6431	S1 B3 T1
211111kw_Simeng_Cntr_3_S1-C6_1_6432	Cntr_3_S1-C6_1_6432	S1 B3 T2
211111kw_Simeng_Diff1_S1-A7_1_6409	Diff1_S1-A7_1_6409	S2 B1 T1
211111kw_Simeng_Diff1_S1-A8_1_6410	Diff1_S1-A8_1_6410	S2 B1 T2
211111kw_Simeng_Diff2_S1-A10_1_6412	Diff2_S1-A10_1_6412	S2 B2 T1
211111kw_Simeng_Diff2_S1-A9_1_6411	Diff2_S1-A9_1_6411	S2 B2 T2
211111kw_Simeng_Diff3_S1-A11_1_6413	Diff3_S1-A11_1_6413	S2 B3 T1
211111kw_Simeng_Diff3_S1-A12_1_6414	Diff3_S1-A12_1_6414	S2 B3 T2
211111kw_Simeng_DiffHyp1_S1-A1_1_6403	DiffHyp1_S1-A1_1_6403	S3 B1 T1
211111kw_Simeng_DiffHyp1_S1-A2_1_6404	DiffHyp1_S1-A2_1_6404	S3 B1 T2
211111kw_Simeng_DiffHyp2_S1-A3_1_6405	DiffHyp2_S1-A3_1_6405	S3 B2 T1
211111kw_Simeng_DiffHyp2_S1-A4_1_6406	DiffHyp2_S1-A4_1_6406	S3 B2 T2
211111kw_Simeng_DiffHyp3_S1-A5_1_6407	DiffHyp3_S1-A5_1_6407	S3 B3 T1
211111kw_Simeng_DiffHyp3_S1-A6_1_6408	DiffHyp3_S1-A6_1_6408	S3 B3 T2

What is the Aim of the Analysis ?

Which proteins are over expressed / enriched in comparison to the control in a statistically significant way ?

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211111kw_Simeng_Cntr_2_S1-C3_1_6429	Cntr_2_S1-C3_1_6429	S1 B2 T1
211111kw_Simeng_Cntr_2_S1-C4_1_6430	Cntr_2_S1-C4_1_6430	S1 B2 T2
211111kw_Simeng_Cntr_3_S1-C5_1_6431	Cntr_3_S1-C5_1_6431	S1 B3 T1
211111kw_Simeng_Cntr_3_S1-C6_1_6432	Cntr_3_S1-C6_1_6432	S1 B3 T2
211111kw_Simeng_Diff1_S1-A7_1_6409	Diff1_S1-A7_1_6409	S2 B1 T1
211111kw_Simeng_Diff1_S1-A8_1_6410	Diff1_S1-A8_1_6410	S2 B1 T2
211111kw_Simeng_Diff2_S1-A10_1_6412	Diff2_S1-A10_1_6412	S2 B2 T1
211111kw_Simeng_Diff2_S1-A9_1_6411	Diff2_S1-A9_1_6411	S2 B2 T2
211111kw_Simeng_Diff3_S1-A11_1_6413	Diff3_S1-A11_1_6413	S2 B3 T1
211111kw_Simeng_Diff3_S1-A12_1_6414	Diff3_S1-A12_1_6414	S2 B3 T2
211111kw_Simeng_DiffHyp1_S1-A1_1_6403	DiffHyp1_S1-A1_1_6403	S3 B1 T1
211111kw_Simeng_DiffHyp1_S1-A2_1_6404	DiffHyp1_S1-A2_1_6404	S3 B1 T2
211111kw_Simeng_DiffHyp2_S1-A3_1_6405	DiffHyp2_S1-A3_1_6405	S3 B2 T1
211111kw_Simeng_DiffHyp2_S1-A4_1_6406	DiffHyp2_S1-A4_1_6406	S3 B2 T2
211111kw_Simeng_DiffHyp3_S1-A5_1_6407	DiffHyp3_S1-A5_1_6407	S3 B3 T1
211111kw_Simeng_DiffHyp3_S1-A6_1_6408	DiffHyp3_S1-A6_1_6408	S3 B3 T2

Perseus

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211111kw_Simeng_Cntr_2_S1-C3_1_6429	Cntr_2_S1-C3_1_6429	S1 B2 T1
211111kw_Simeng_Cntr_2_S1-C4_1_6430	Cntr_2_S1-C4_1_6430	S1 B2 T2
211111kw_Simeng_Cntr_3_S1-C5_1_6431	Cntr_3_S1-C5_1_6431	S1 B3 T1
211111kw_Simeng_Cntr_3_S1-C6_1_6432	Cntr_3_S1-C6_1_6432	S1 B3 T2
211111kw_Simeng_Diff1_S1-A7_1_6409	Diff1_S1-A7_1_6409	S2 B1 T1
211111kw_Simeng_Diff1_S1-A8_1_6410	Diff1_S1-A8_1_6410	S2 B1 T2
211111kw_Simeng_Diff2_S1-A10_1_6412	Diff2_S1-A10_1_6412	S2 B2 T1
211111kw_Simeng_Diff2_S1-A9_1_6411	Diff2_S1-A9_1_6411	S2 B2 T2
211111kw_Simeng_Diff3_S1-A11_1_6413	Diff3_S1-A11_1_6413	S2 B3 T1
211111kw_Simeng_Diff3_S1-A12_1_6414	Diff3_S1-A12_1_6414	S2 B3 T2
211111kw_Simeng_DiffHyp1_S1-A1_1_6403	DiffHyp1_S1-A1_1_6403	S3 B1 T1
211111kw_Simeng_DiffHyp1_S1-A2_1_6404	DiffHyp1_S1-A2_1_6404	S3 B1 T2
211111kw_Simeng_DiffHyp2_S1-A3_1_6405	DiffHyp2_S1-A3_1_6405	S3 B2 T1
211111kw_Simeng_DiffHyp2_S1-A4_1_6406	DiffHyp2_S1-A4_1_6406	S3 B2 T2
211111kw_Simeng_DiffHyp3_S1-A5_1_6407	DiffHyp3_S1-A5_1_6407	S3 B3 T1
211111kw_Simeng_DiffHyp3_S1-A6_1_6408	DiffHyp3_S1-A6_1_6408	S3 B3 T2

Comparison between two samples: **t-Test**

t-Test: Is the mean of two groups of measurement repeats the same ?

Perseus

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211111kw_Simeng_Cntr_1_S1-C2_1_6428	Cntr_1_S1-C2_1_6428	S1 B1 T2
211111kw_Simeng_Cntr_2_S1-C3_1_6429	Cntr_2_S1-C3_1_6429	S1 B2 T1
211111kw_Simeng_Cntr_2_S1-C4_1_6430	Cntr_2_S1-C4_1_6430	S1 B2 T2
211111kw_Simeng_Cntr_3_S1-C5_1_6431	Cntr_3_S1-C5_1_6431	S1 B3 T1
211111kw_Simeng_Cntr_3_S1-C6_1_6432	Cntr_3_S1-C6_1_6432	S1 B3 T2
211111kw_Simeng_Diff1_S1-A7_1_6409	Diff1_S1-A7_1_6409	S2 B1 T1
211111kw_Simeng_Diff1_S1-A8_1_6410	Diff1_S1-A8_1_6410	S2 B1 T2
211111kw_Simeng_Diff2_S1-A10_1_6412	Diff2_S1-A10_1_6412	S2 B2 T1
211111kw_Simeng_Diff2_S1-A9_1_6411	Diff2_S1-A9_1_6411	S2 B2 T2
211111kw_Simeng_Diff3_S1-A11_1_6413	Diff3_S1-A11_1_6413	S2 B3 T1
211111kw_Simeng_Diff3_S1-A12_1_6414	Diff3_S1-A12_1_6414	S2 B3 T2
211111kw_Simeng_DiffHyp1_S1-A1_1_6403	DiffHyp1_S1-A1_1_6403	S3 B1 T1
211111kw_Simeng_DiffHyp1_S1-A2_1_6404	DiffHyp1_S1-A2_1_6404	S3 B1 T2
211111kw_Simeng_DiffHyp2_S1-A3_1_6405	DiffHyp2_S1-A3_1_6405	S3 B2 T1
211111kw_Simeng_DiffHyp2_S1-A4_1_6406	DiffHyp2_S1-A4_1_6406	S3 B2 T2
211111kw_Simeng_DiffHyp3_S1-A5_1_6407	DiffHyp3_S1-A5_1_6407	S3 B3 T1
211111kw_Simeng_DiffHyp3_S1-A6_1_6408	DiffHyp3_S1-A6_1_6408	S3 B3 T2

Comparison between two samples: **t-Test**

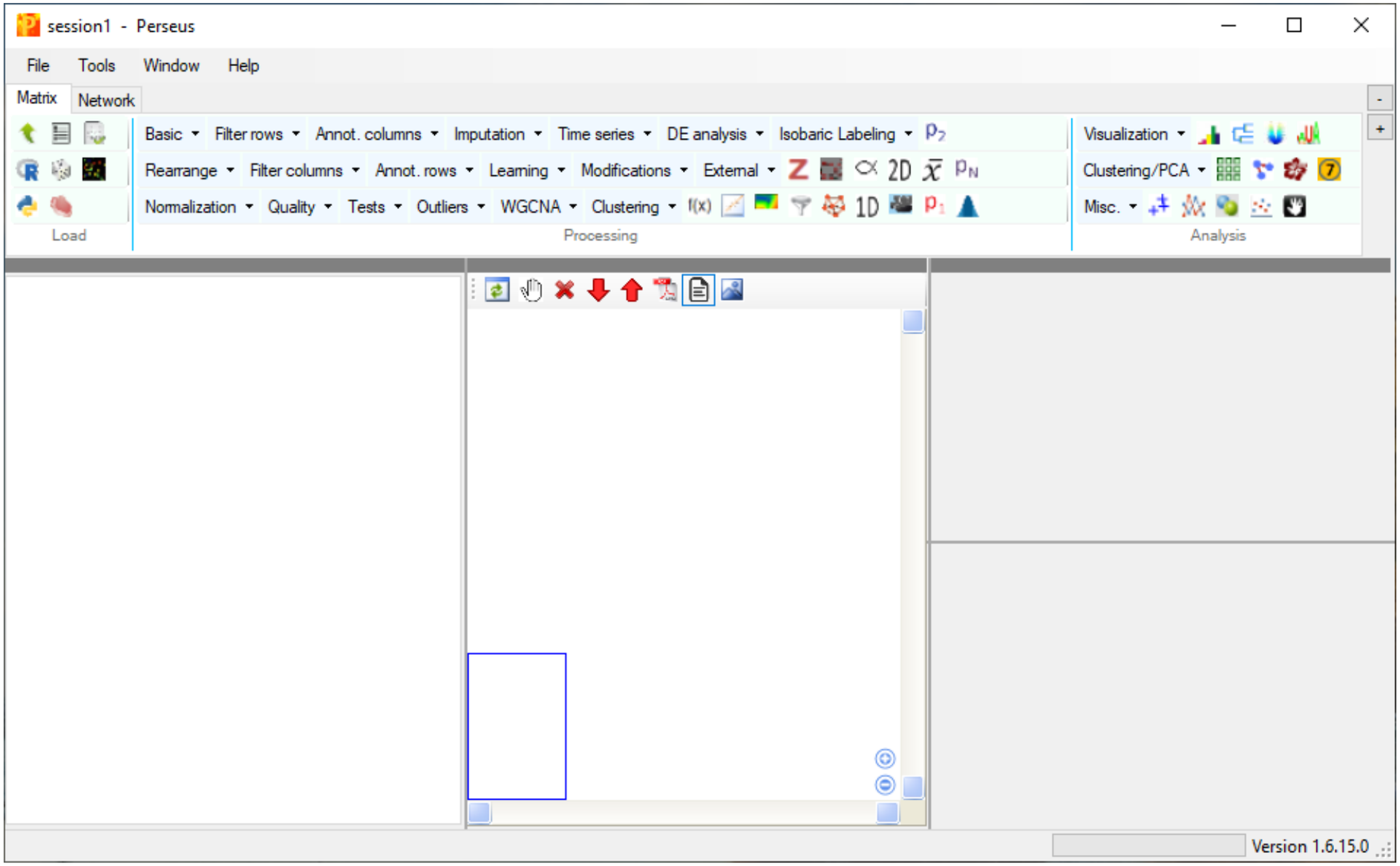
t-Test: Is the mean of two groups of measurement repeats the same ?

Comparison between several samples:

ANOVA - Test

ANOVA-Test: Are the means of several groups of measurement repeats the same ?

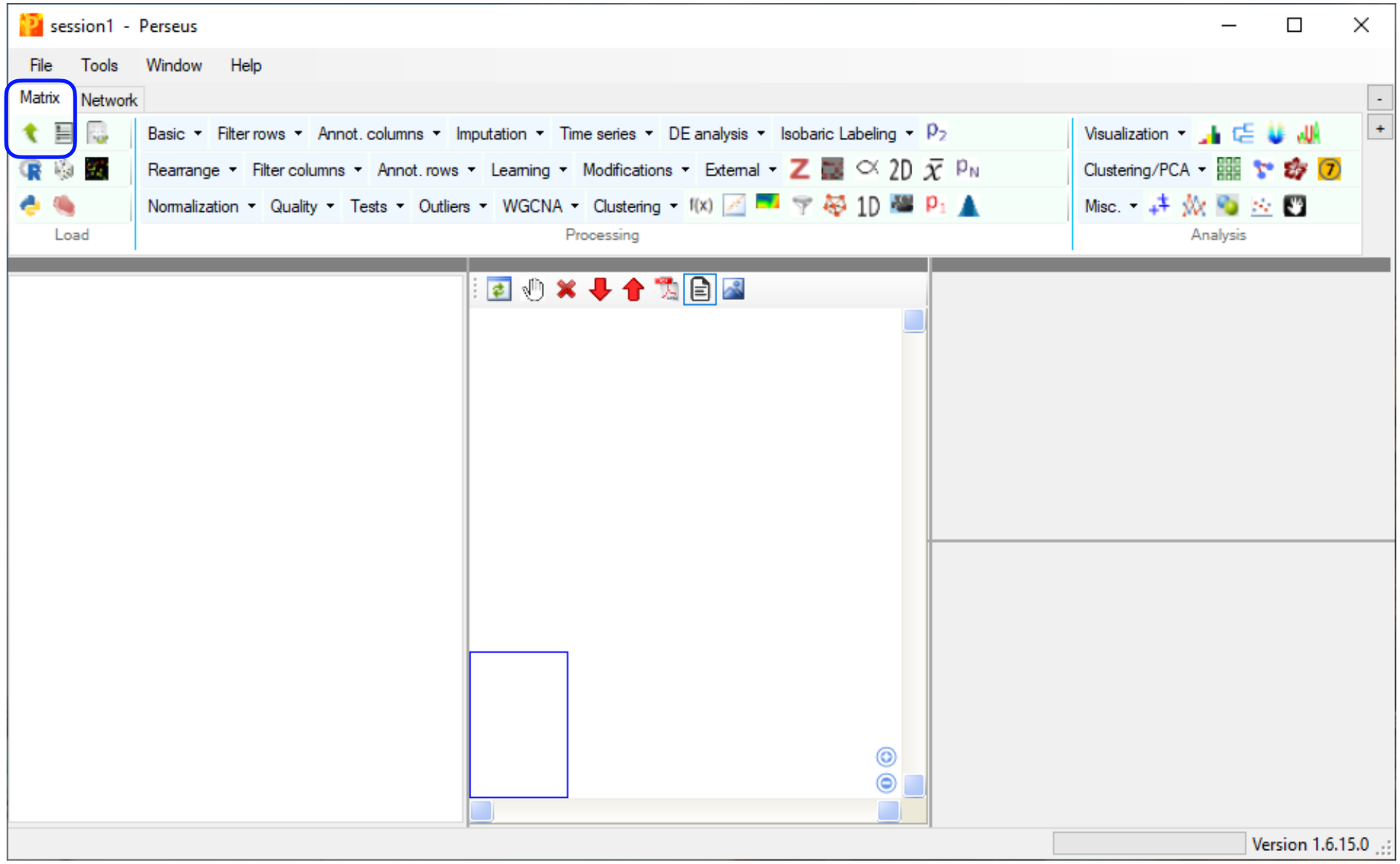
Start Perseus and Load Data: proteinGroups.txt



S. Tyanova and J. Cox, “Perseus: A Bioinformatics Platform for Integrative Analysis of Proteomics Data in Cancer Research.,” *Methods Mol Biol*, vol. 1711, pp. 133-148, 2018

Perseus

Start Perseus and Load Data: proteinGroups.txt



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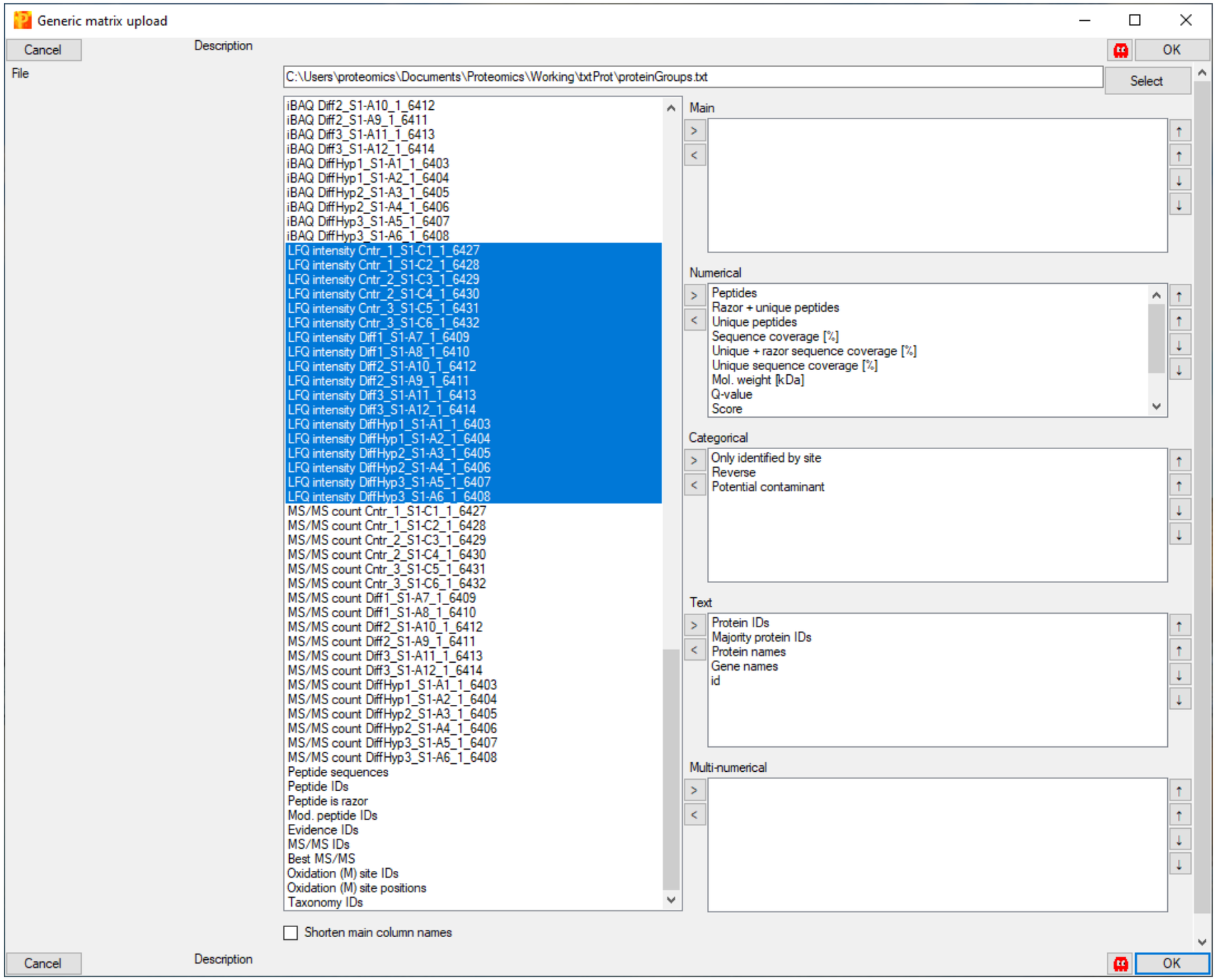

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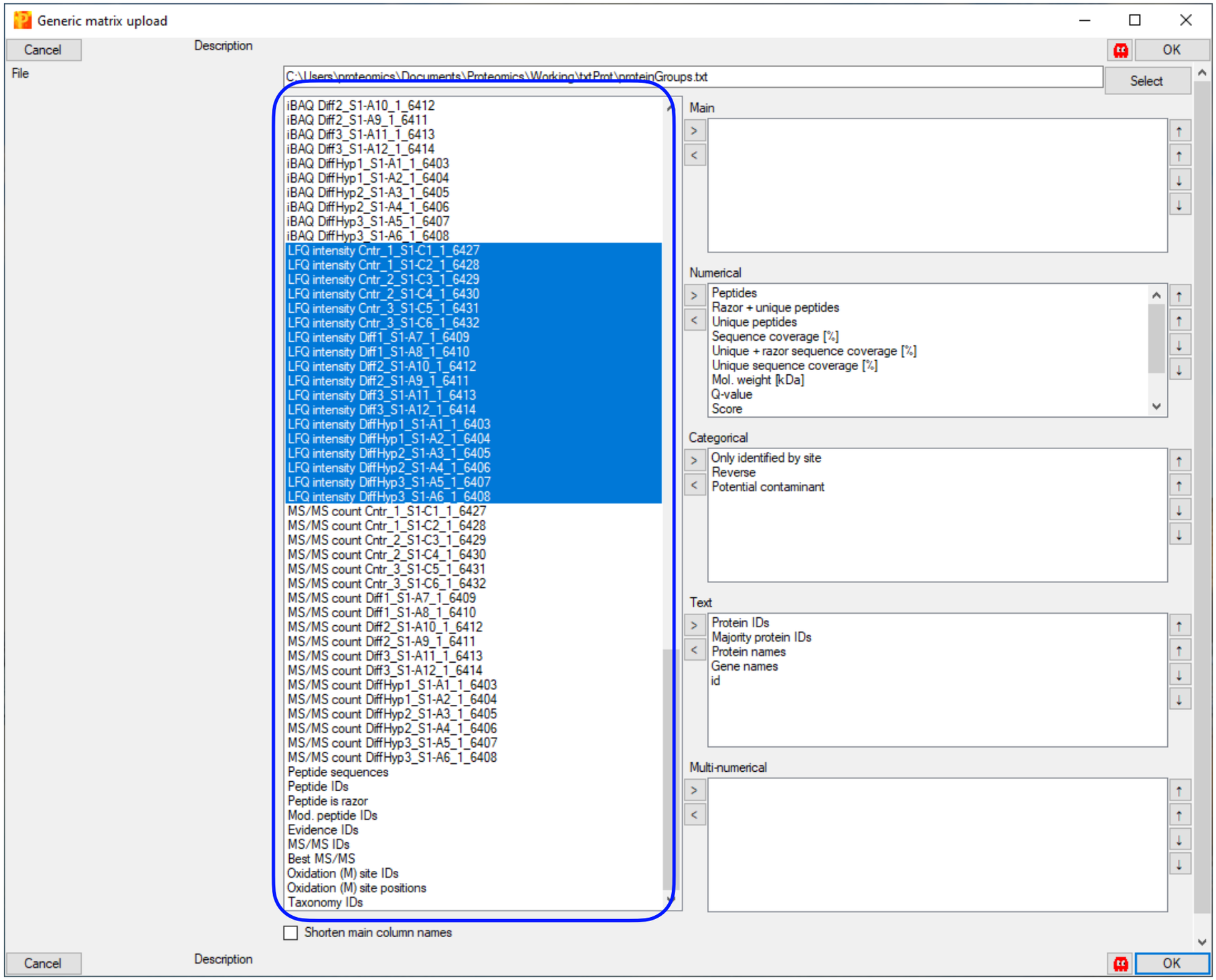

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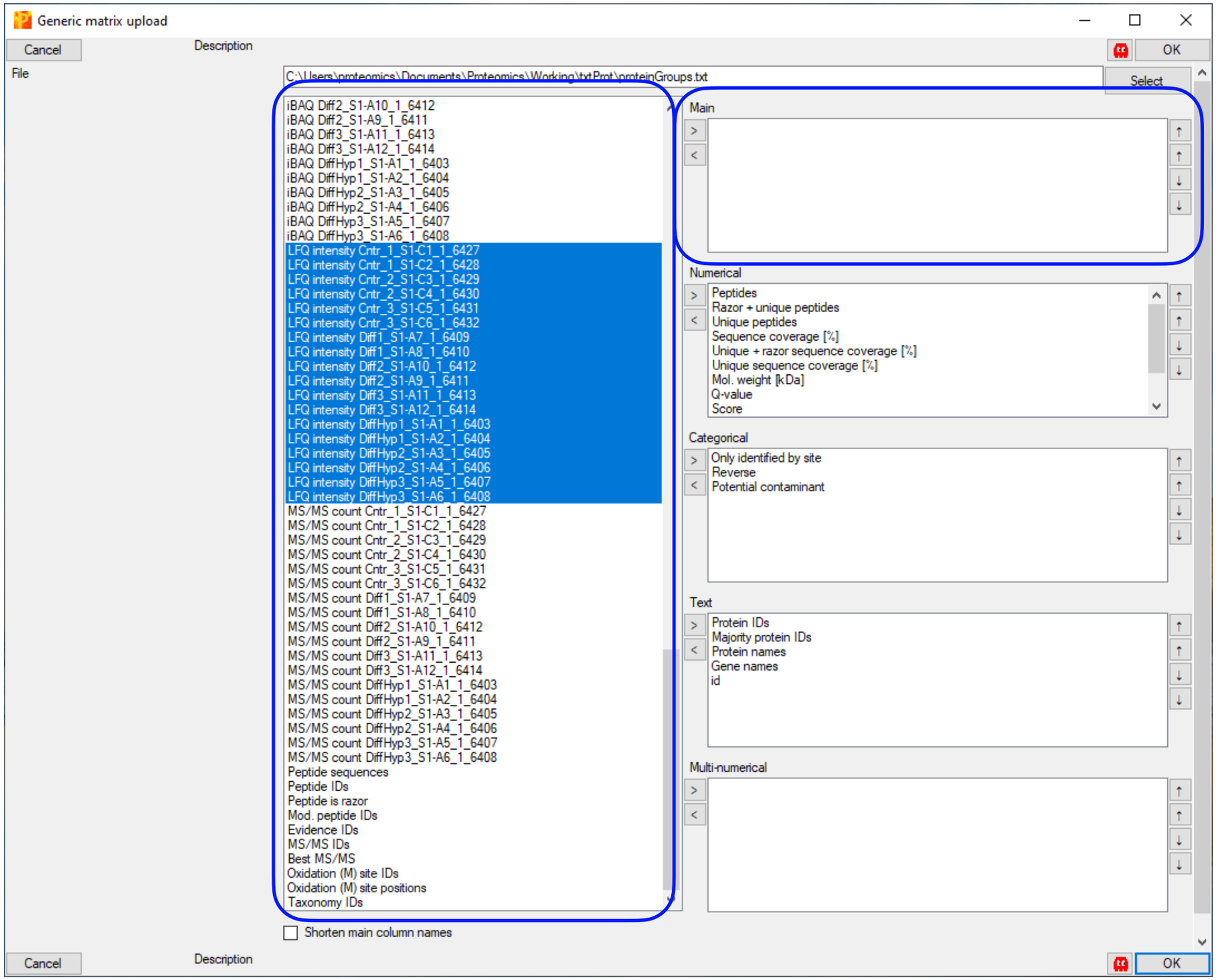

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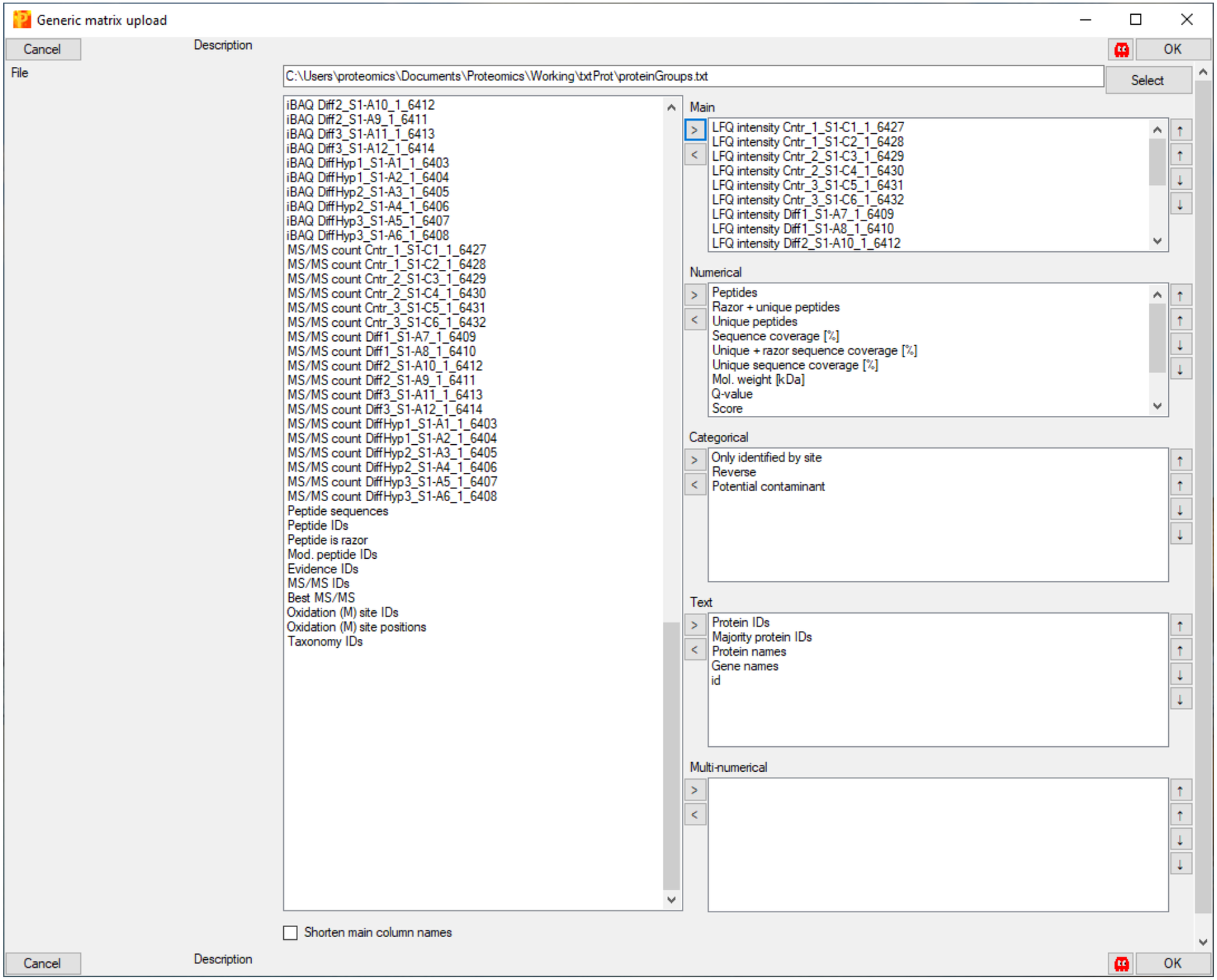
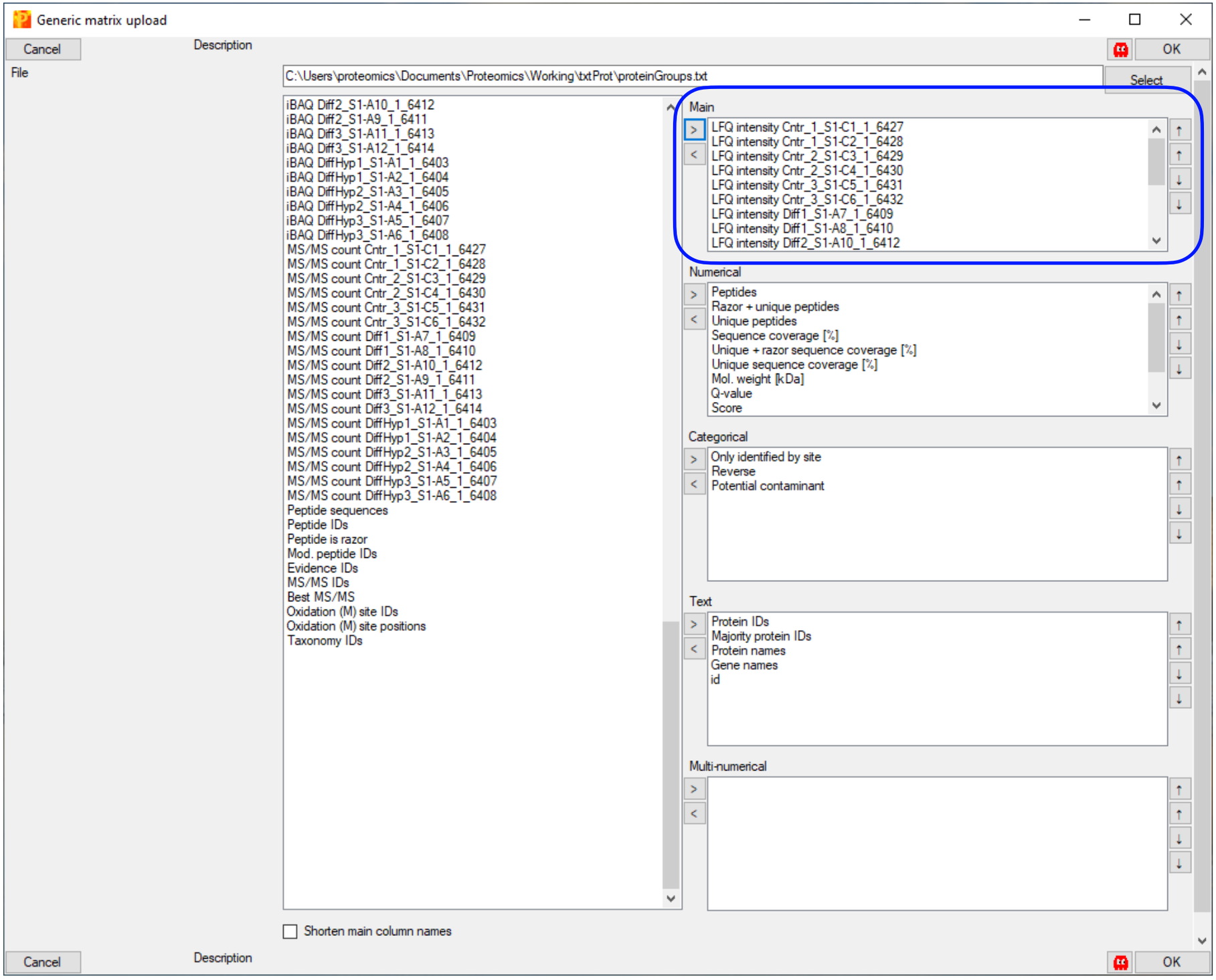


Start Perseus and Load Data: proteinGroups.txt



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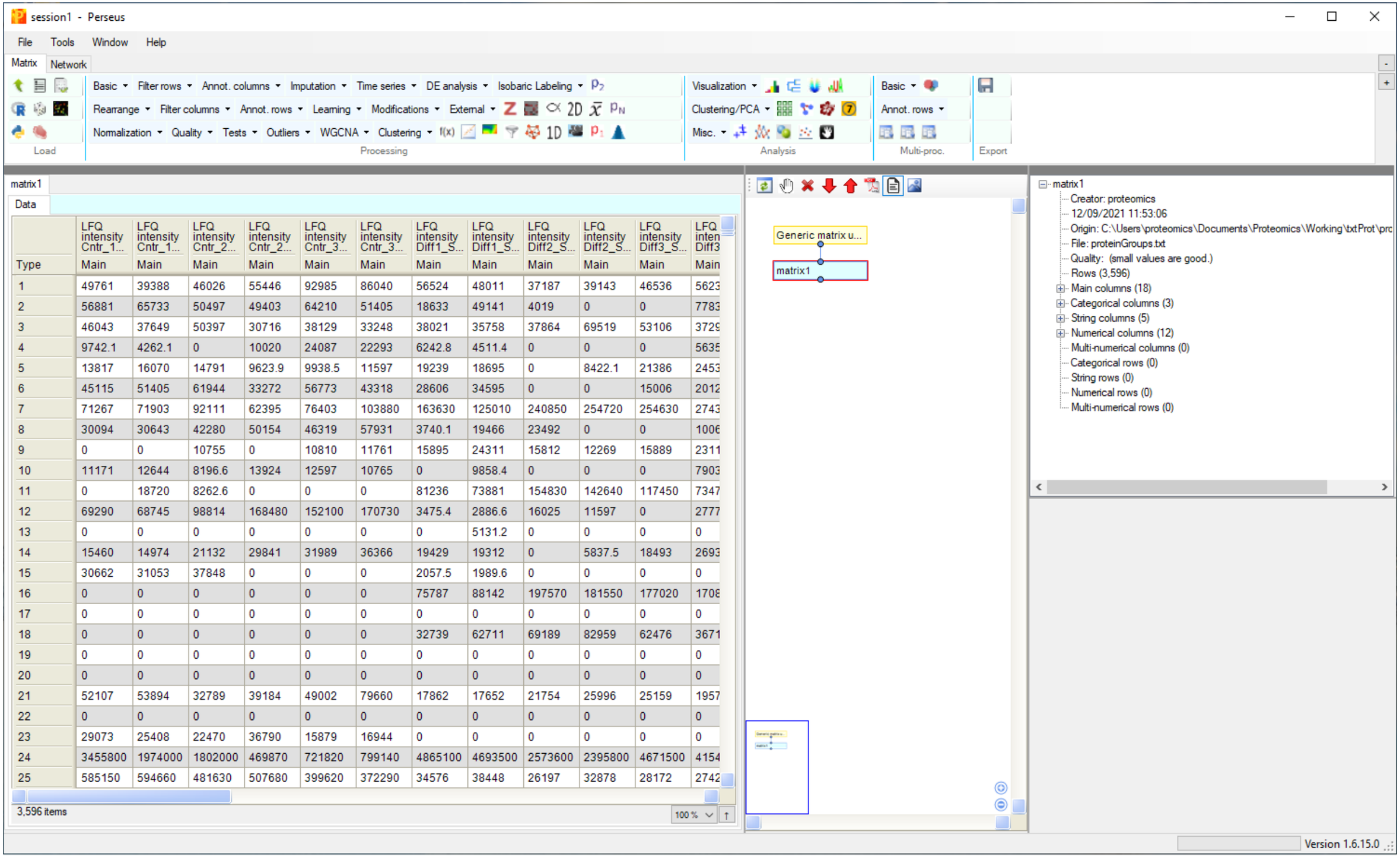

	LFQ intensity Cntr_1...	LFQ intensity Cntr_1...	LFQ intensity Cntr_2...	LFQ intensity Cntr_2...	LFQ intensity Cntr_3...	LFQ intensity Cntr_3...	LFQ intensity Diff1_S...	LFQ intensity Diff1_S...	LFQ intensity Diff2_S...	LFQ intensity Diff2_S...	LFQ intensity Diff3_S...	LFQ inten Diff3
Type	Main	Main	Main	Main	Main	Main	Main	Main	Main	Main	Main	Main
1	49761	39388	46026	55446	92985	86040	56524	48011	37187	39143	46536	5623
2	56881	65733	50497	49403	64210	51405	18633	49141	4019	0	0	7783
3	46043	37649	50397	30716	38129	33248	38021	35758	37864	69519	53106	3729
4	9742.1	4262.1	0	10020	24087	22293	6242.8	4511.4	0	0	0	5635
5	13817	16070	14791	9623.9	9938.5	11597	19239	18695	0	8422.1	21386	2453
6	45115	51405	61944	33272	56773	43318	28606	34595	0	0	15006	2012
7	71267	71903	92111	62395	76403	103880	163630	125010	240850	254720	254630	2743
8	30094	30643	42280	50154	46319	57931	3740.1	19466	23492	0	0	1006
9	0	0	10755	0	10810	11761	15895	24311	15812	12269	15889	2311
10	11171	12644	8196.6	13924	12597	10765	0	9858.4	0	0	0	7903
11	0	18720	8262.6	0	0	0	81236	73881	154830	142640	117450	7347
12	69290	68745	98814	168480	152100	170730	3475.4	2886.6	16025	11597	0	2777
13	0	0	0	0	0	0	0	5131.2	0	0	0	0
14	15460	14974	21132	29841	31989	36366	19429	19312	0	5837.5	18493	2693
15	30662	31053	37848	0	0	0	2057.5	1989.6	0	0	0	0
16	0	0	0	0	0	0	75787	88142	197570	181550	177020	1708
17	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	32739	62711	69189	82959	62476	3671
19	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
21	52107	53894	32789	39184	49002	79660	17862	17652	21754	25996	25159	1957
22	0	0	0	0	0	0	0	0	0	0	0	0
23	29073	25408	22470	36790	15879	16944	0	0	0	0	0	0
24	3455800	1974000	1802000	469870	721820	799140	4865100	4693500	2573600	2395800	4671500	4154
25	585150	594660	481630	507680	399620	372290	34576	38448	26197	32878	28172	2742

Perseus

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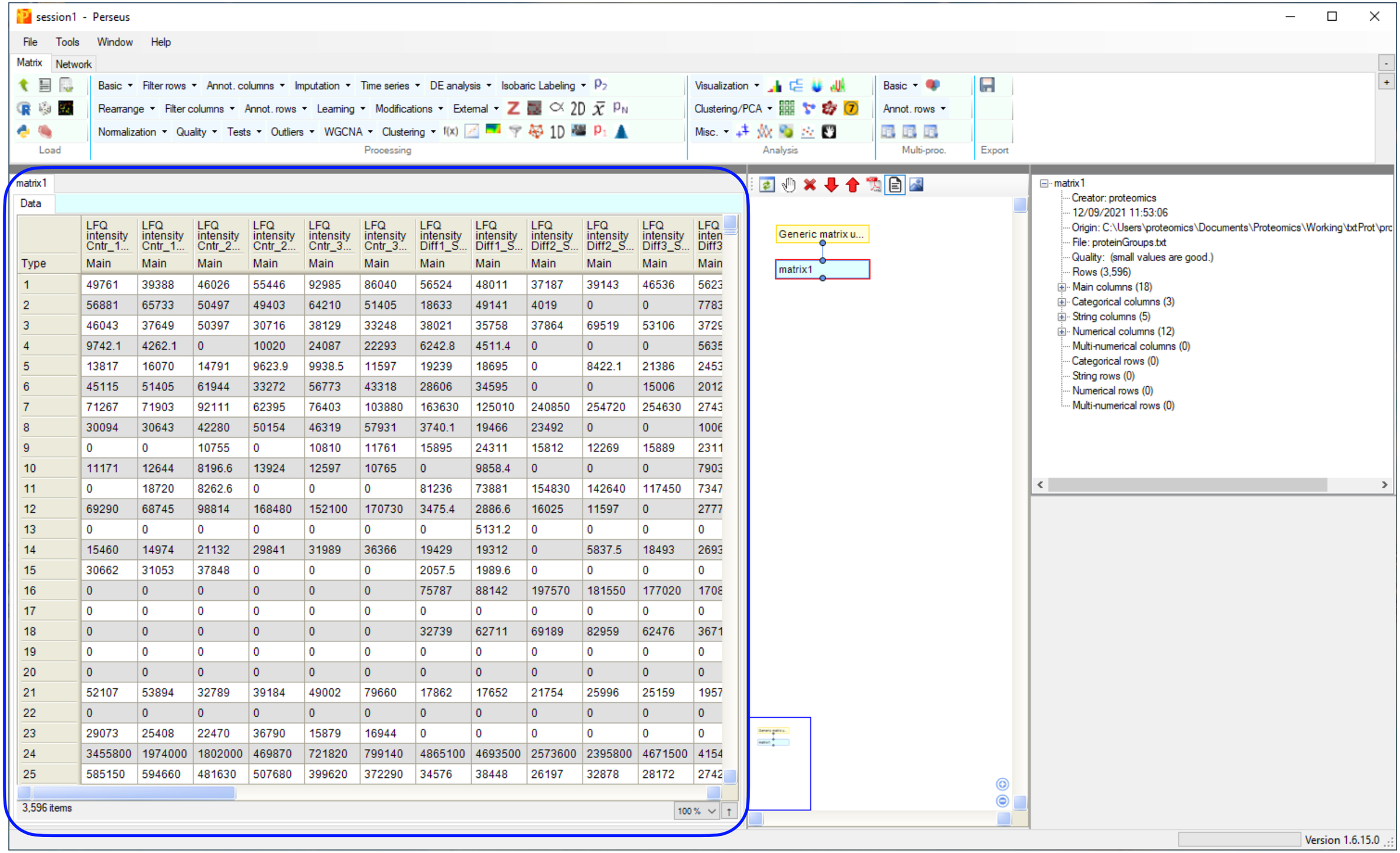

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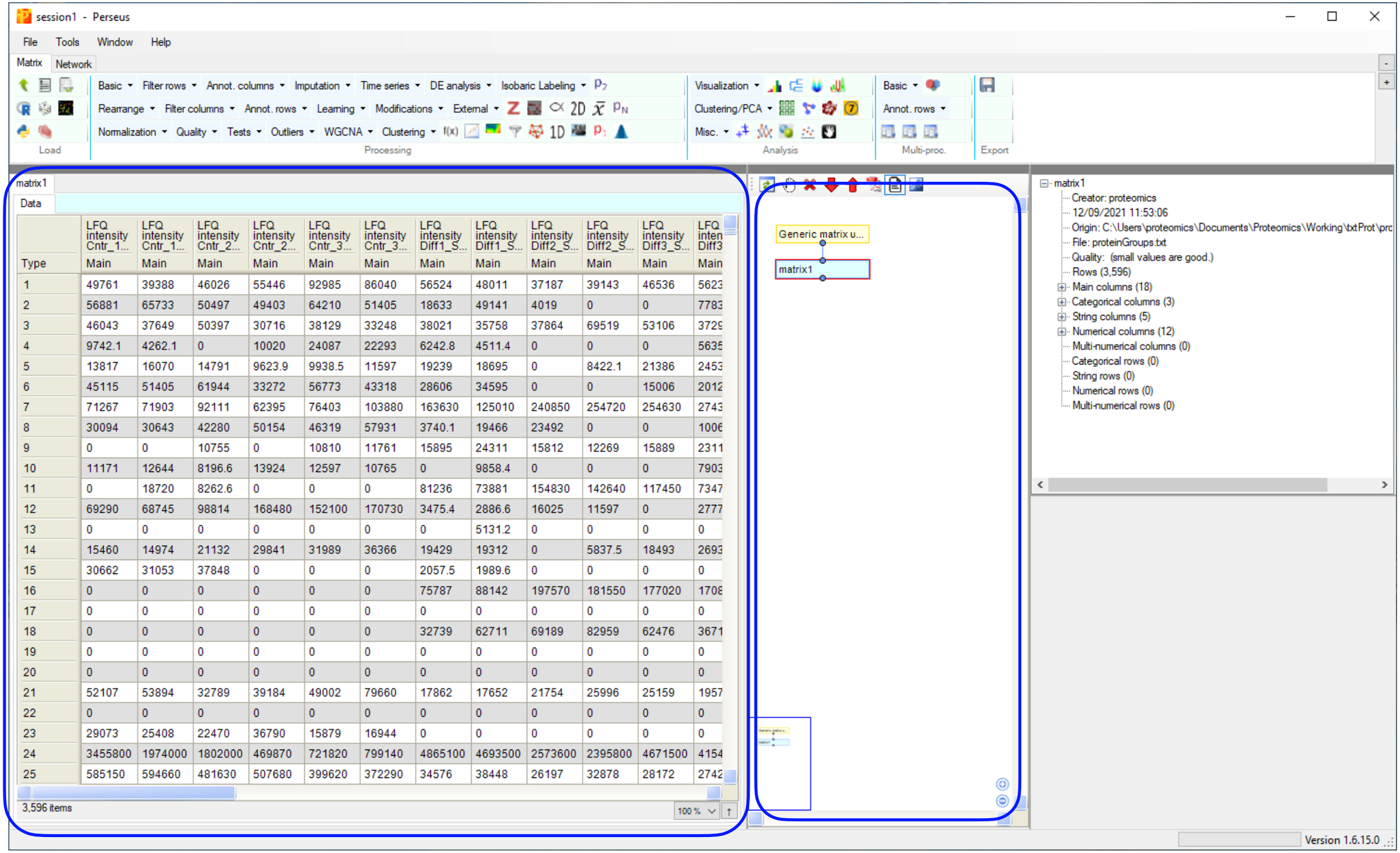
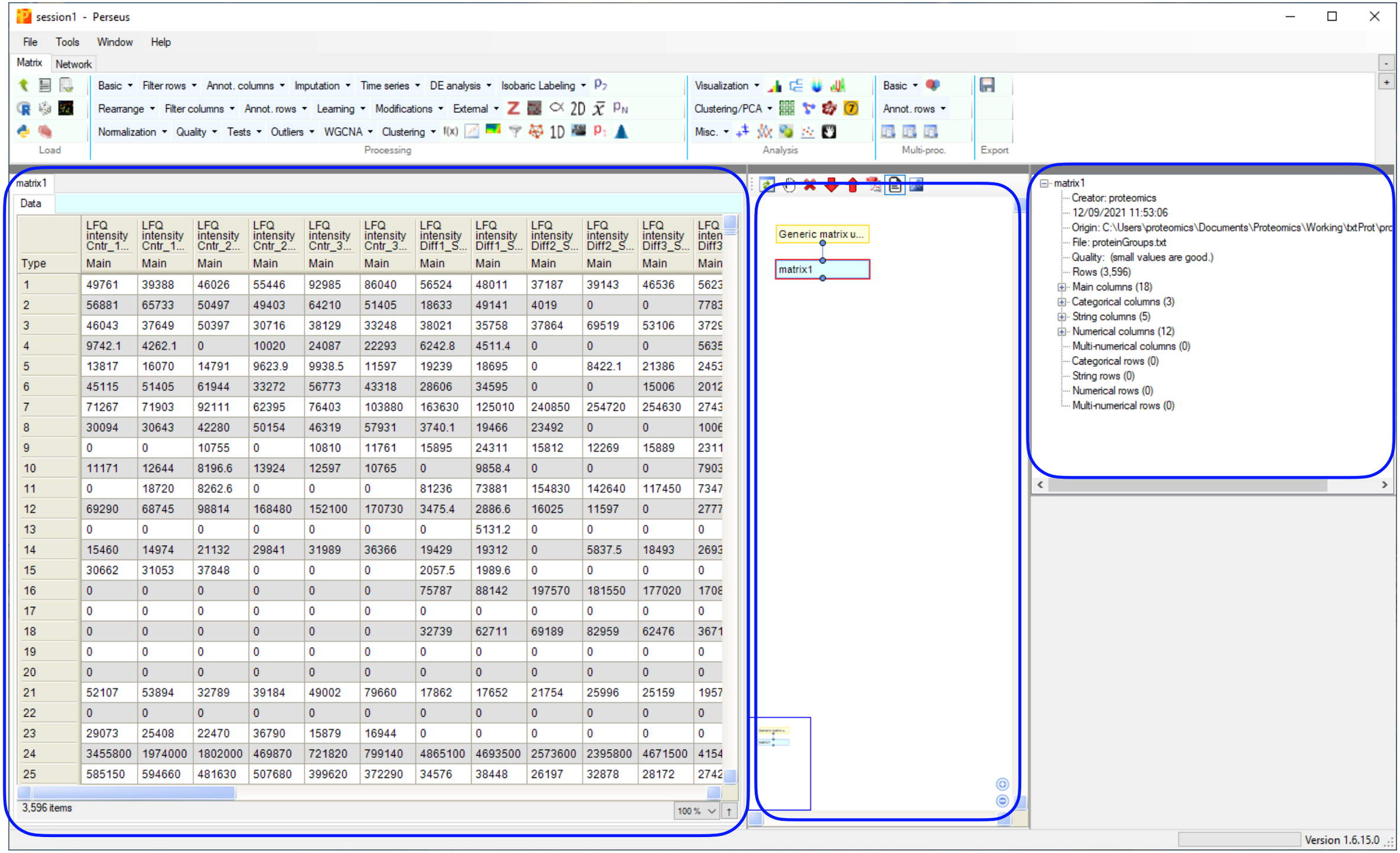
12	69290	68745	98814	168480	152100	170730	3475.4	2886.6	16025	11597	0	2777
13	0	0	0	0	0	0	0	5131.2	0	0	0	0
14	15460	14974	21132	29841	31989	36366	19429	19312	0	5837.5	18493	2693
15	30662	31053	37848	0	0	0	2057.5	1989.6	0	0	0	0
16	0	0	0	0	0	0	75787	88142	197570	181550	177020	1708
17	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	32739	62711	69189	82959	62476	3671
19	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
21	52107	53894	32789	39184	49002	79660	17862	17652	21754	25996	25159	1957
22	0	0	0	0	0	0	0	0	0	0	0	0
23	29073	25408	22470	36790	15879	16944	0	0	0	0	0	0
24	3455800	1974000	1802000	469870	721820	799140	4865100	4693500	2573600	2395800	4671500	4154
25	585150	594660	481630	507680	399620	372290	34576	38448	26197	32878	28172	2742

Start Perseus and Load Data: proteinGroups.txt



	LFQ intensity Cntr_1...	LFQ intensity Cntr_1...	LFQ intensity Cntr_2...	LFQ intensity Cntr_2...	LFQ intensity Cntr_3...	LFQ intensity Cntr_3...	LFQ intensity Diff1_S...	LFQ intensity Diff1_S...	LFQ intensity Diff2_S...	LFQ intensity Diff2_S...	LFQ intensity Diff3_S...	LFQ inten Diff3
Type	Main	Main	Main	Main	Main	Main	Main	Main	Main	Main	Main	Main
1	49761	39388	46026	55446	92985	86040	56524	48011	37187	39143	46536	5623
2	56881	65733	50497	49403	64210	51405	18633	49141	4019	0	0	7783
3	46043	37649	50397	30716	38129	33248	38021	35758	37864	69519	53106	3729
4	9742.1	4262.1	0	10020	24087	22293	6242.8	4511.4	0	0	0	5635
5	13817	16070	14791	9623.9	9938.5	11597	19239	18695	0	8422.1	21386	2453
6	45115	51405	61944	33272	56773	43318	28606	34595	0	0	15006	2012
7	71267	71903	92111	62395	76403	103880	163630	125010	240850	254720	254630	2743
8	30094	30643	42280	50154	46319	57931	3740.1	19466	23492	0	0	1006
9	0	0	10755	0	10810	11761	15895	24311	15812	12269	15889	2311
10	11171	12644	8196.6	13924	12597	10765	0	9858.4	0	0	0	7903
11	0	18720	8262.6	0	0	0	81236	73881	154830	142640	117450	7347
12	69290	68745	98814	168480	152100	170730	3475.4	2886.6	16025	11597	0	2777
13	0	0	0	0	0	0	0	5131.2	0	0	0	0
14	15460	14974	21132	29841	31989	36366	19429	19312	0	5837.5	18493	2693
15	30662	31053	37848	0	0	0	2057.5	1989.6	0	0	0	0
16	0	0	0	0	0	0	75787	88142	197570	181550	177020	1708
17	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	32739	62711	69189	82959	62476	3671
19	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
21	52107	53894	32789	39184	49002	79660	17862	17652	21754	25996	25159	1957
22	0	0	0	0	0	0	0	0	0	0	0	0
23	29073	25408	22470	36790	15879	16944	0	0	0	0	0	0
24	3455800	1974000	1802000	469870	721820	799140	4865100	4693500	2573600	2395800	4671500	4154
25	585150	594660	481630	507680	399620	372290	34576	38448	26197	32878	28172	2742

Start Perseus and Load Data: proteinGroups.txt



	LFQ intensity Cntr_1...	LFQ intensity Cntr_1...	LFQ intensity Cntr_2...	LFQ intensity Cntr_2...	LFQ intensity Cntr_3...	LFQ intensity Cntr_3...	LFQ intensity Diff1_S...	LFQ intensity Diff1_S...	LFQ intensity Diff2_S...	LFQ intensity Diff2_S...	LFQ intensity Diff3_S...	LFQ inten Diff3
Type	Main	Main	Main	Main	Main	Main	Main	Main	Main	Main	Main	Main
1	49761	39388	46026	55446	92985	86040	56524	48011	37187	39143	46536	5623
2	56881	65733	50497	49403	64210	51405	18633	49141	4019	0	0	7783
3	46043	37649	50397	30716	38129	33248	38021	35758	37864	69519	53106	3729
4	9742.1	4262.1	0	10020	24087	22293	6242.8	4511.4	0	0	0	5635
5	13817	16070	14791	9623.9	9938.5	11597	19239	18695	0	8422.1	21386	2453
6	45115	51405	61944	33272	56773	43318	28606	34595	0	0	15006	2012
7	71267	71903	92111	62395	76403	103880	163630	125010	240850	254720	254630	2743
8	30094	30643	42280	50154	46319	57931	3740.1	19466	23492	0	0	1006
9	0	0	10755	0	10810	11761	15895	24311	15812	12269	15889	2311
10	11171	12644	8196.6	13924	12597	10765	0	9858.4	0	0	0	7903
11	0	18720	8262.6	0	0	0	81236	73881	154830	142640	117450	7347
12	69290	68745	98814	168480	152100	170730	3475.4	2886.6	16025	11597	0	2777
13	0	0	0	0	0	0	0	5131.2	0	0	0	0
14	15460	14974	21132	29841	31989	36366	19429	19312	0	5837.5	18493	2693
15	30662	31053	37848	0	0	0	2057.5	1989.6	0	0	0	0
16	0	0	0	0	0	0	75787	88142	197570	181550	177020	1708
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19	0	0	0	0	0	0	0	0	0	0	0	0
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21	52107	53894	32789	39184	49002	79660	17862	17652	21754	25996	25159	1957
22	0	0	0	0	0	0	0	0	0	0	0	0
23	29073	25408	22470	36790	15879	16944	0	0	0	0	0	0
24	3455800	1974000	1802000	469870	721820	799140	4865100	4693500	2573600	2395800	4671500	4154
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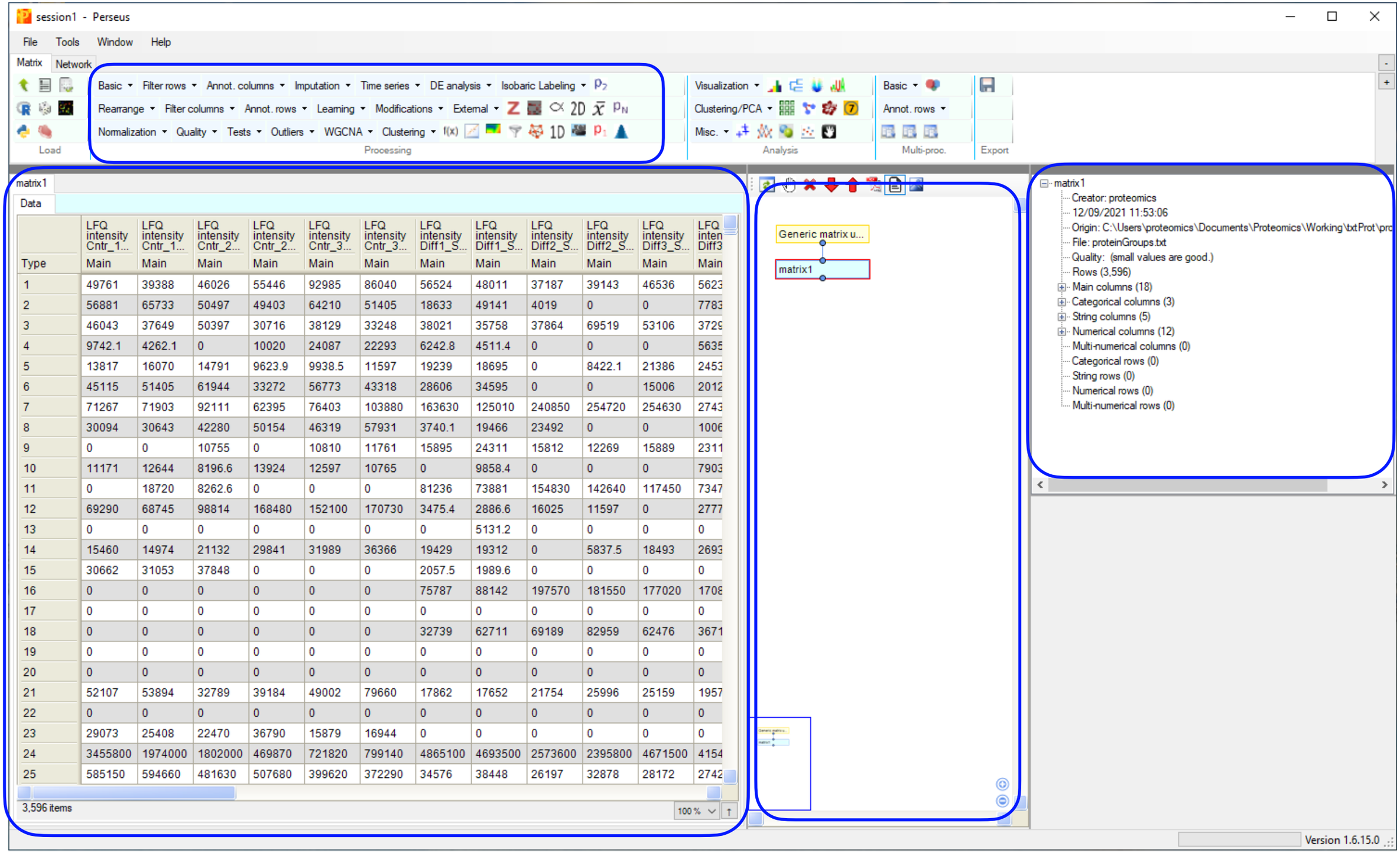
Start Perseus and Load Data: proteinGroups.txt



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Type	Main	Main	Main	Main	Main	Main	Main	Main	Main	Main	Main	Main
1	49761	39388	46026	55446	92985	86040	56524	48011	37187	39143	46536	5623
2	56881	65733	50497	49403	64210	51405	18633	49141	4019	0	0	7783
3	46043	37649	50397	30716	38129	33248	38021	35758	37864	69519	53106	3729
4	9742.1	4262.1	0	10020	24087	22293	6242.8	4511.4	0	0	0	5635
5	13817	16070	14791	9623.9	9938.5	11597	19239	18695	0	8422.1	21386	2453
6	45115	51405	61944	33272	56773	43318	28606	34595	0	0	15006	2012
7	71267	71903	92111	62395	76403	103880	163630	125010	240850	254720	254630	2743
8	30094	30643	42280	50154	46319	57931	3740.1	19466	23492	0	0	1006
9	0	0	10755	0	10810	11761	15895	24311	15812	12269	15889	2311
10	11171	12644	8196.6	13924	12597	10765	0	9858.4	0	0	0	7903
11	0	18720	8262.6	0	0	0	81236	73881	154830	142640	117450	7347
12	69290	68745	98814	168480	152100	170730	3475.4	2886.6	16025	11597	0	2777
13	0	0	0	0	0	0	0	5131.2	0	0	0	0
14	15460	14974	21132	29841	31989	36366	19429	19312	0	5837.5	18493	2693
15	30662	31053	37848	0	0	0	2057.5	1989.6	0	0	0	0
16	0	0	0	0	0	0	75787	88142	197570	181550	177020	1708
17	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	32739	62711	69189	82959	62476	3671
19	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
21	52107	53894	32789	39184	49002	79660	17862	17652	21754	25996	25159	1957
22	0	0	0	0	0	0	0	0	0	0	0	0
23	29073	25408	22470	36790	15879	16944	0	0	0	0	0	0
24	3455800	1974000	1802000	469870	721820	799140	4865100	4693500	2573600	2395800	4671500	4154
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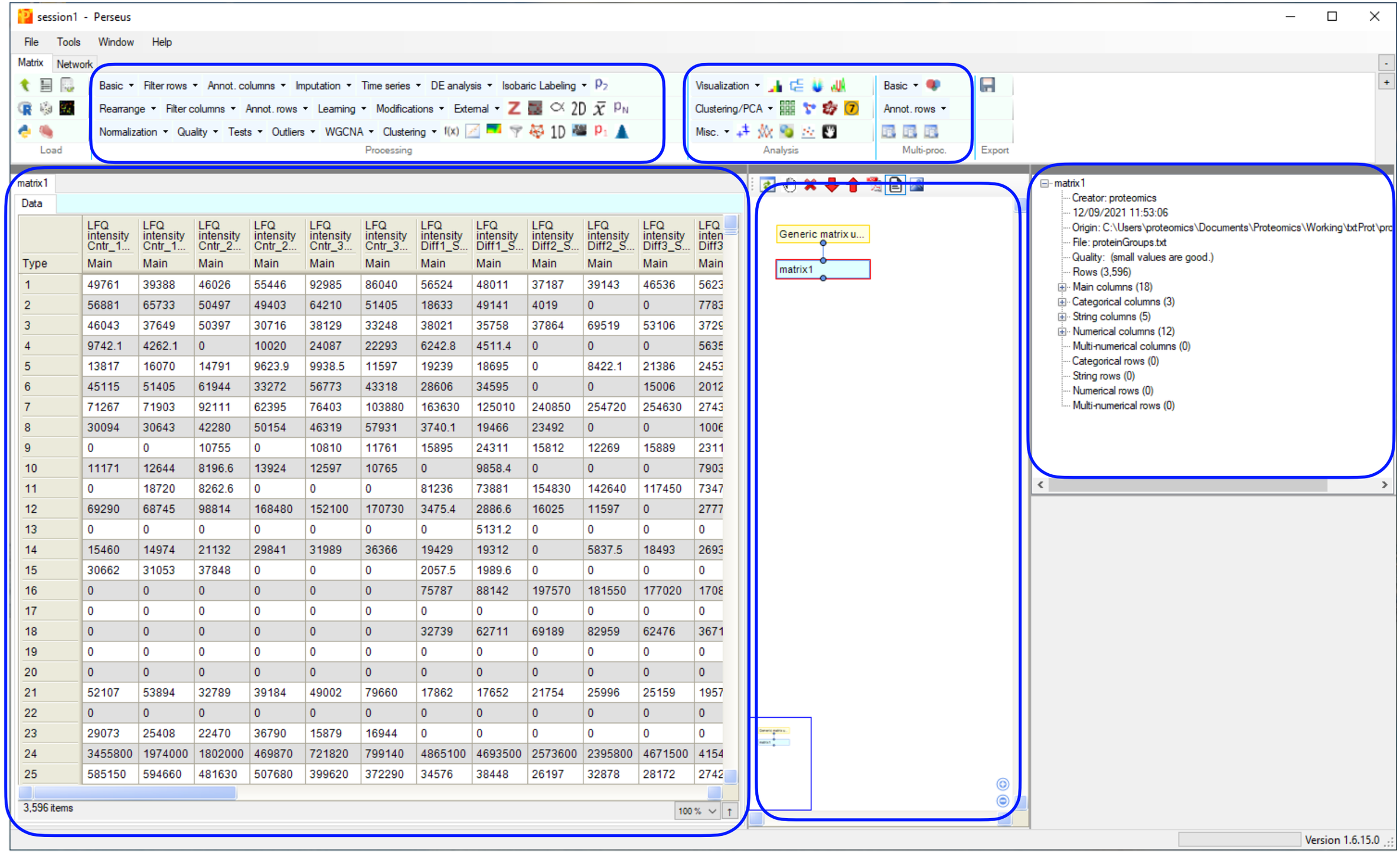
Start Perseus and Load Data: proteinGroups.txt



	LFQ intensity Cntr_1...	LFQ intensity Cntr_1...	LFQ intensity Cntr_2...	LFQ intensity Cntr_2...	LFQ intensity Cntr_3...	LFQ intensity Cntr_3...	LFQ intensity Diff1_S...	LFQ intensity Diff1_S...	LFQ intensity Diff2_S...	LFQ intensity Diff2_S...	LFQ intensity Diff3_S...	LFQ inten Diff3
Type	Main	Main	Main	Main	Main	Main	Main	Main	Main	Main	Main	Main
1	49761	39388	46026	55446	92985	86040	56524	48011	37187	39143	46536	5623
2	56881	65733	50497	49403	64210	51405	18633	49141	4019	0	0	7783
3	46043	37649	50397	30716	38129	33248	38021	35758	37864	69519	53106	3729
4	9742.1	4262.1	0	10020	24087	22293	6242.8	4511.4	0	0	0	5635
5	13817	16070	14791	9623.9	9938.5	11597	19239	18695	0	8422.1	21386	2453
6	45115	51405	61944	33272	56773	43318	28606	34595	0	0	15006	2012
7	71267	71903	92111	62395	76403	103880	163630	125010	240850	254720	254630	2743
8	30094	30643	42280	50154	46319	57931	3740.1	19466	23492	0	0	1006
9	0	0	10755	0	10810	11761	15895	24311	15812	12269	15889	2311
10	11171	12644	8196.6	13924	12597	10765	0	9858.4	0	0	0	7903
11	0	18720	8262.6	0	0	0	81236	73881	154830	142640	117450	7347
12	69290	68745	98814	168480	152100	170730	3475.4	2886.6	16025	11597	0	2777
13	0	0	0	0	0	0	0	5131.2	0	0	0	0
14	15460	14974	21132	29841	31989	36366	19429	19312	0	5837.5	18493	2693
15	30662	31053	37848	0	0	0	2057.5	1989.6	0	0	0	0
16	0	0	0	0	0	0	75787	88142	197570	181550	177020	1708
17	0	0	0	0	0	0	0	0	0	0	0	0
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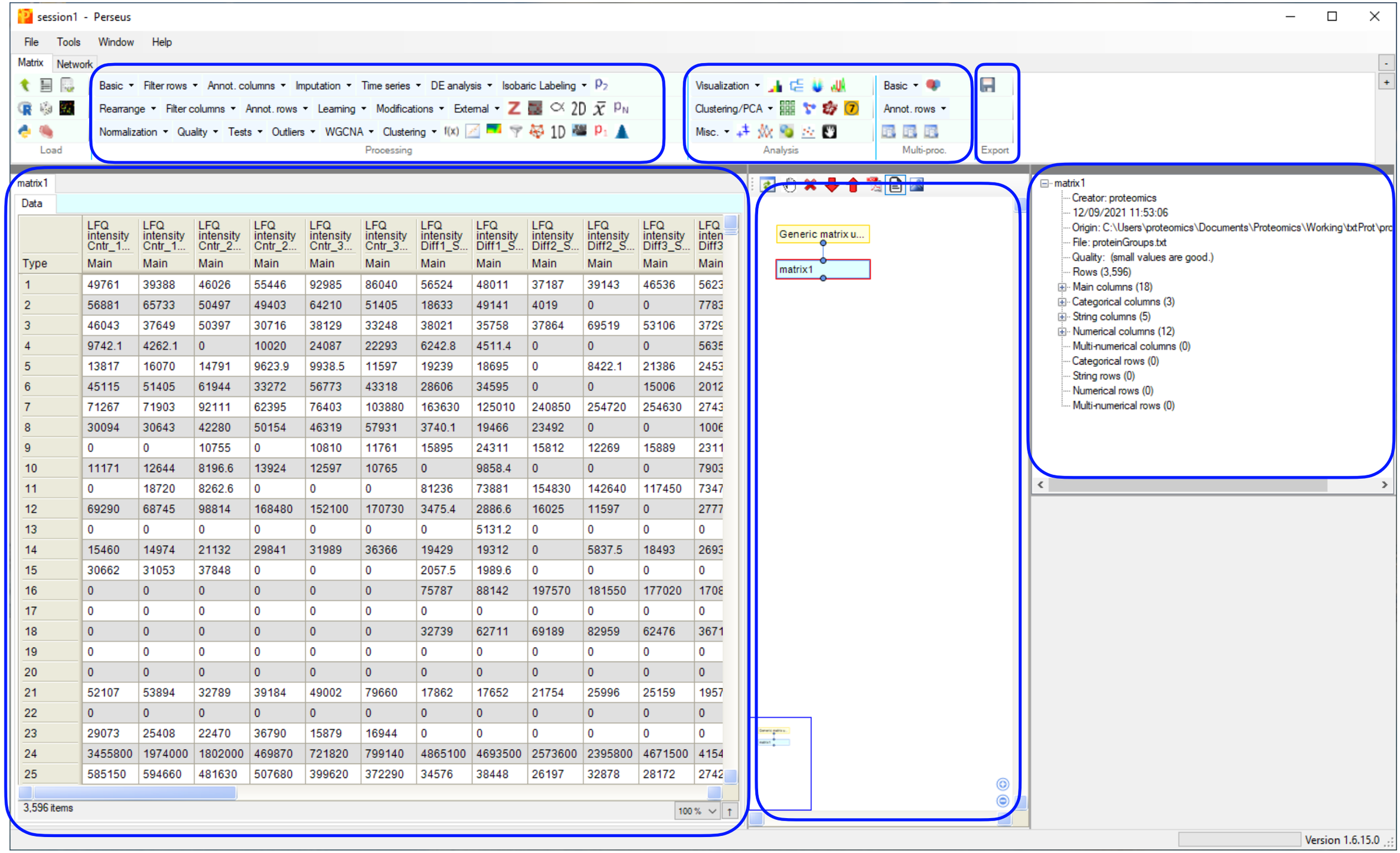
20	0	0	0	0	0	0	0	0	0	0	0	0
21	52107	53894	32789	39184	49002	79660	17862	17652	21754	25996	25159	1957
22	0	0	0	0	0	0	0	0	0	0	0	0
23	29073	25408	22470	36790	15879	16944	0	0	0	0	0	0
24	3455800	1974000	1802000	469870	721820	799140	4865100	4693500	2573600	2395800	4671500	4154
25	585150	594660	481630	507680	399620	372290	34576	38448	26197	32878	28172	2742

Start Perseus and Load Data: proteinGroups.txt



	LFQ intensity Cntr_1...	LFQ intensity Cntr_1...	LFQ intensity Cntr_2...	LFQ intensity Cntr_2...	LFQ intensity Cntr_3...	LFQ intensity Cntr_3...	LFQ intensity Diff1_S...	LFQ intensity Diff1_S...	LFQ intensity Diff2_S...	LFQ intensity Diff2_S...	LFQ intensity Diff3_S...	LFQ inten Diff3
Type	Main	Main	Main	Main	Main	Main	Main	Main	Main	Main	Main	Main
1	49761	39388	46026	55446	92985	86040	56524	48011	37187	39143	46536	5623
2	56881	65733	50497	49403	64210	51405	18633	49141	4019	0	0	7783
3	46043	37649	50397	30716	38129	33248	38021	35758	37864	69519	53106	3729
4	9742.1	4262.1	0	10020	24087	22293	6242.8	4511.4	0	0	0	5635
5	13817	16070	14791	9623.9	9938.5	11597	19239	18695	0	8422.1	21386	2453
6	45115	51405	61944	33272	56773	43318	28606	34595	0	0	15006	2012
7	71267	71903	92111	62395	76403	103880	163630	125010	240850	254720	254630	2743
8	30094	30643	42280	50154	46319	57931	3740.1	19466	23492	0	0	1006
9	0	0	10755	0	10810	11761	15895	24311	15812	12269	15889	2311
10	11171	12644	8196.6	13924	12597	10765	0	9858.4	0	0	0	7903
11	0	18720	8262.6	0	0	0	81236	73881	154830	142640	117450	7347
12	69290	68745	98814	168480	152100	170730	3475.4	2886.6	16025	11597	0	2777
13	0	0	0	0	0	0	0	5131.2	0	0	0	0
14	15460	14974	21132	29841	31989	36366	19429	19312	0	5837.5	18493	2693
15	30662	31053	37848	0	0	0	2057.5	1989.6	0	0	0	0
16	0	0	0	0	0	0	75787	88142	197570	181550	177020	1708
17	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	32739	62711	69189	82959	62476	3671
19	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
21	52107	53894	32789	39184	49002	79660	17862	17652	21754	25996	25159	1957
22	0	0	0	0	0	0	0	0	0	0	0	0
23	29073	25408	22470	36790	15879	16944	0	0	0	0	0	0
24	3455800	1974000	1802000	469870	721820	799140	4865100	4693500	2573600	2395800	4671500	4154
25	585150	594660	481630	507680	399620	372290	34576	38448	26197	32878	28172	2742

Perseus

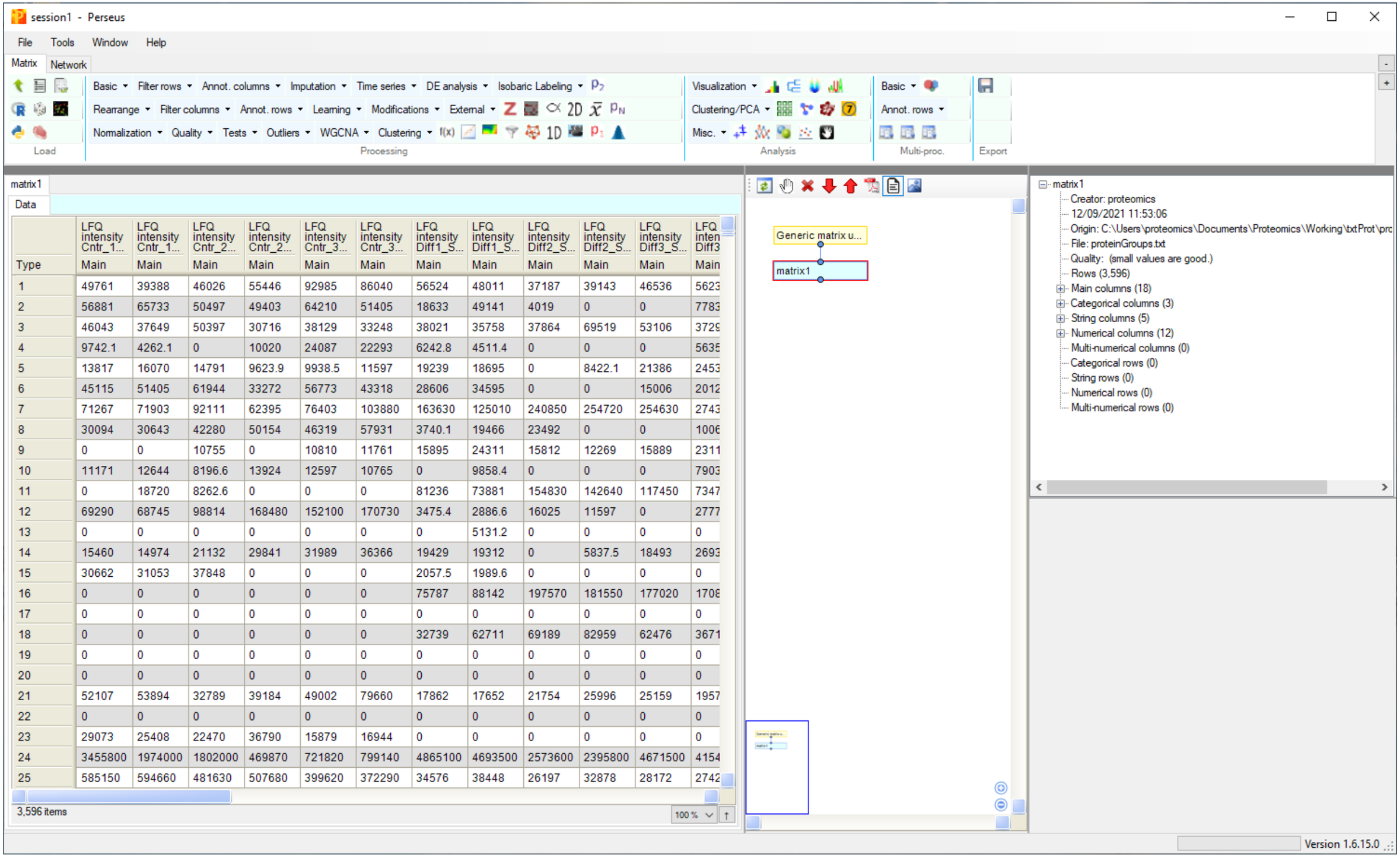
Filter rows (proteins)which are not relevant : **Filter rows > on categorical column**

Proteins, that are identified in the reverse database search and only by site (by a modification)

Perseus

Filter rows (proteins)which are not relevant : **Filter rows > on categorical column**

Proteins, that are identified in the reverse database search and only by site (by a modification)



	LFQ intensity Cntr_1...	LFQ intensity Cntr_1...	LFQ intensity Cntr_2...	LFQ intensity Cntr_2...	LFQ intensity Cntr_3...	LFQ intensity Cntr_3...	LFQ intensity Diff1_S...	LFQ intensity Diff1_S...	LFQ intensity Diff2_S...	LFQ intensity Diff2_S...	LFQ intensity Diff3_S...	LFQ inten Diff3
Type	Main	Main	Main	Main	Main	Main	Main	Main	Main	Main	Main	Main
1	49761	39388	46026	55446	92985	86040	56524	48011	37187	39143	46536	5623
2	56881	65733	50497	49403	64210	51405	18633	49141	4019	0	0	7783
3	46043	37649	50397	30716	38129	33248	38021	35758	37864	69519	53106	3729
4	9742.1	4262.1	0	10020	24087	22293	6242.8	4511.4	0	0	0	5635
5	13817	16070	14791	9623.9	9938.5	11597	19239	18695	0	8422.1	21386	2453
6	45115	51405	61944	33272	56773	43318	28606	34595	0	0	15006	2012
7	71267	71903	92111	62395	76403	103880	163630	125010	240850	254720	254630	2743
8	30094	30643	42280	50154	46319	57931	3740.1	19466	23492	0	0	1006
9	0	0	10755	0	10810	11761	15895	24311	15812	12269	15889	2311
10	11171	12644	8196.6	13924	12597	10765	0	9858.4	0	0	0	7903
11	0	18720	8262.6	0	0	0	81236	73881	154830	142640	117450	7347
12	69290	68745	98814	168480	152100	170730	3475.4	2886.6	16025	11597	0	2777
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22	0	0	0	0	0	0	0	0	0	0	0	0
23	29073	25408	22470	36790	15879	16944	0	0	0	0	0	0
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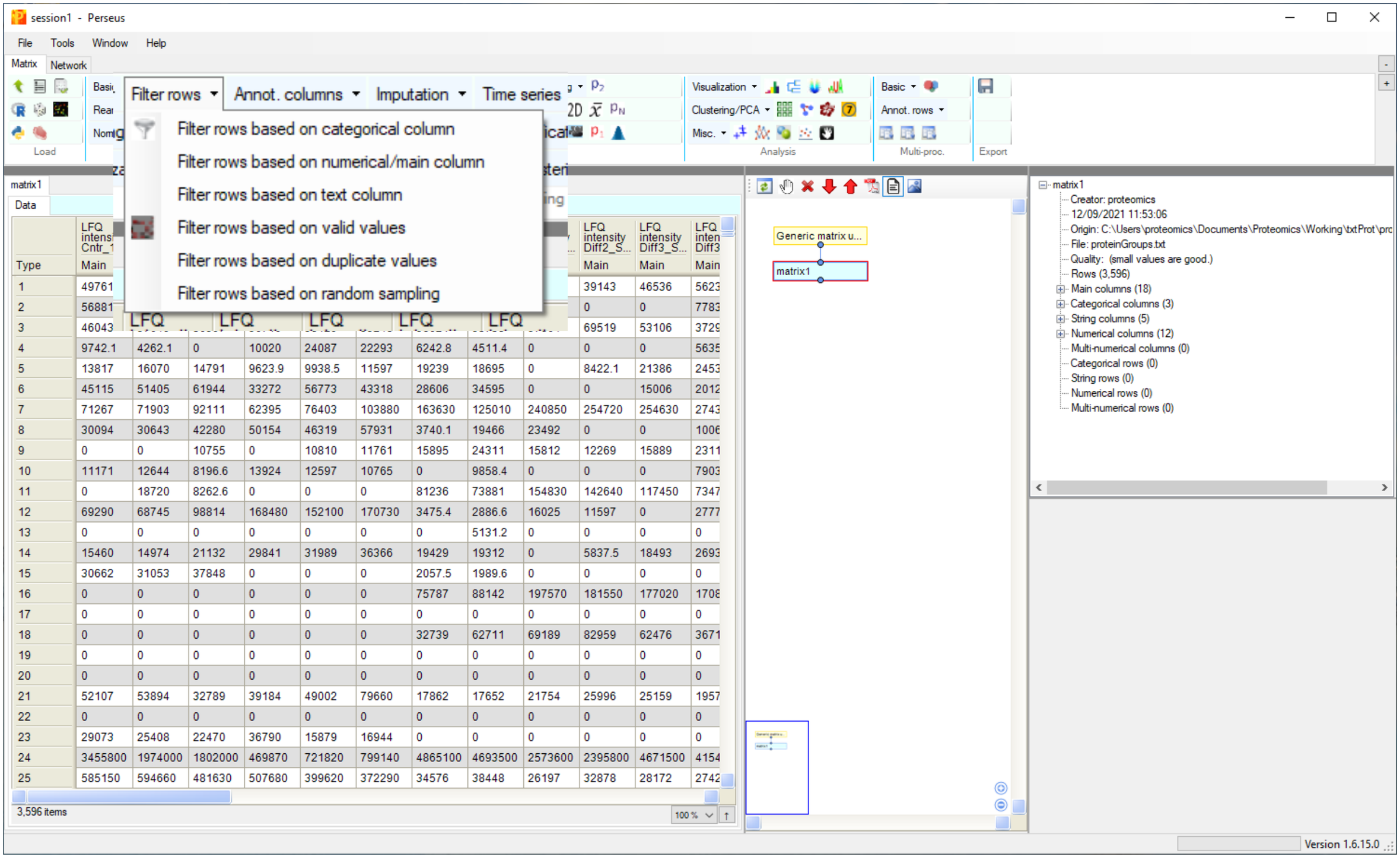
Perseus

Filter rows (proteins)which are not relevant : **Filter rows > on categorical column**

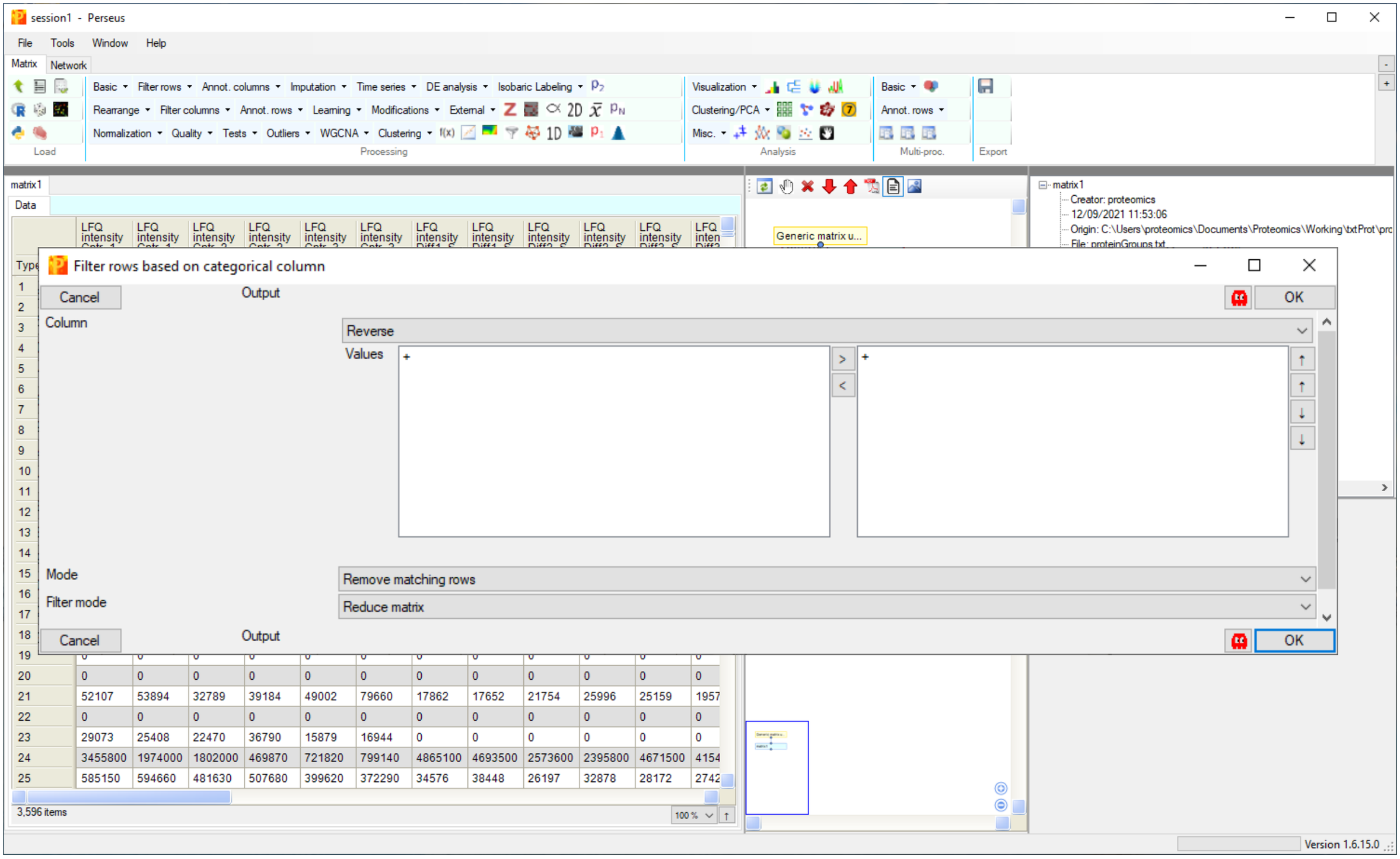
Proteins, that are identified in the reverse database search and only by site (by a modification)



Perseus

Filter rows (proteins)which are not relevant : **Filter rows > on categorical column**

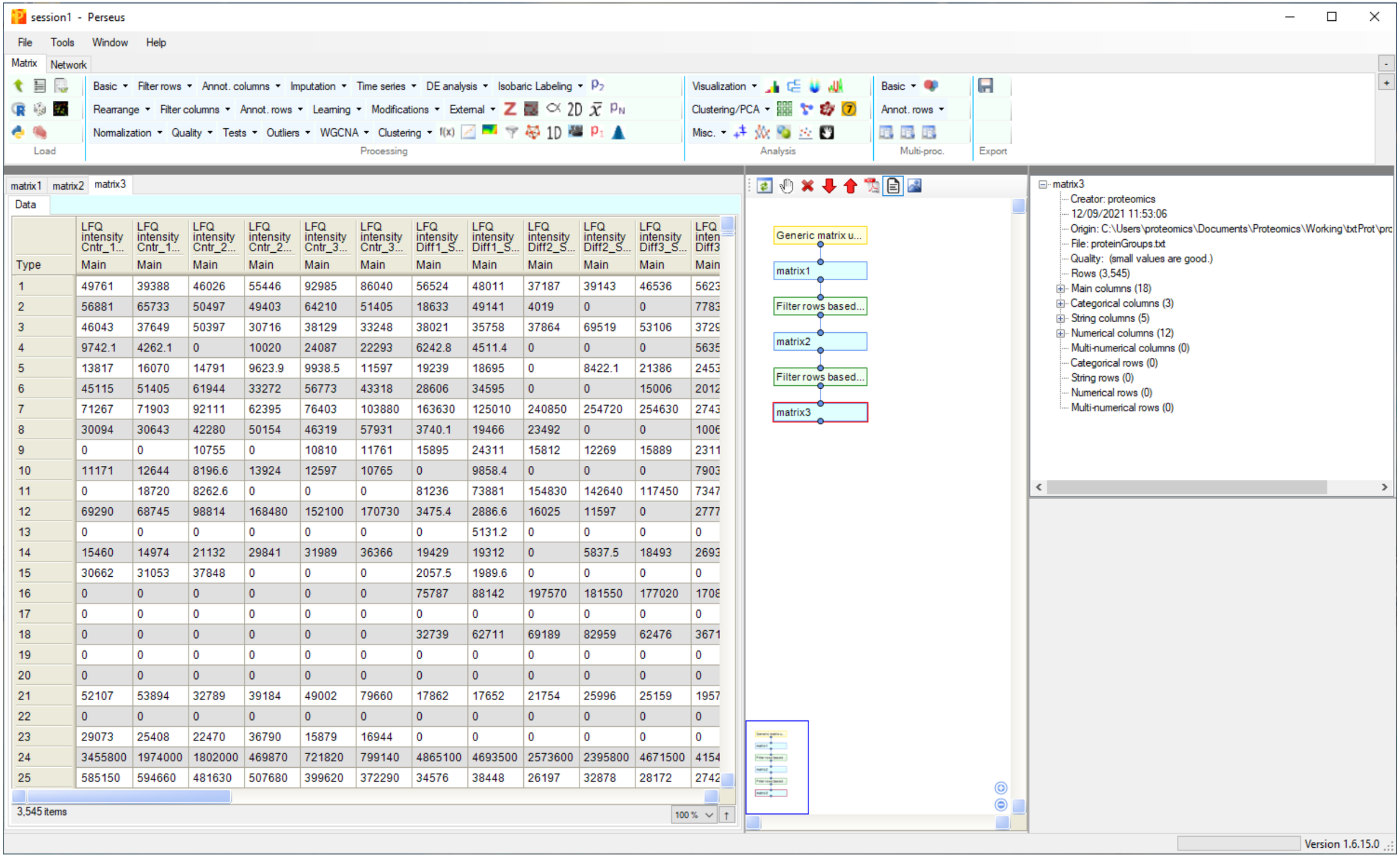
Proteins, that are identified in the reverse database search and only by site (by a modification)



Perseus

Filter rows (proteins) which are not relevant : **Filter rows > on categorical column**

Proteins, that are identified in the reverse database search and only by site (by a modification)



	LFQ intensity Cntr_1...	LFQ intensity Cntr_1...	LFQ intensity Cntr_2...	LFQ intensity Cntr_2...	LFQ intensity Cntr_3...	LFQ intensity Cntr_3...	LFQ intensity Diff1_S...	LFQ intensity Diff1_S...	LFQ intensity Diff2_S...	LFQ intensity Diff2_S...	LFQ intensity Diff3_S...	LFQ inten Diff3
Type	Main	Main	Main	Main	Main	Main	Main	Main	Main	Main	Main	Main
1	49761	39388	46026	55446	92985	86040	56524	48011	37187	39143	46536	5623
2	56881	65733	50497	49403	64210	51405	18633	49141	4019	0	0	7783
3	46043	37649	50397	30716	38129	33248	38021	35758	37864	69519	53106	3729
4	9742.1	4262.1	0	10020	24087	22293	6242.8	4511.4	0	0	0	5635
5	13817	16070	14791	9623.9	9938.5	11597	19239	18695	0	8422.1	21386	2453
6	45115	51405	61944	33272	56773	43318	28606	34595	0	0	15006	2012
7	71267	71903	92111	62395	76403	103880	163630	125010	240850	254720	254630	2743
8	30094	30643	42280	50154	46319	57931	3740.1	19466	23492	0	0	1006
9	0	0	10755	0	10810	11761	15895	24311	15812	12269	15889	2311
10	11171	12644	8196.6	13924	12597	10765	0	9858.4	0	0	0	7903
11	0	18720	8262.6	0	0	0	81236	73881	154830	142640	117450	7347
12	69290	68745	98814	168480	152100	170730	3475.4	2886.6	16025	11597	0	2777
13	0	0	0	0	0	0	0	5131.2	0	0	0	0
14	15460	14974	21132	29841	31989	36366	19429	19312	0	5837.5	18493	2693
15	30662	31053	37848	0	0	0	2057.5	1989.6	0	0	0	0
16	0	0	0	0	0	0	75787	88142	197570	181550	177020	1708
17	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	32739	62711	69189	82959	62476	3671
19	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
21	52107	53894	32789	39184	49002	79660	17862	17652	21754	25996	25159	1957
22	0	0	0	0	0	0	0	0	0	0	0	0
23	29073	25408	22470	36790	15879	16944	0	0	0	0	0	0
24	3455800	1974000	1802000	469870	721820	799140	4865100	4693500	2573600	2395800	4671500	4154
25	585150	594660	481630	507680	399620	372290	34576	38448	26197	32878	28172	2742

Perseus

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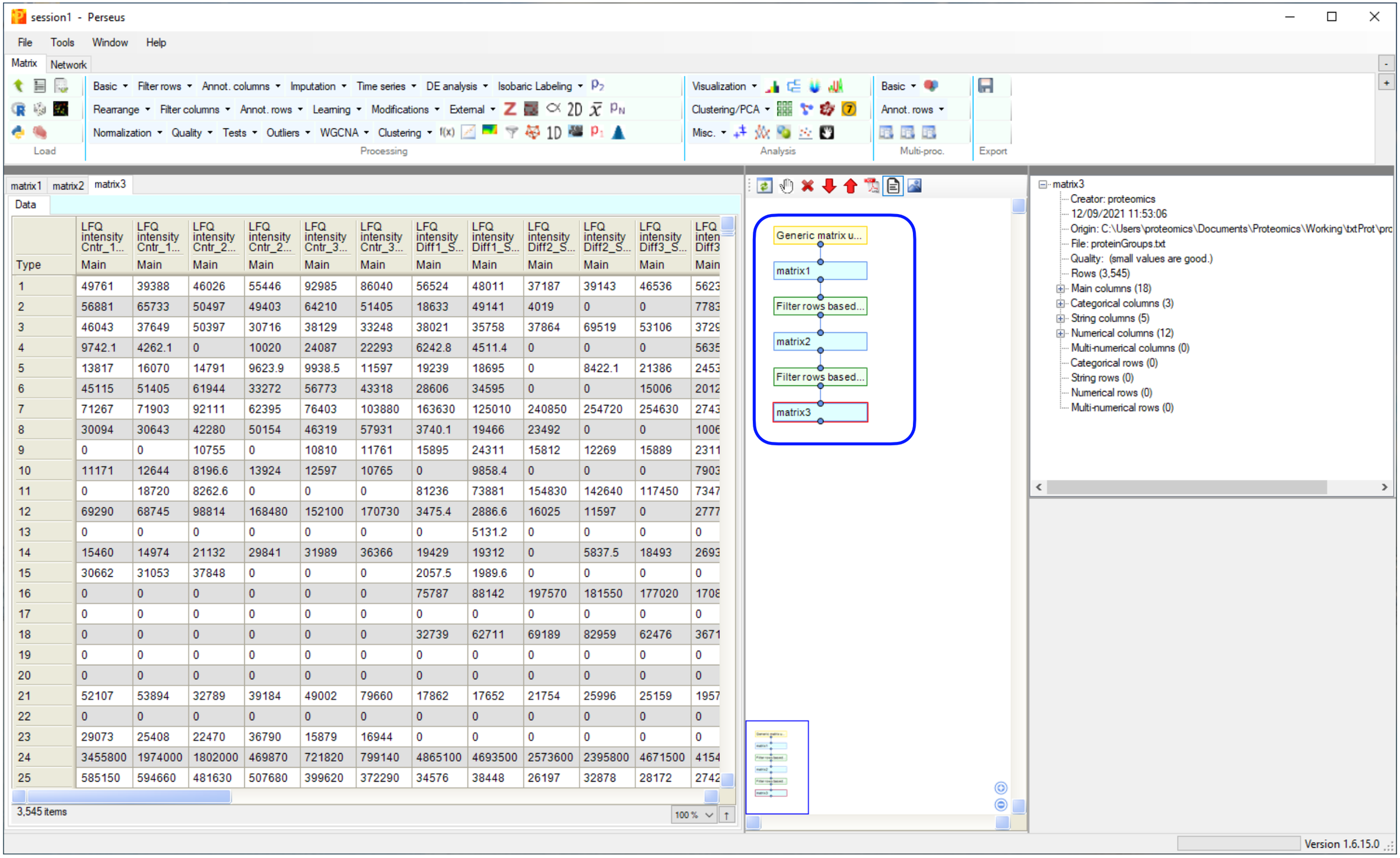

	LFQ intensity Cntr_1...	LFQ intensity Cntr_1...	LFQ intensity Cntr_2...	LFQ intensity Cntr_2...	LFQ intensity Cntr_3...	LFQ intensity Cntr_3...	LFQ intensity Diff1_S...	LFQ intensity Diff1_S...	LFQ intensity Diff2_S...	LFQ intensity Diff2_S...	LFQ intensity Diff3_S...	LFQ inten Diff3
Type	Main	Main	Main	Main	Main	Main	Main	Main	Main	Main	Main	Main
1	49761	39388	46026	55446	92985	86040	56524	48011	37187	39143	46536	5623
2	56881	65733	50497	49403	64210	51405	18633	49141	4019	0	0	7783
3	46043	37649	50397	30716	38129	33248	38021	35758	37864	69519	53106	3729
4	9742.1	4262.1	0	10020	24087	22293	6242.8	4511.4	0	0	0	5635
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7	71267	71903	92111	62395	76403	103880	163630	125010	240850	254720	254630	2743
8	30094	30643	42280	50154	46319	57931	3740.1	19466	23492	0	0	1006
9	0	0	10755	0	10810	11761	15895	24311	15812	12269	15889	2311
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11	0	18720	8262.6	0	0	0	81236	73881	154830	142640	117450	7347
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16	0	0	0	0	0	0	75787	88142	197570	181550	177020	1708
17	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	32739	62711	69189	82959	62476	3671
19	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
21	52107	53894	32789	39184	49002	79660	17862	17652	21754	25996	25159	1957
22	0	0	0	0	0	0	0	0	0	0	0	0
23	29073	25408	22470	36790	15879	16944	0	0	0	0	0	0
24	3455800	1974000	1802000	469870	721820	799140	4865100	4693500	2573600	2395800	4671500	4154
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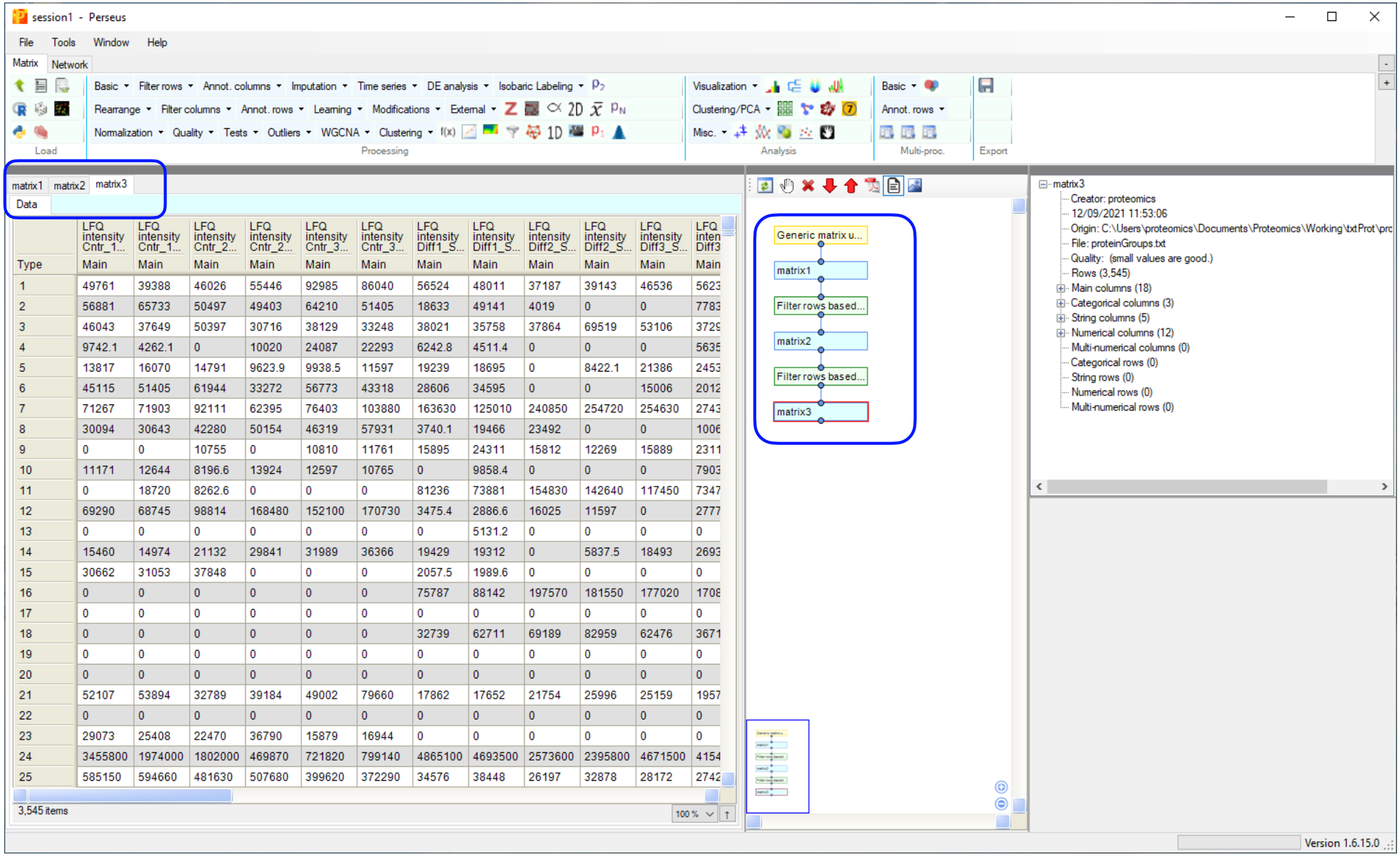

	LFQ intensity Cntr_1...	LFQ intensity Cntr_1...	LFQ intensity Cntr_2...	LFQ intensity Cntr_2...	LFQ intensity Cntr_3...	LFQ intensity Cntr_3...	LFQ intensity Diff1_S...	LFQ intensity Diff1_S...	LFQ intensity Diff2_S...	LFQ intensity Diff2_S...	LFQ intensity Diff3_S...	LFQ inten Diff3
Type	Main	Main	Main	Main	Main	Main	Main	Main	Main	Main	Main	Main
1	49761	39388	46026	55446	92985	86040	56524	48011	37187	39143	46536	5623
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9	0	0	10755	0	10810	11761	15895	24311	15812	12269	15889	2311
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Perseus

Convert the Statistical Distribution of Intensity Values into a Gaußsche Normal Distribution: **Basic > Transform > log2(x)**

t-Test and ANOVA test require normal distributed data

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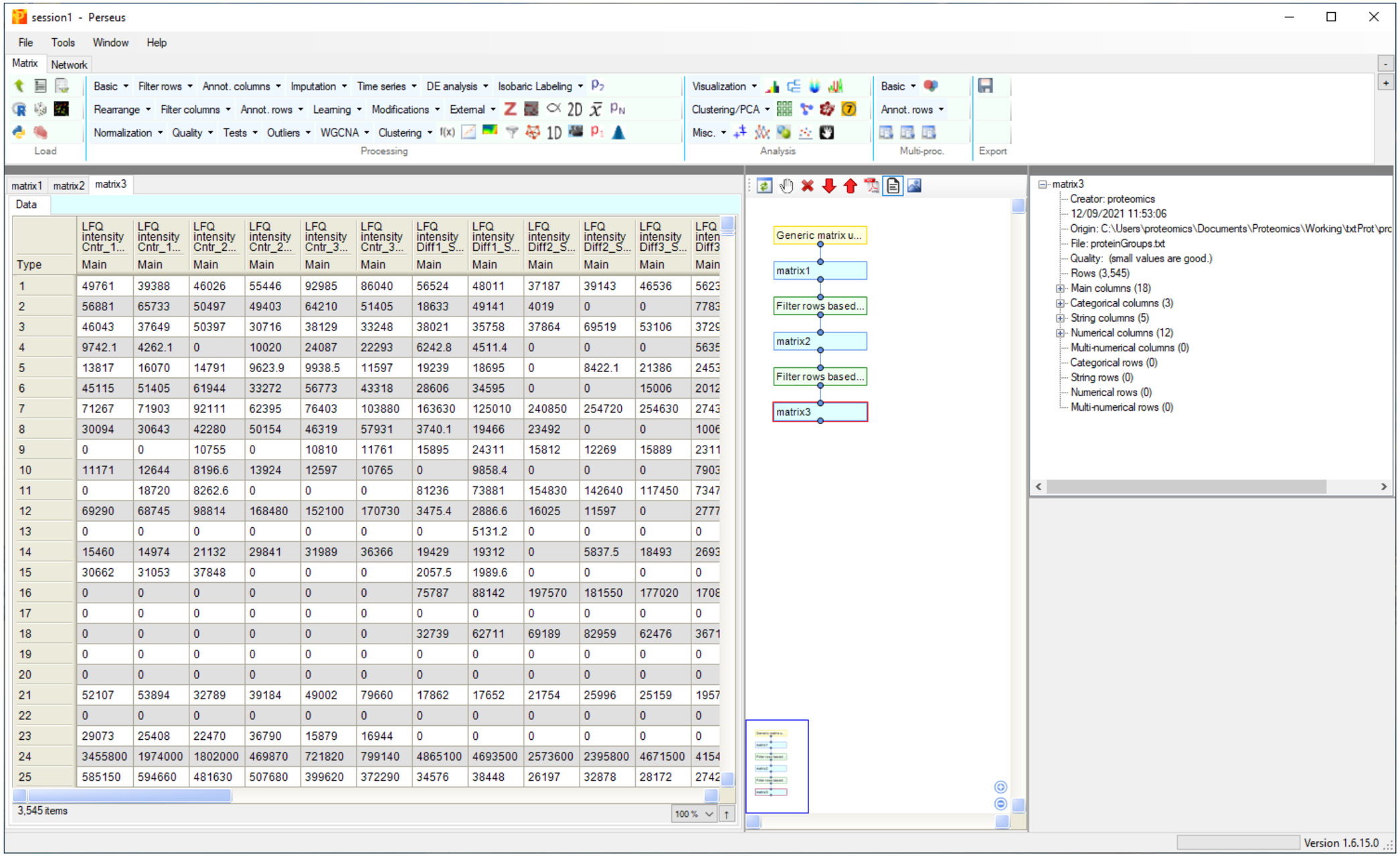

Type	LFQ intensity Cntr_1... Main	LFQ intensity Cntr_1... Main	LFQ intensity Cntr_2... Main	LFQ intensity Cntr_2... Main	LFQ intensity Cntr_3... Main	LFQ intensity Cntr_3... Main	LFQ intensity Diff1_S... Main	LFQ intensity Diff1_S... Main	LFQ intensity Diff2_S... Main	LFQ intensity Diff2_S... Main	LFQ intensity Diff3_S... Main	LFQ inten Diff3 Main
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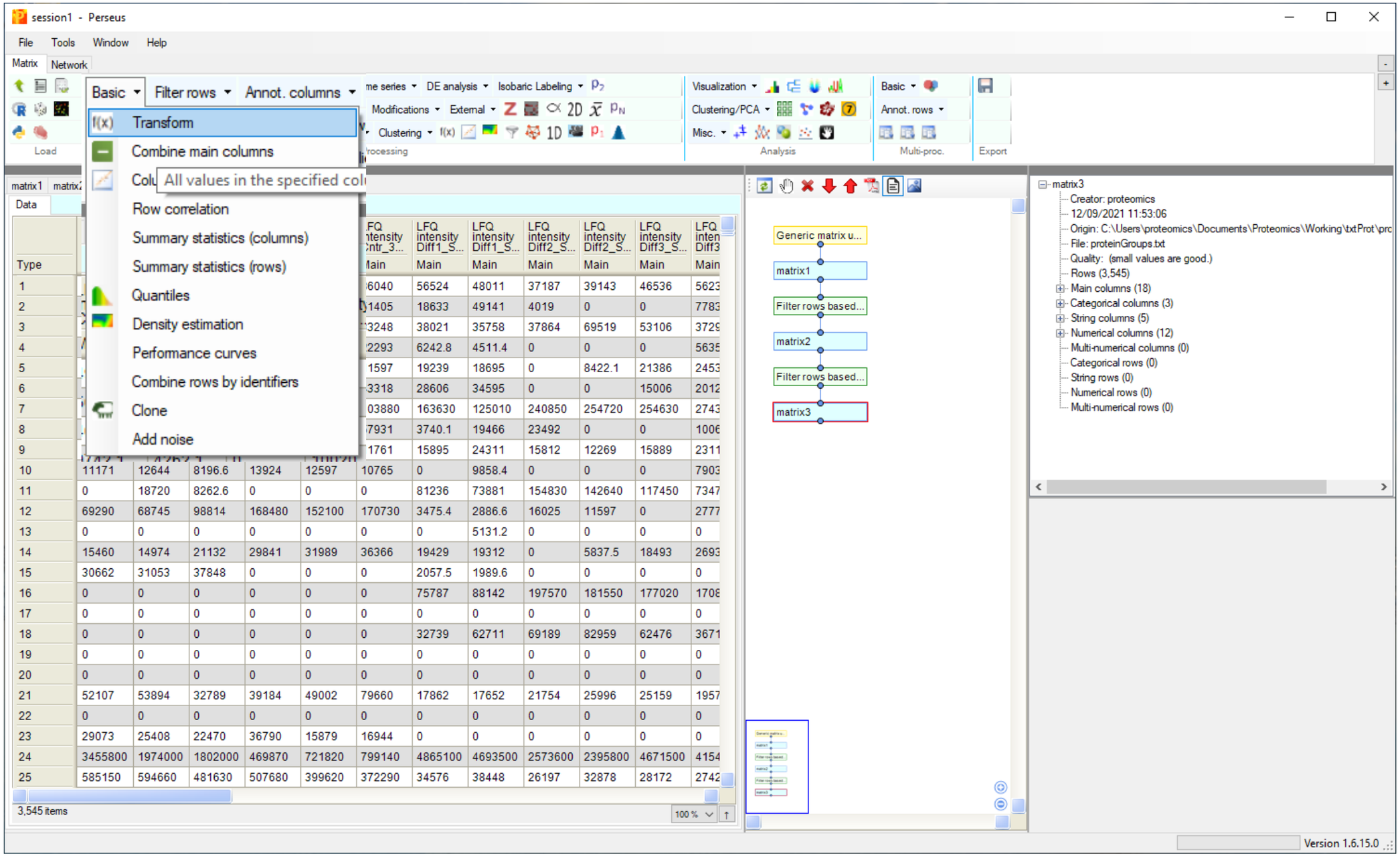

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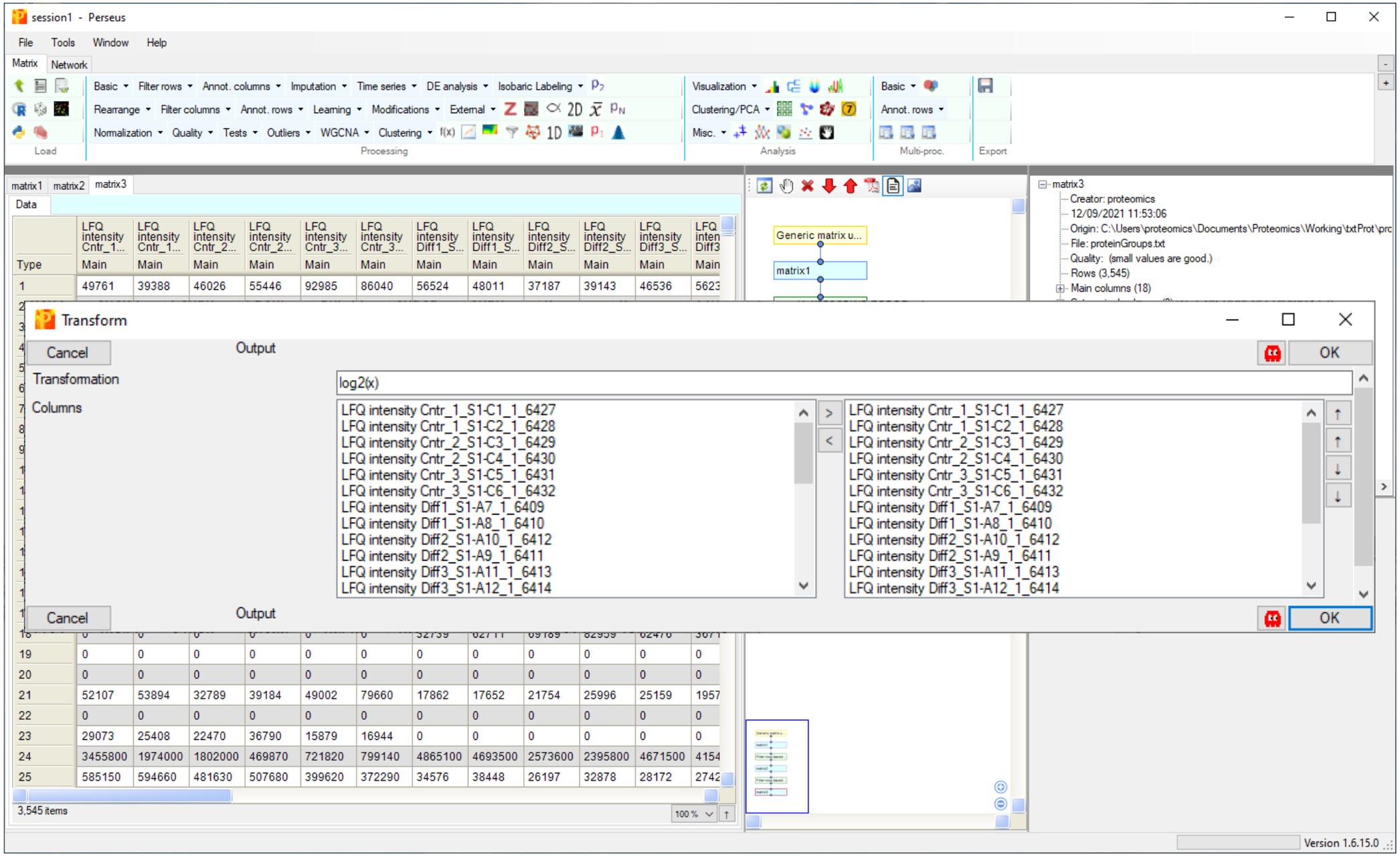

Perseus

Sample Grouping (technical and biological replicates !): **Annot. Rows > Categorical Annotation Row**

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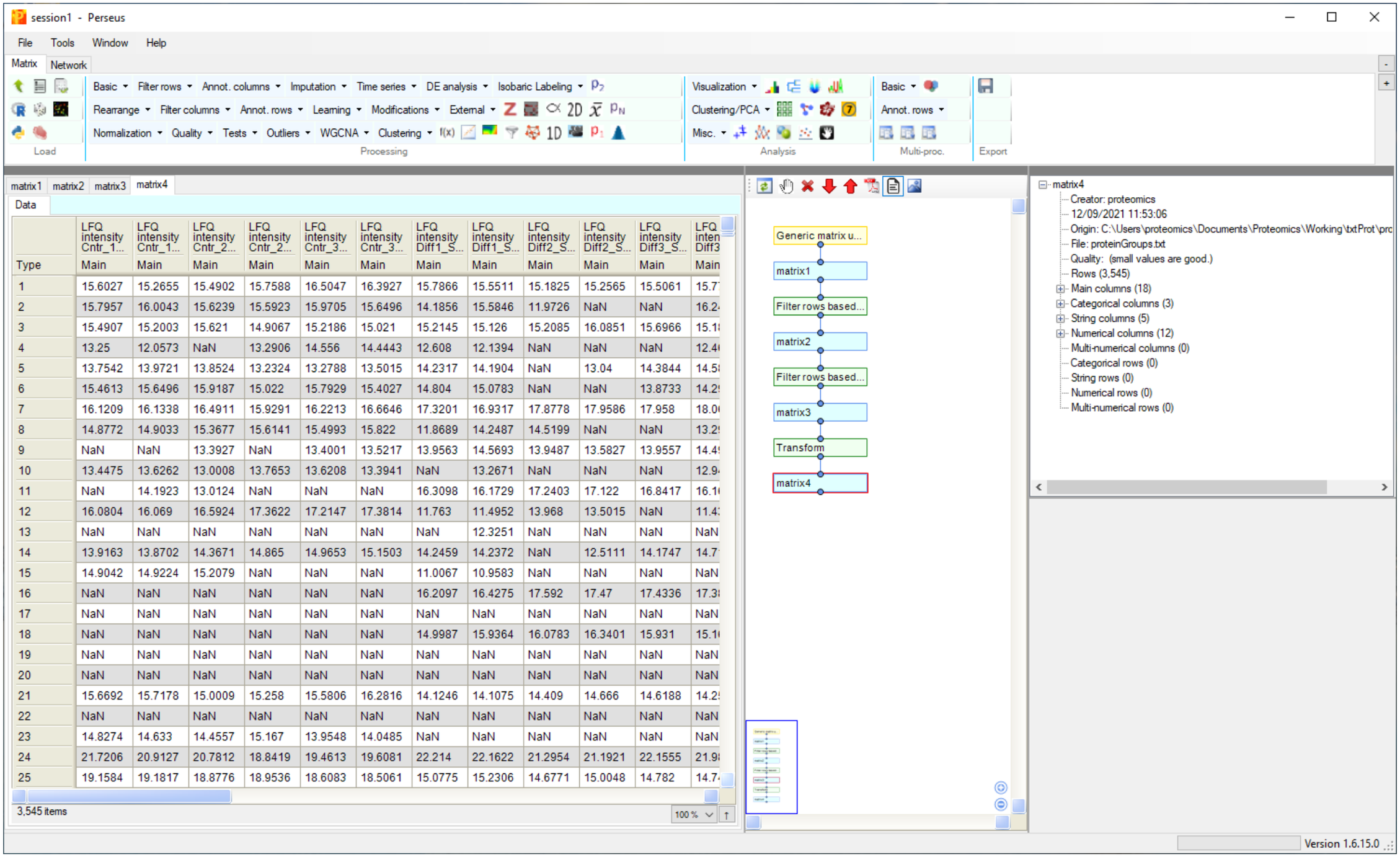

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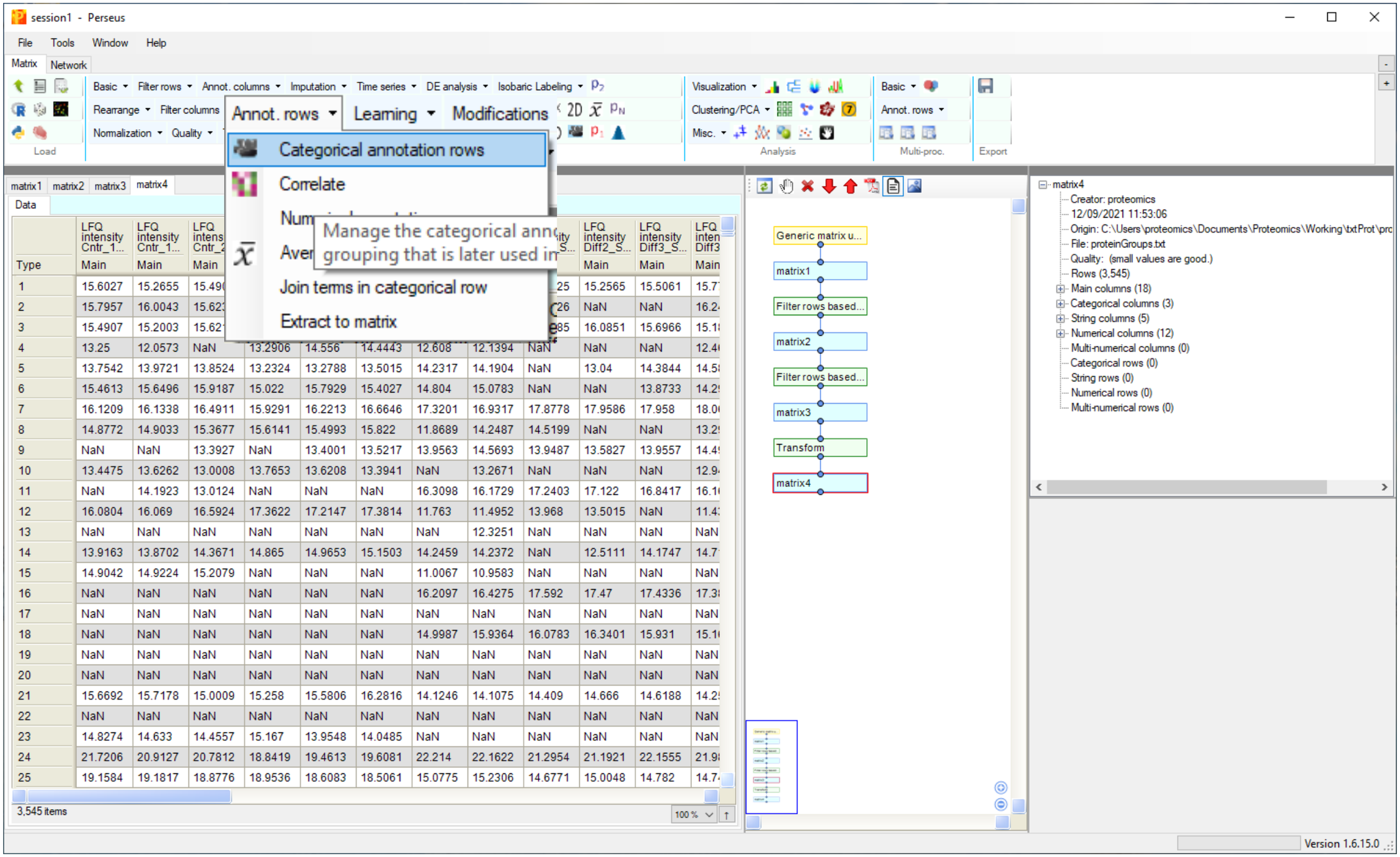

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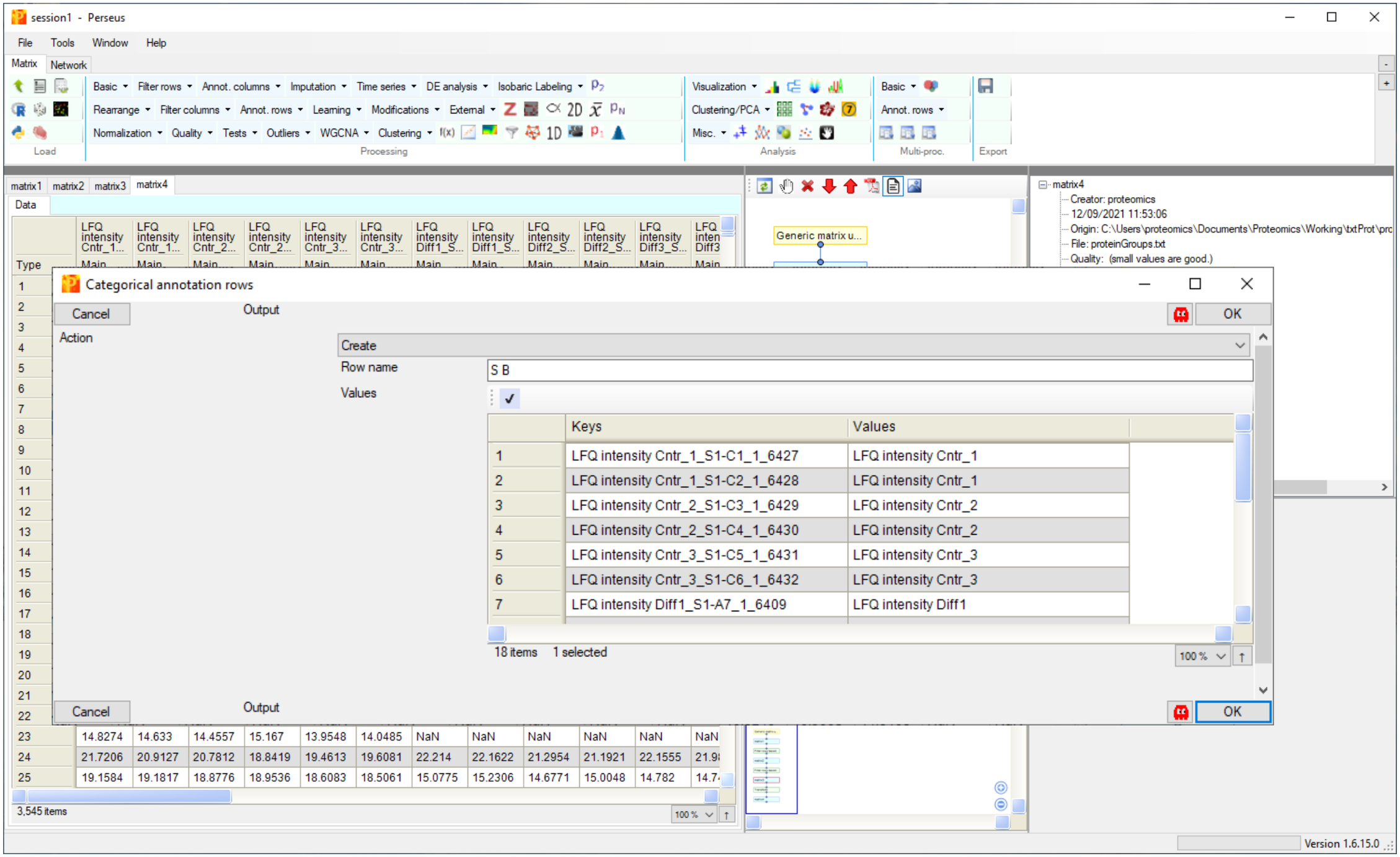

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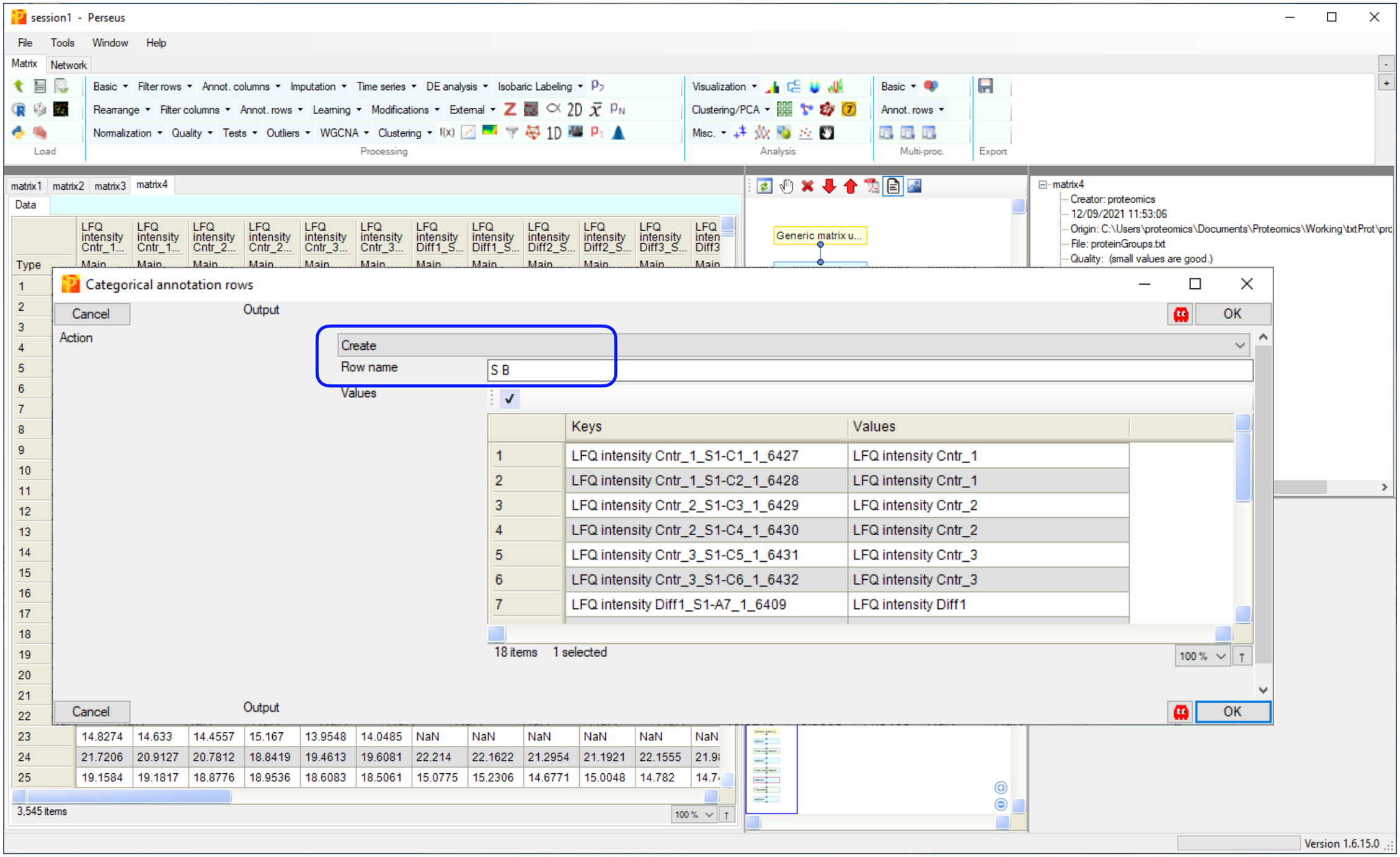

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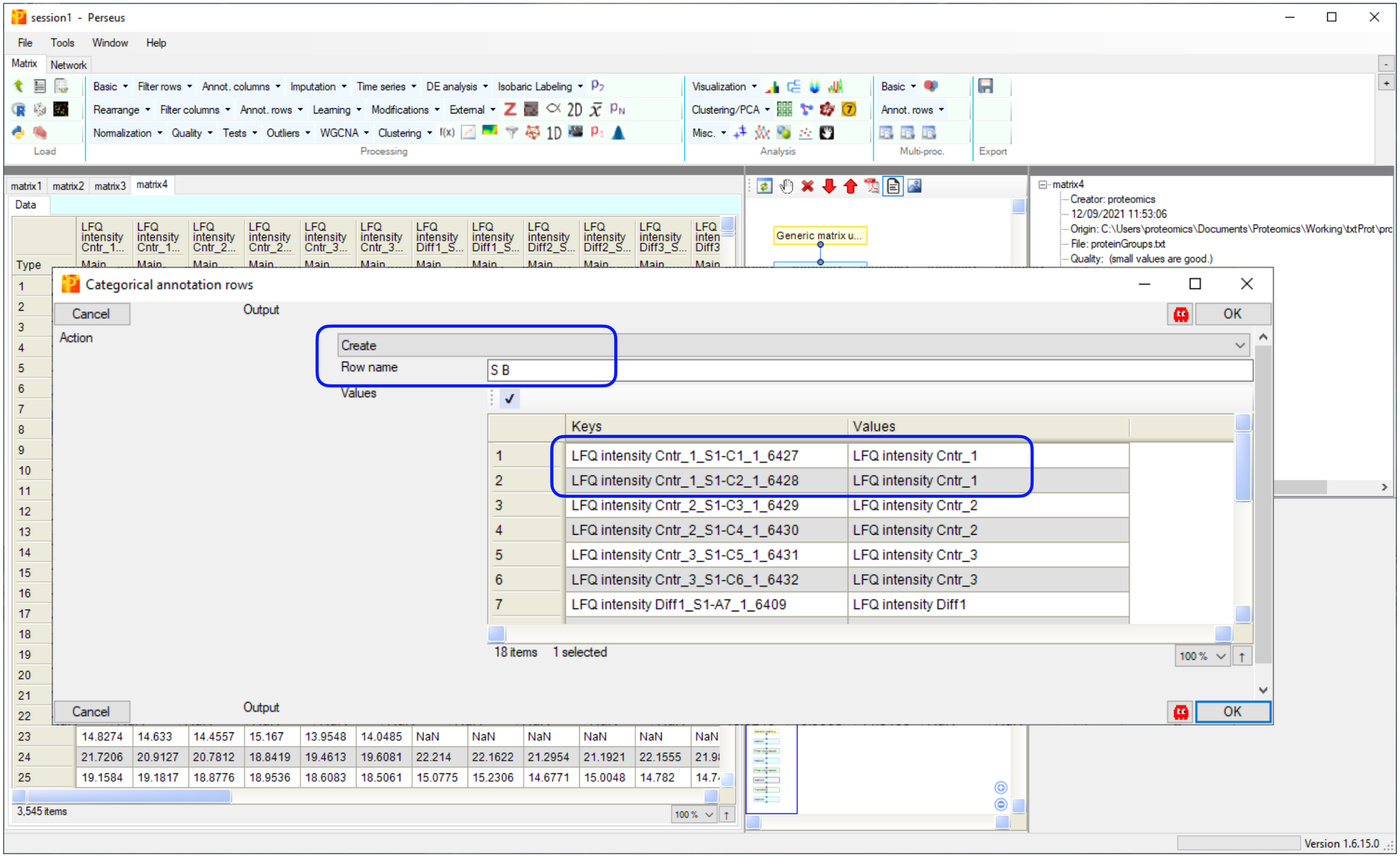

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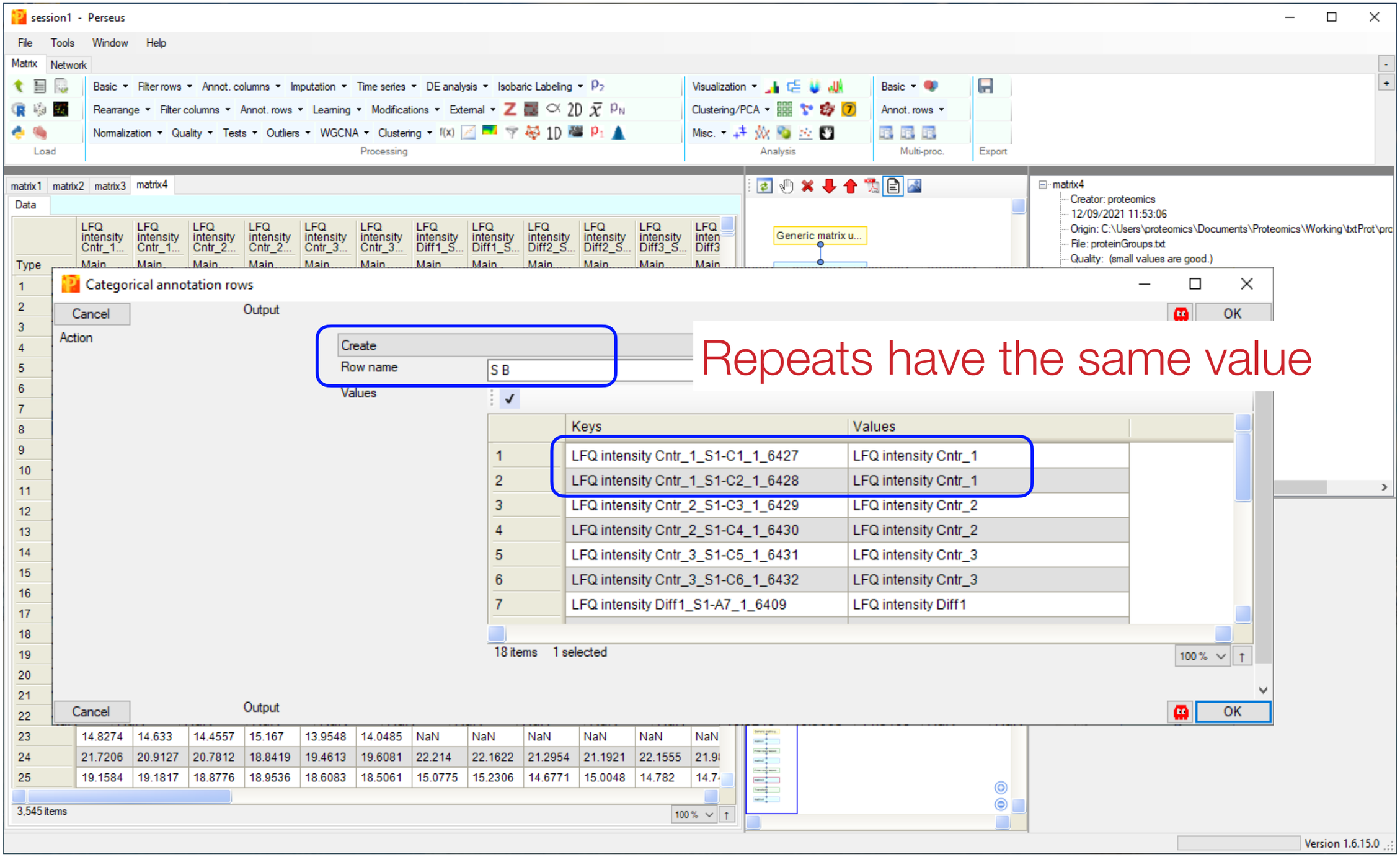

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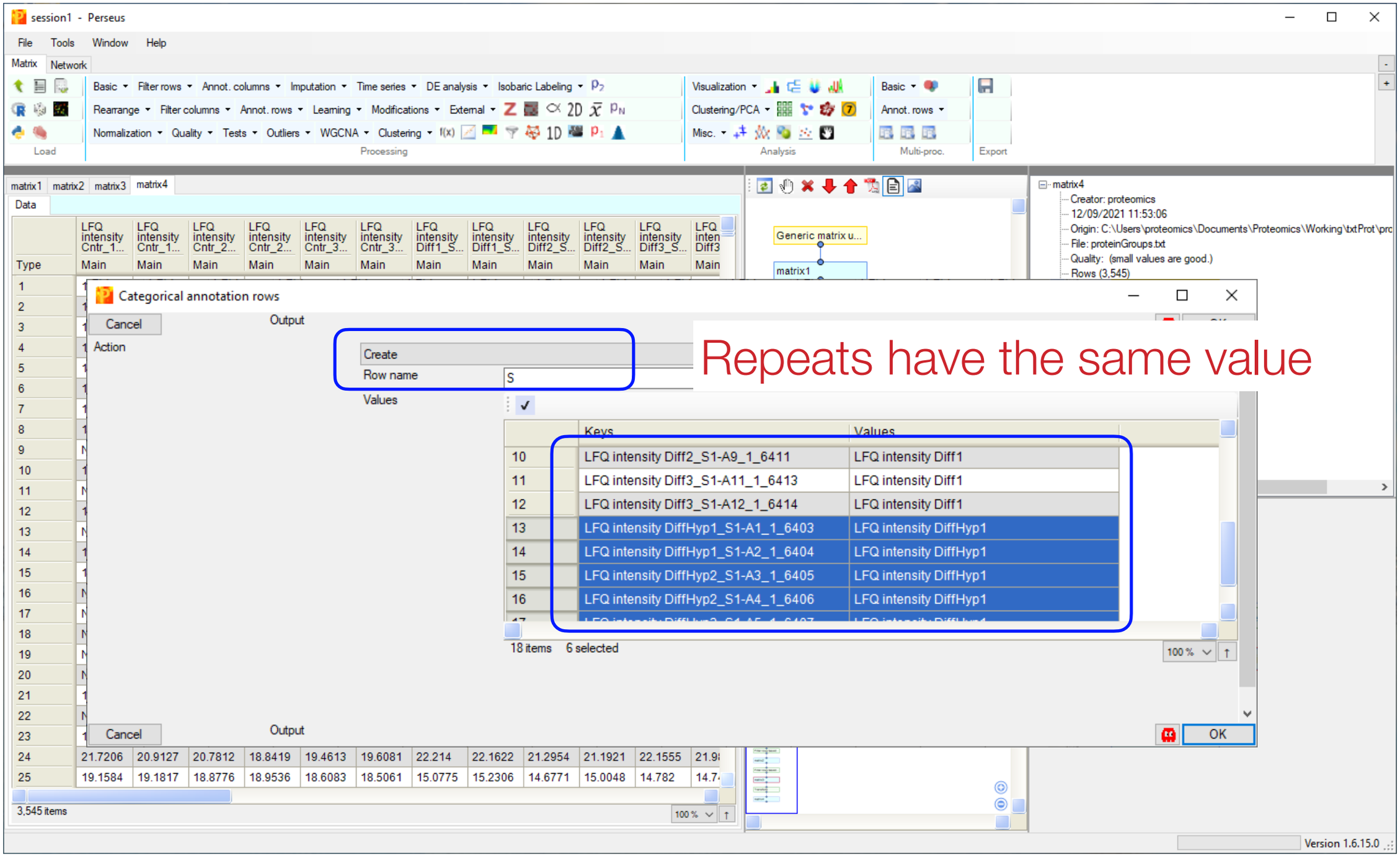
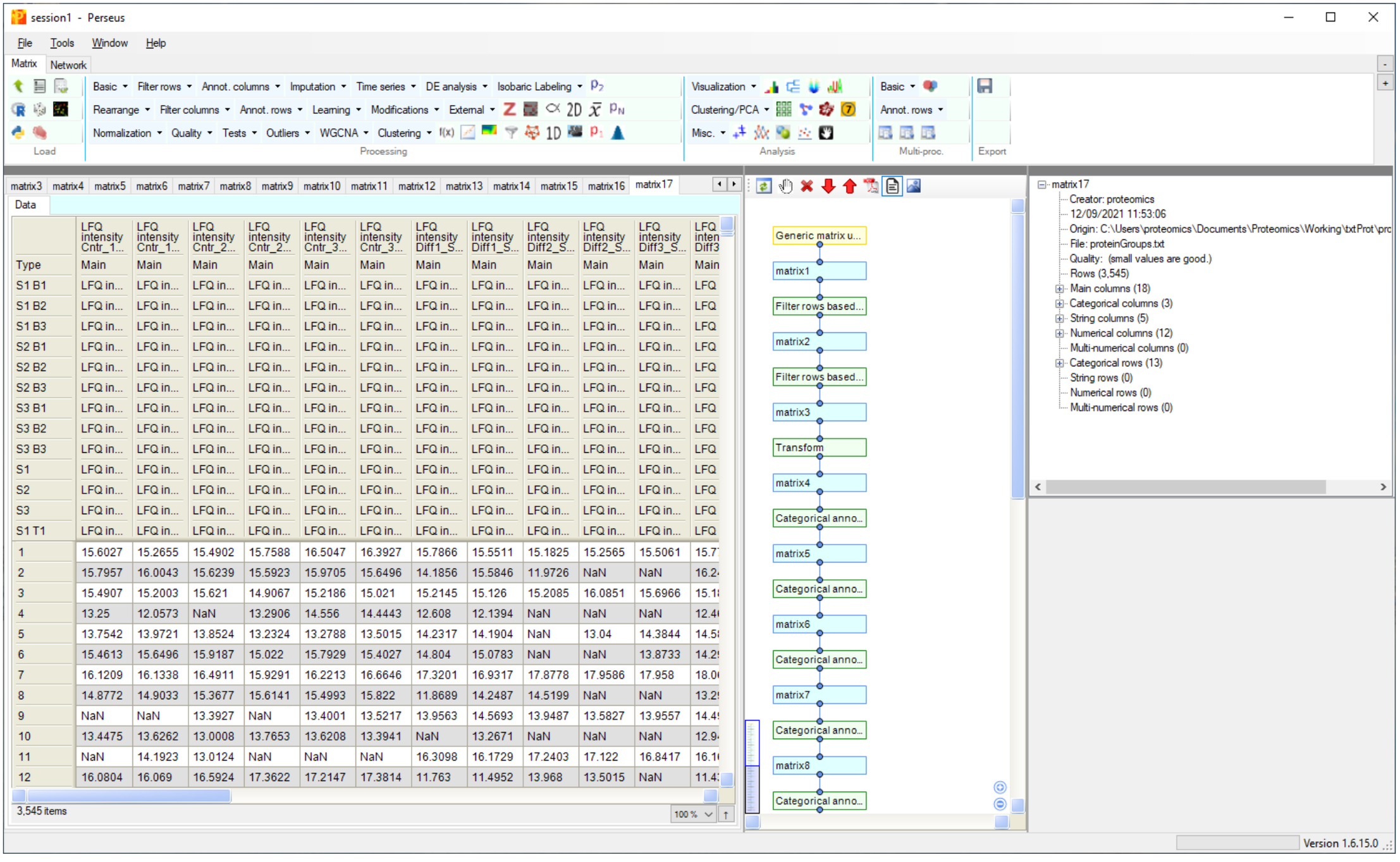


Perseus

Data Quality: **Filter Rows > Filter rows based on valid numbers**



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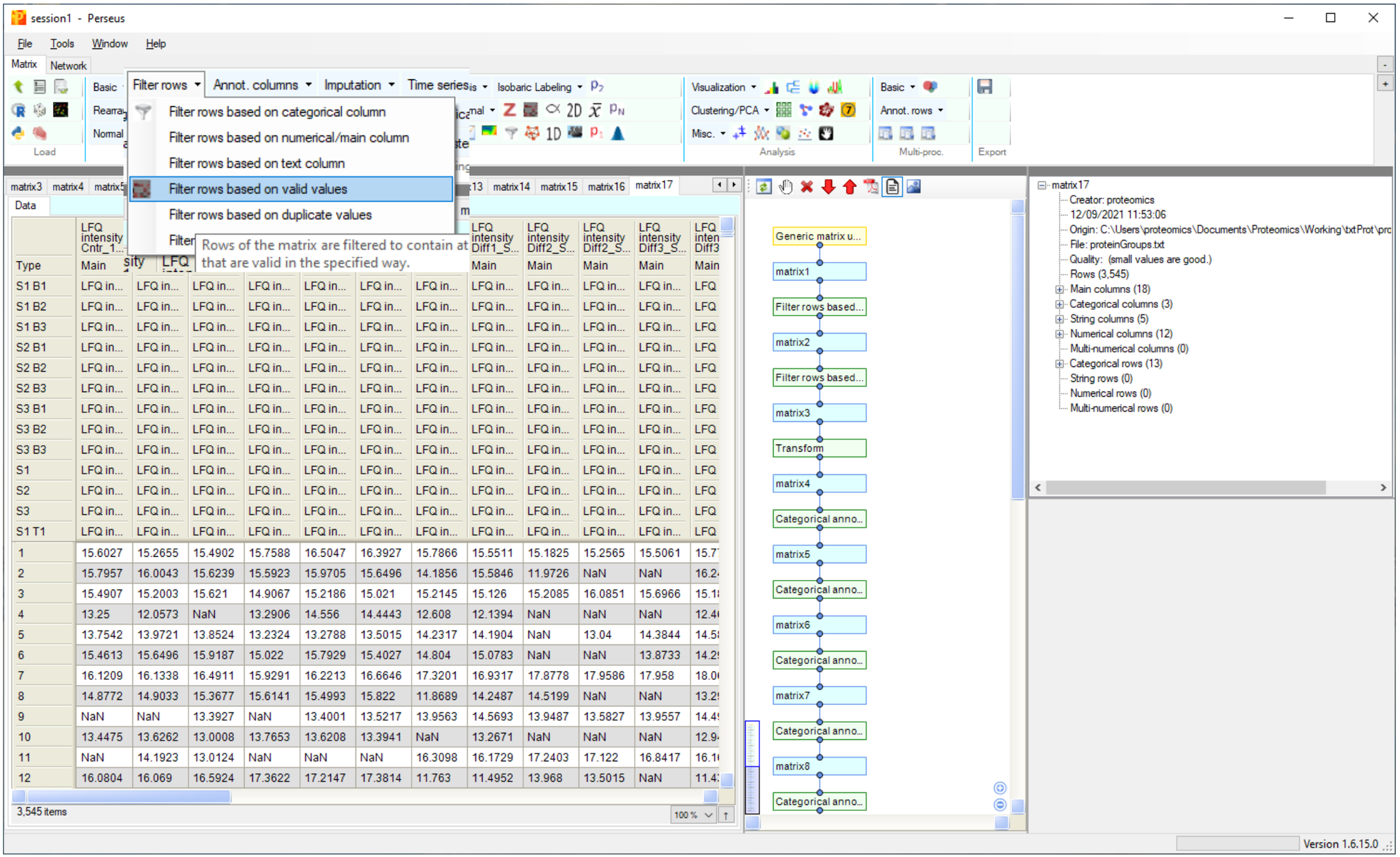

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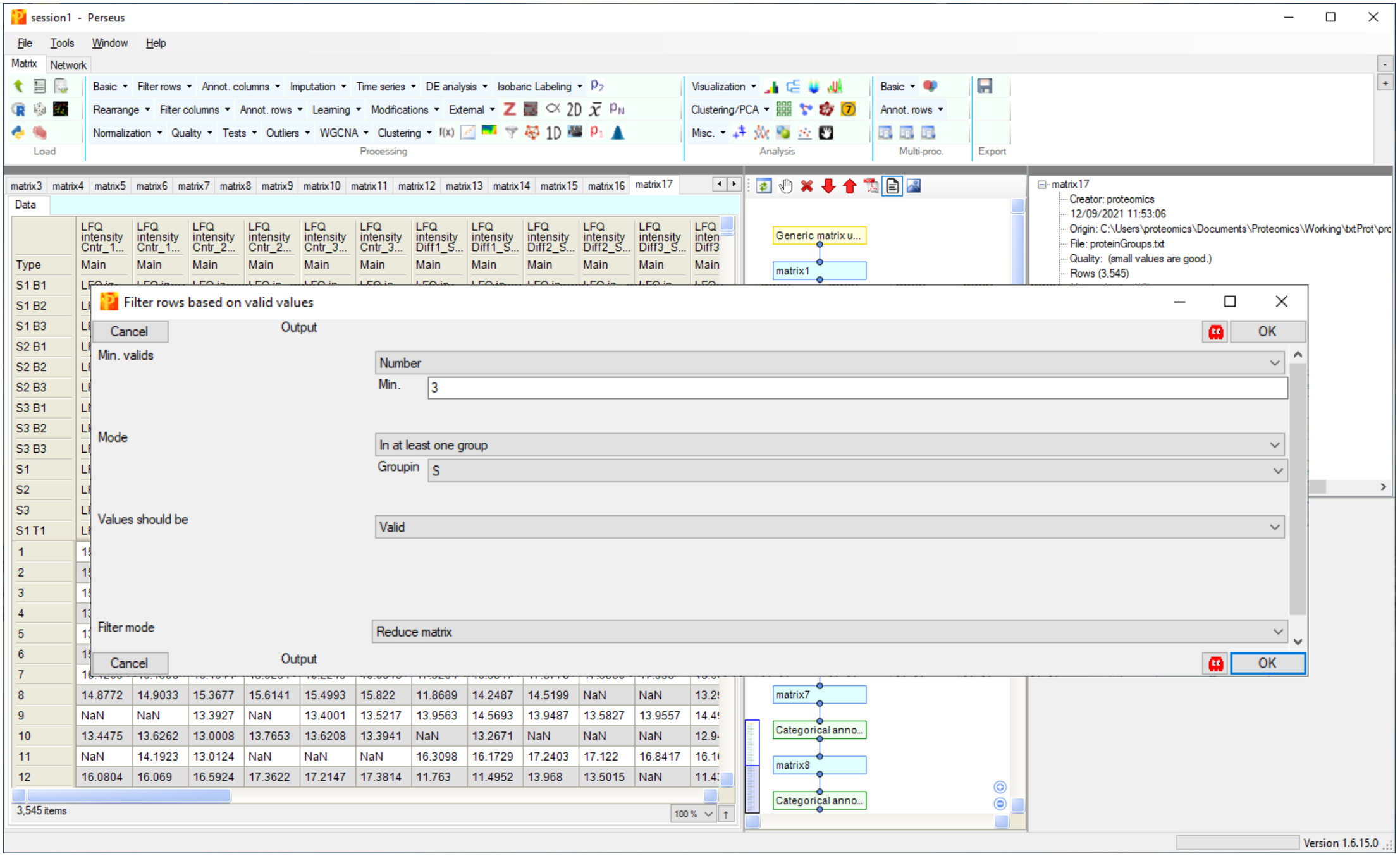

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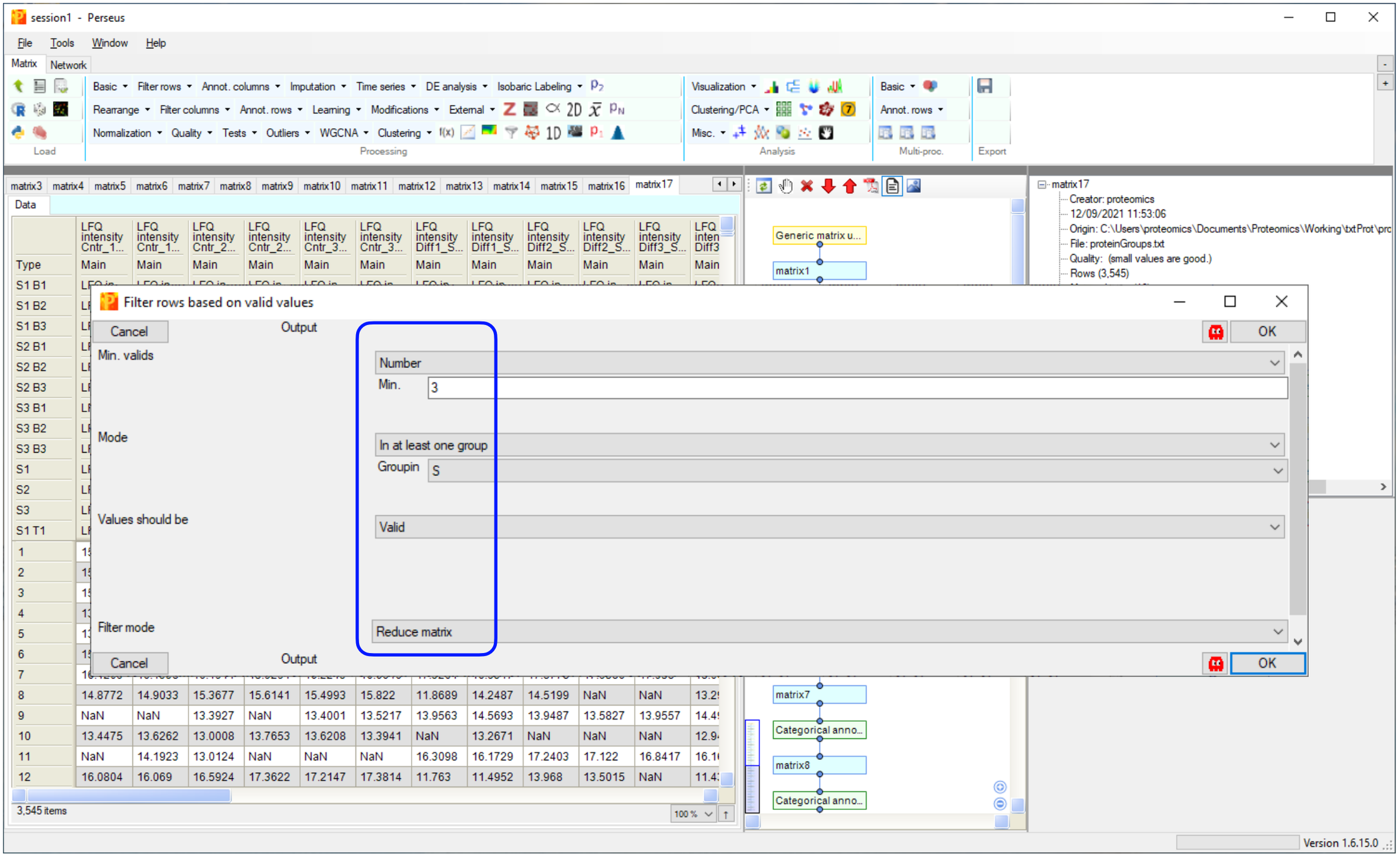
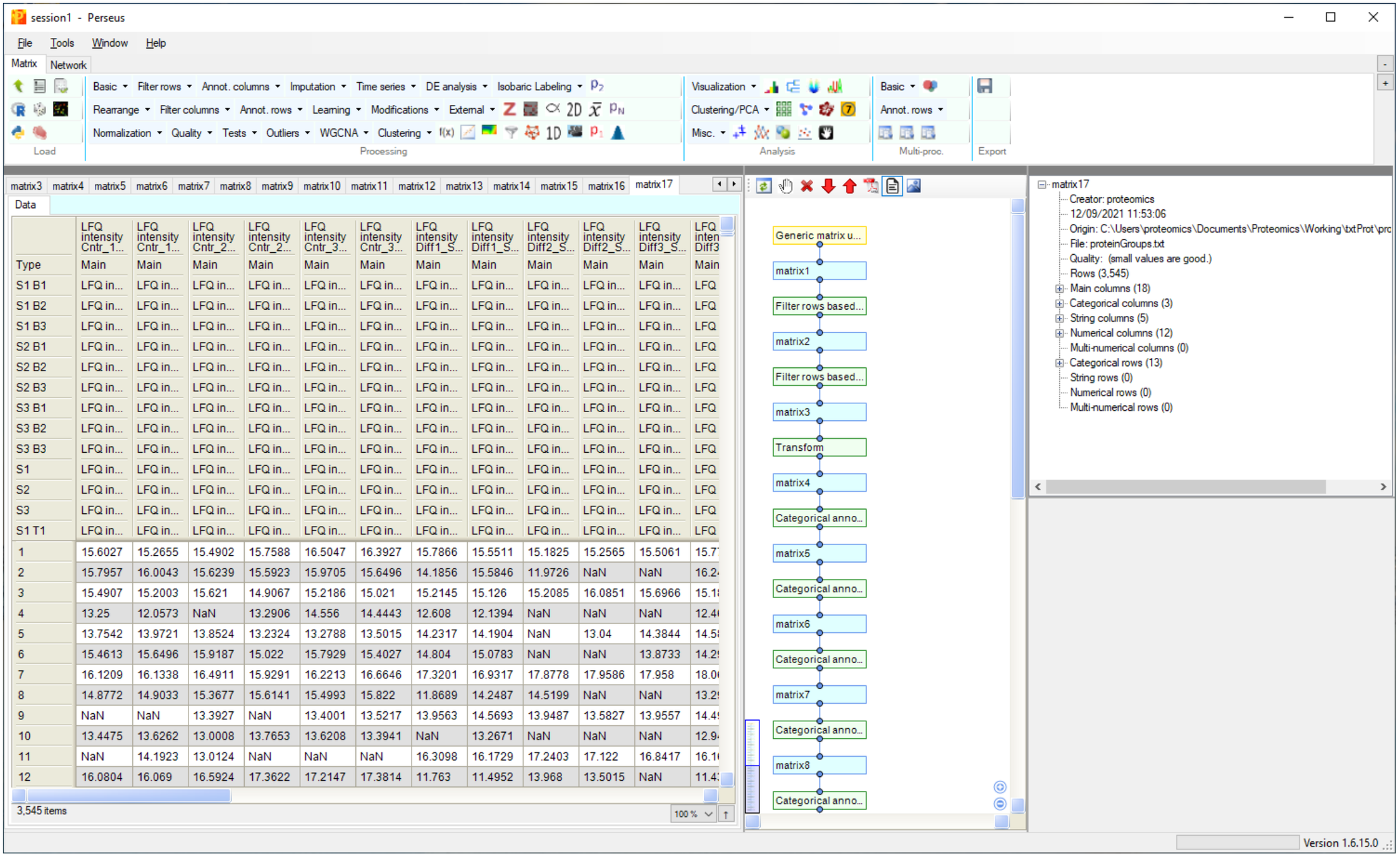


Perseus

Data Quality - Fill in missing values : **Imputation > Replace missing values from normal distribution**



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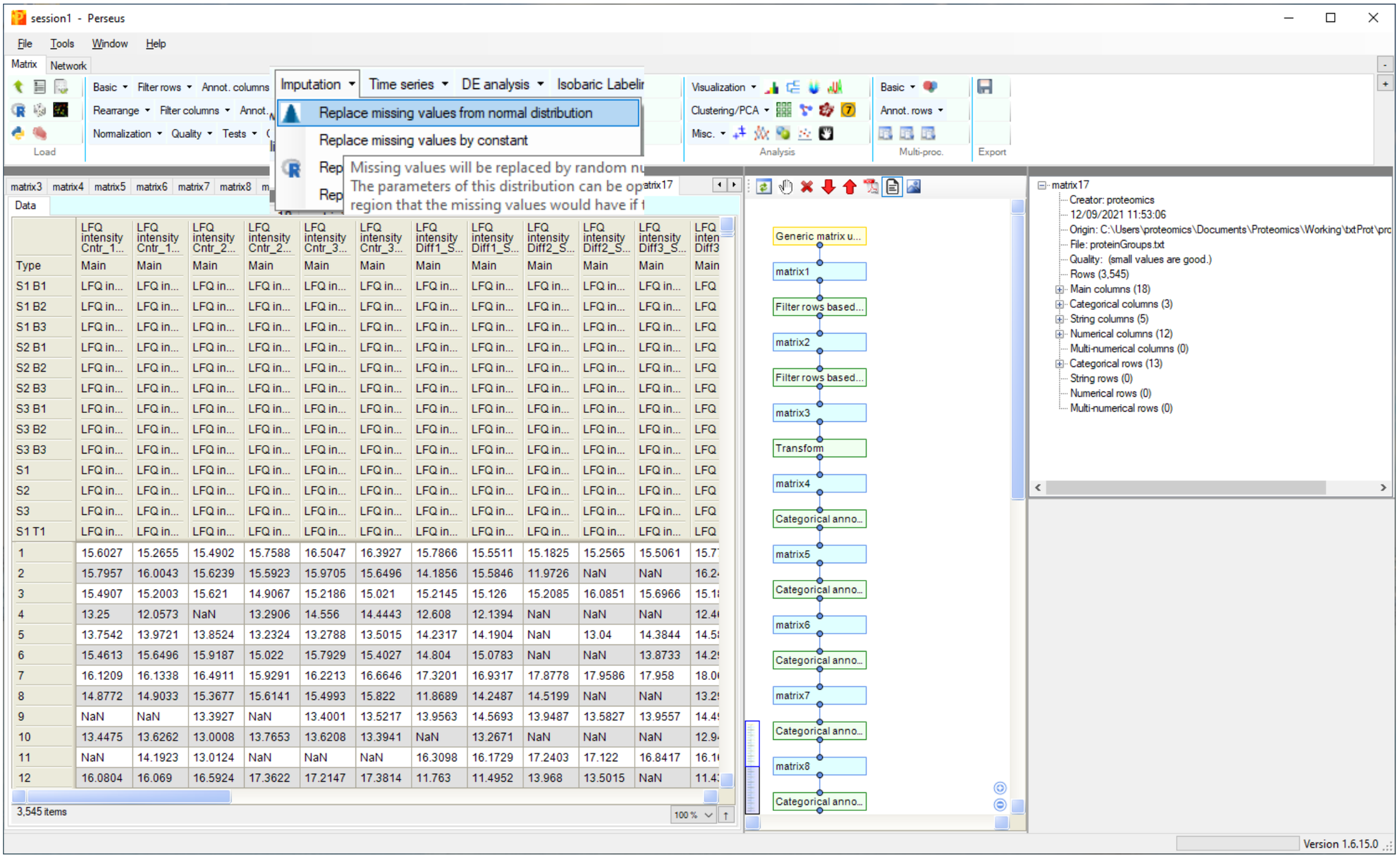

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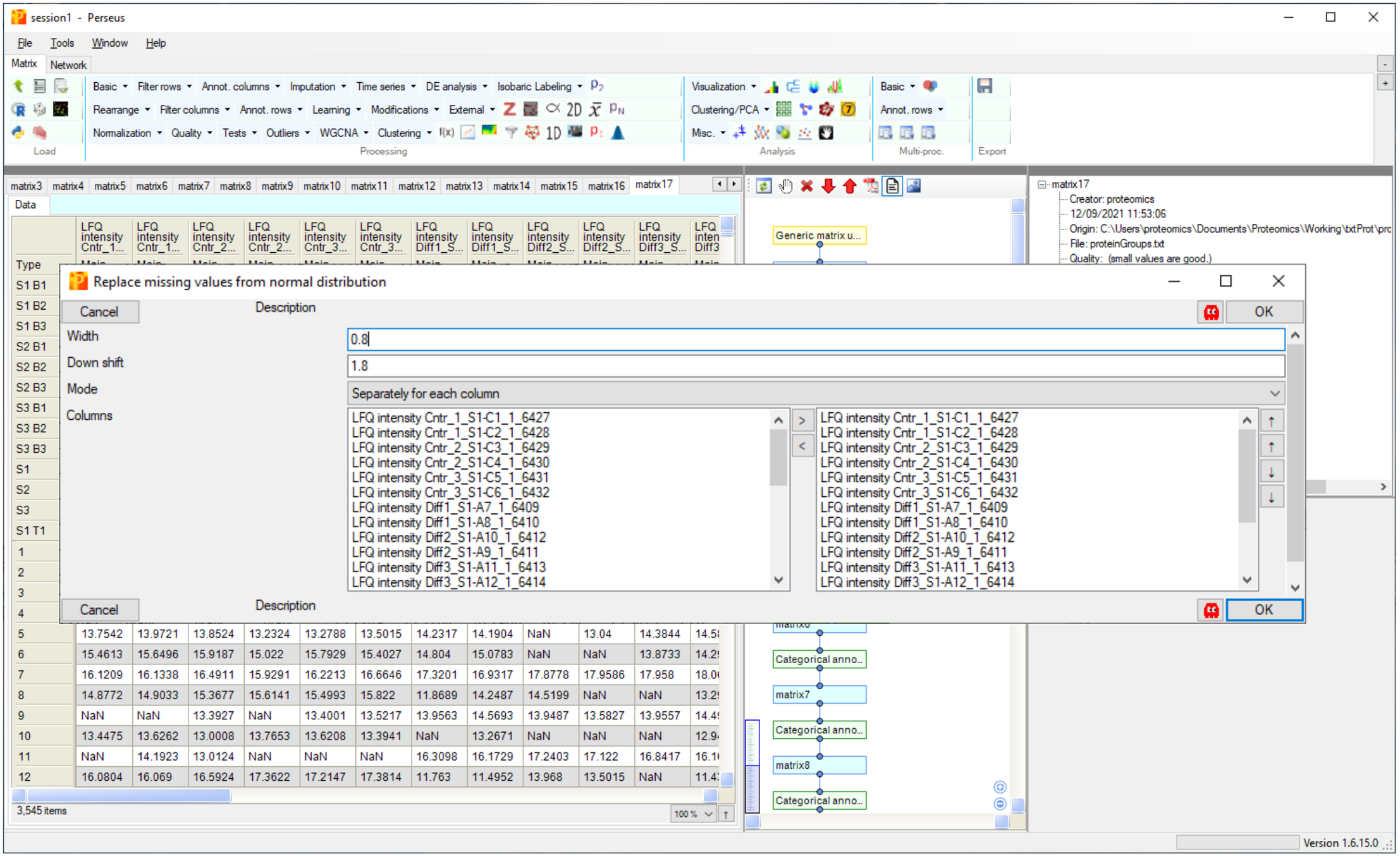

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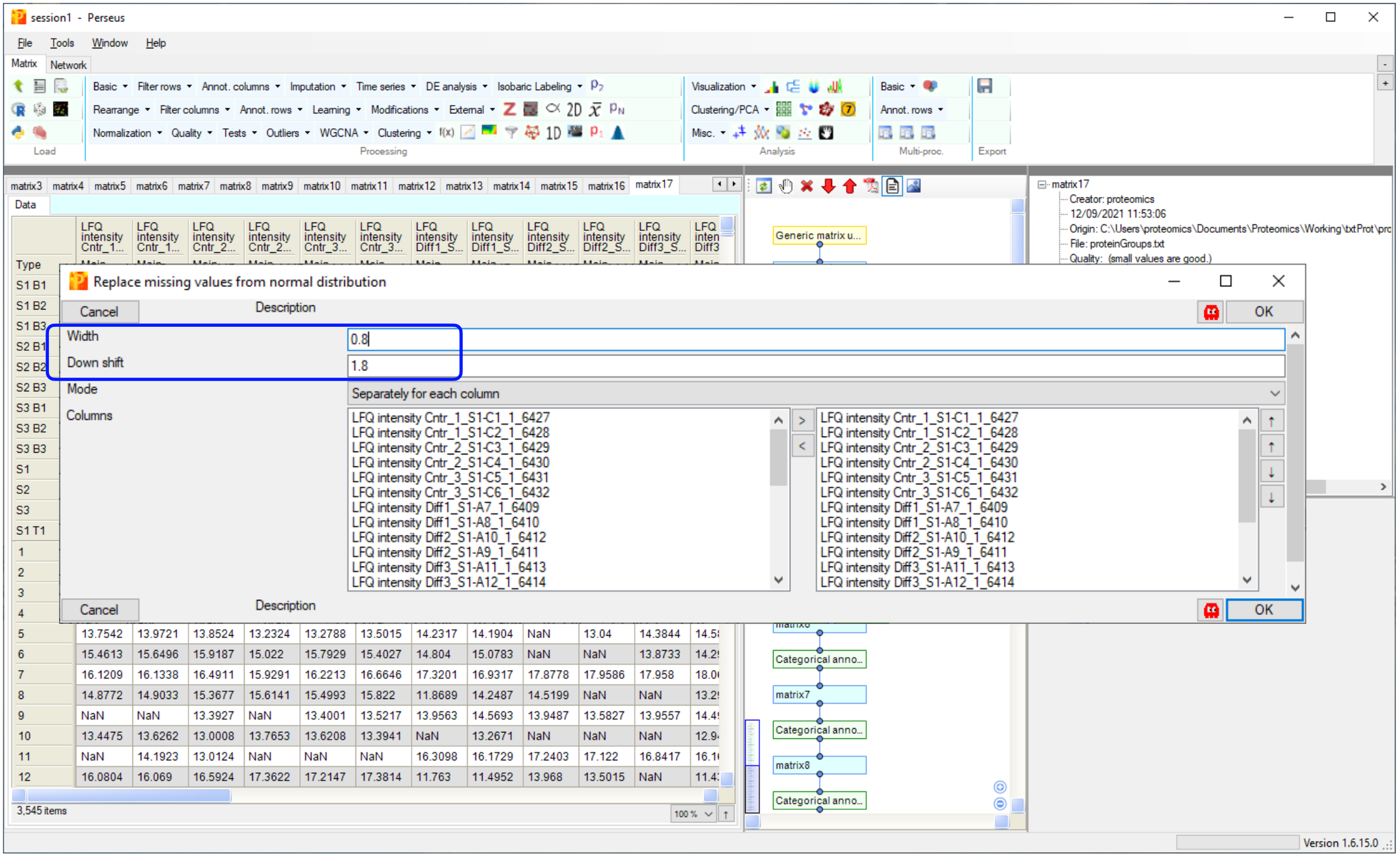
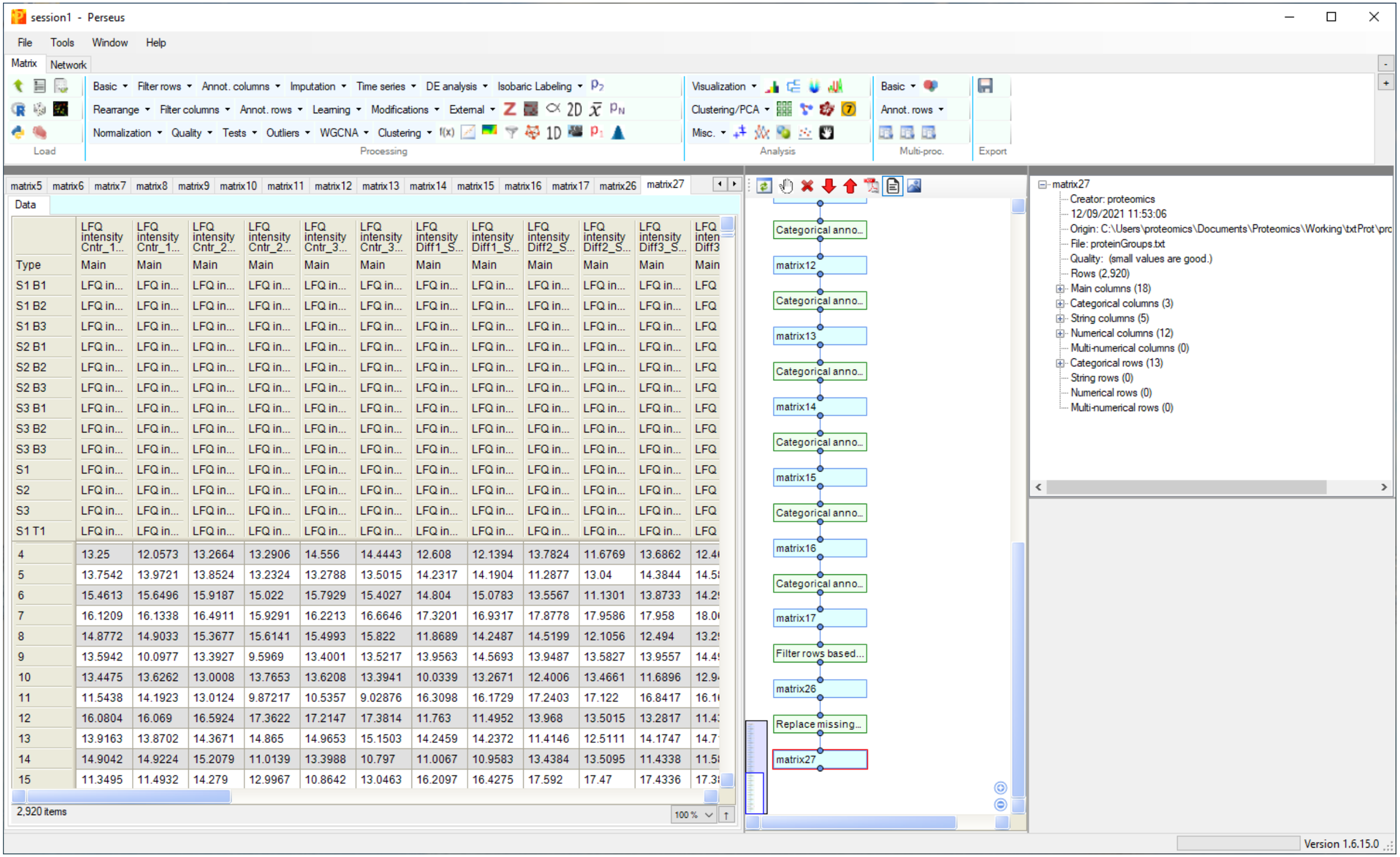


Perseus

Data Quality - Normal distributed values ? : **Visualisation - Histogram**



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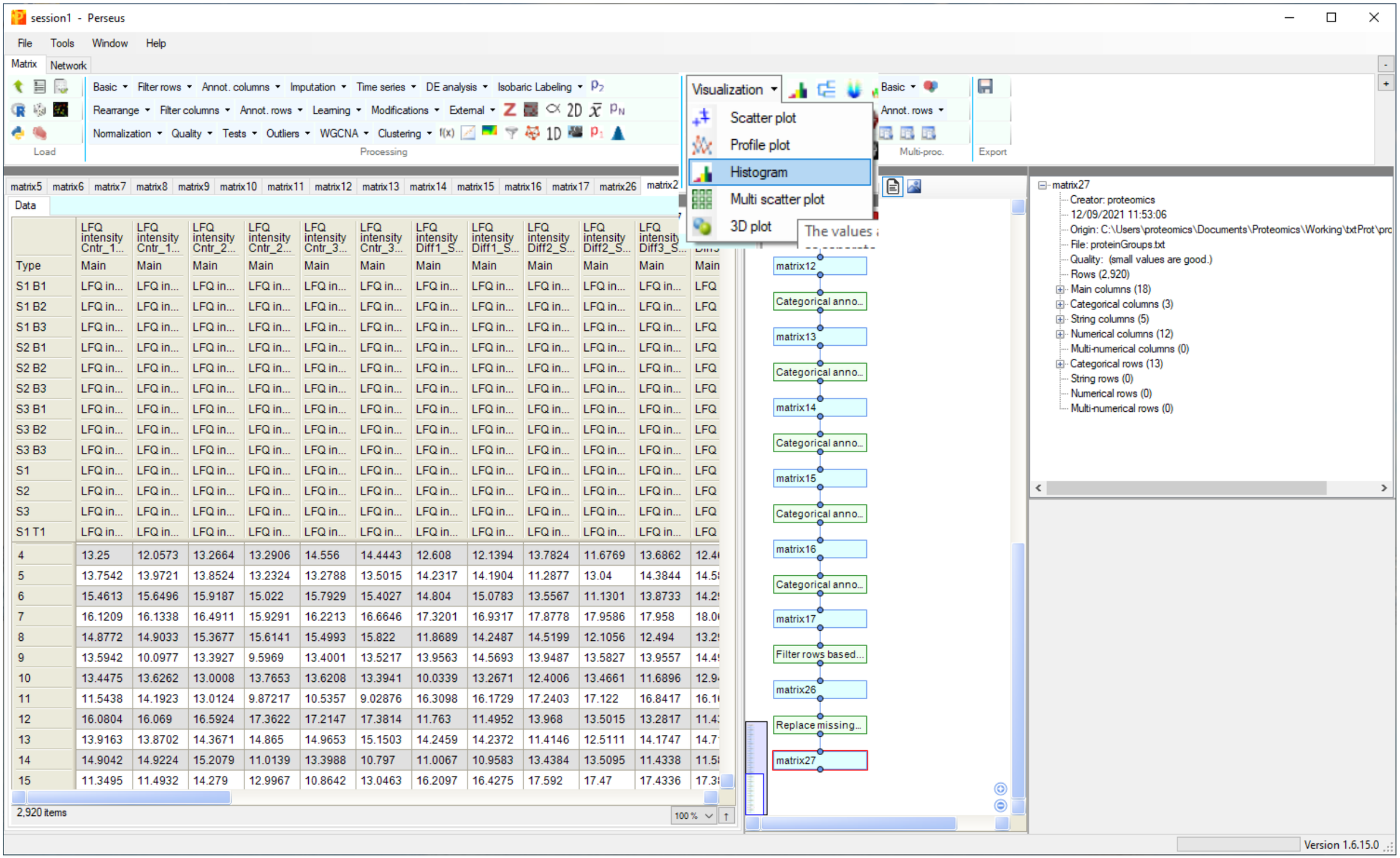

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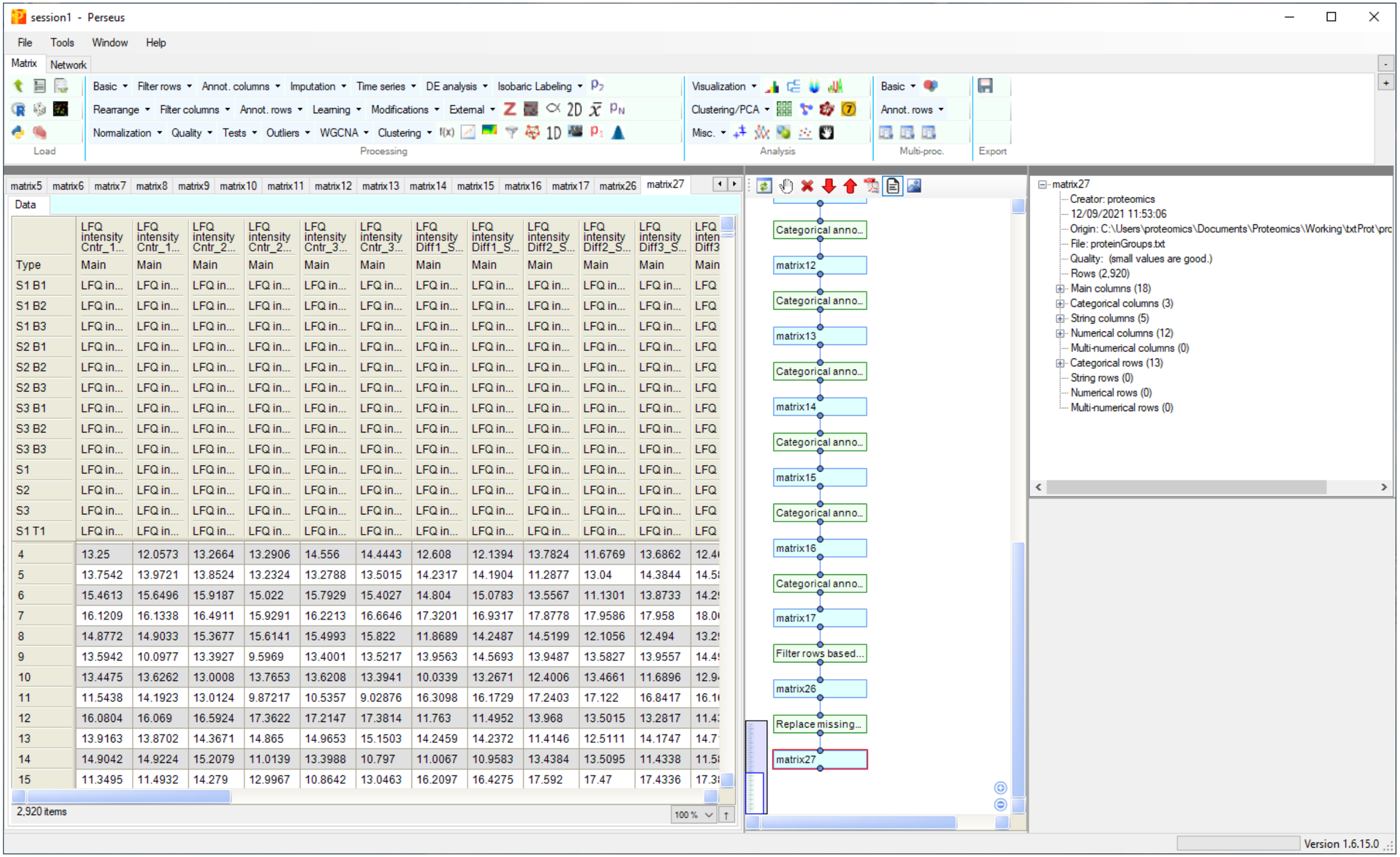
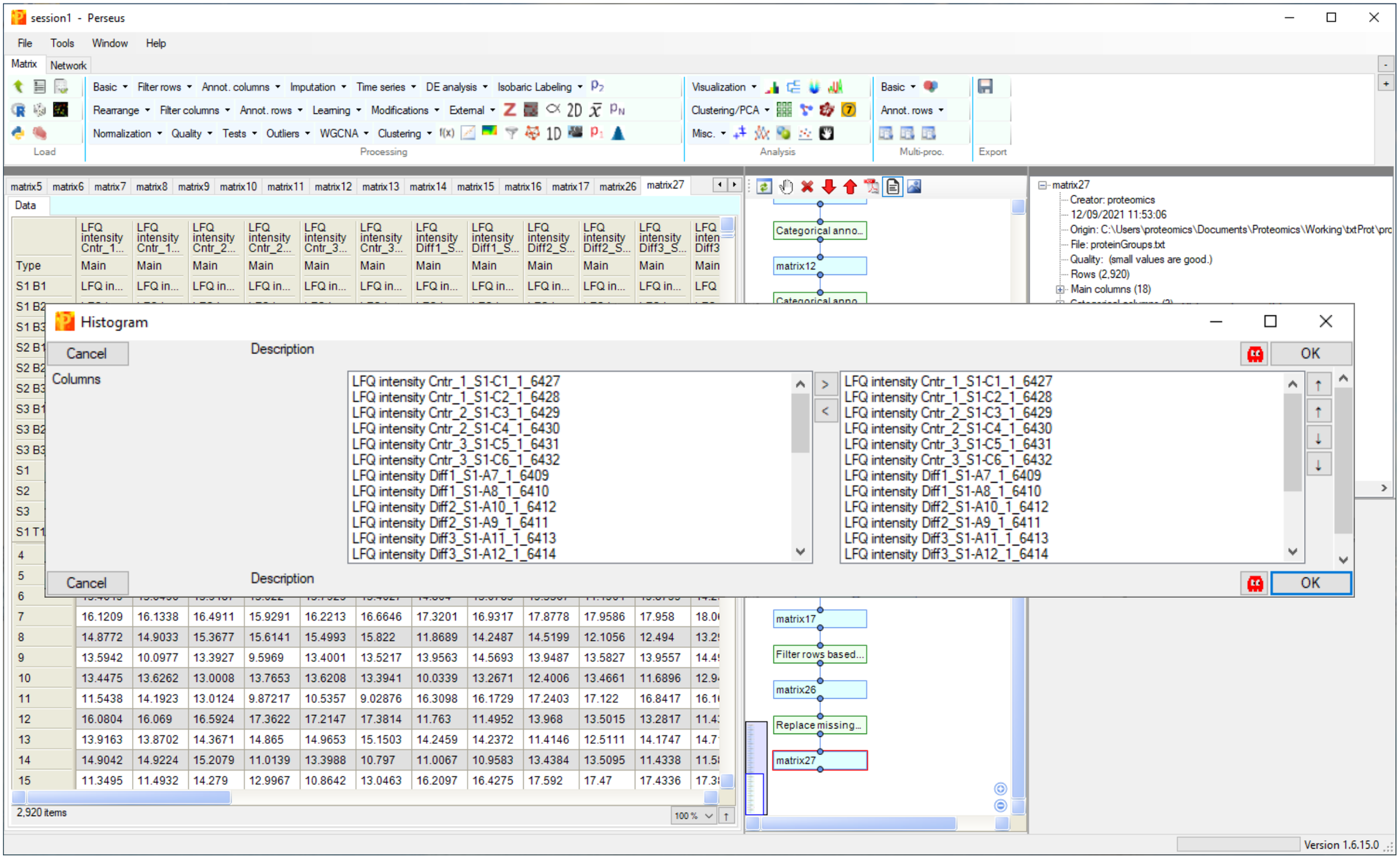


Perseus

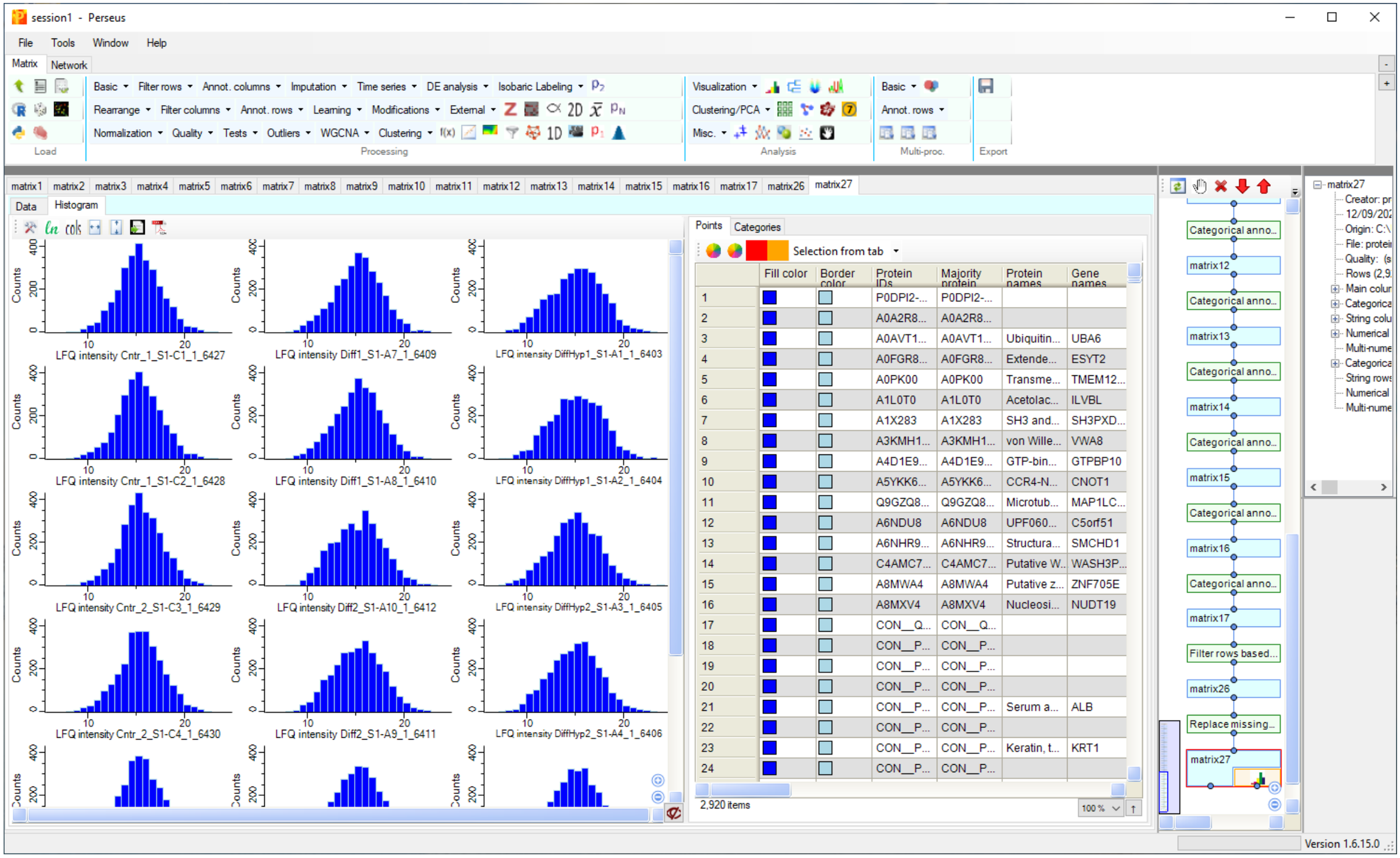
Data Quality - Normal distributed values ? : **Visualisation - Histogram**



Perseus

Data Quality - Distribution of the intensity values of the different proteins? :

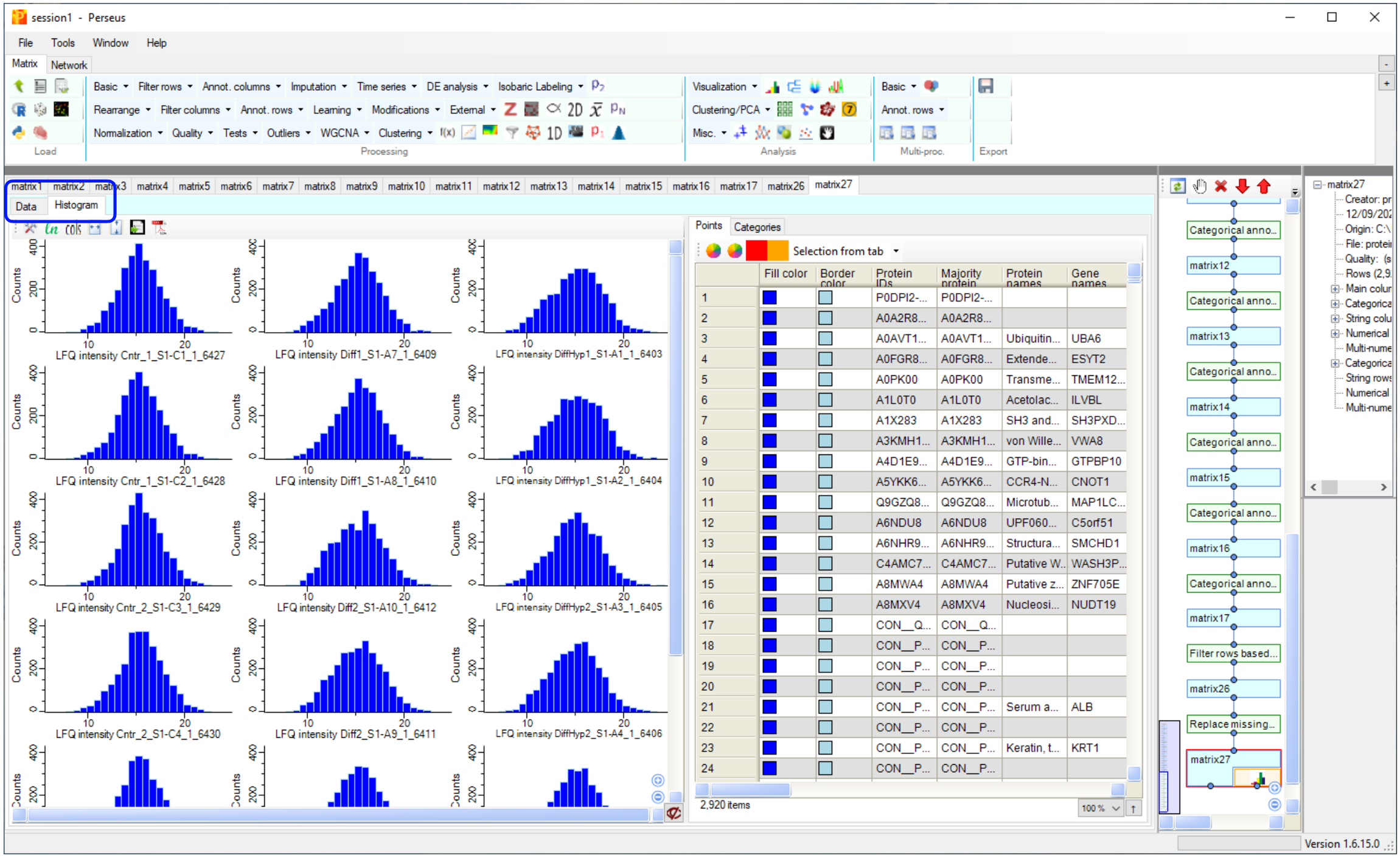
Visualisation - Histogram



Perseus

Data Quality - Distribution of the intensity values of the different proteins? :

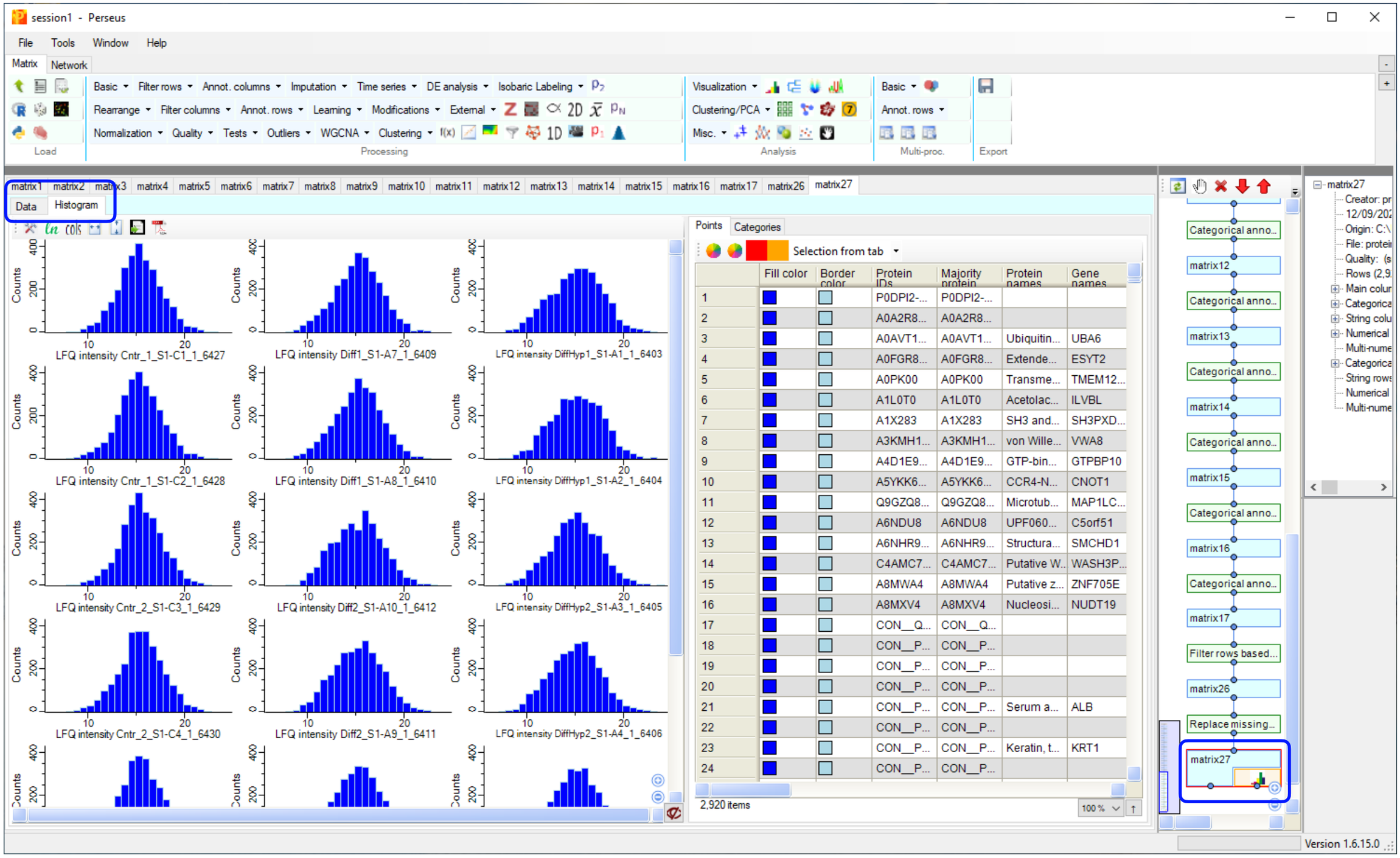
Visualisation - Histogram



Perseus

Data Quality - Distribution of the intensity values of the different proteins? :

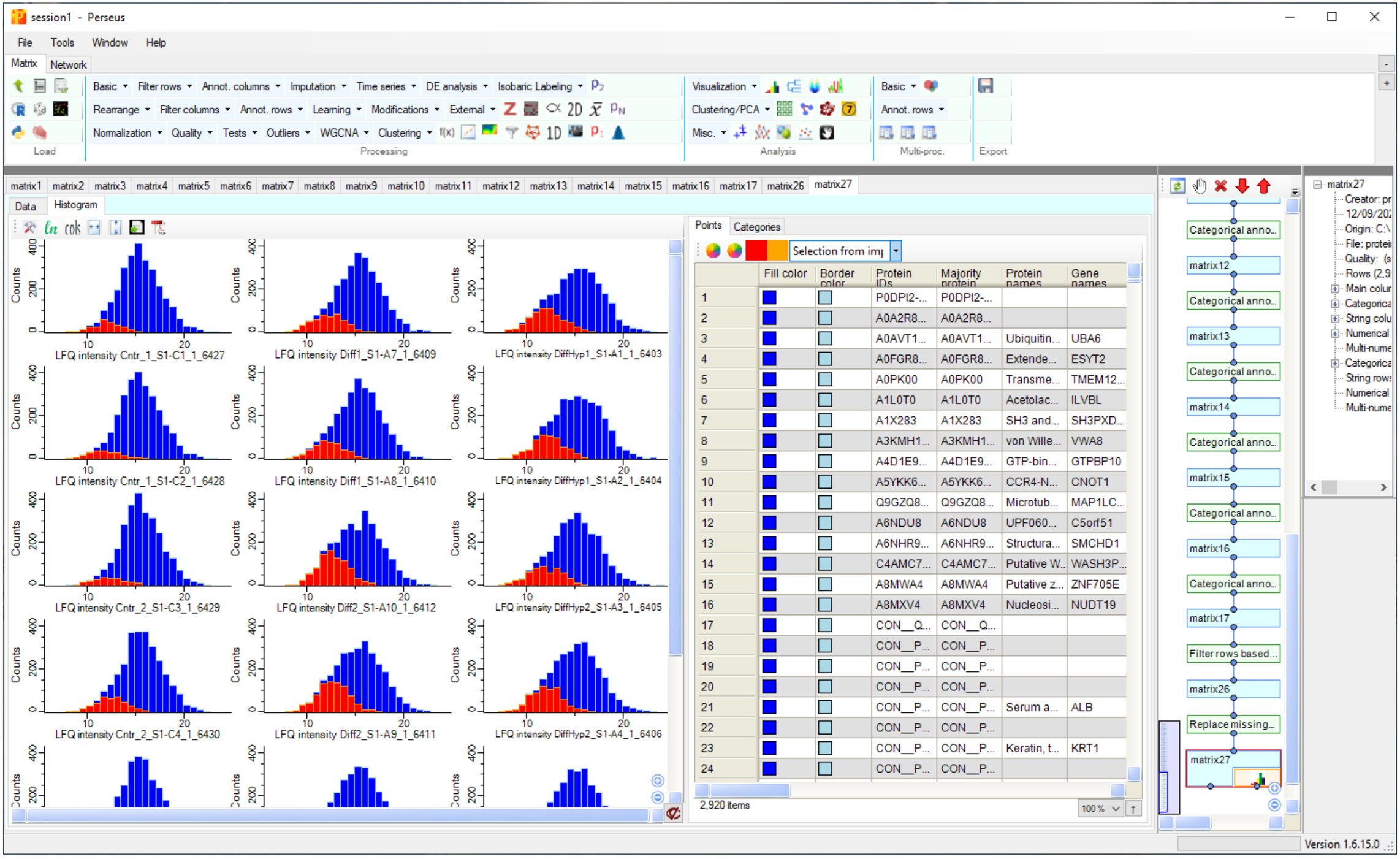
Visualisation - Histogram



Perseus

Data Quality - Distribution of the intensity values of the different proteins? :

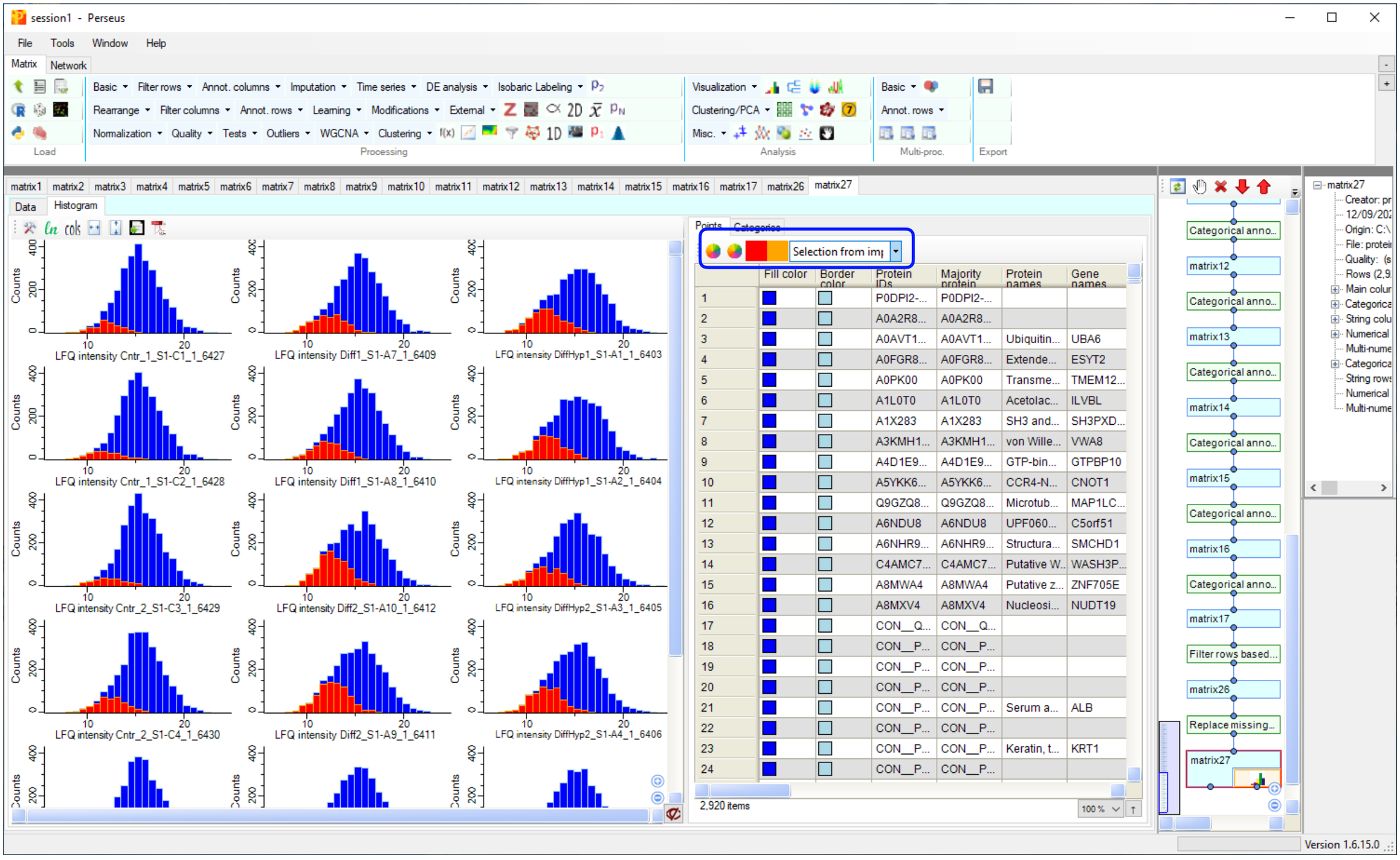
Visualisation - Histogram



Perseus

Data Quality - Distribution of the intensity values of the different proteins? :

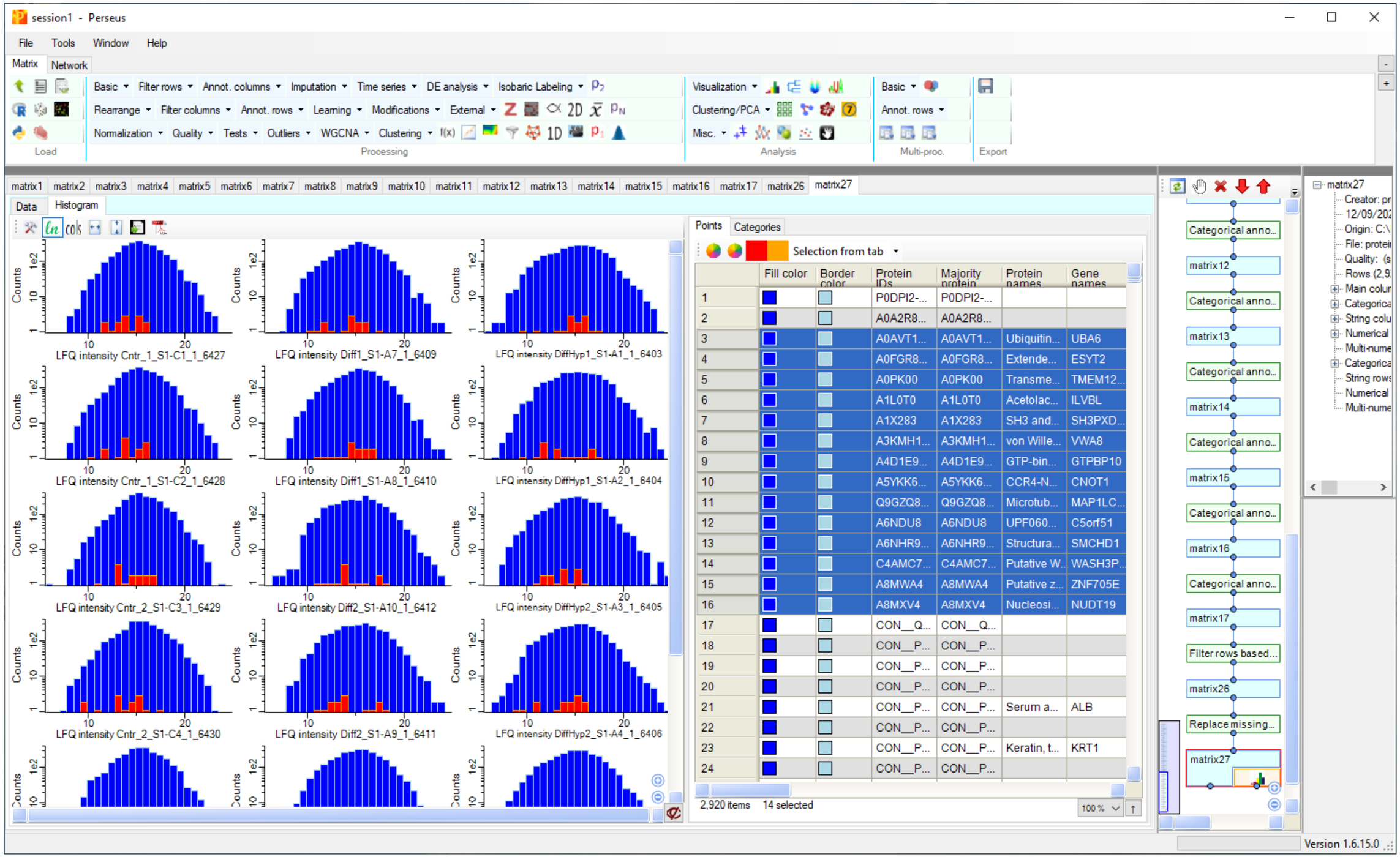
Visualisation - Histogram



Perseus

Data Quality - Distribution of the intensity values of the different proteins? :

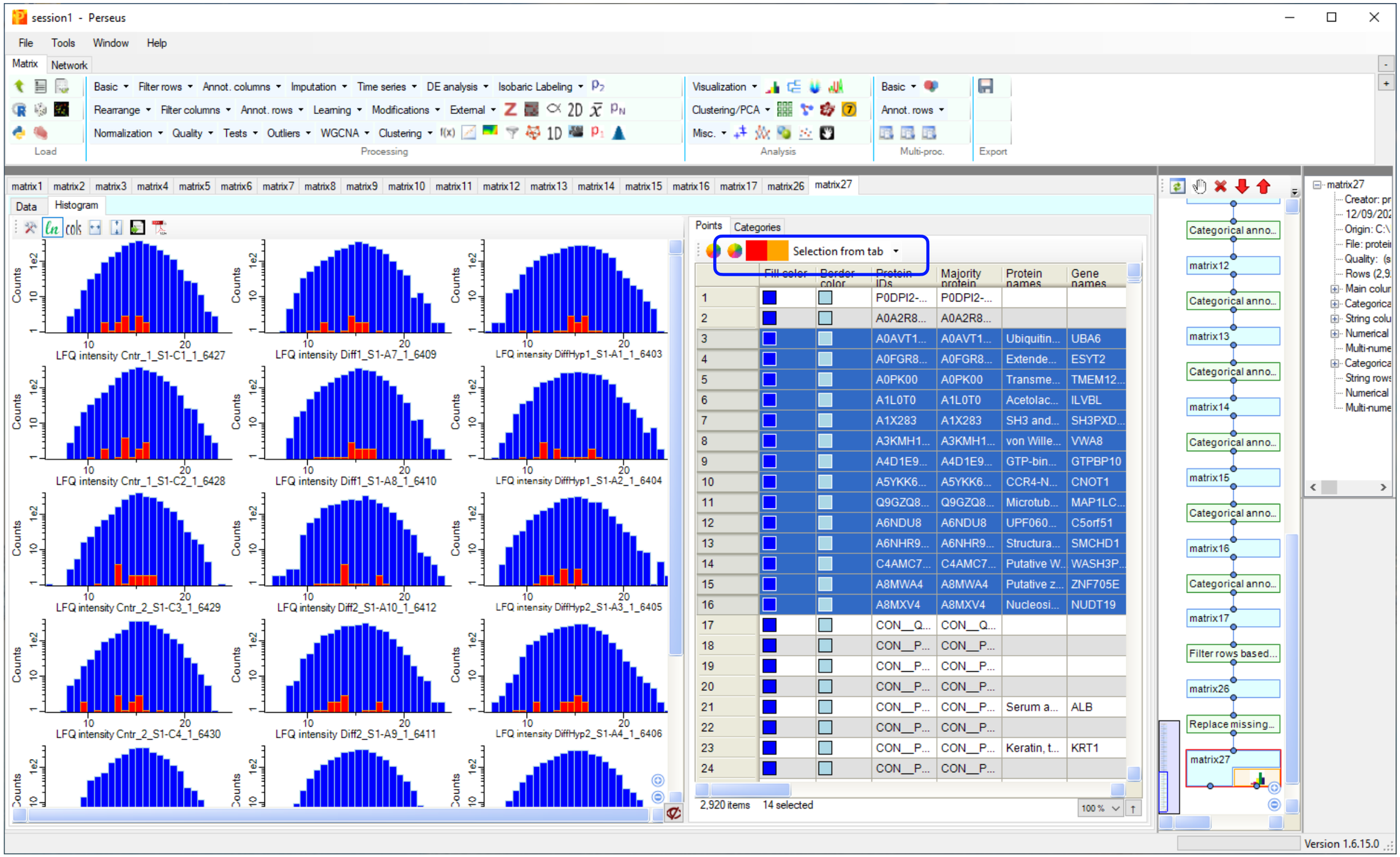
Visualisation - Histogram



Perseus

Data Quality - Distribution of the intensity values of the different proteins? :

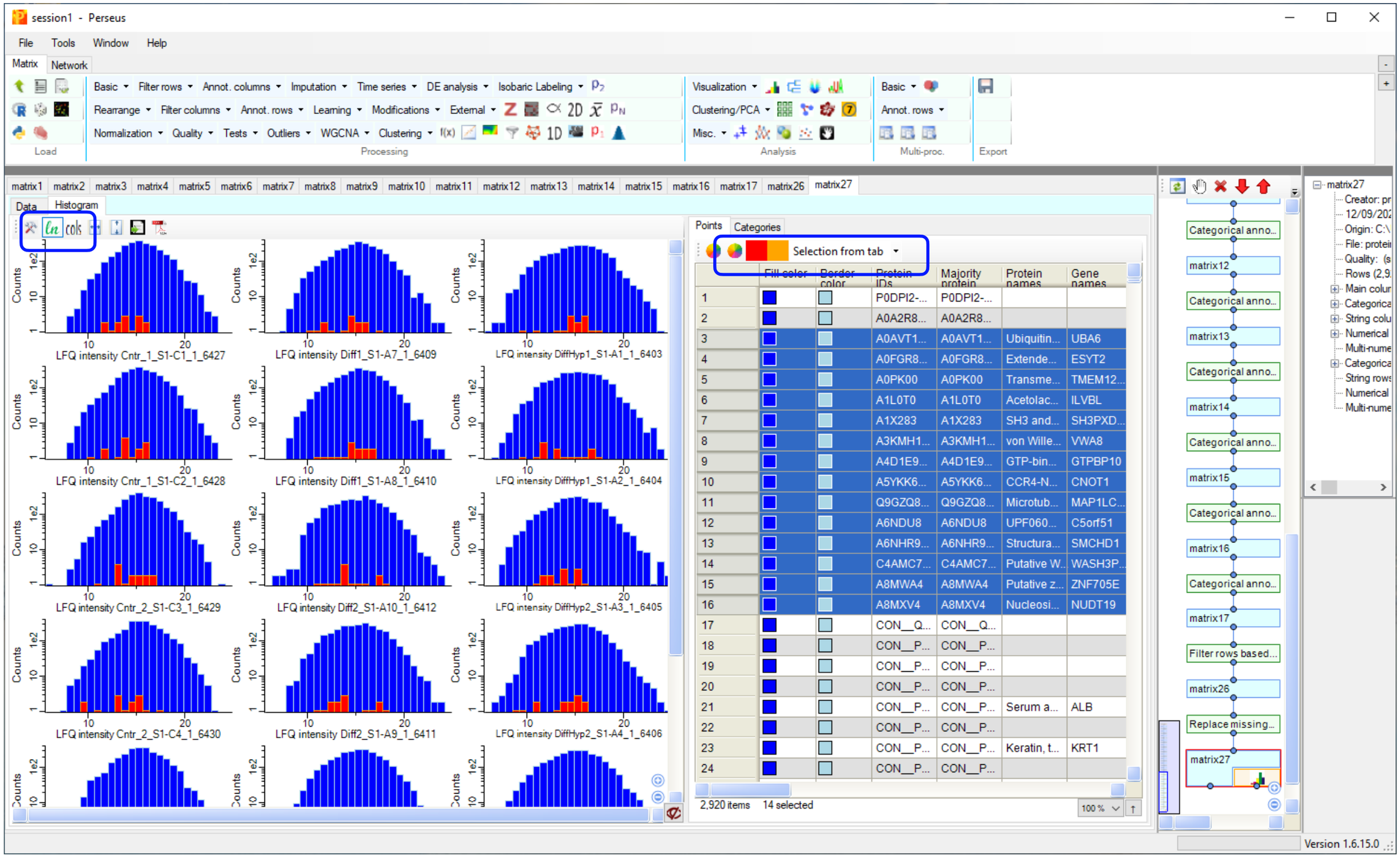
Visualisation - Histogram



Perseus

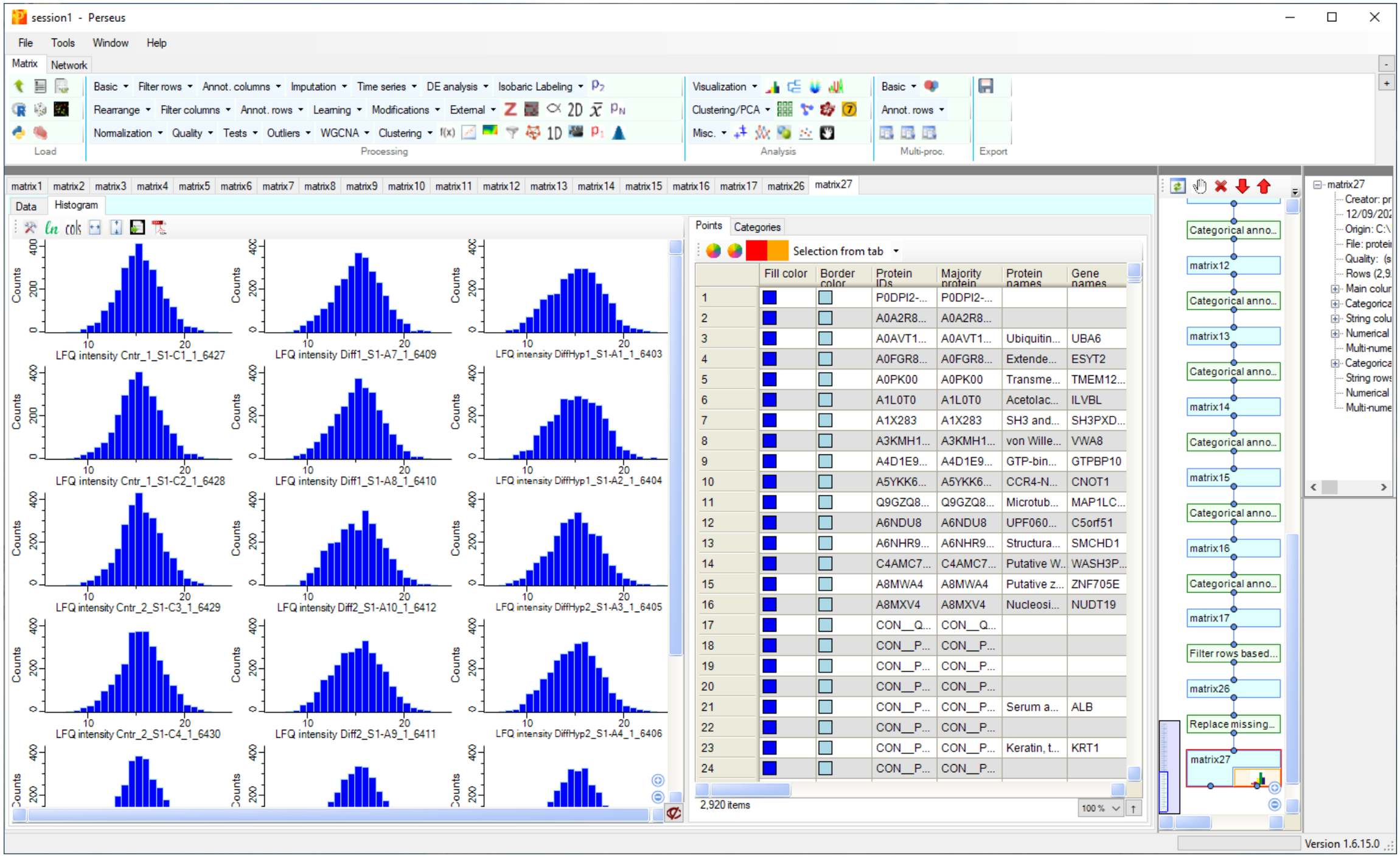
Data Quality - Distribution of the intensity values of the different proteins? :

Visualisation - Histogram



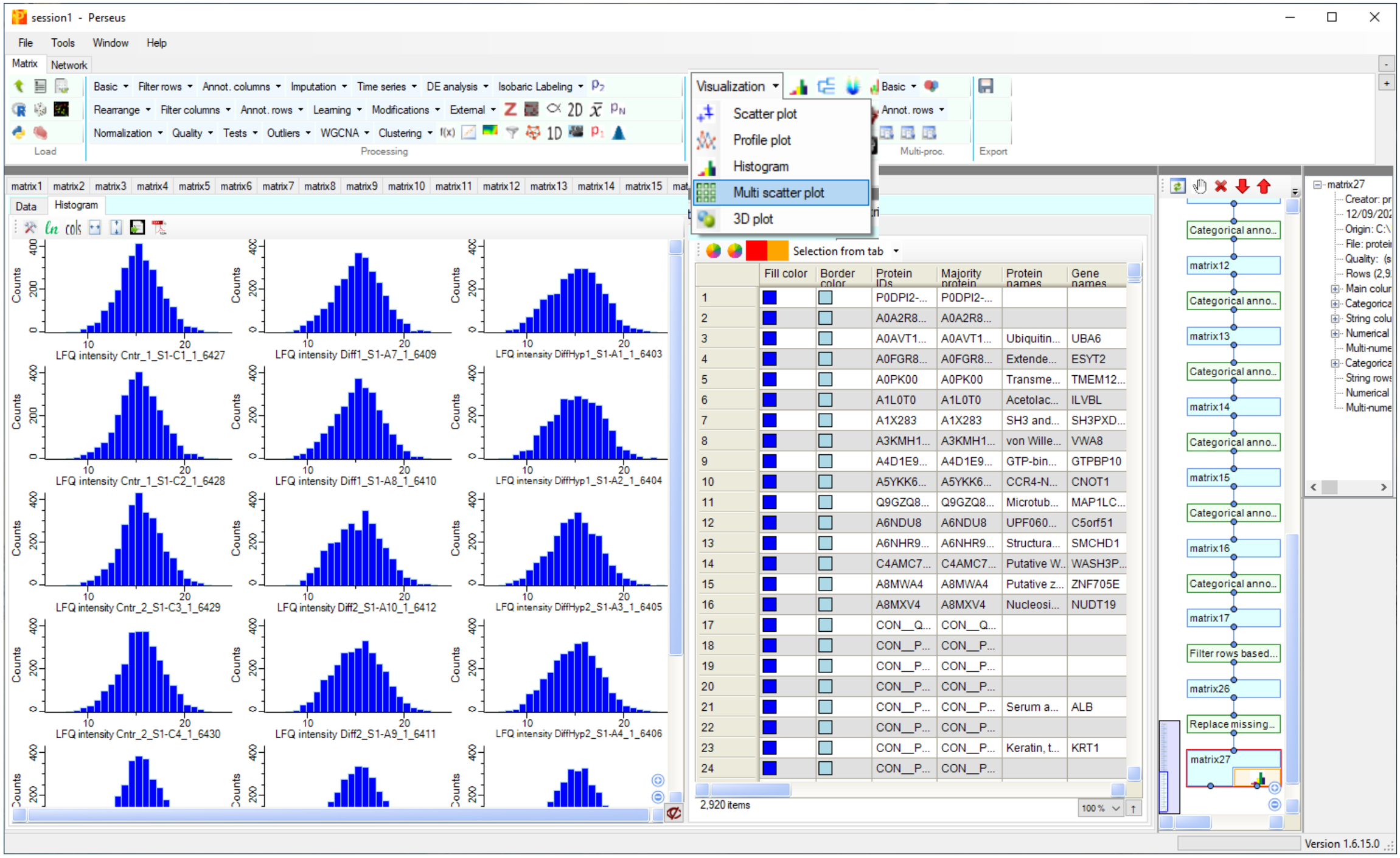
Perseus

Statistical Data Analysis - Data Quality : **Visualisation - Multi Scatter Plot**



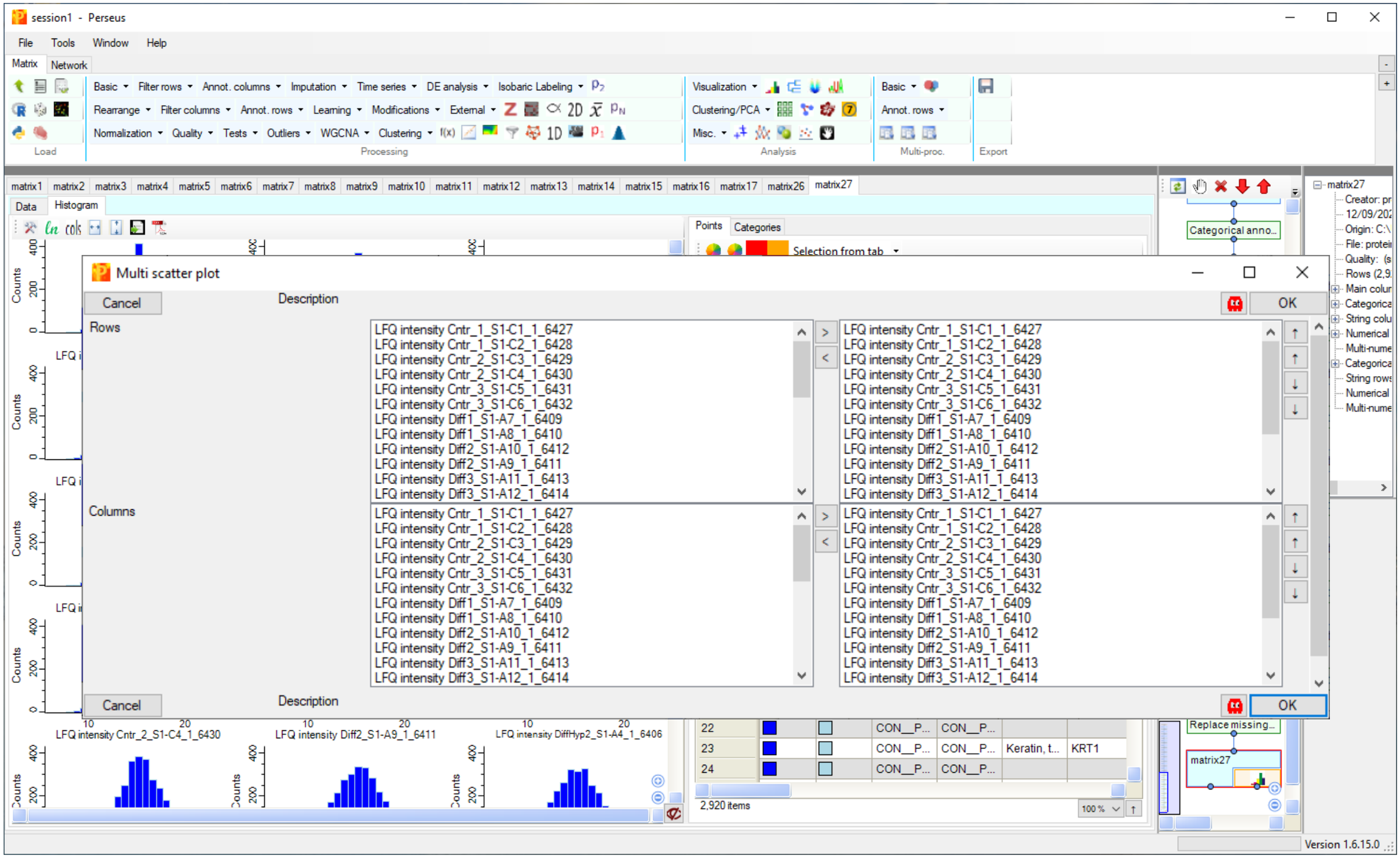
Perseus

Statistical Data Analysis - Data Quality : **Visualisation - Multi Scatter Plot**



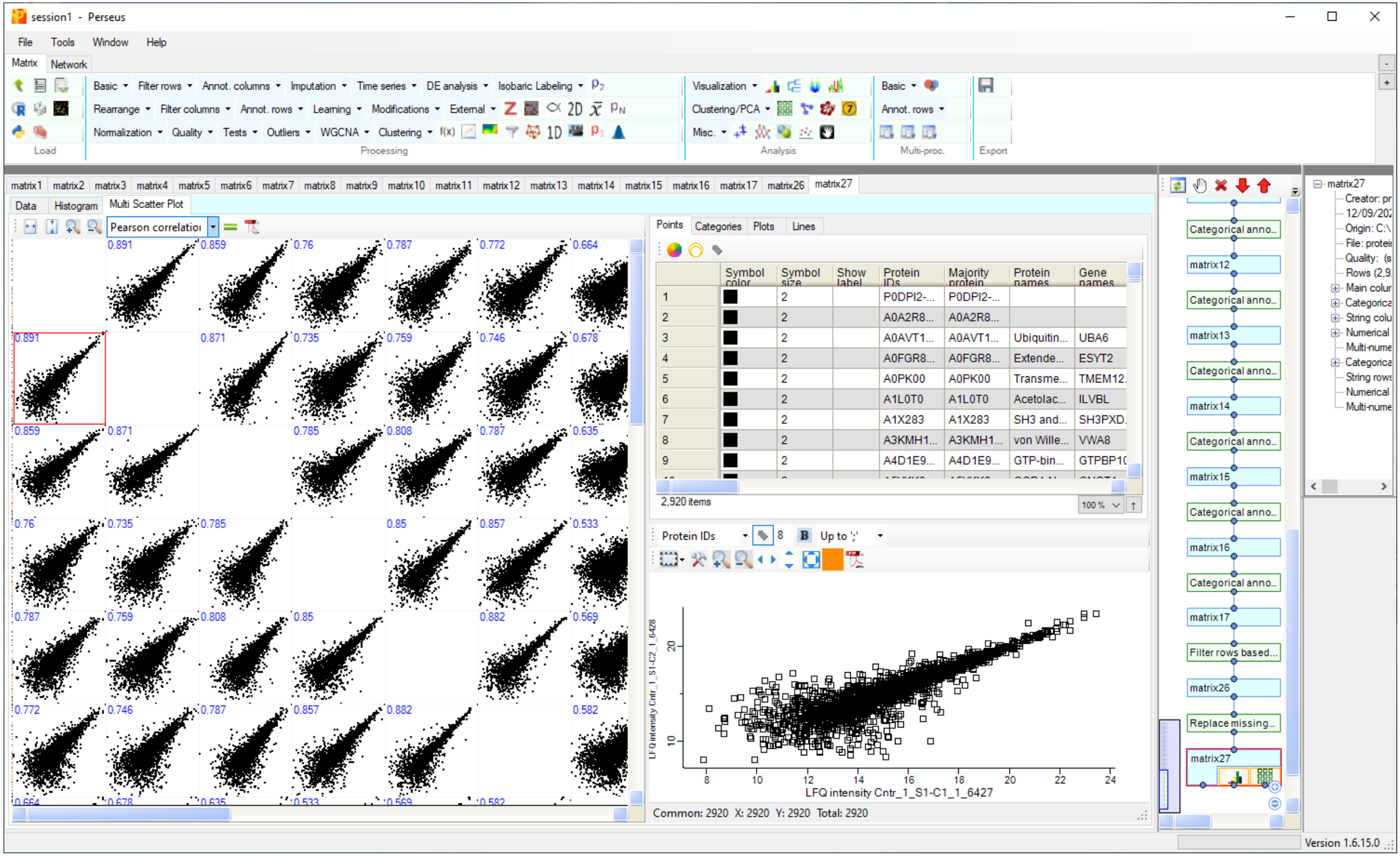
Perseus

Statistical Data Analysis - Data Quality : **Visualisation - Multi Scatter Plot**



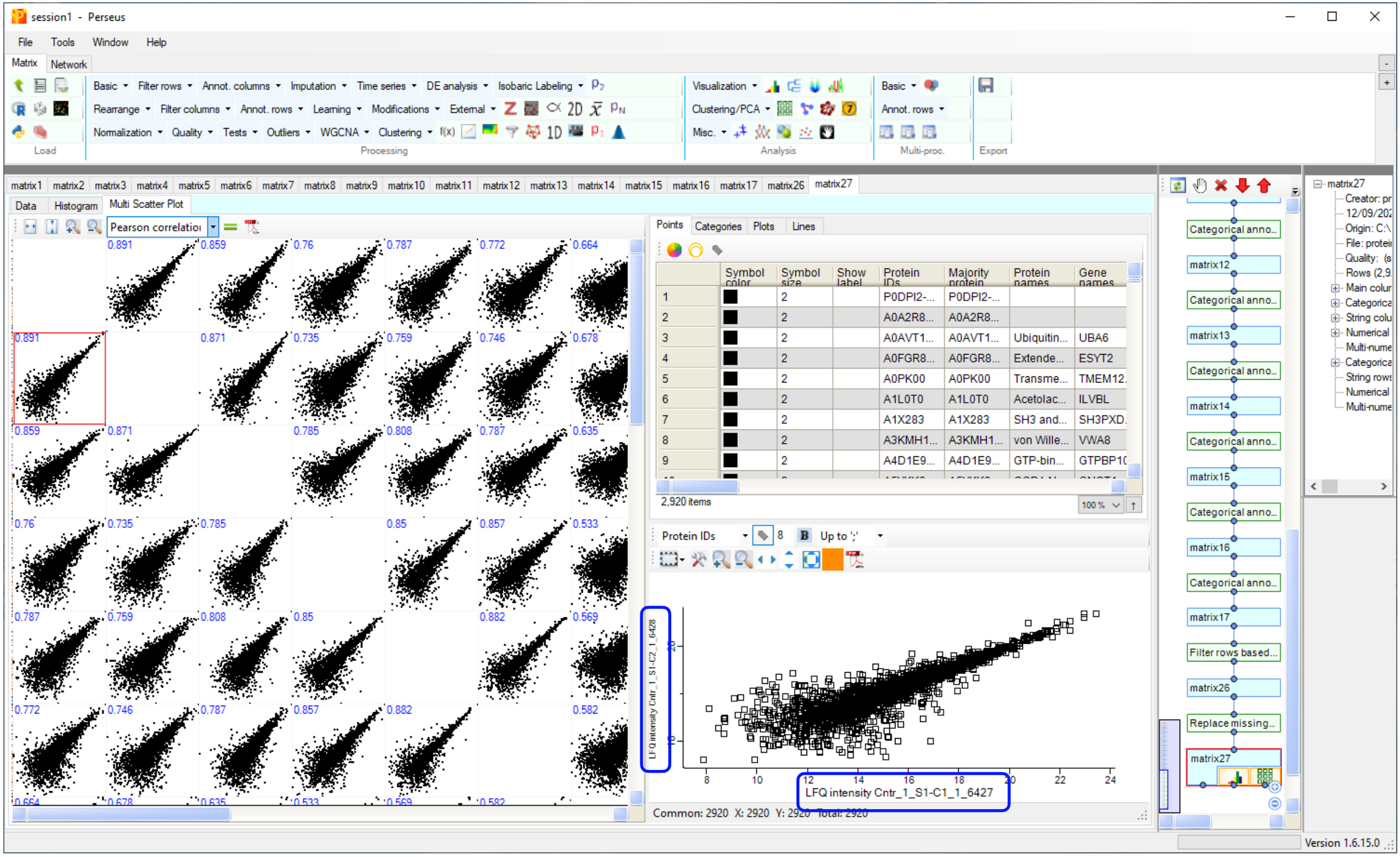
Perseus

Statistical Data Analysis - Data Quality : **Visualisation - Multi Scatter Plot**



Perseus

Statistical Data Analysis - Data Quality : **Visualisation - Multi Scatter Plot**



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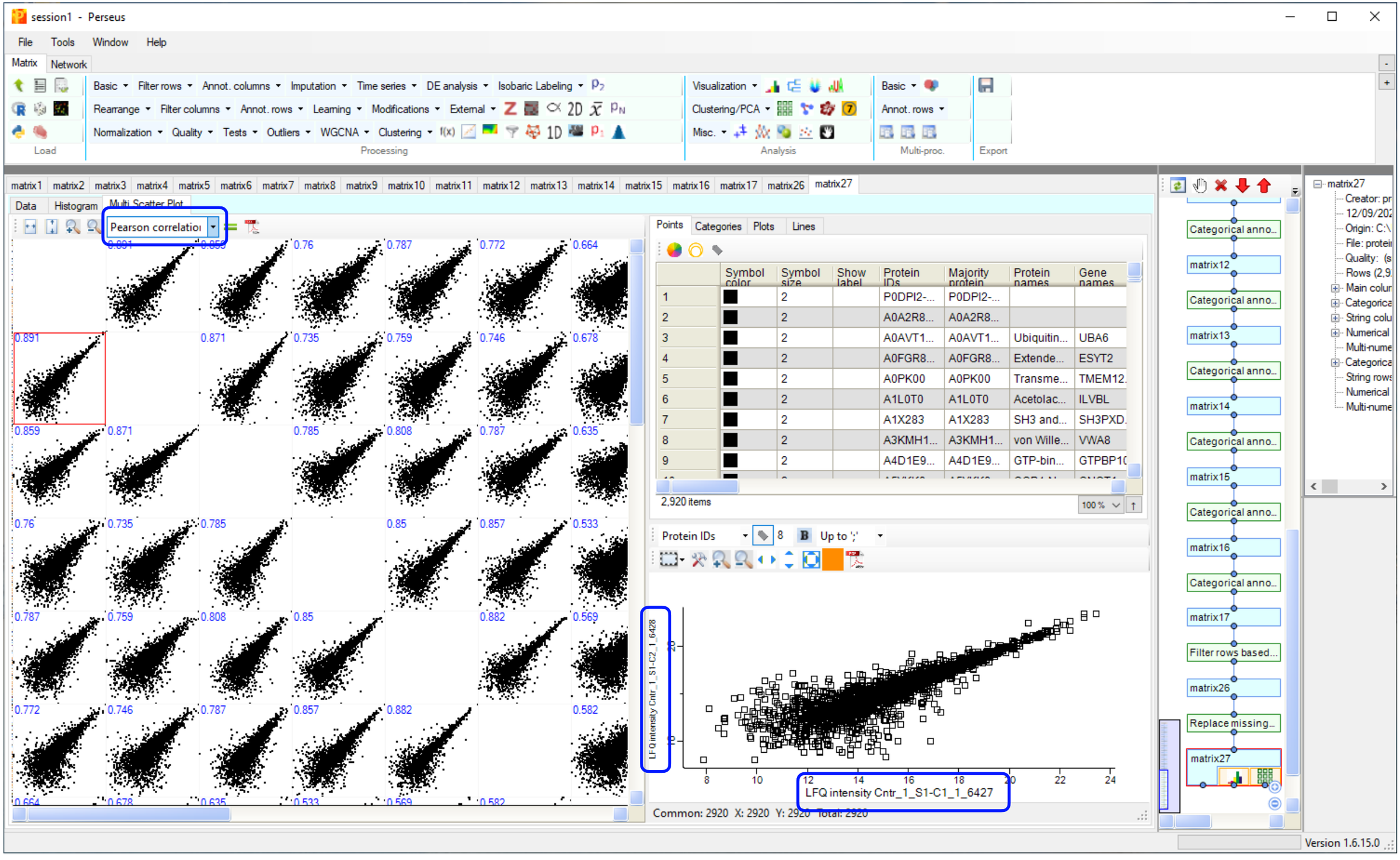
Statistical Data Analysis - Data Quality : **Visualisation - Multi Scatter Plot**



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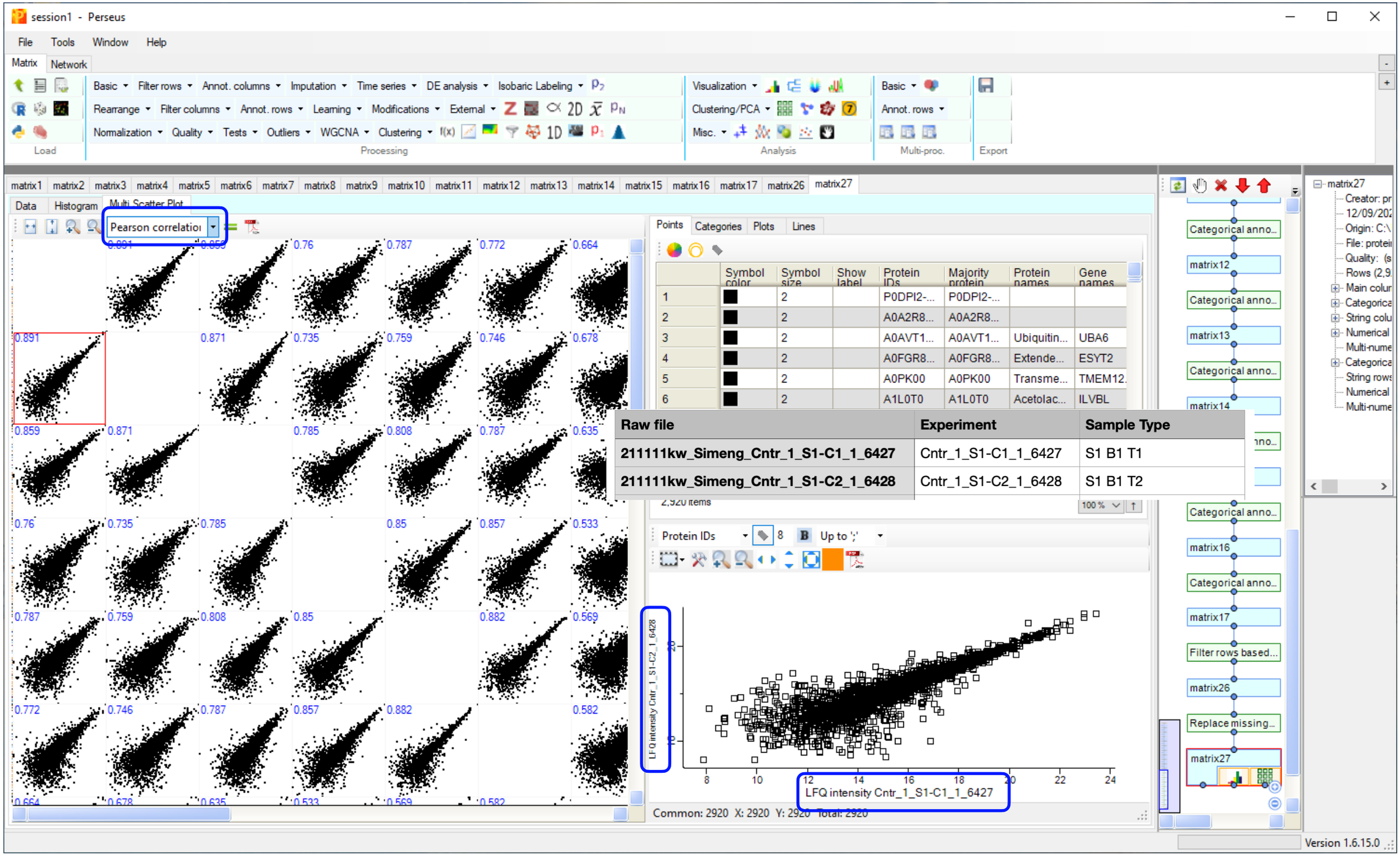
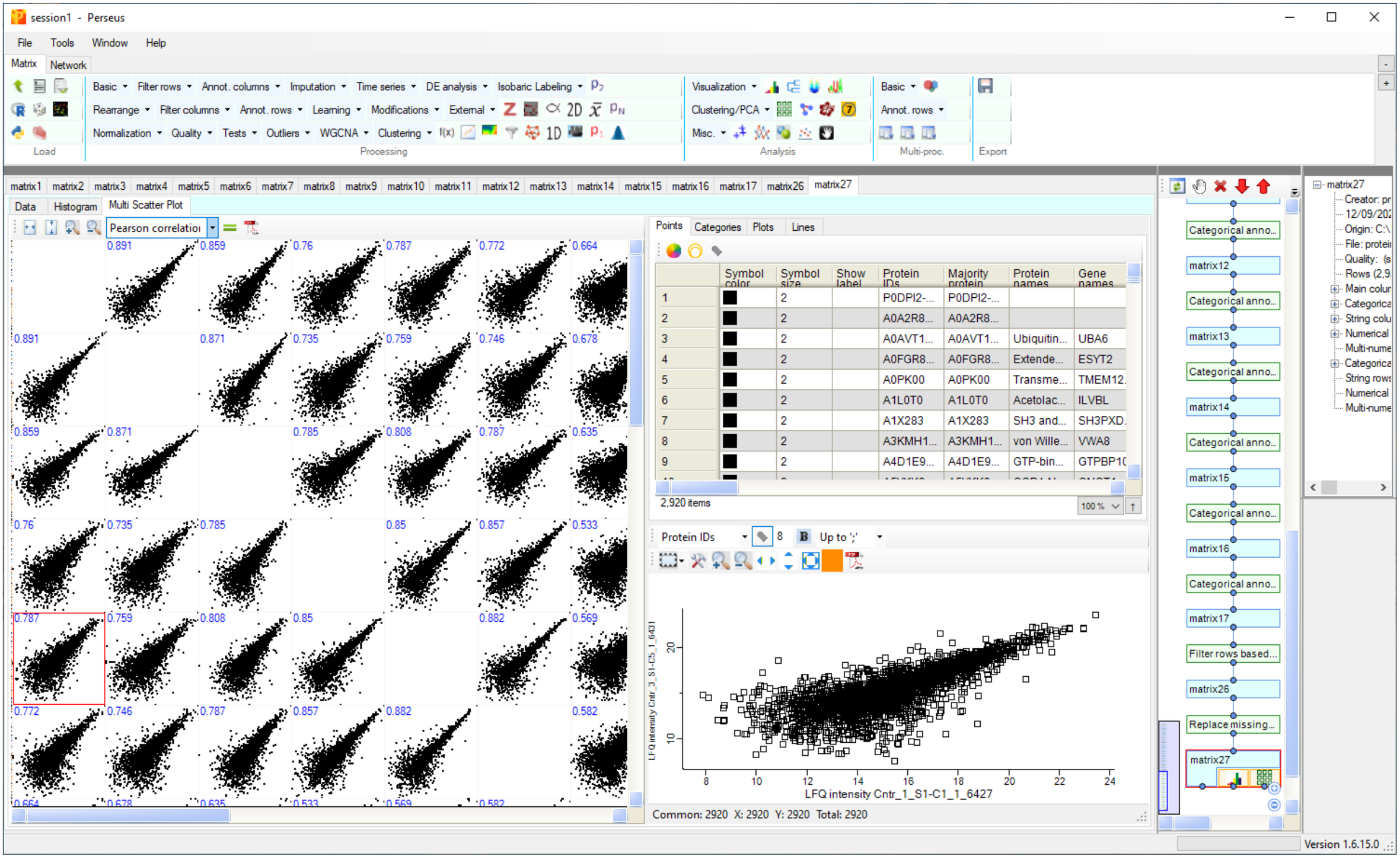
Statistical Data Analysis - Data Quality : **Visualisation - Multi Scatter Plot**



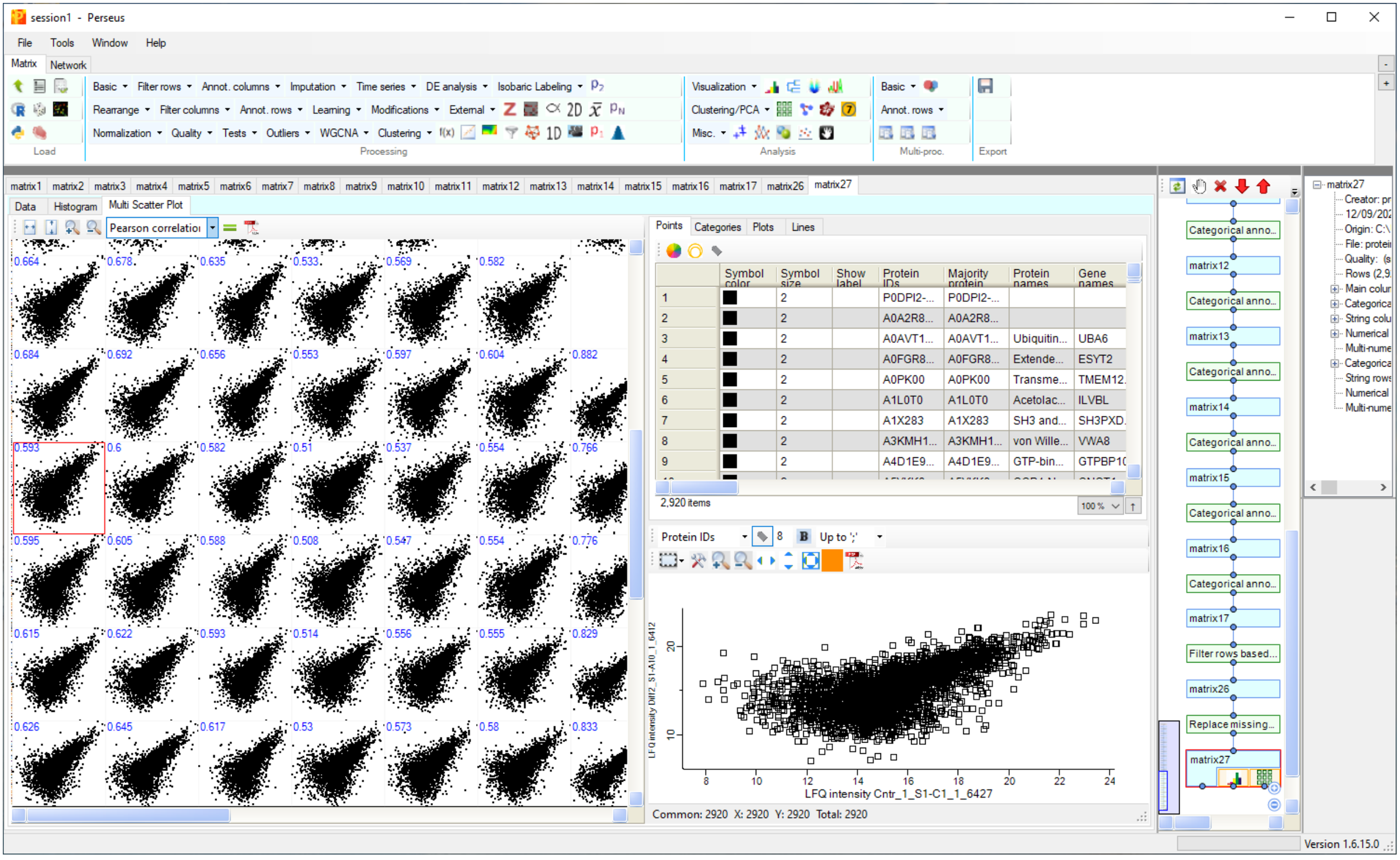
Perseus

Statistical Data Analysis - Data Quality : **Visualisation - Multi Scatter Plot**



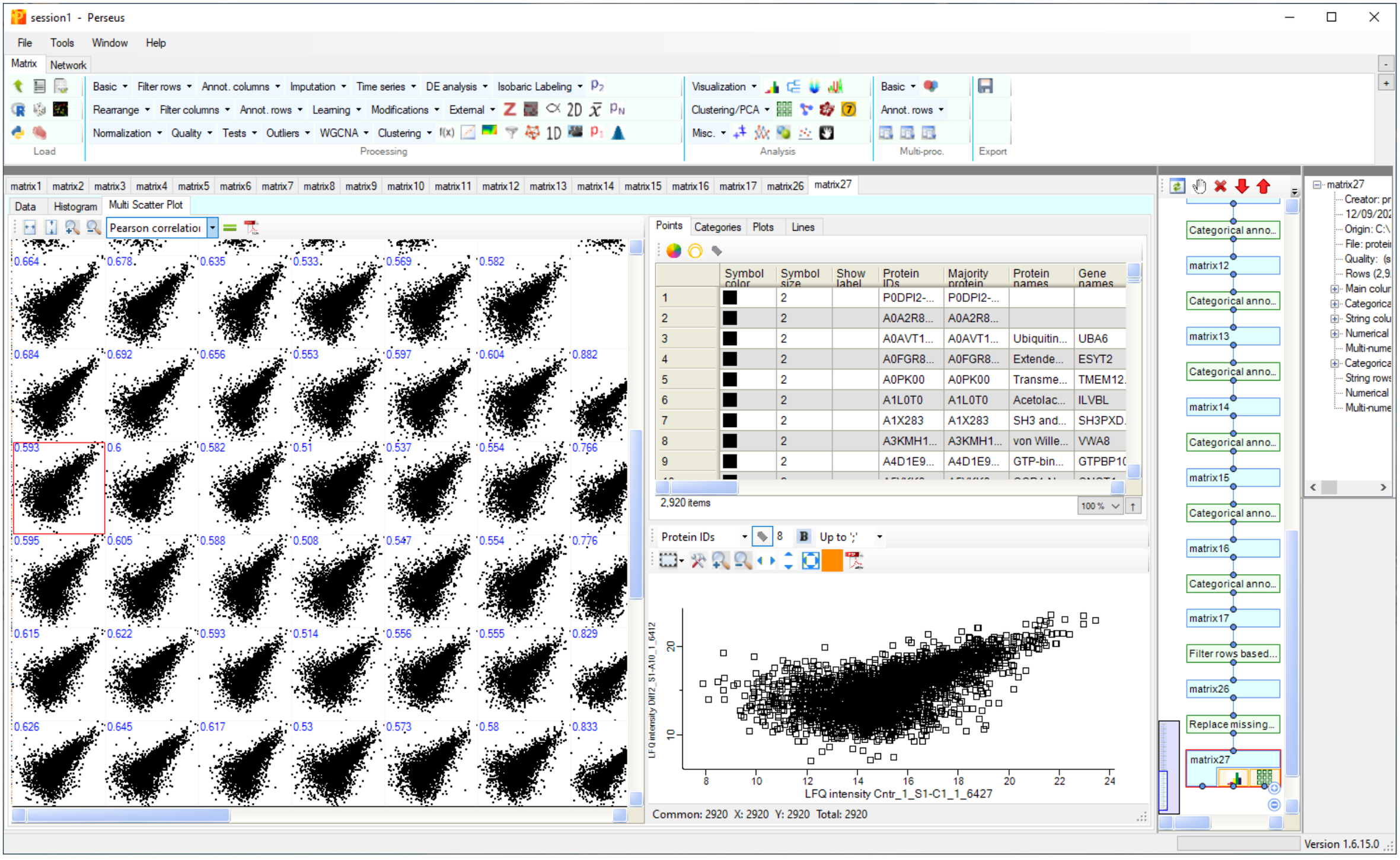
Perseus

Statistical Data Analysis - Data Quality : **Visualisation - Multi Scatter Plot**



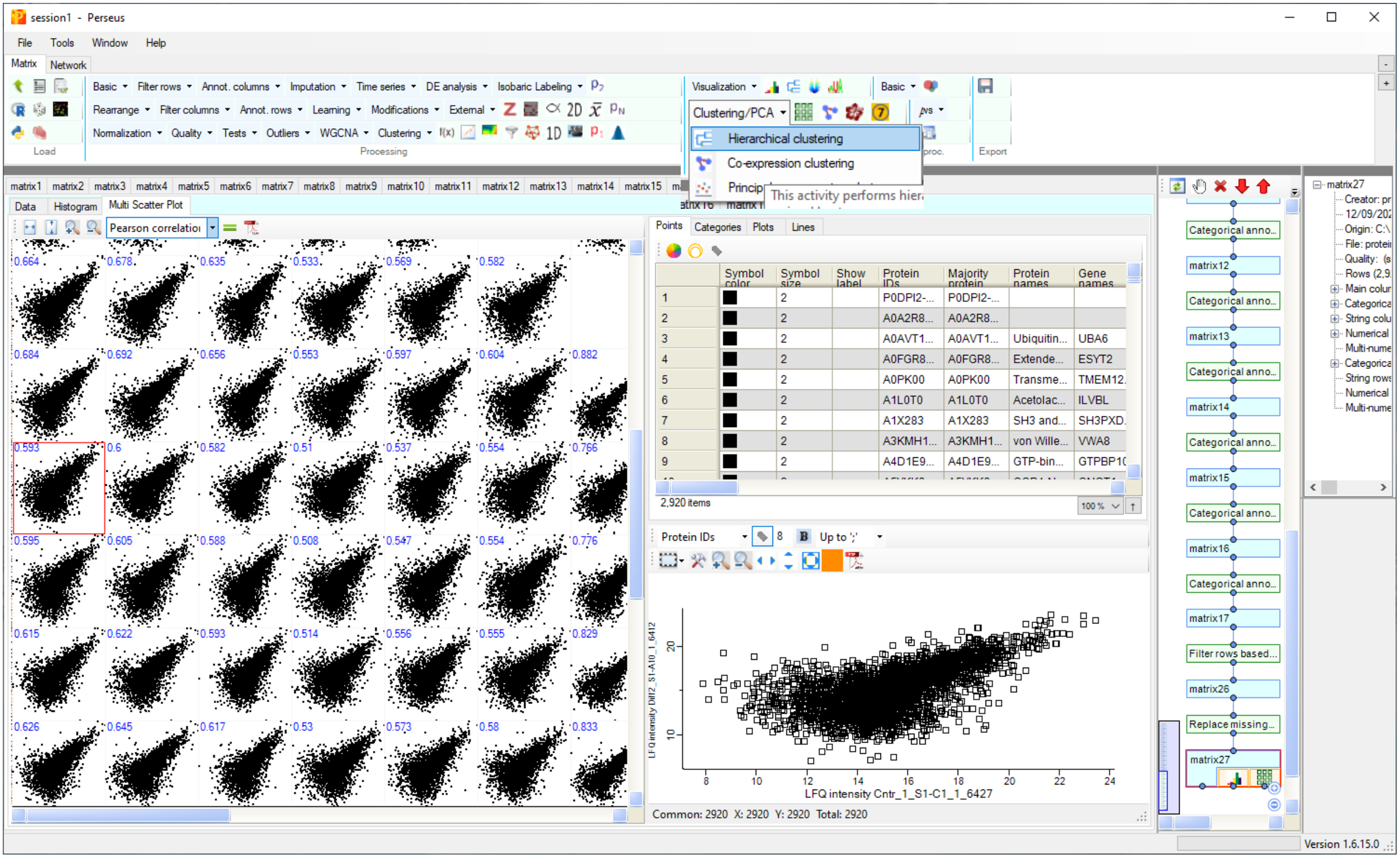
Perseus

Statistical Data Analysis - Data Quality : **Clustering/PCA - Hierarchical Cluster**



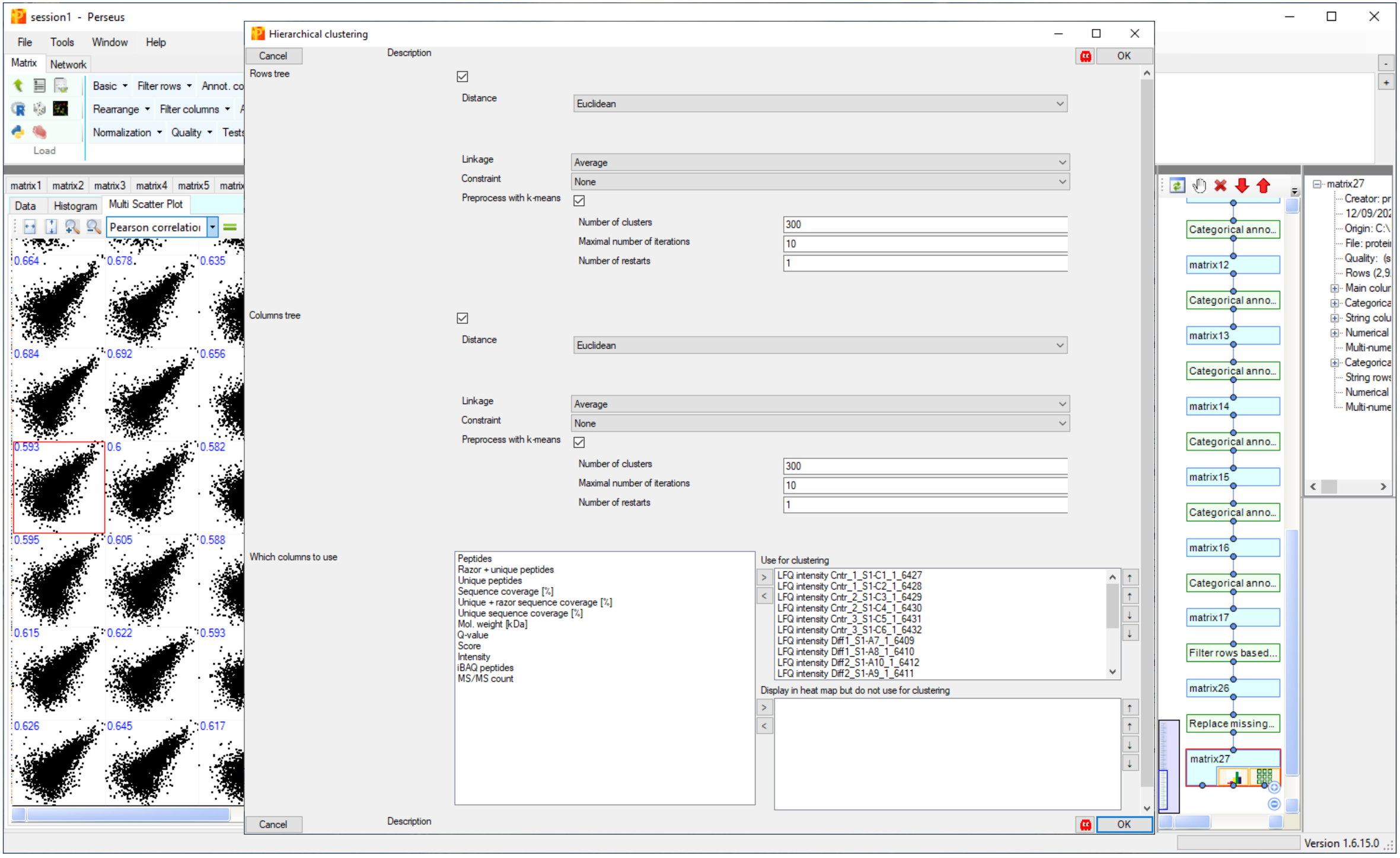
Perseus

Statistical Data Analysis - Data Quality : **Clustering/PCA - Hierarchical Cluster**



Perseus

Statistical Data Analysis - Data Quality : **Clustering/PCA - Hierarchical Cluster**



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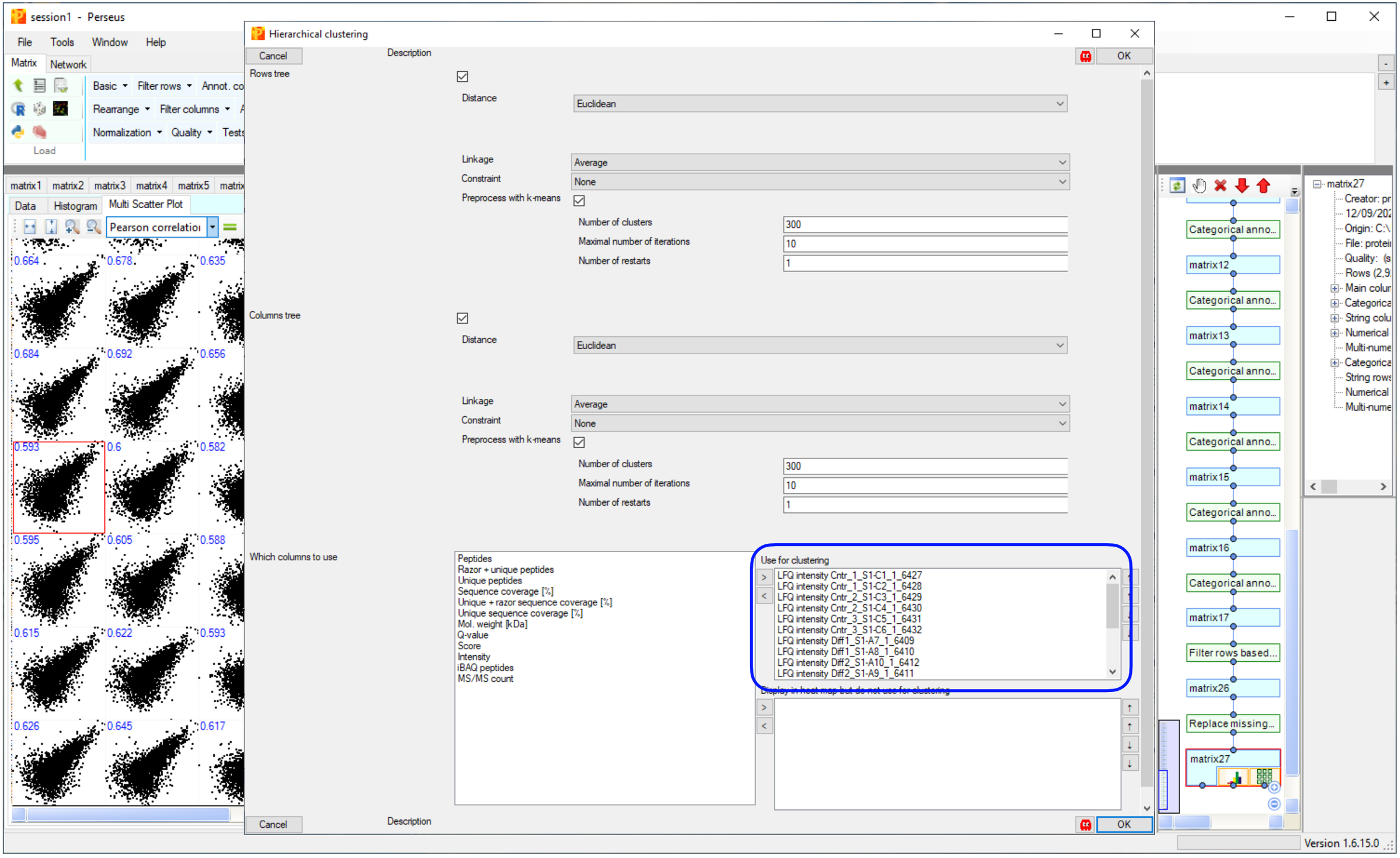
Statistical Data Analysis - Data Quality : **Clustering/PCA - Hierarchical Cluster**



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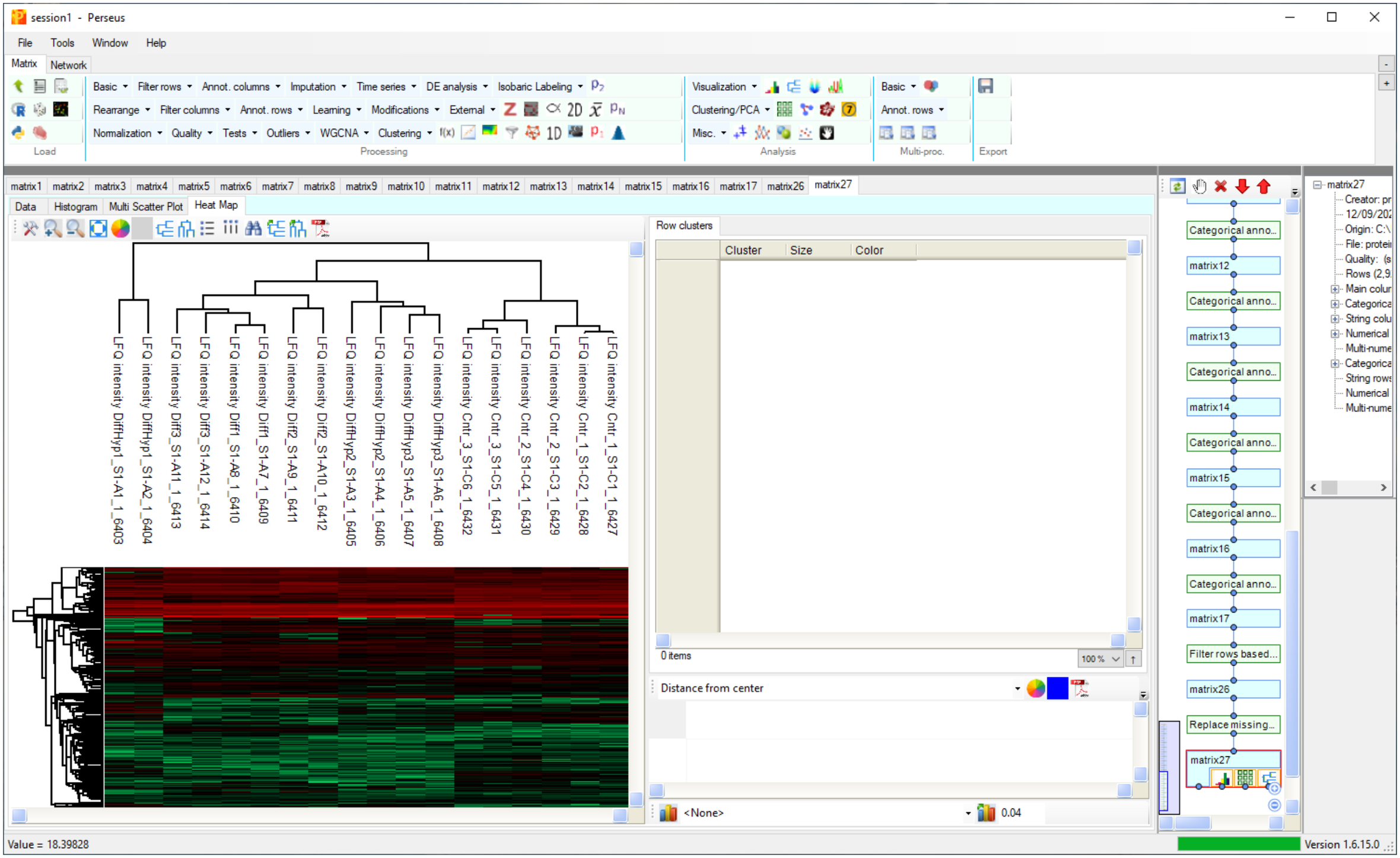
Statistical Data Analysis - Data Quality : **Clustering/PCA - Hierarchical Cluster**



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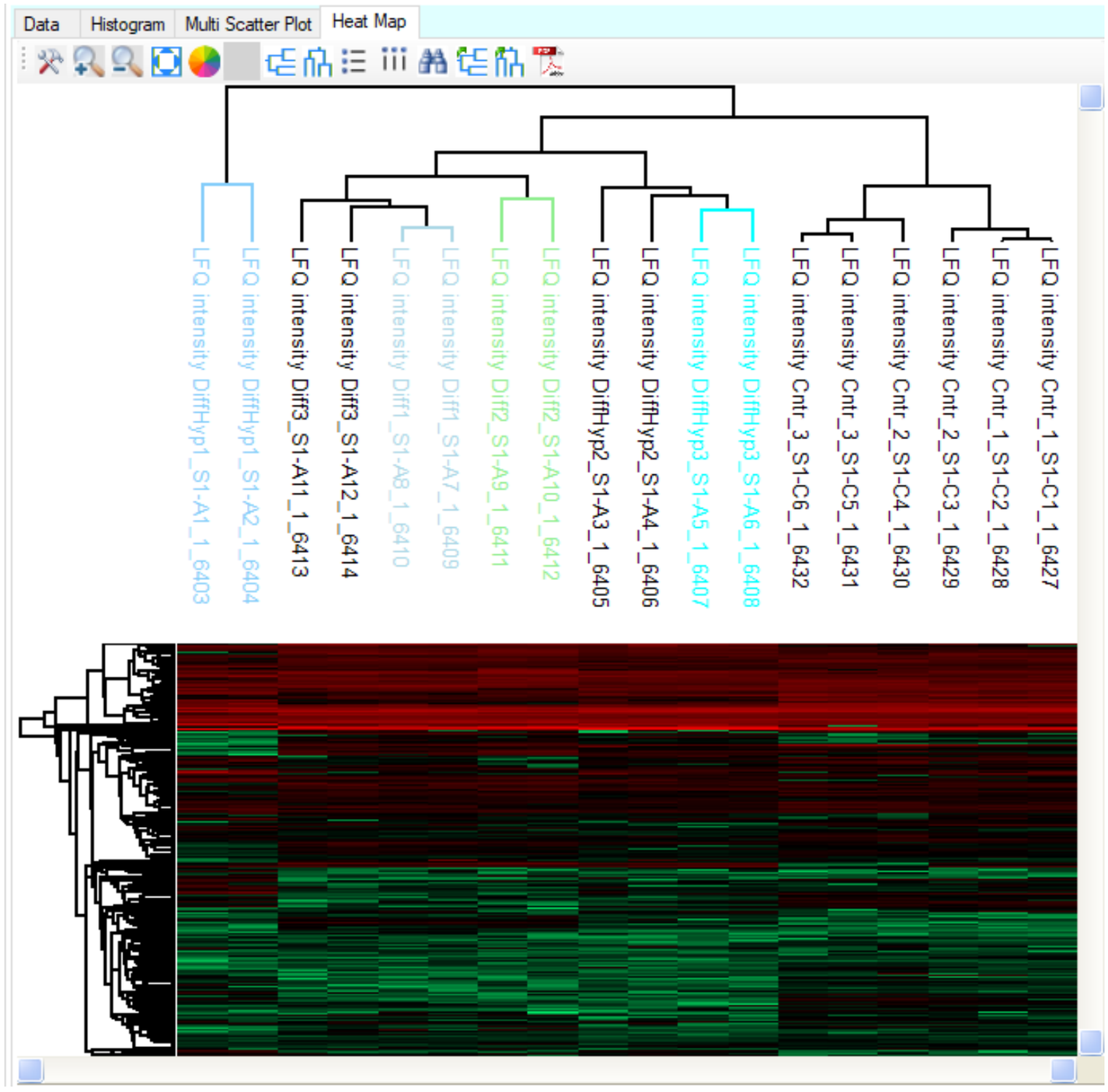
Statistical Data Analysis - Data Quality : **Clustering/PCA - Hierarchical Cluster**



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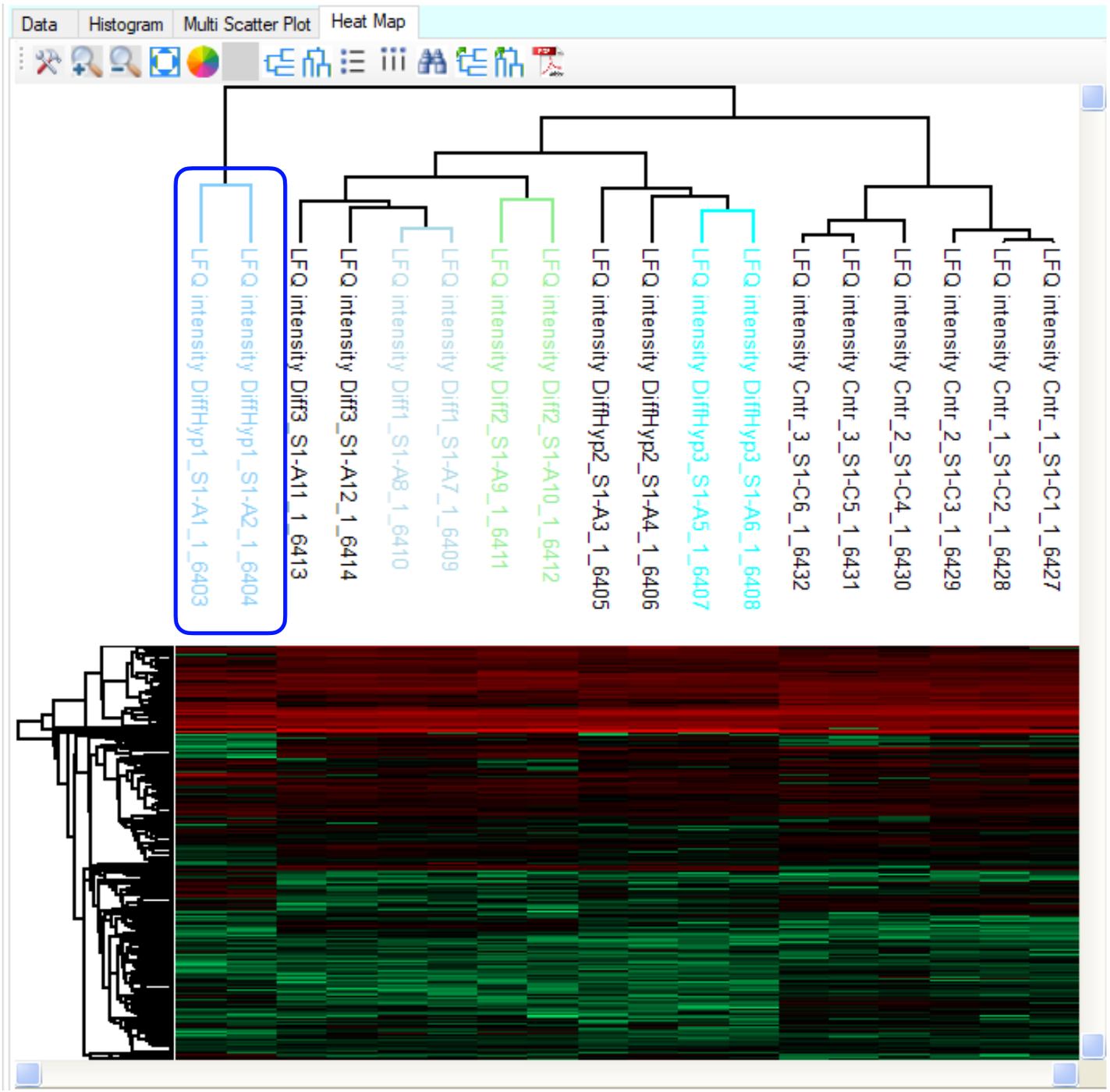
Statistical Data Analysis - Data Quality : **Clustering/PCA - Hierarchical Cluster**



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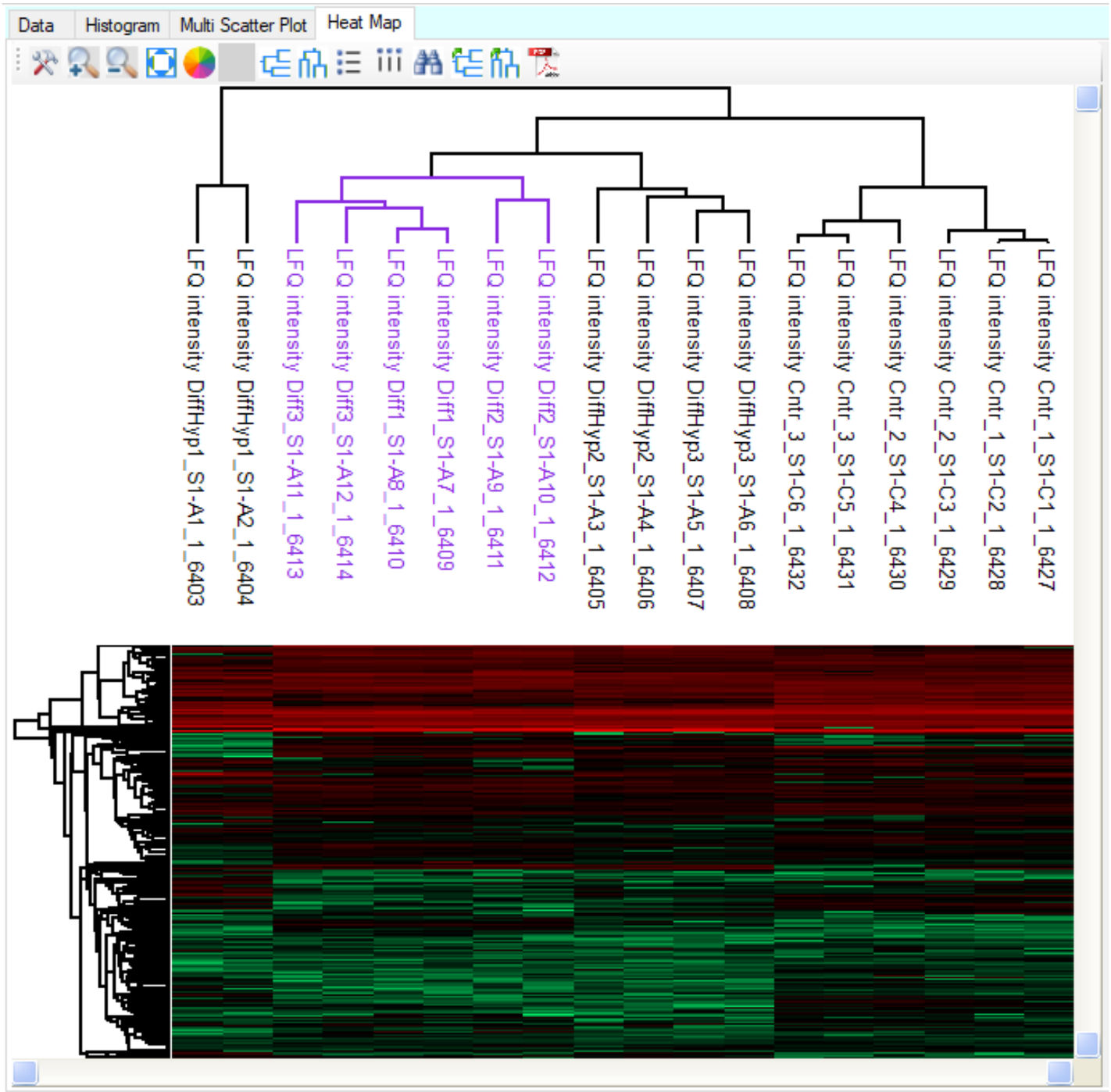
Statistical Data Analysis - Data Quality : **Clustering/PCA - Hierarchical Cluster**



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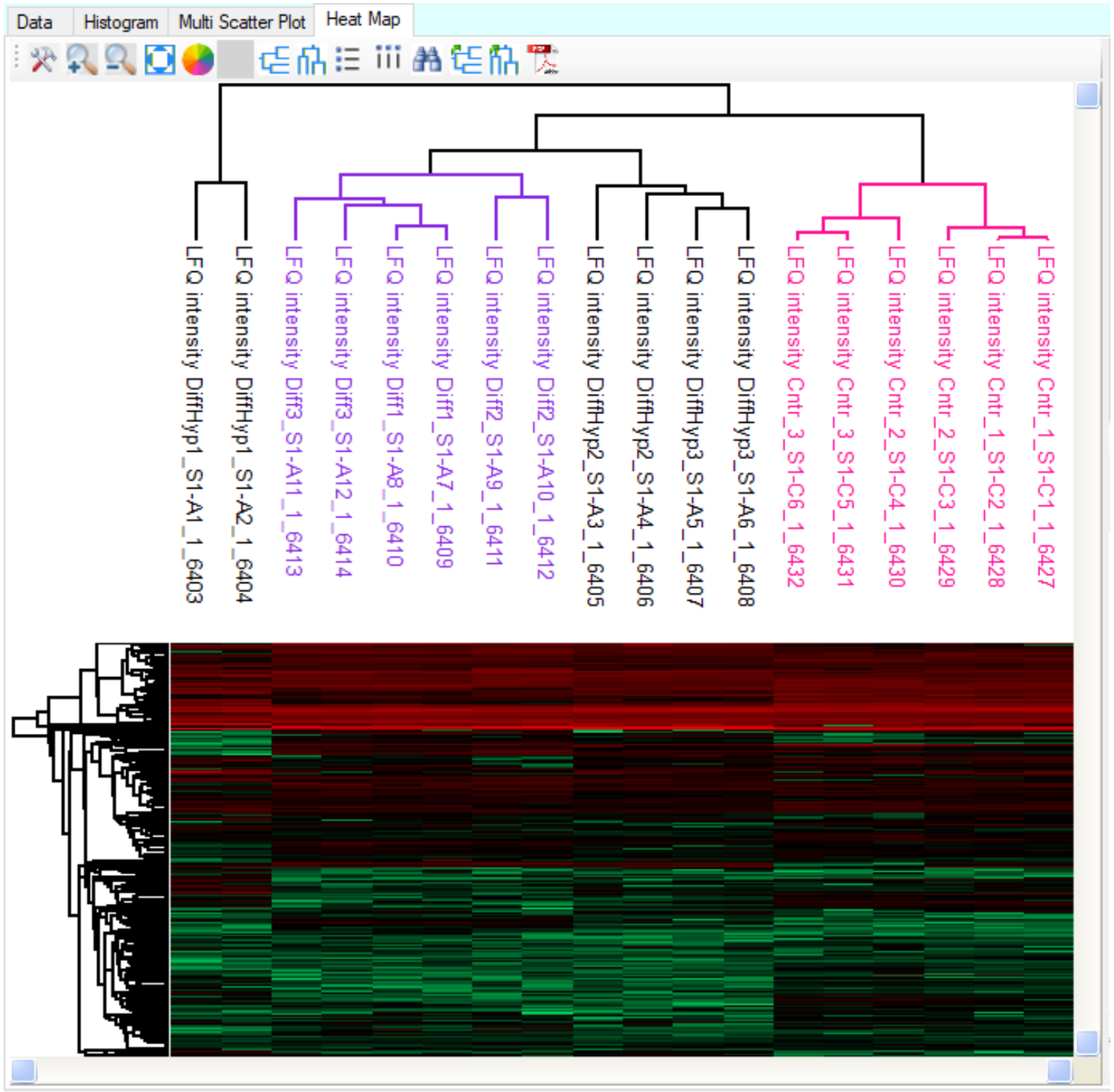
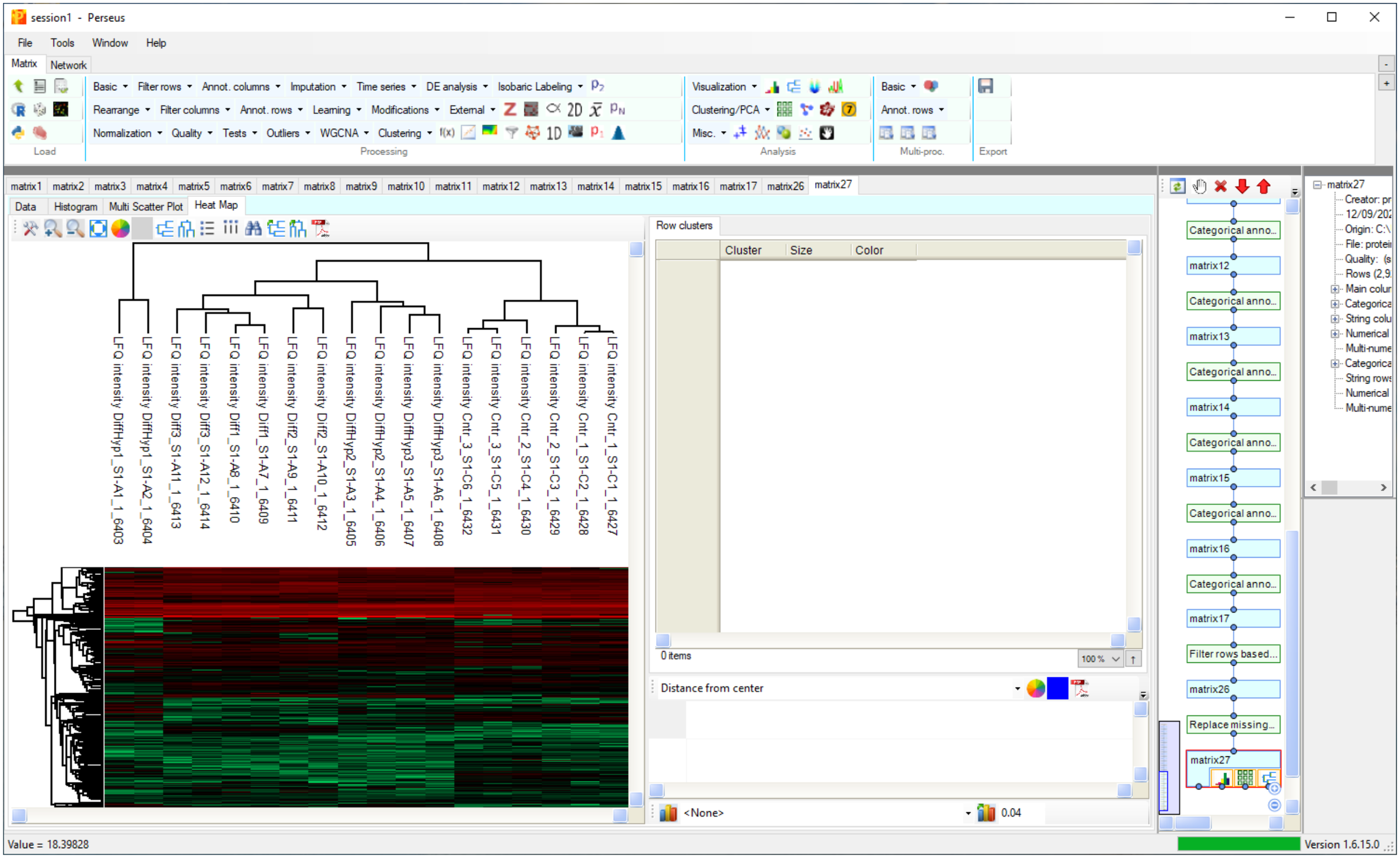
Statistical Data Analysis - Data Quality : **Clustering/PCA - Hierarchical Cluster**



Perseus

Statistical Data Analysis - Data Quality : **Clustering/PCA - Principal Component Analysis**



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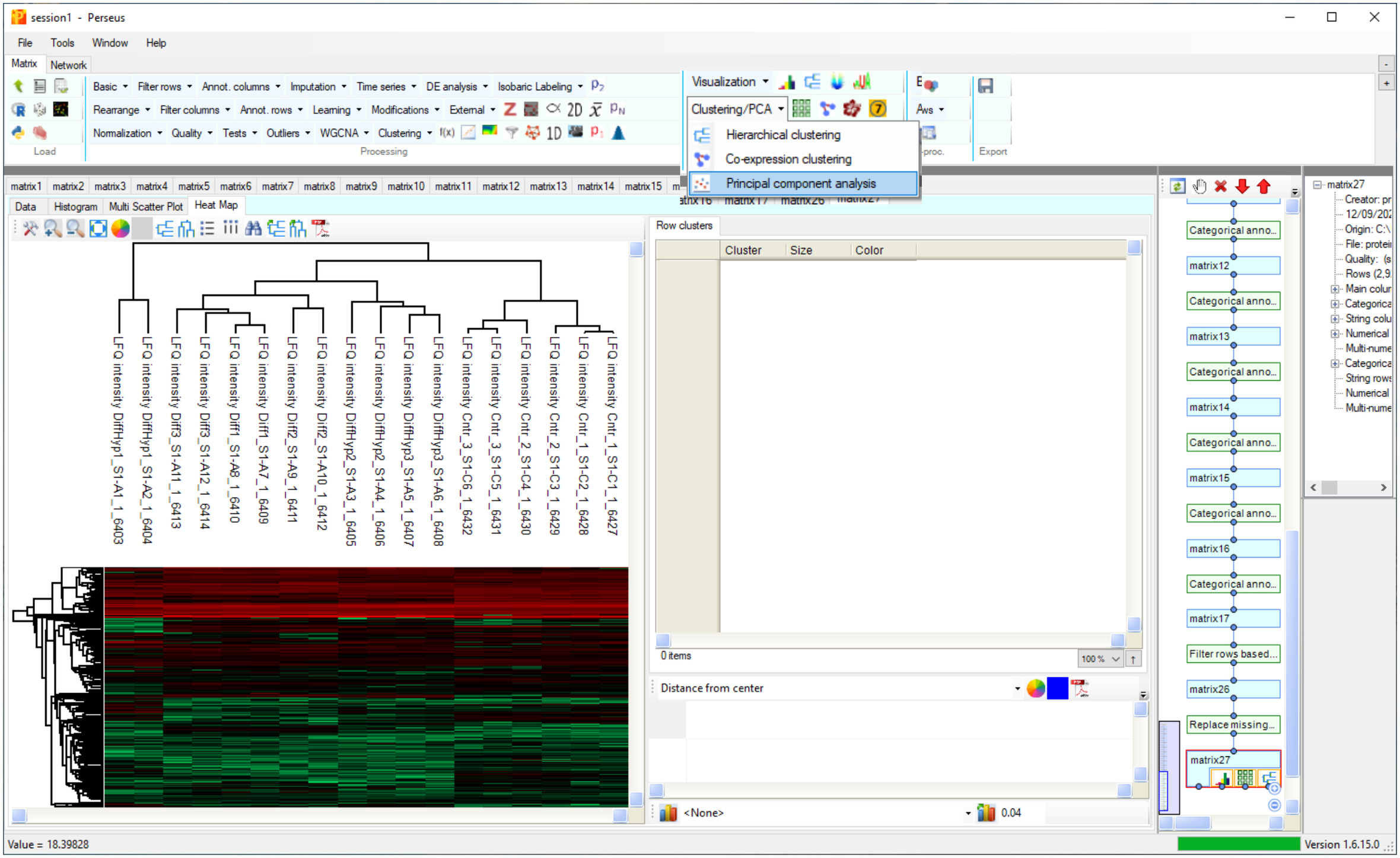
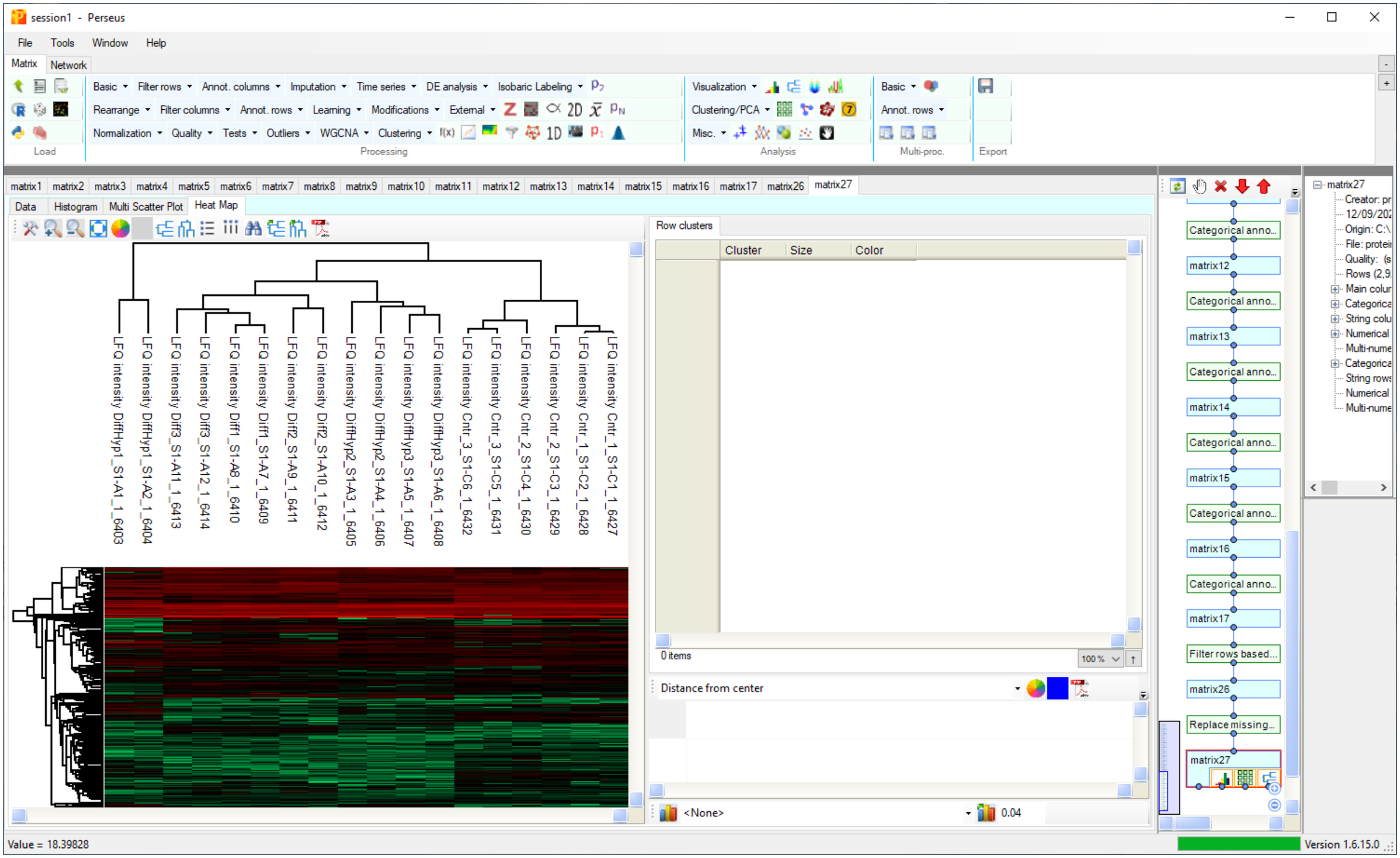
Statistical Data Analysis - Data Quality : **Clustering/PCA - Principal Component Analysis**



Perseus

Statistical Data Analysis - Data Quality : **Clustering/PCA - Principal Component Analysis**



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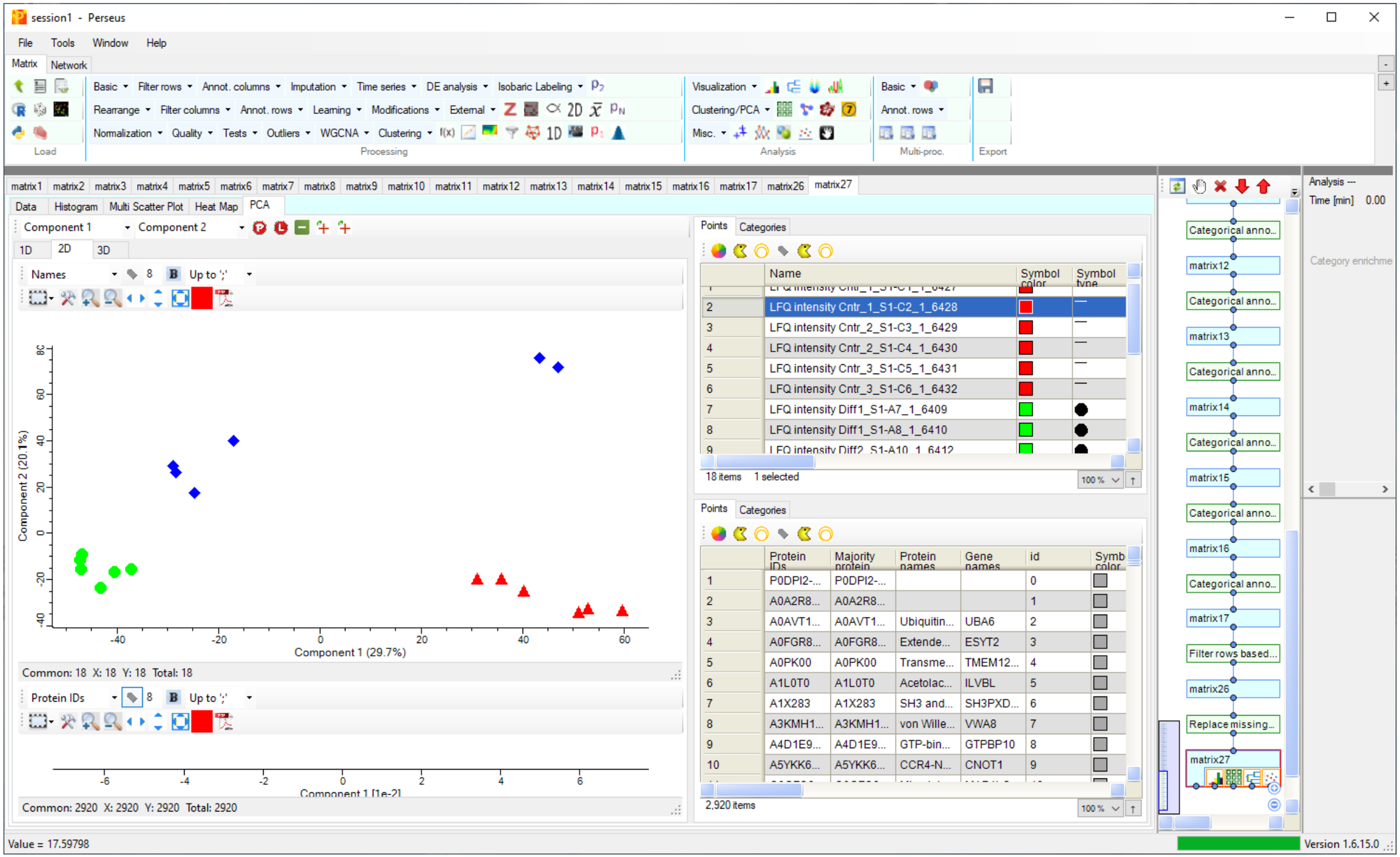
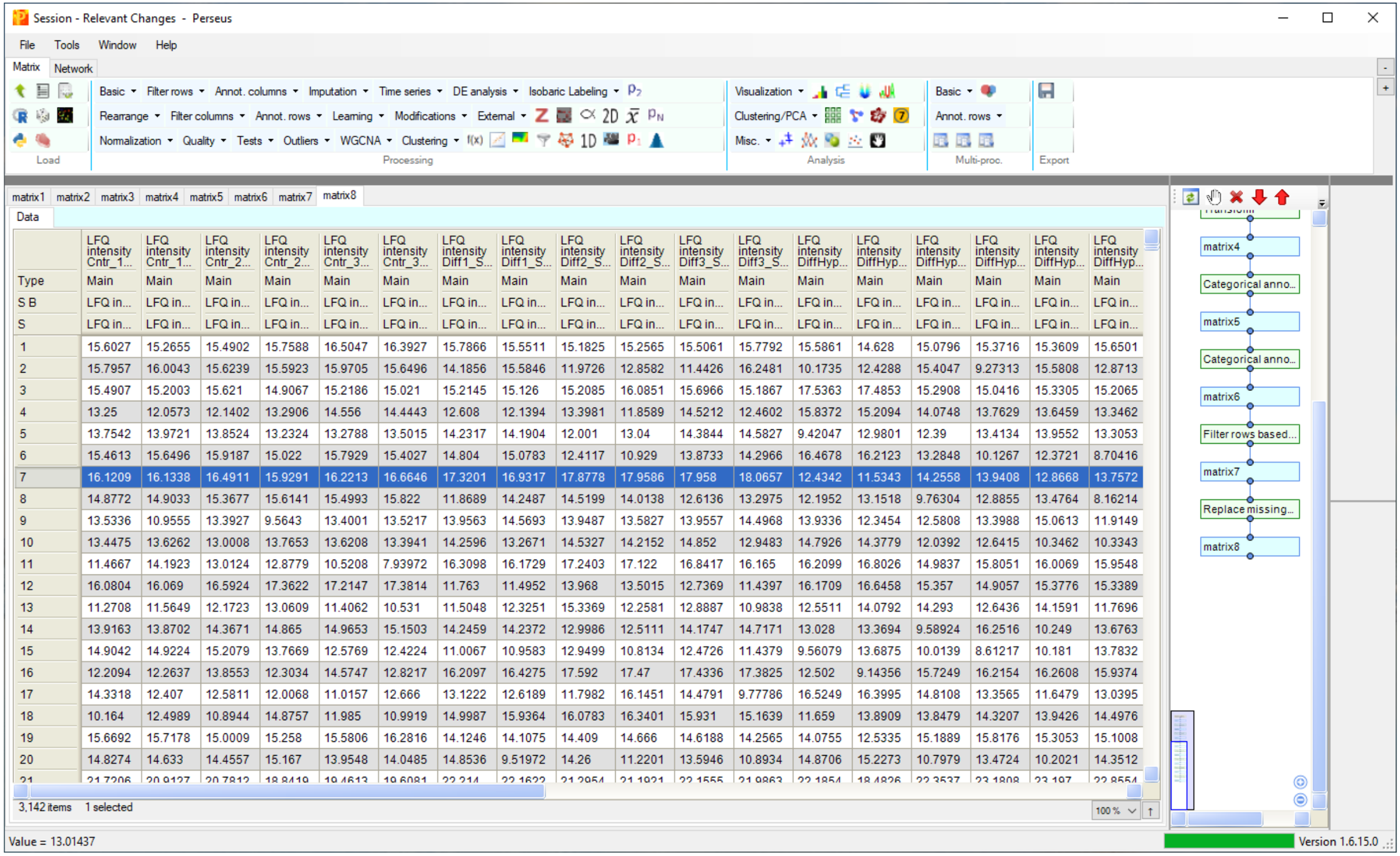
Statistical Data Analysis - Data Quality : **Clustering/PCA - Principal Component Analysis**



Perseus

Statistical Data Analysis - Enrichment Test : t-Test

Processing > Tests > Two samples tests



Perseus

Statistical Data Analysis - Enrichment Test : t-Test

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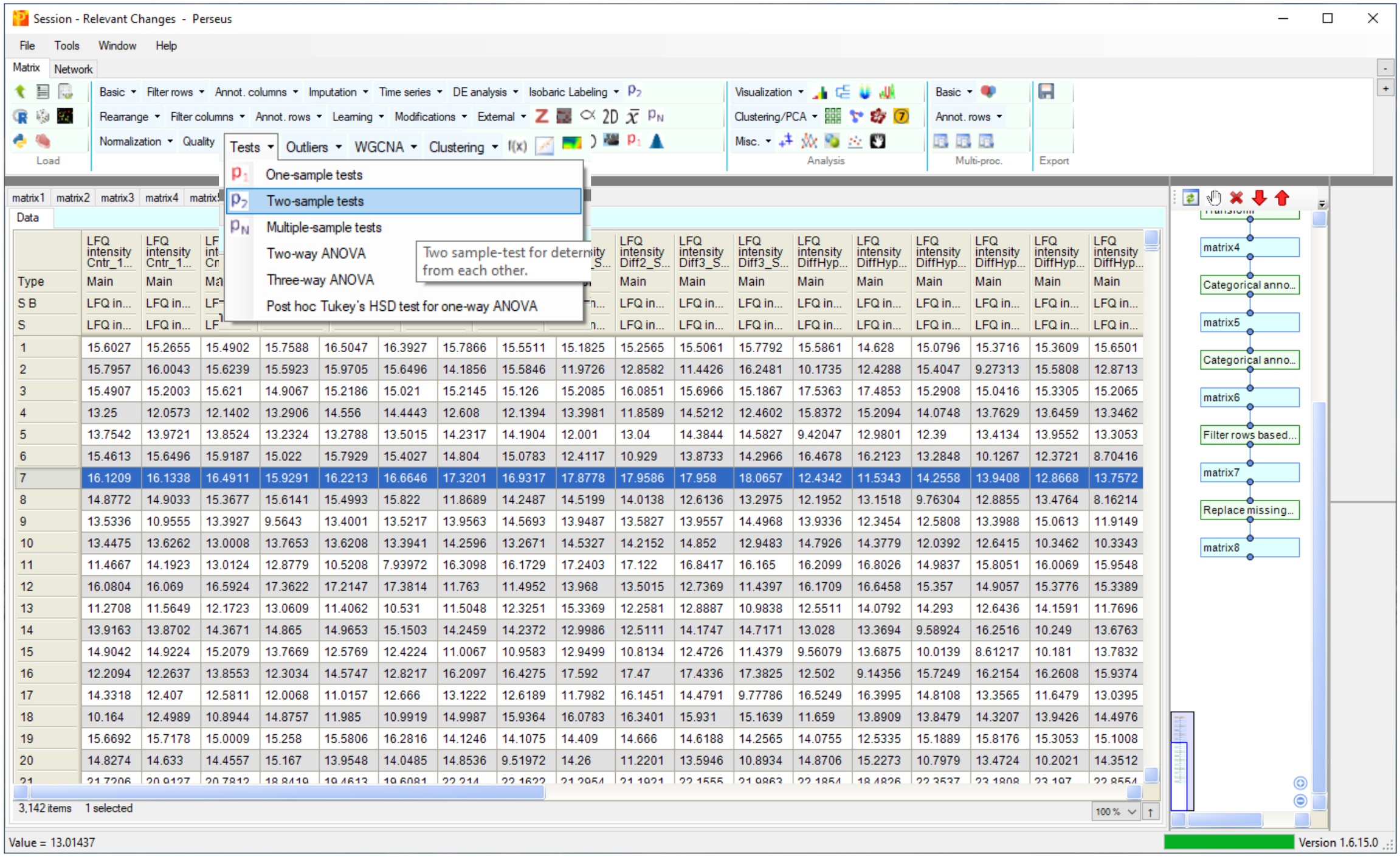
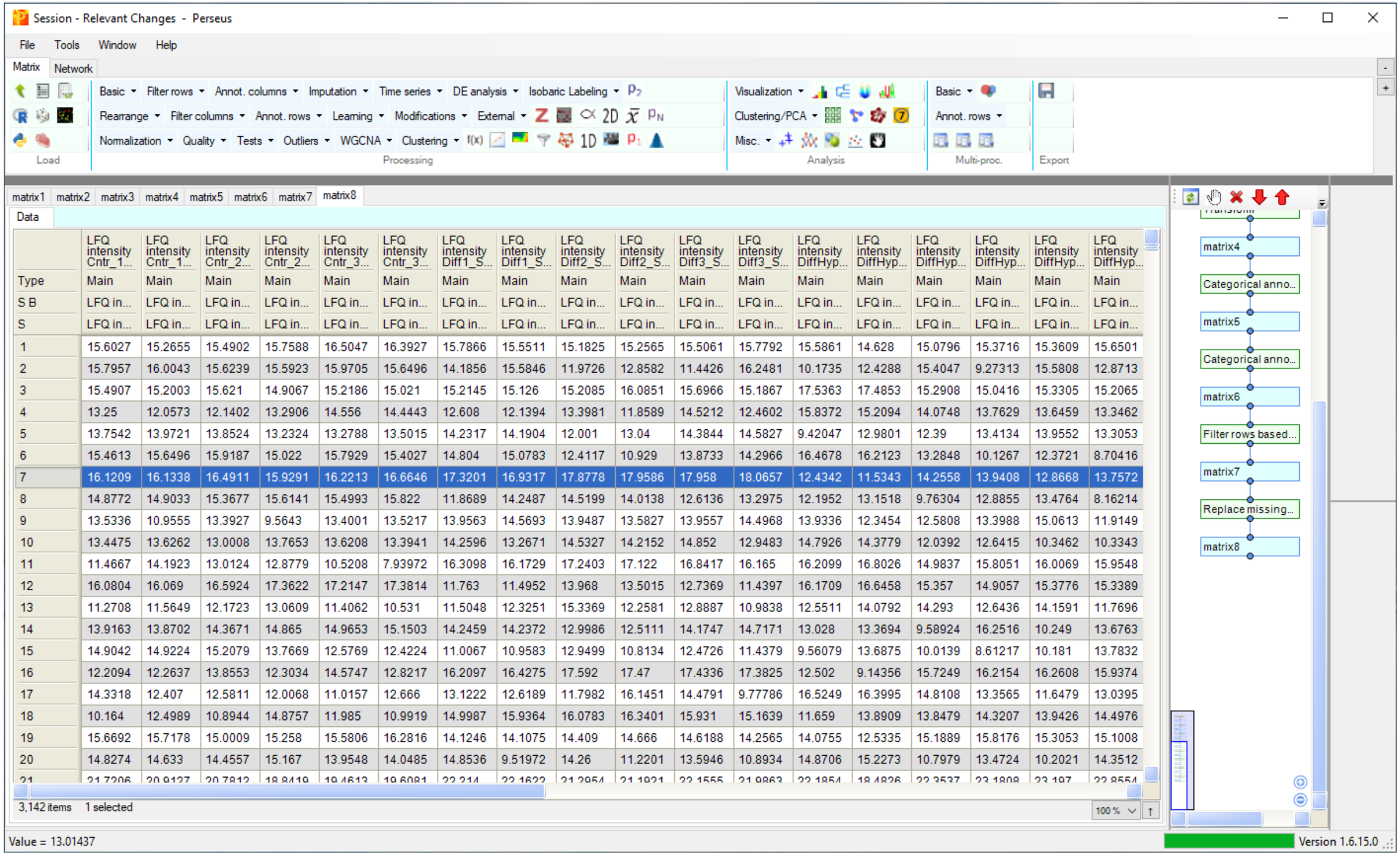


Perseus

Statistical Data Analysis - Enrichment Test : t-Test

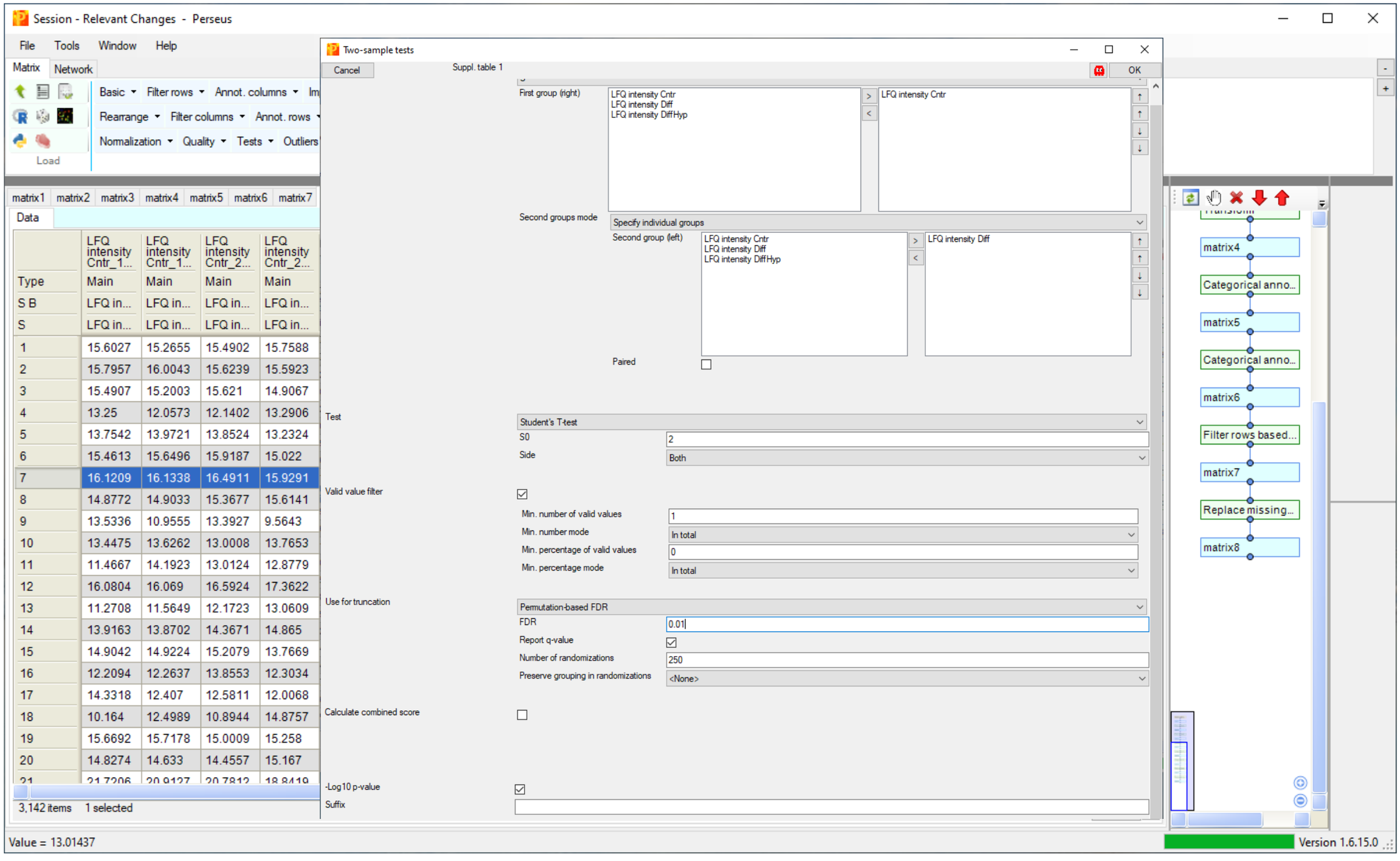
Processing > Tests > Two samples tests



Perseus

Statistical Data Analysis - Enrichment Test : t-Test

Processing > Tests > Two samples tests



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Statistical Data Analysis - Enrichment Test : t-Test

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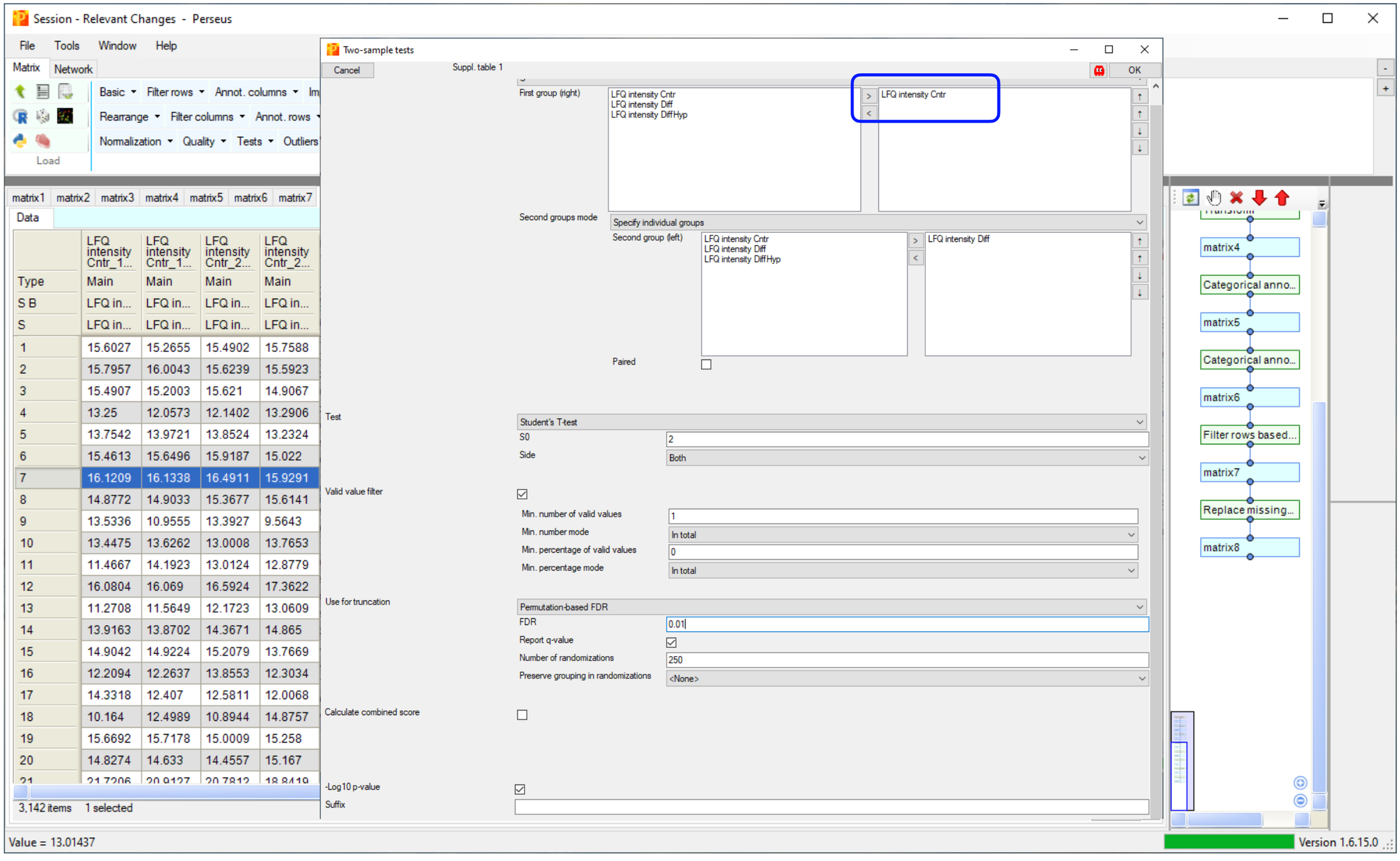

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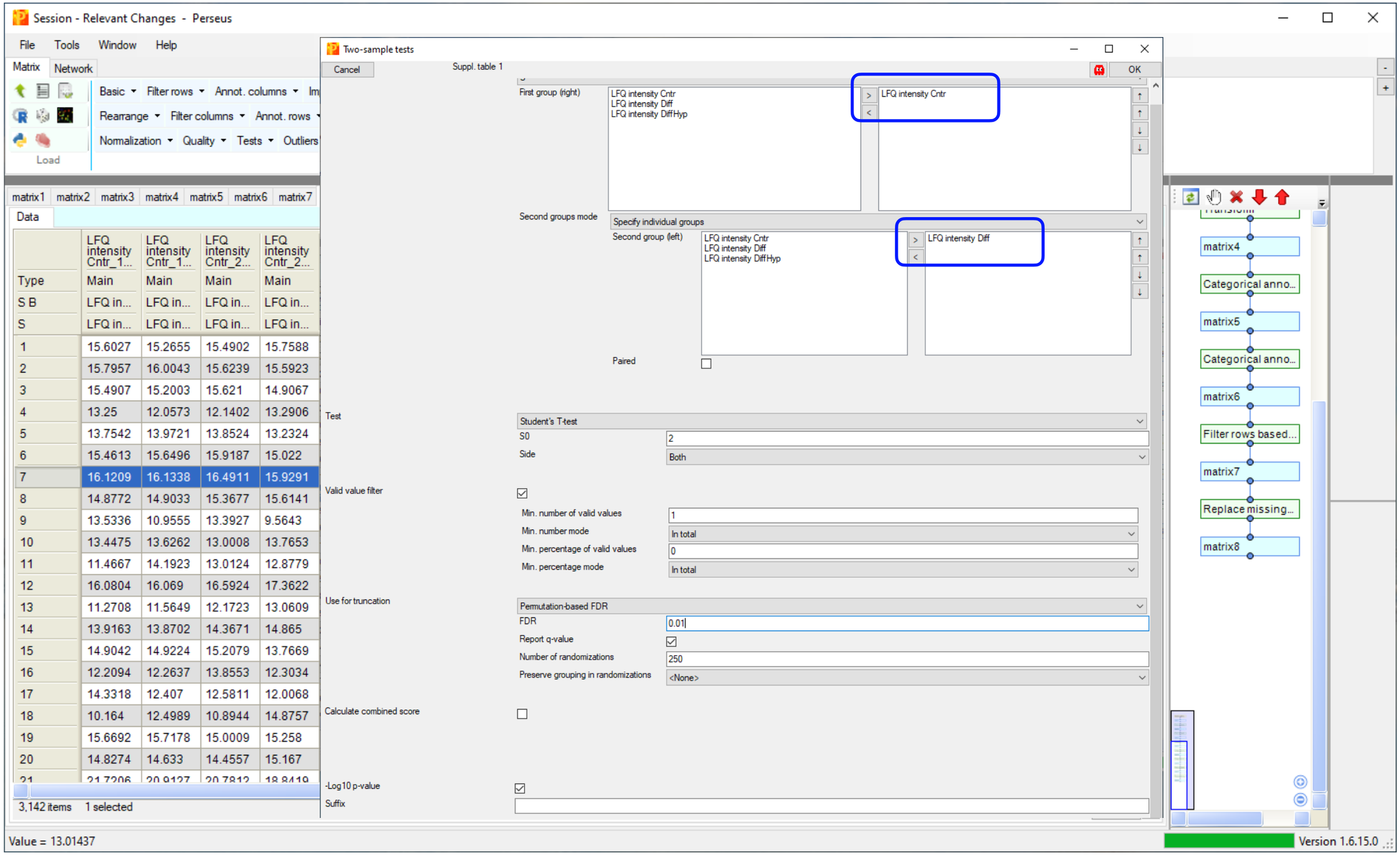
Statistical Data Analysis - Enrichment Test : t-Test

Processing > Tests > Two samples tests



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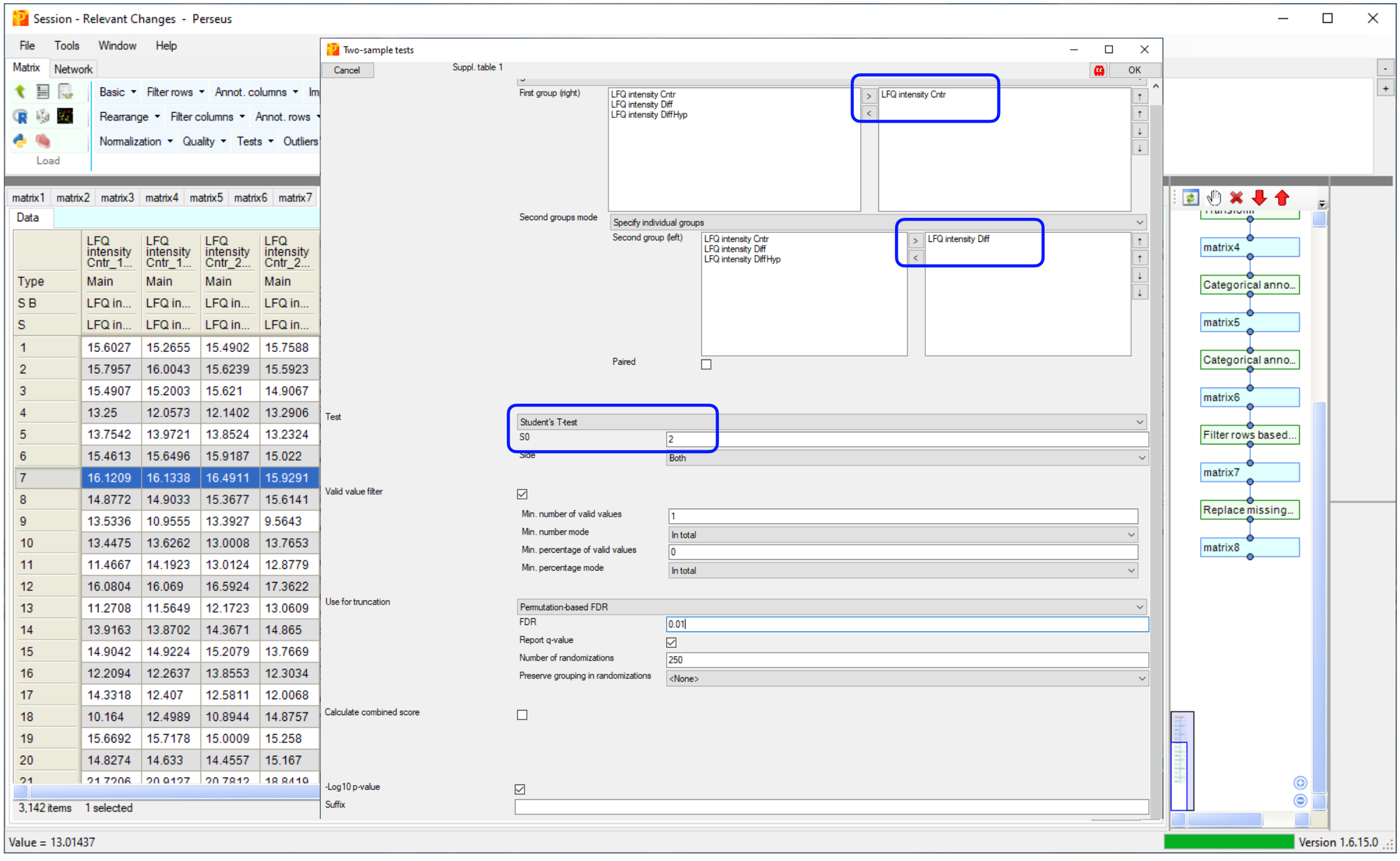
Statistical Data Analysis - Enrichment Test : t-Test

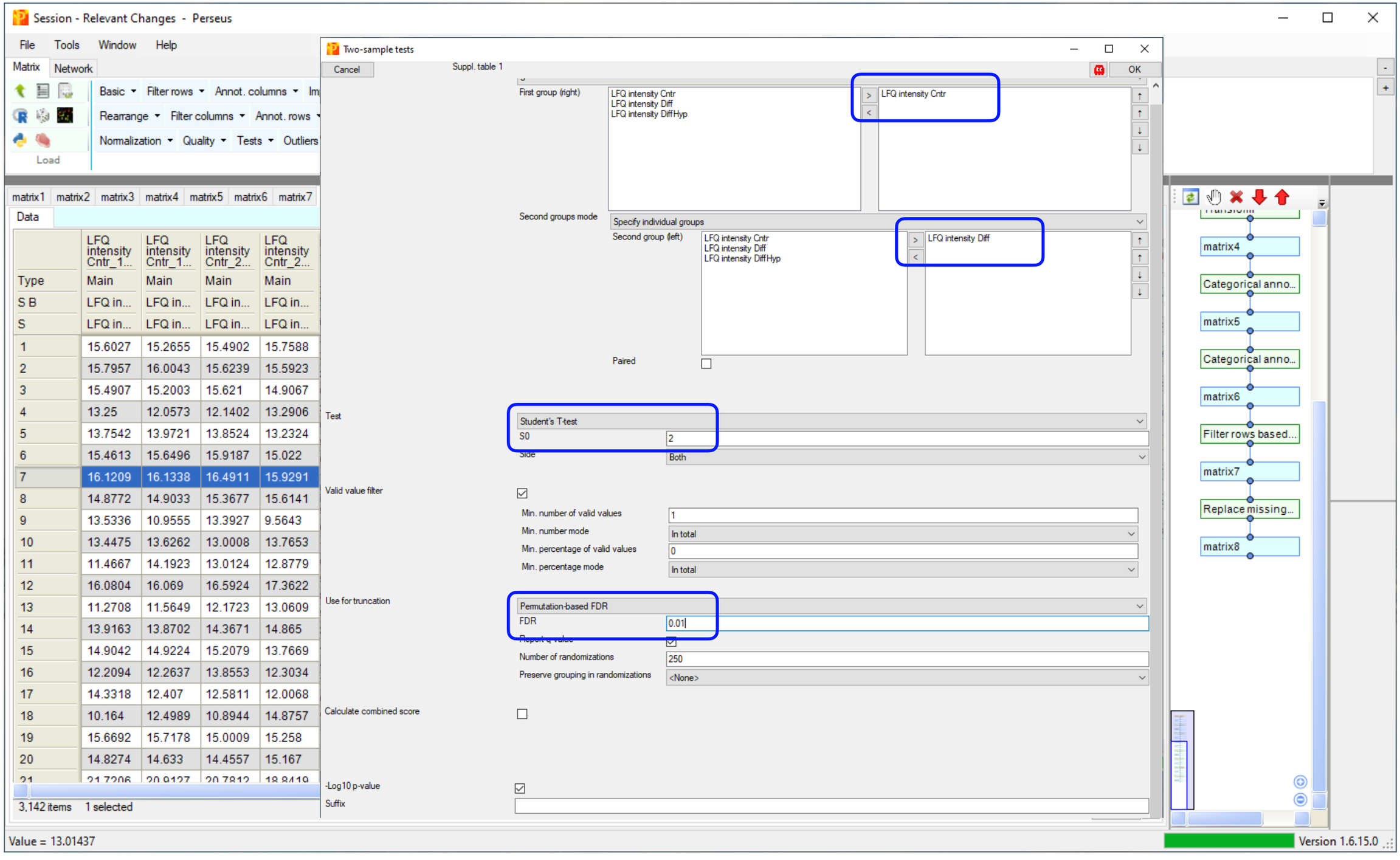
Processing > Tests > Two samples tests



Perseus

Statistical Data Analysis - Enrichment Test : t-Test

Processing > Tests > Two samples tests



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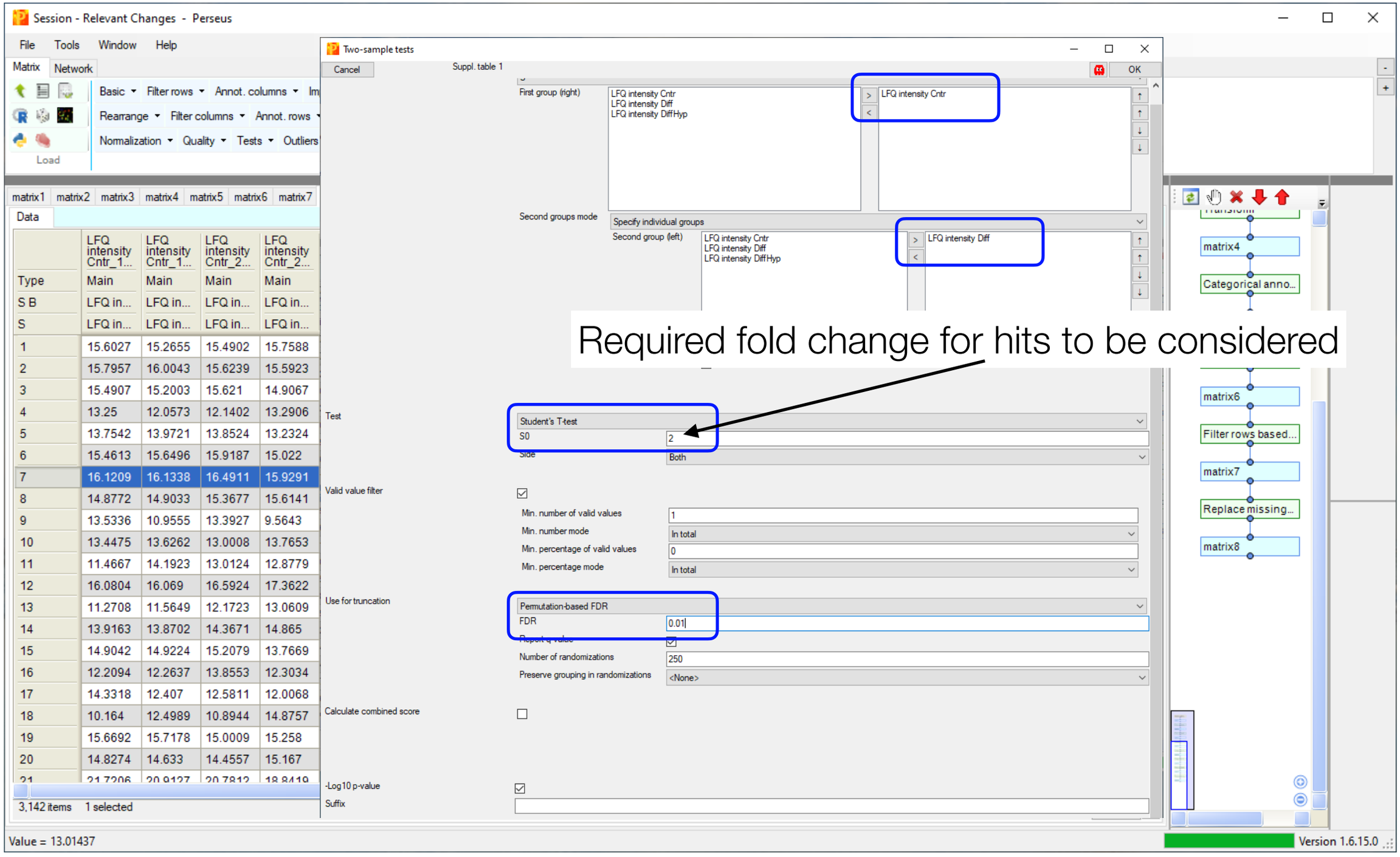
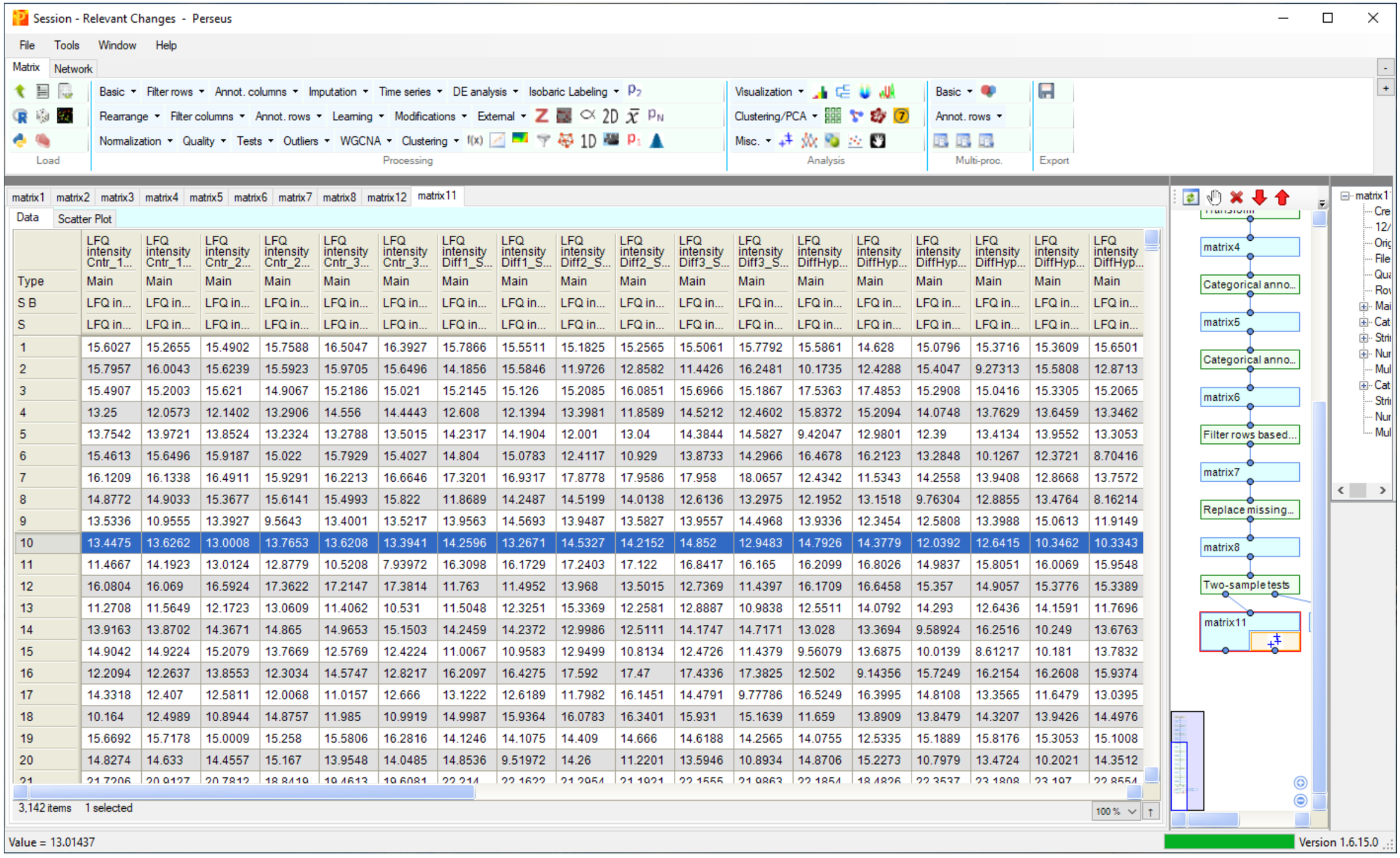
Statistical Data Analysis - Enrichment Test : t-Test

Processing > Tests > Two samples tests



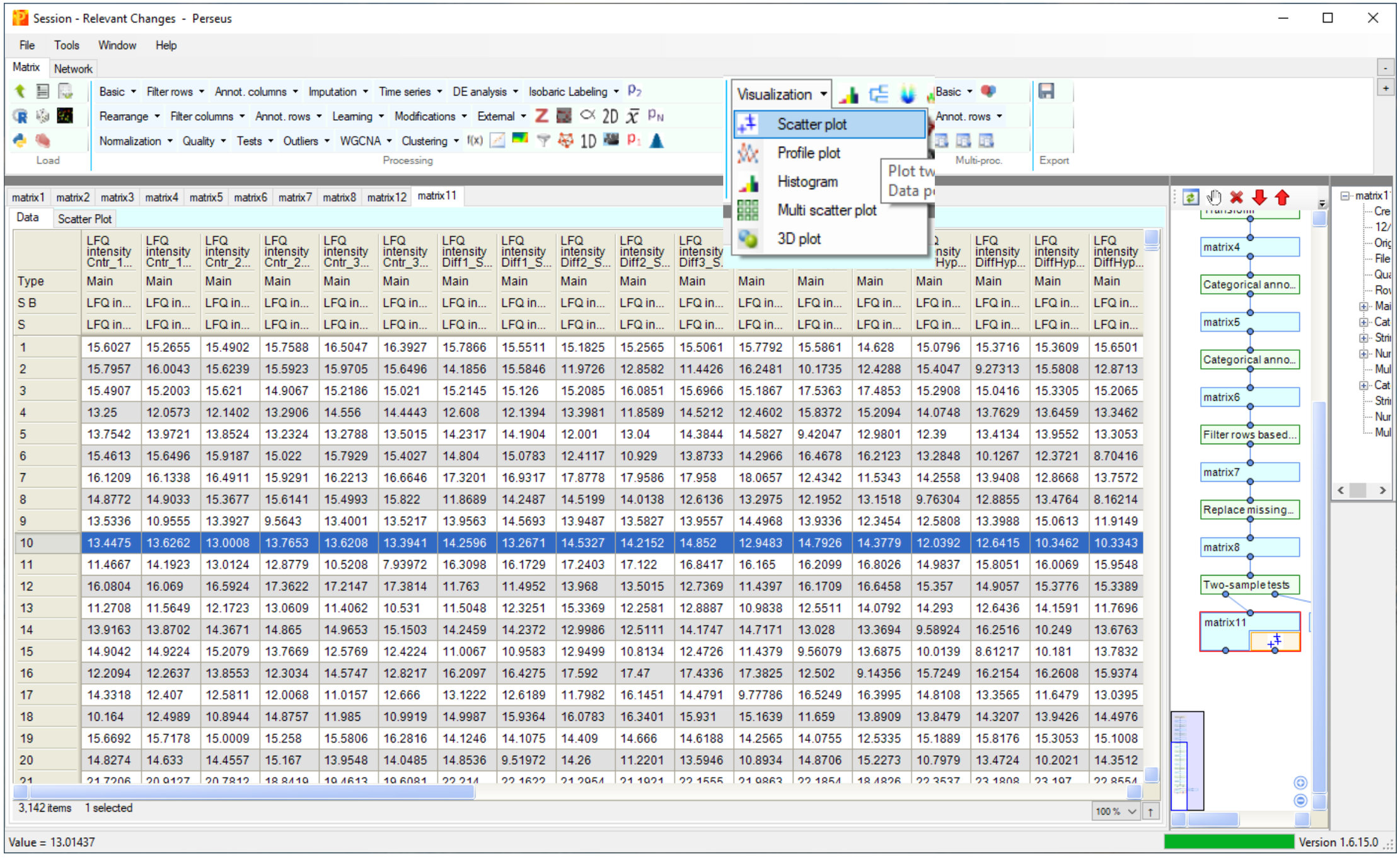
Perseus

Statistical Data Analysis - Visualisation: Intensity Difference - Statistical Significance - **Visualisation > Scatter Plot**



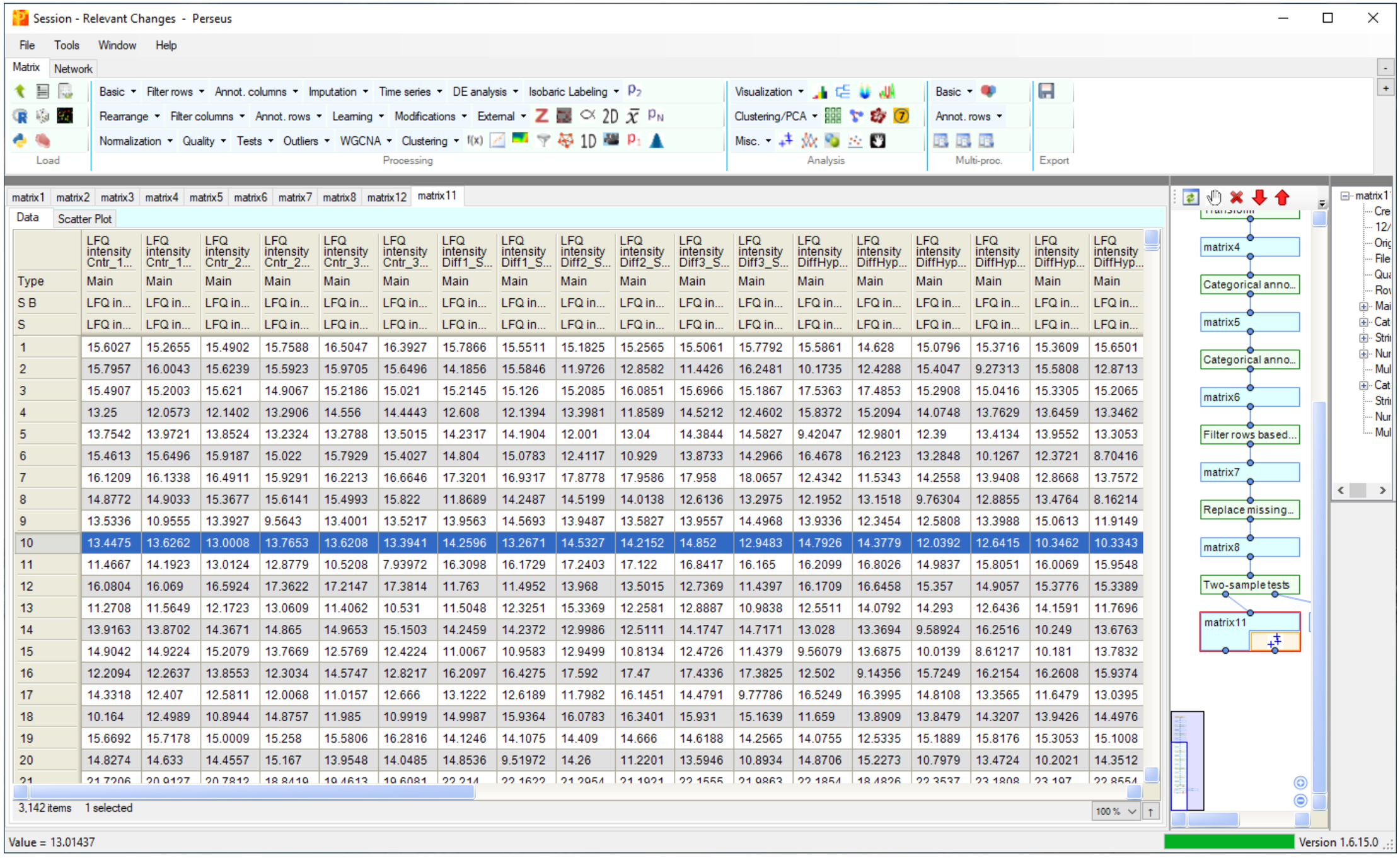
Perseus

Statistical Data Analysis - Visualisation: Intensity Difference - Statistical Significance - **Visualisation > Scatter Plot**



Perseus

Statistical Data Analysis - Visualisation: Intensity Difference - Statistical Significance - **Visualisation > Scatter Plot**



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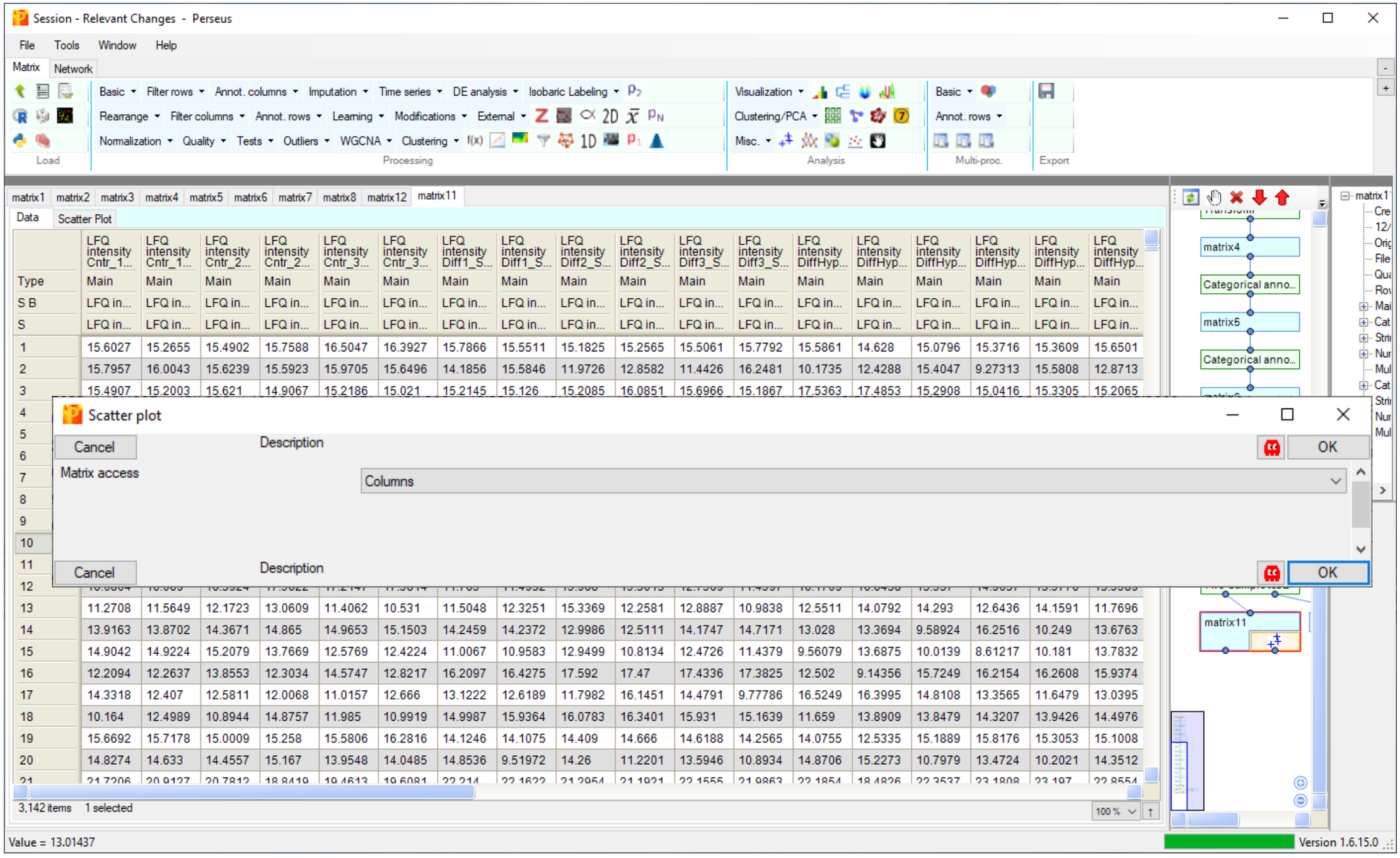
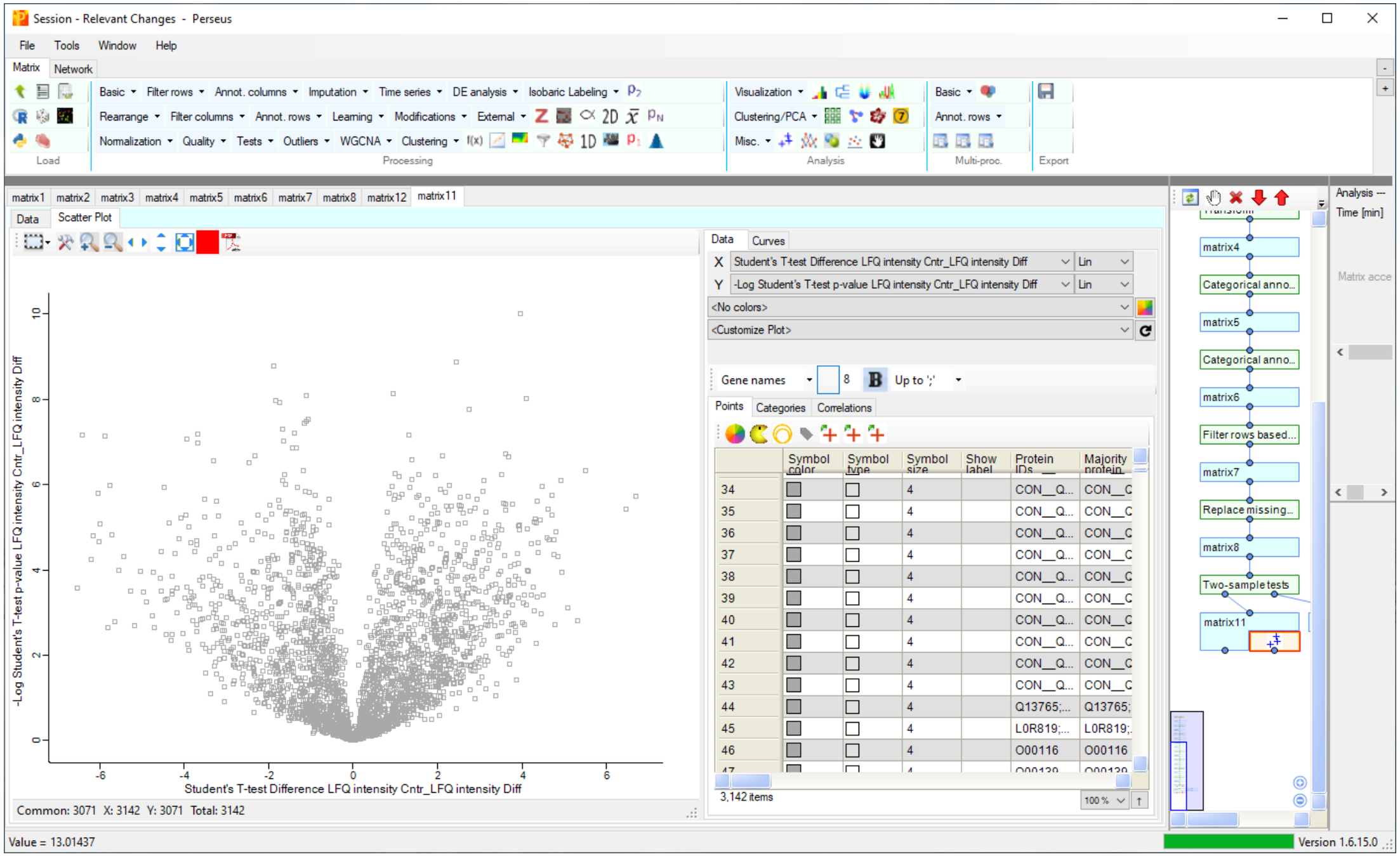
Statistical Data Analysis - Visualisation: Intensity Difference - Statistical Significance - **Visualisation > Scatter Plot**



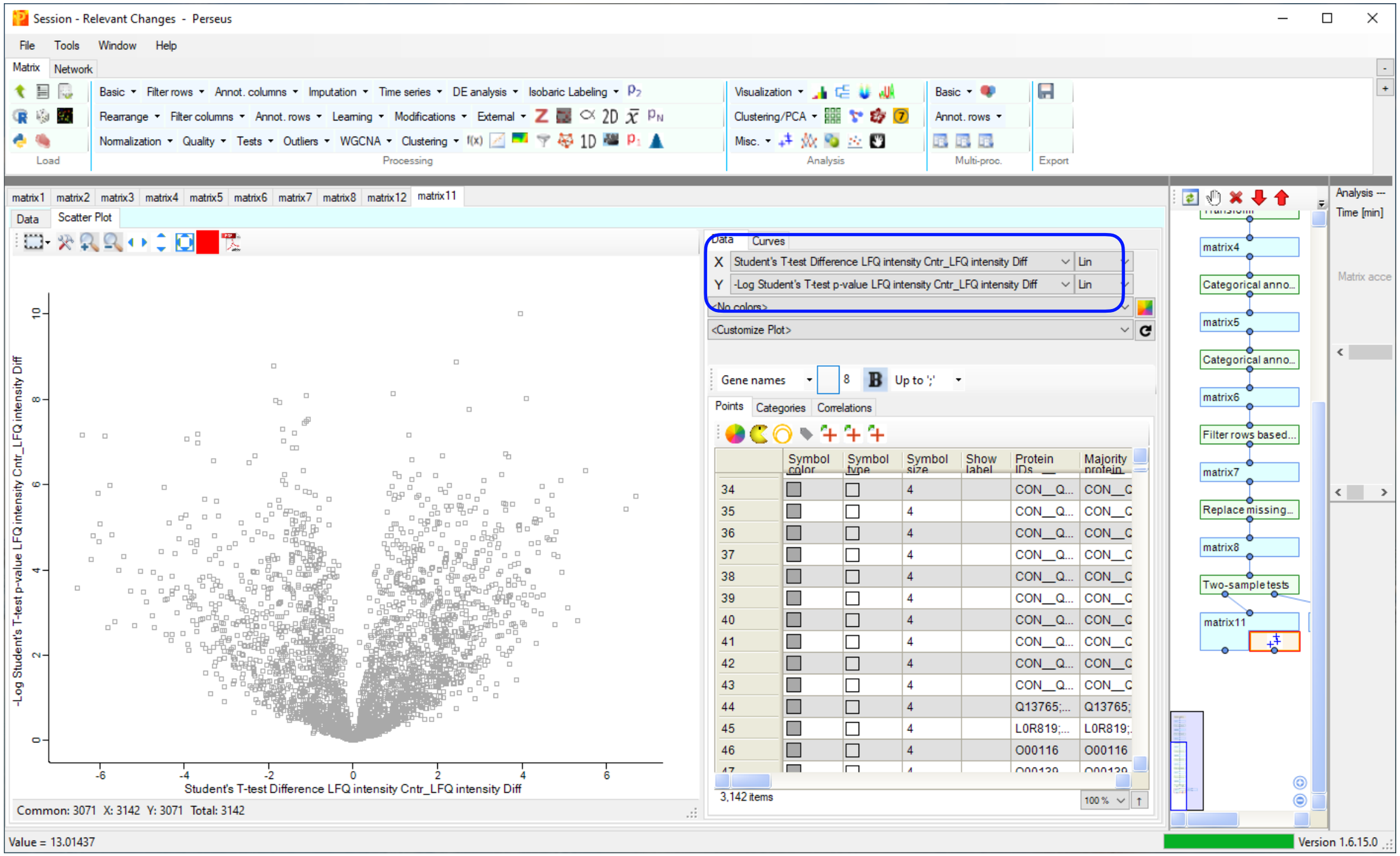
Perseus

Statistical Data Analysis - Visualisation: Intensity Difference - Statistical Significance - **Visualisation > Scatter Plot**



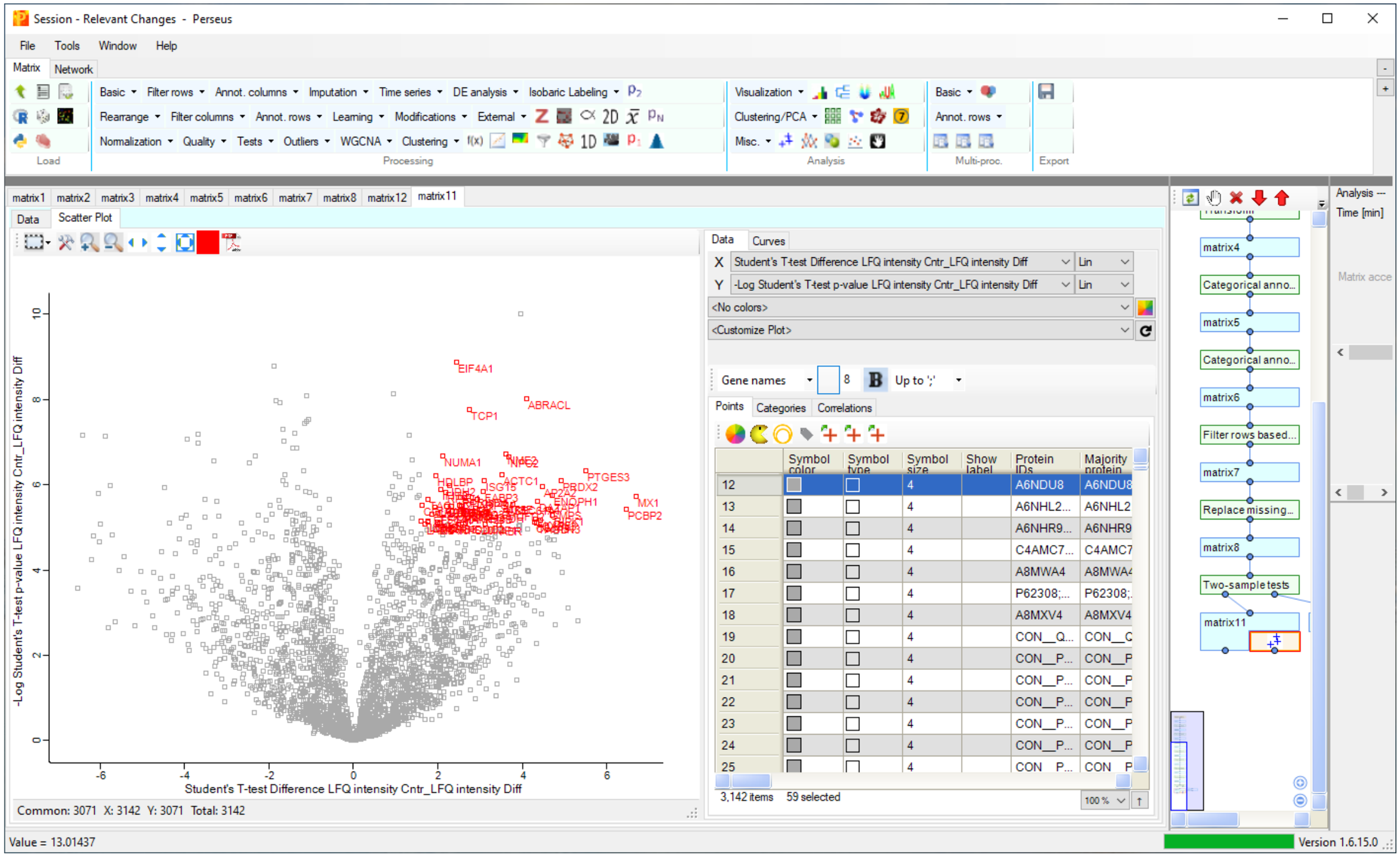
Perseus

Statistical Data Analysis - Visualisation: Intensity Difference - Statistical Significance - **Visualisation > Scatter Plot**



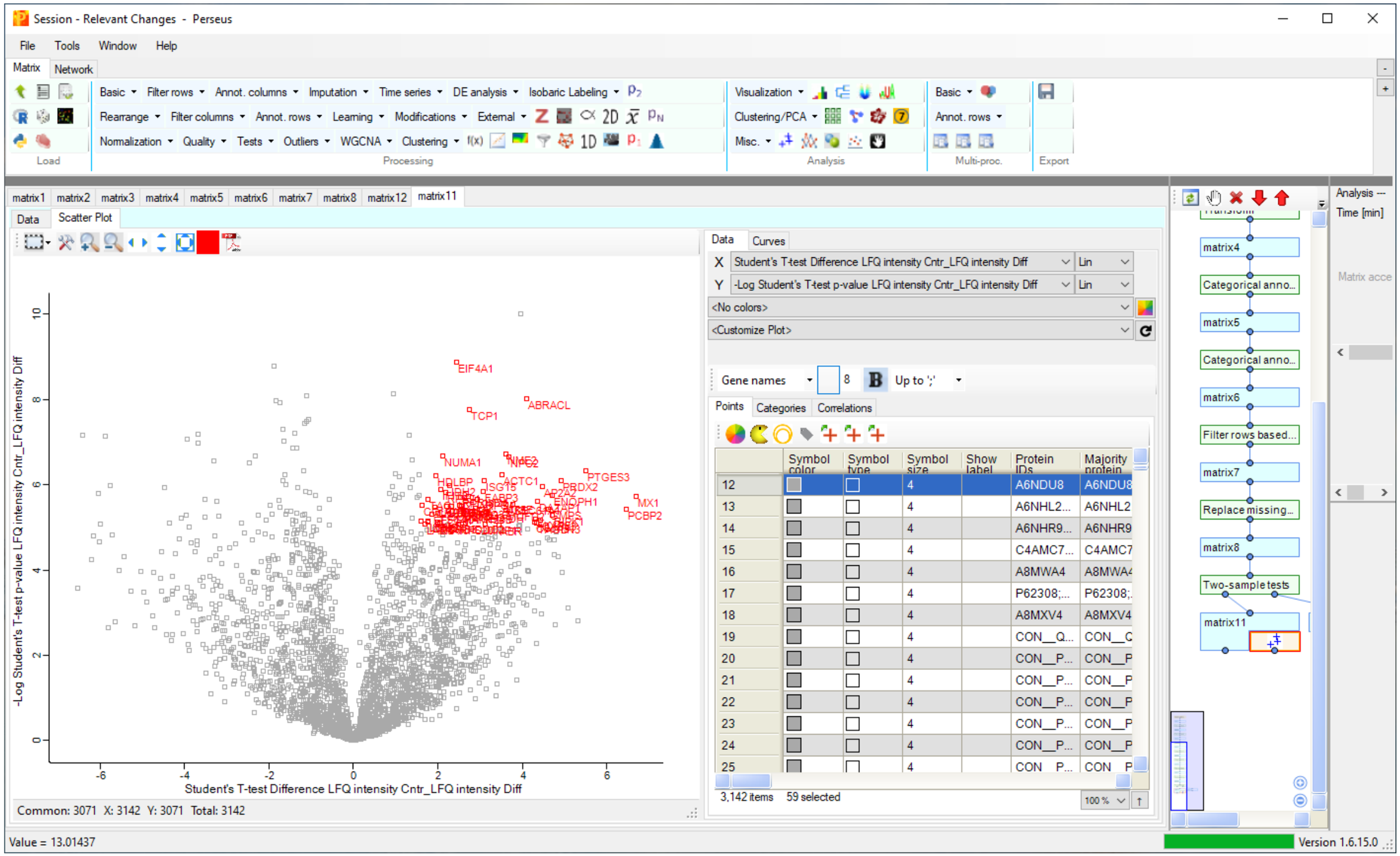
Perseus

Statistical Data Analysis - Visualisation: Intensity Difference - Statistical Significance - **Visualisation > Scatter Plot**



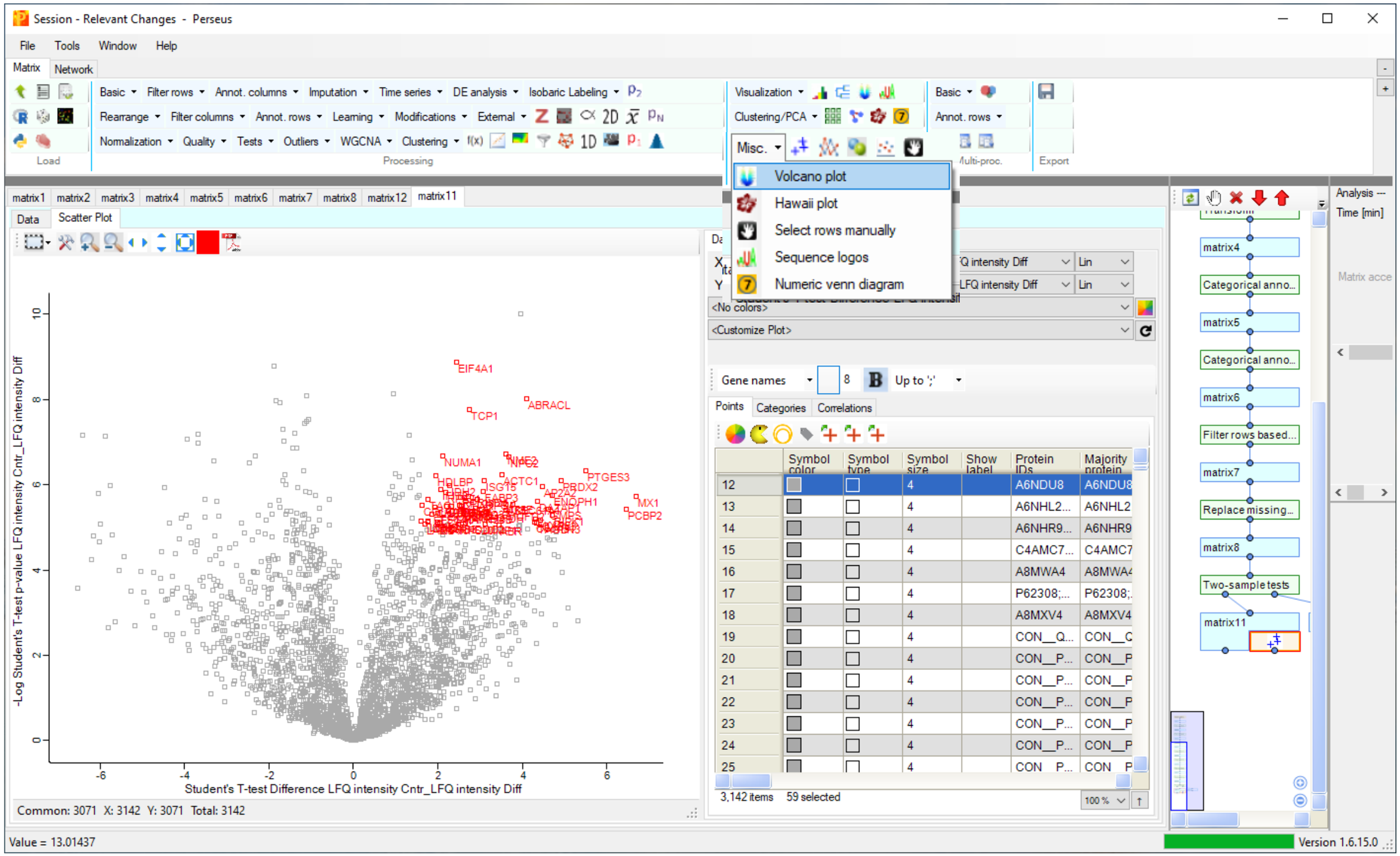
Perseus

Statistical Data Analysis - Visualisation: Intensity Difference - Statistical Significance - **Misc. > Volcano plot**



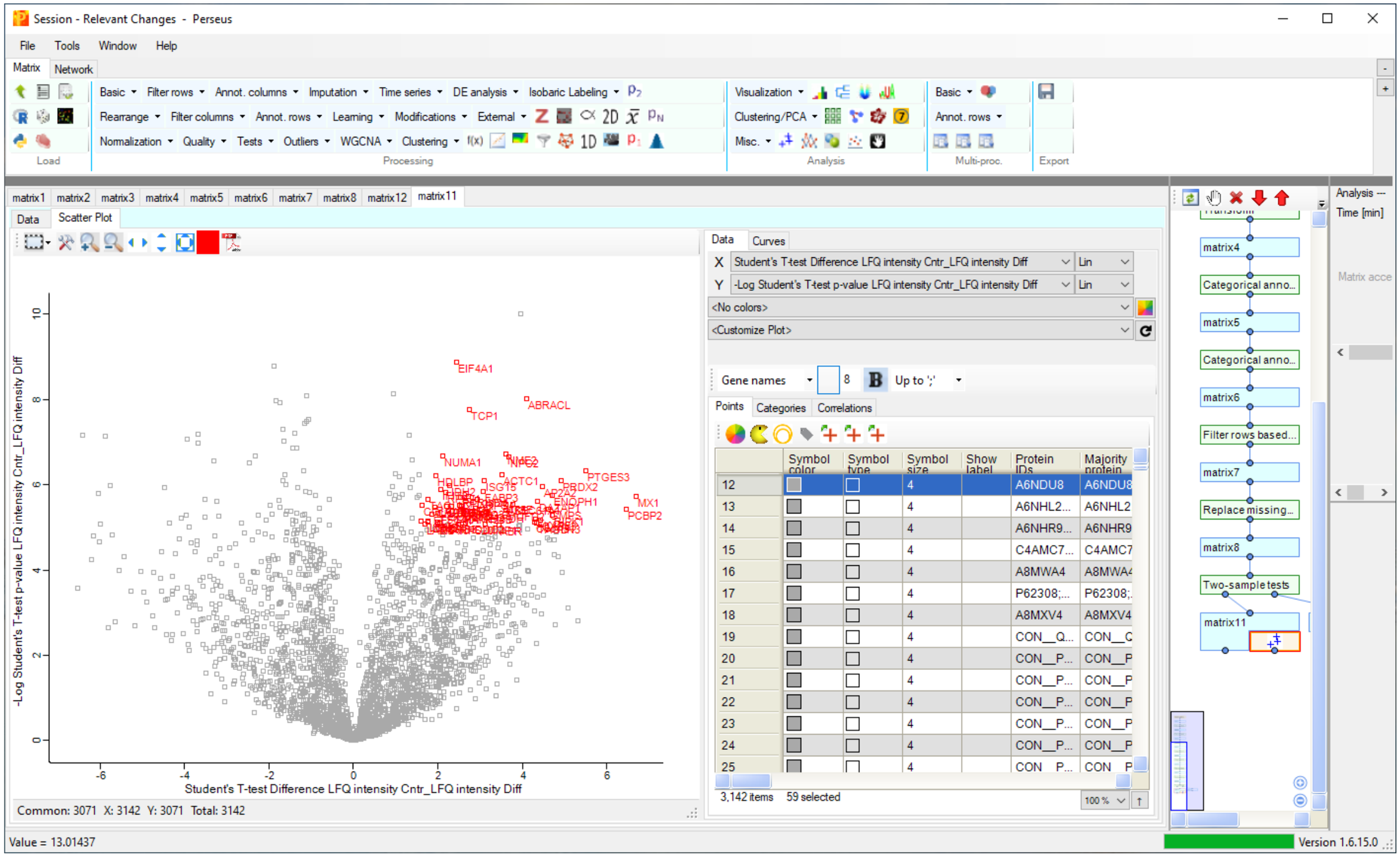
Perseus

Statistical Data Analysis - Visualisation: Intensity Difference - Statistical Significance - **Misc. > Volcano plot**



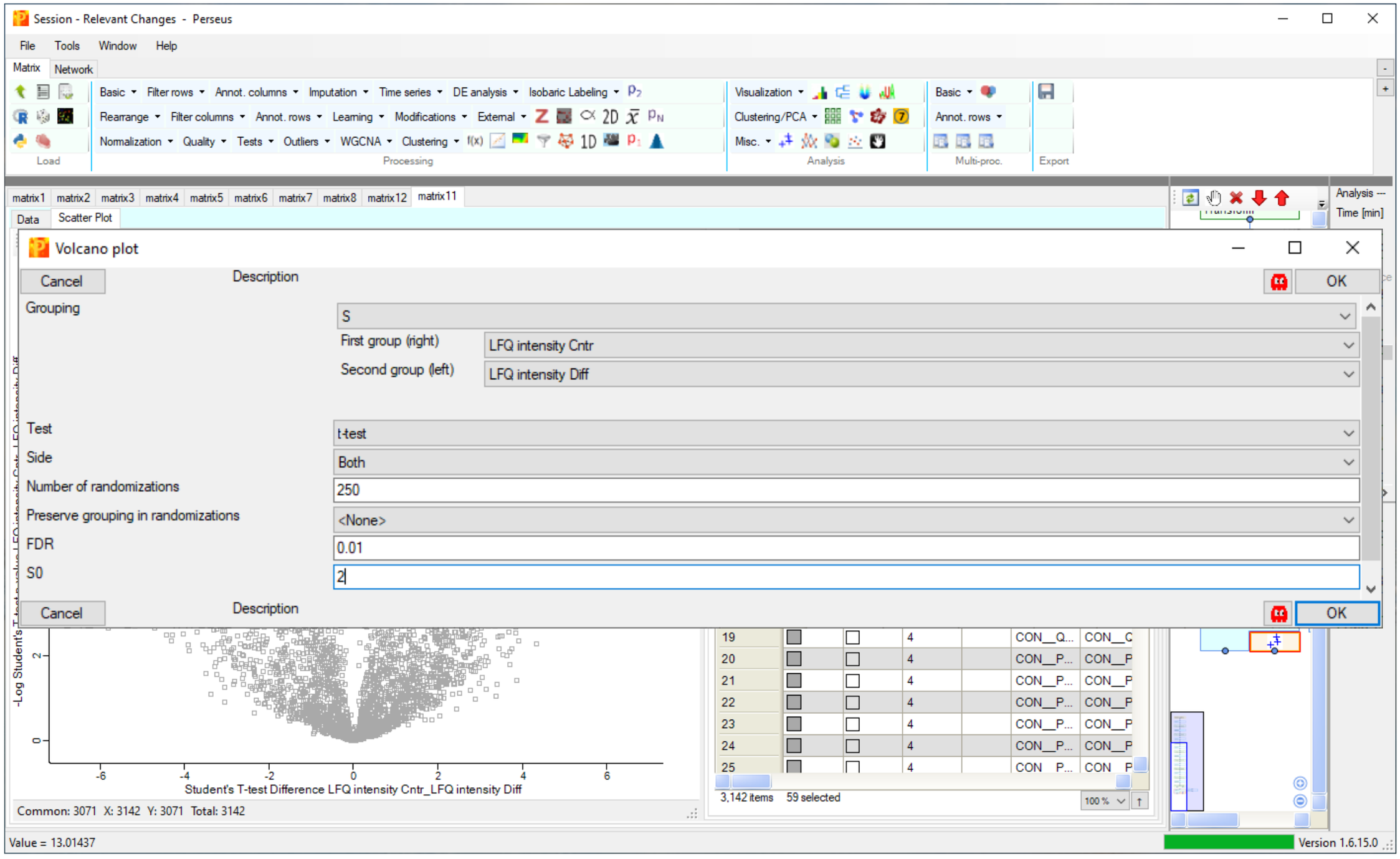
Perseus

Statistical Data Analysis - Visualisation: Intensity Difference - Statistical Significance - **Misc. > Volcano plot**



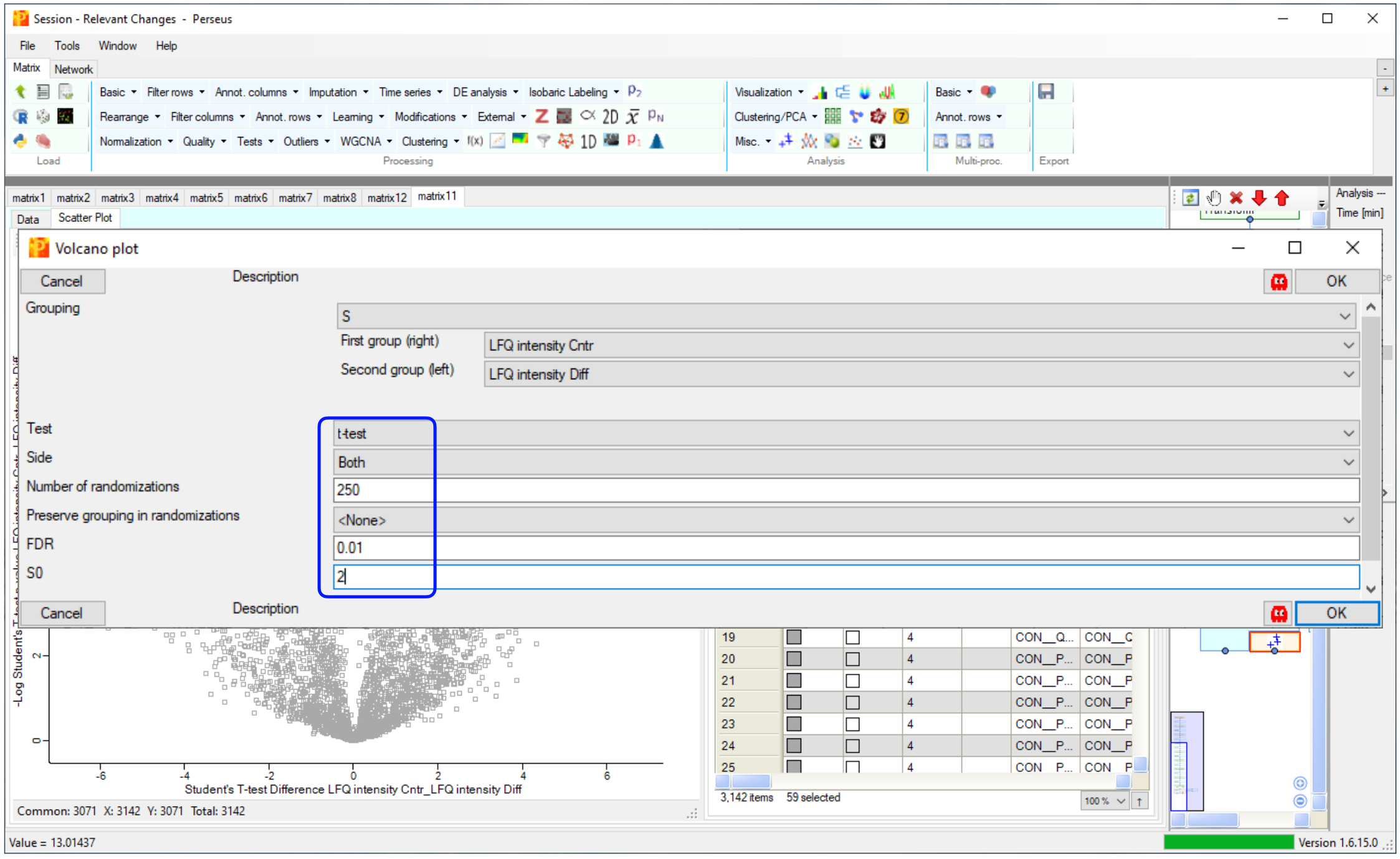
Perseus

Statistical Data Analysis - Visualisation: Intensity Difference - Statistical Significance - **Misc. > Volcano plot**



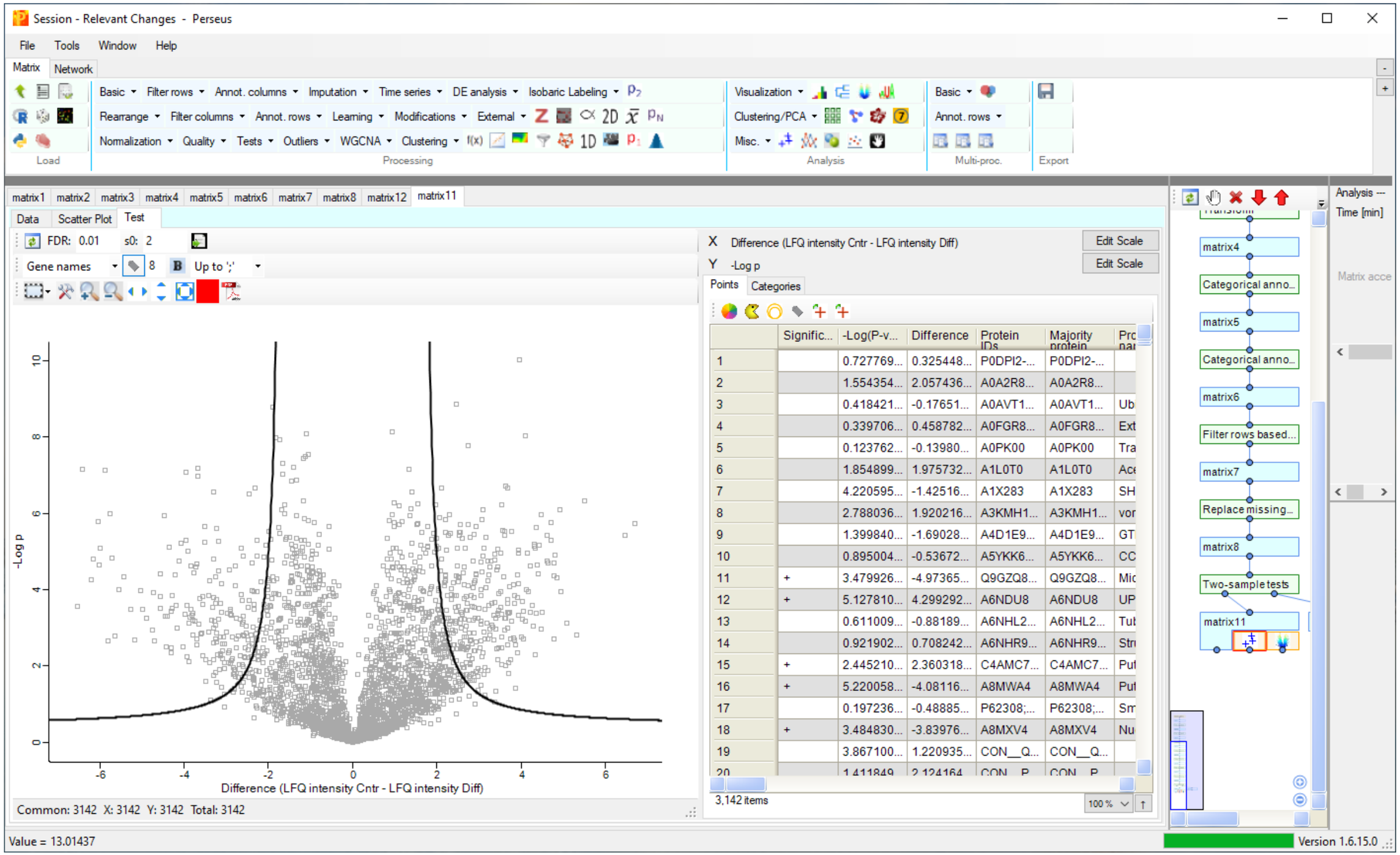
Perseus

Statistical Data Analysis - Visualisation: Intensity Difference - Statistical Significance - **Misc. > Volcano plot**



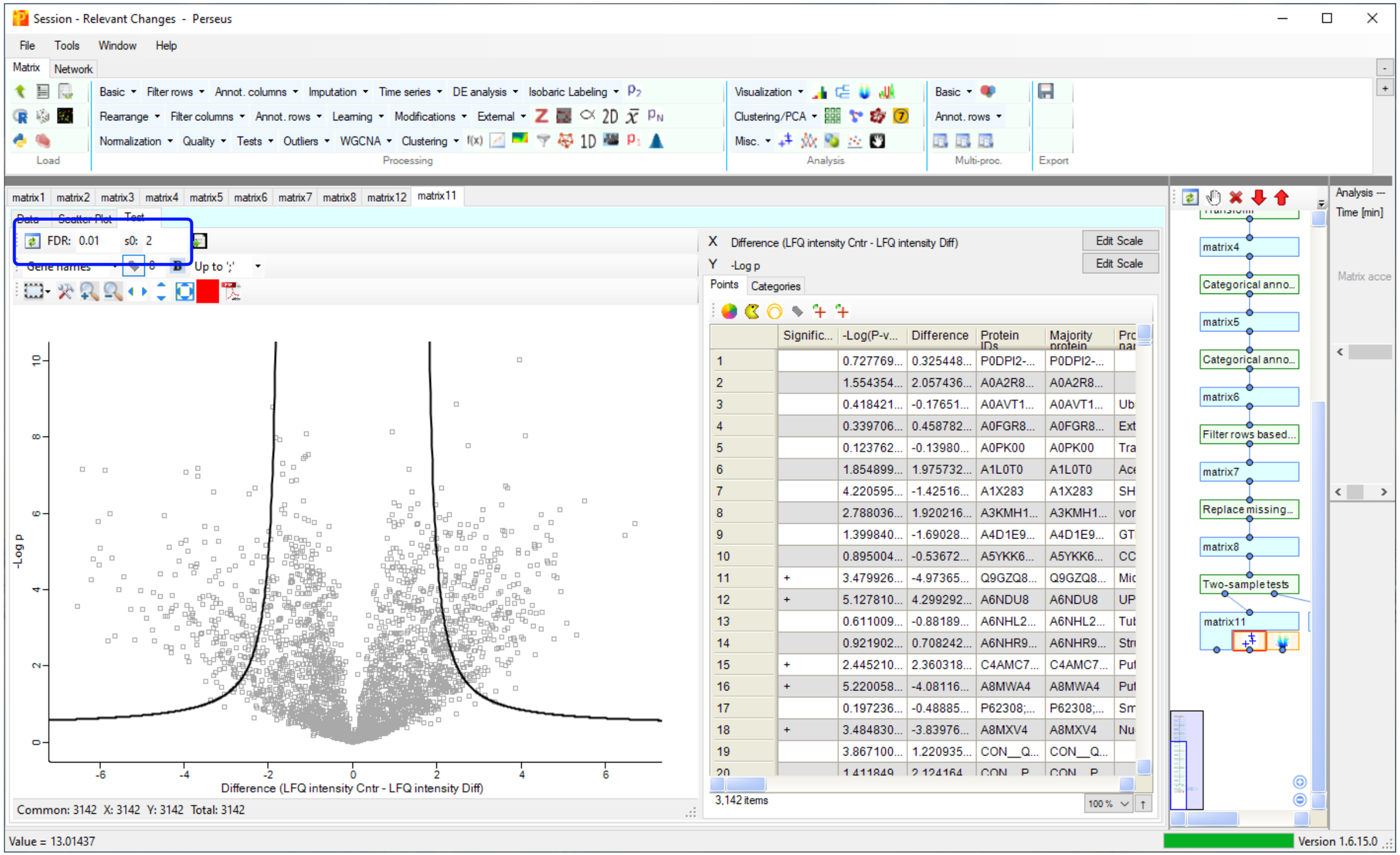
Perseus

Statistical Data Analysis - Visualisation: Intensity Difference - Statistical Significance - **Misc. > Volcano plot**



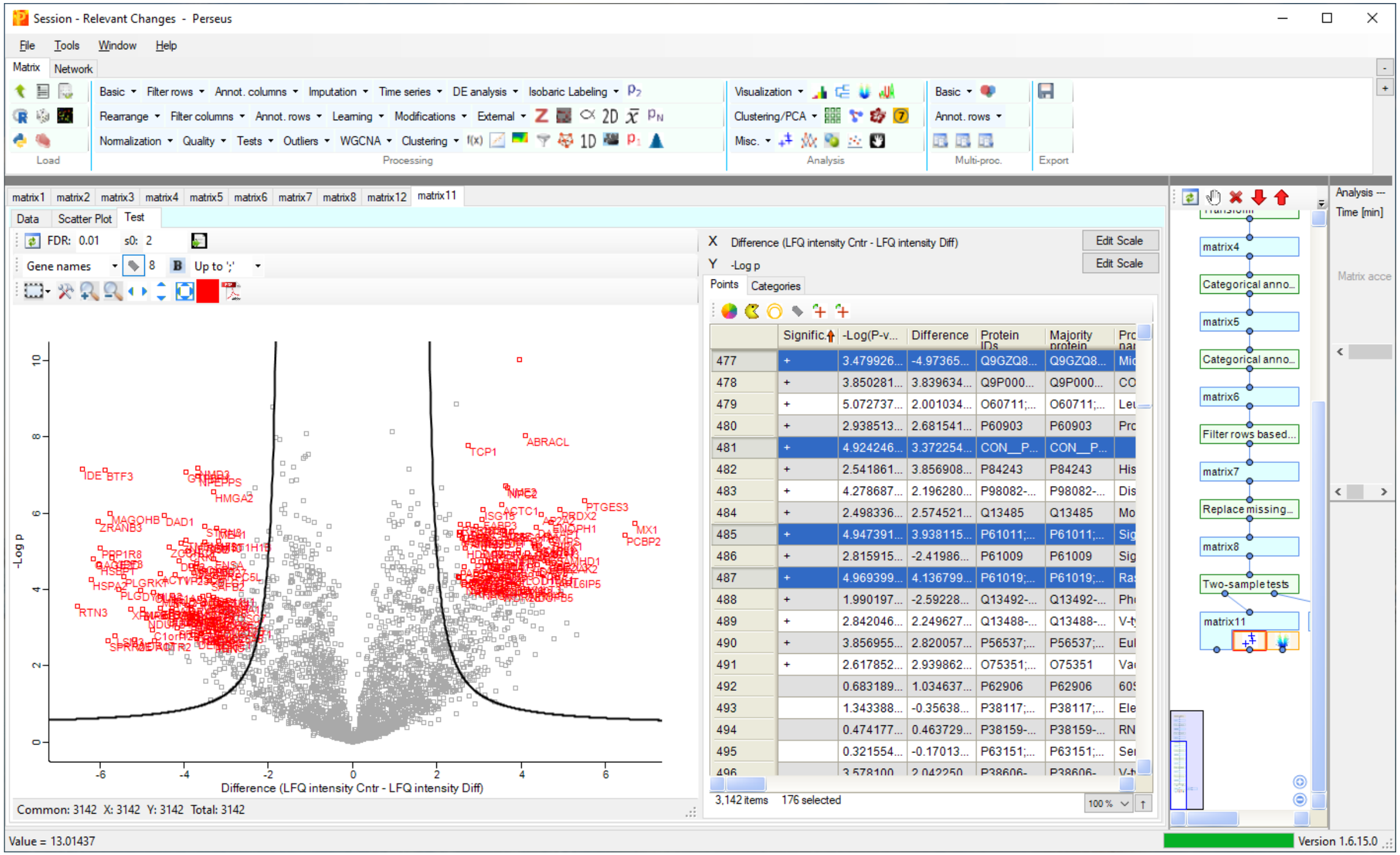
Perseus

Statistical Data Analysis - Visualisation: Intensity Difference - Statistical Significance - **Misc. > Volcano plot**



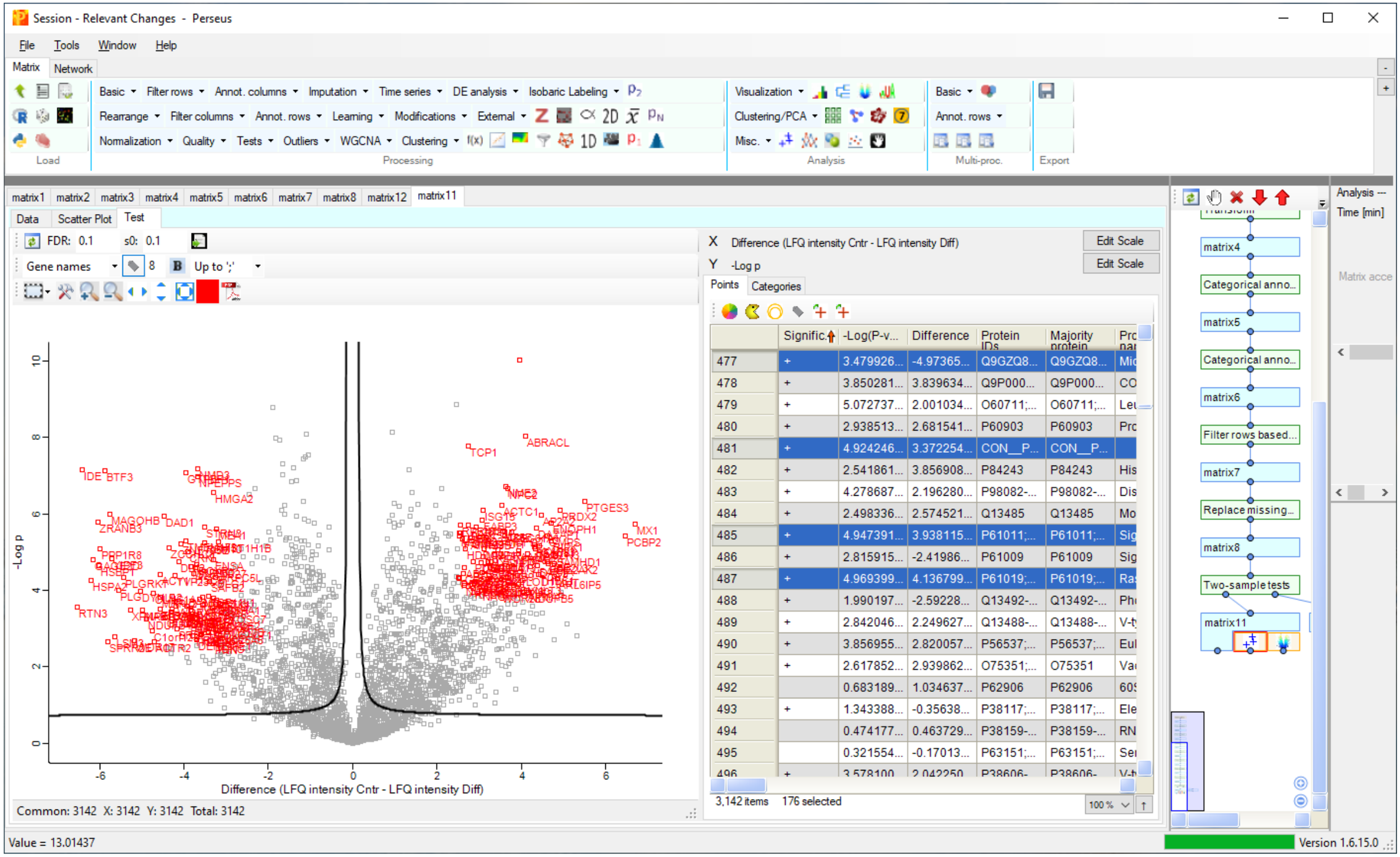
Perseus

Statistical Data Analysis - Visualisation: Intensity Difference - Statistical Significance - **Misc. > Volcano plot**



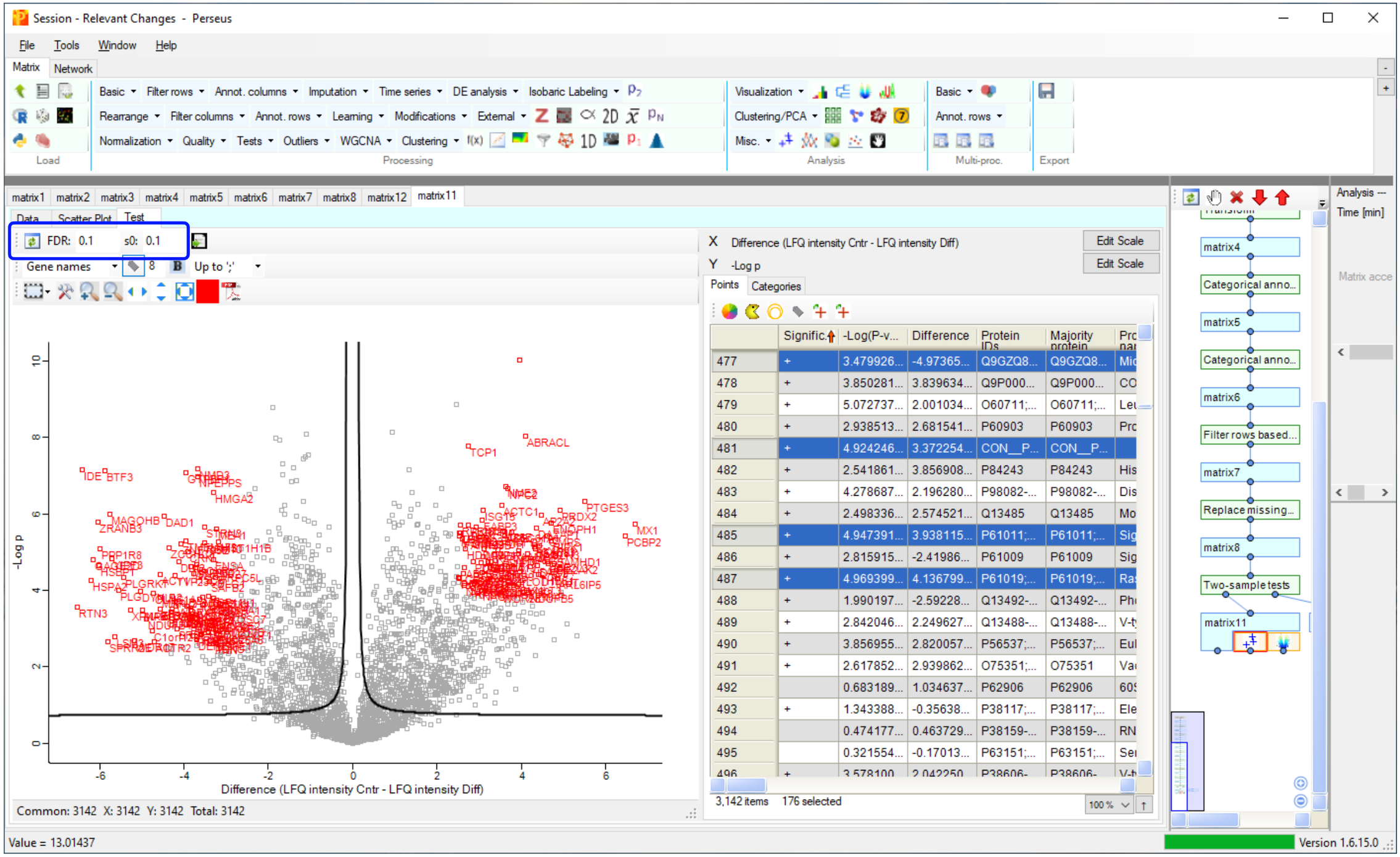
Perseus

Statistical Data Analysis - Visualisation: Intensity Difference - Statistical Significance - **Misc. > Volcano plot**



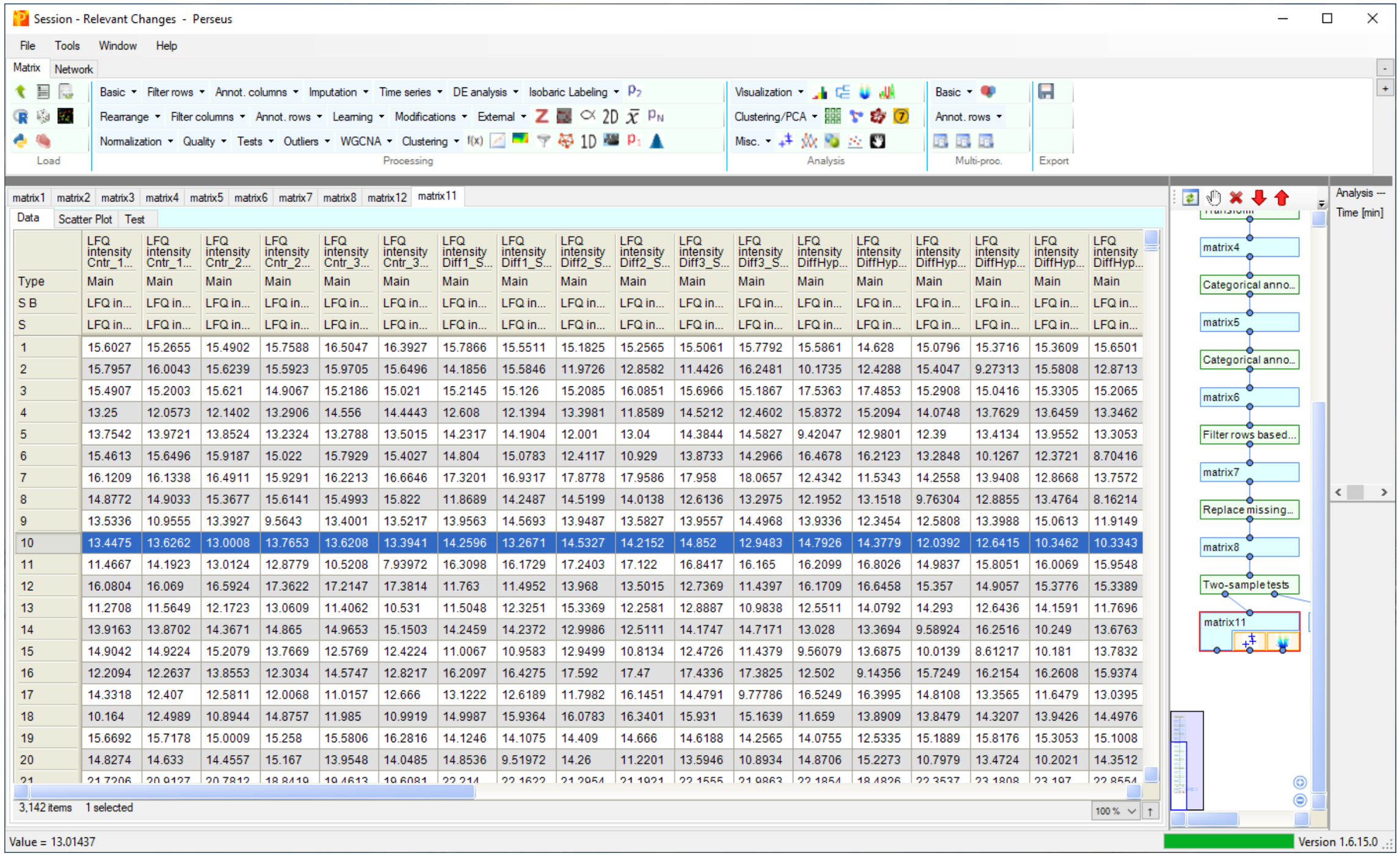
Perseus

Statistical Data Analysis - Visualisation: Intensity Difference - Statistical Significance - **Misc. > Volcano plot**



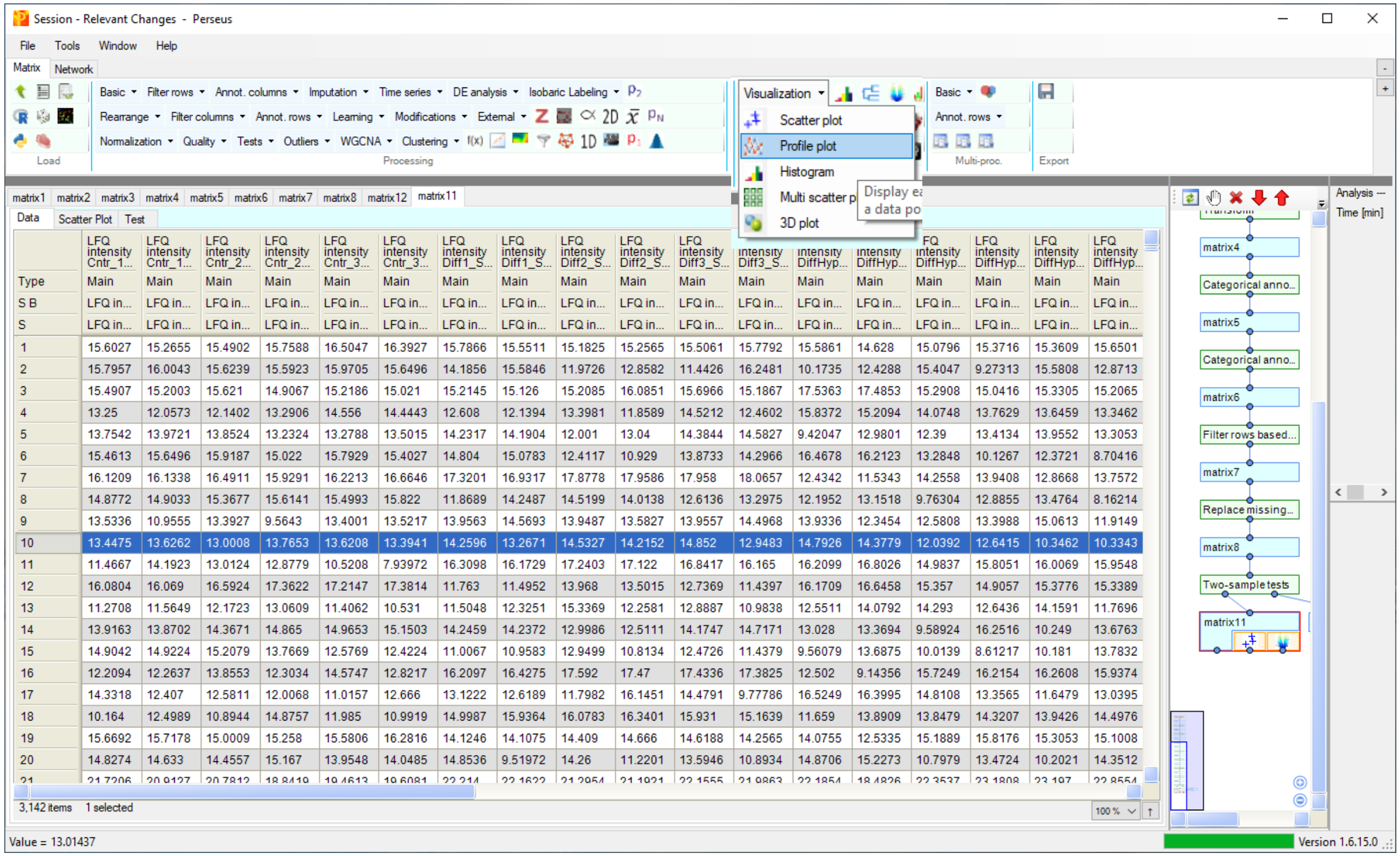
Perseus

Statistical Data Analysis - Visualisation: Time Course Analysis - **Visualisation. > Profile Plot**



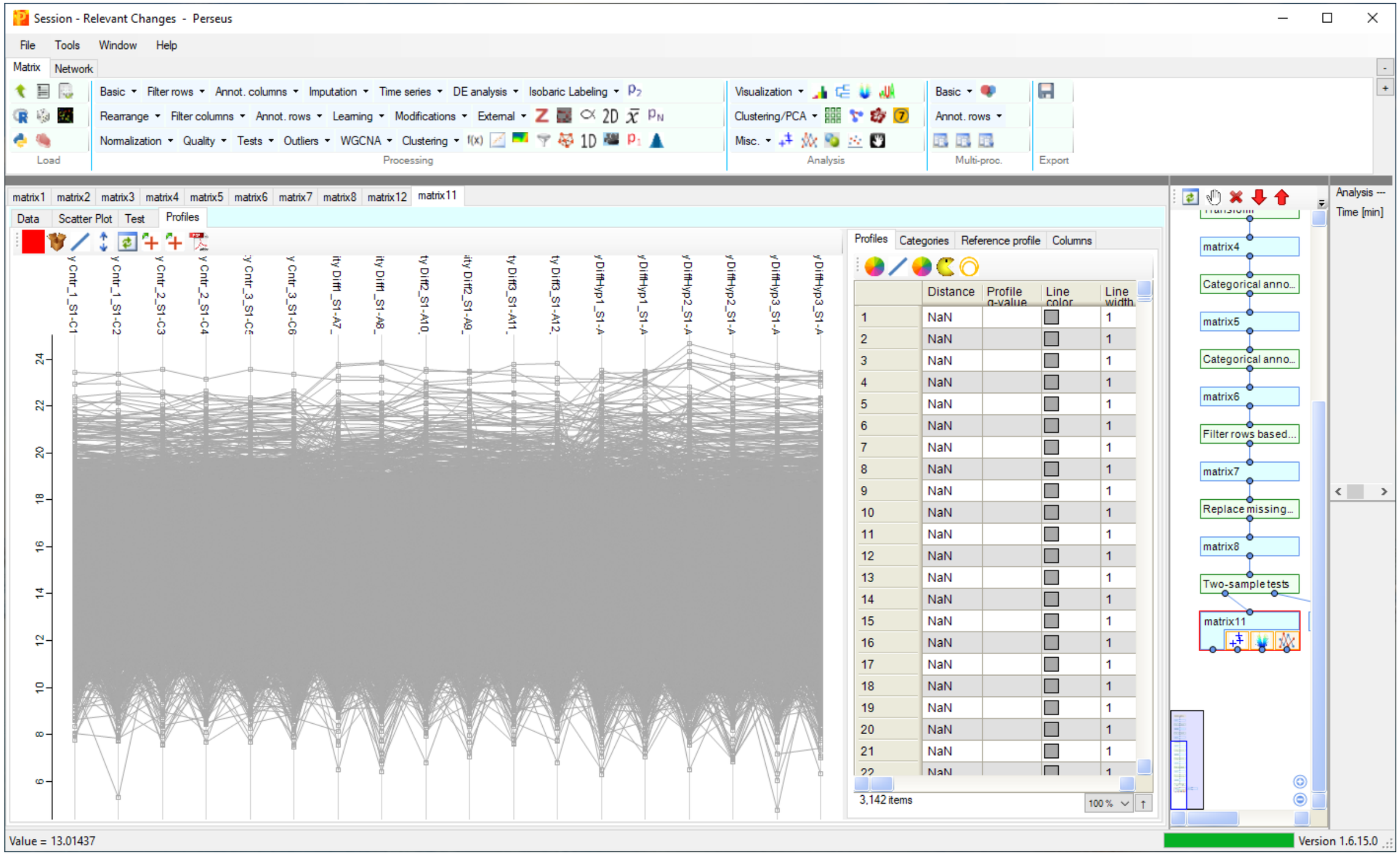
Perseus

Statistical Data Analysis - Visualisation: Time Course Analysis - **Visualisation. > Profile Plot**



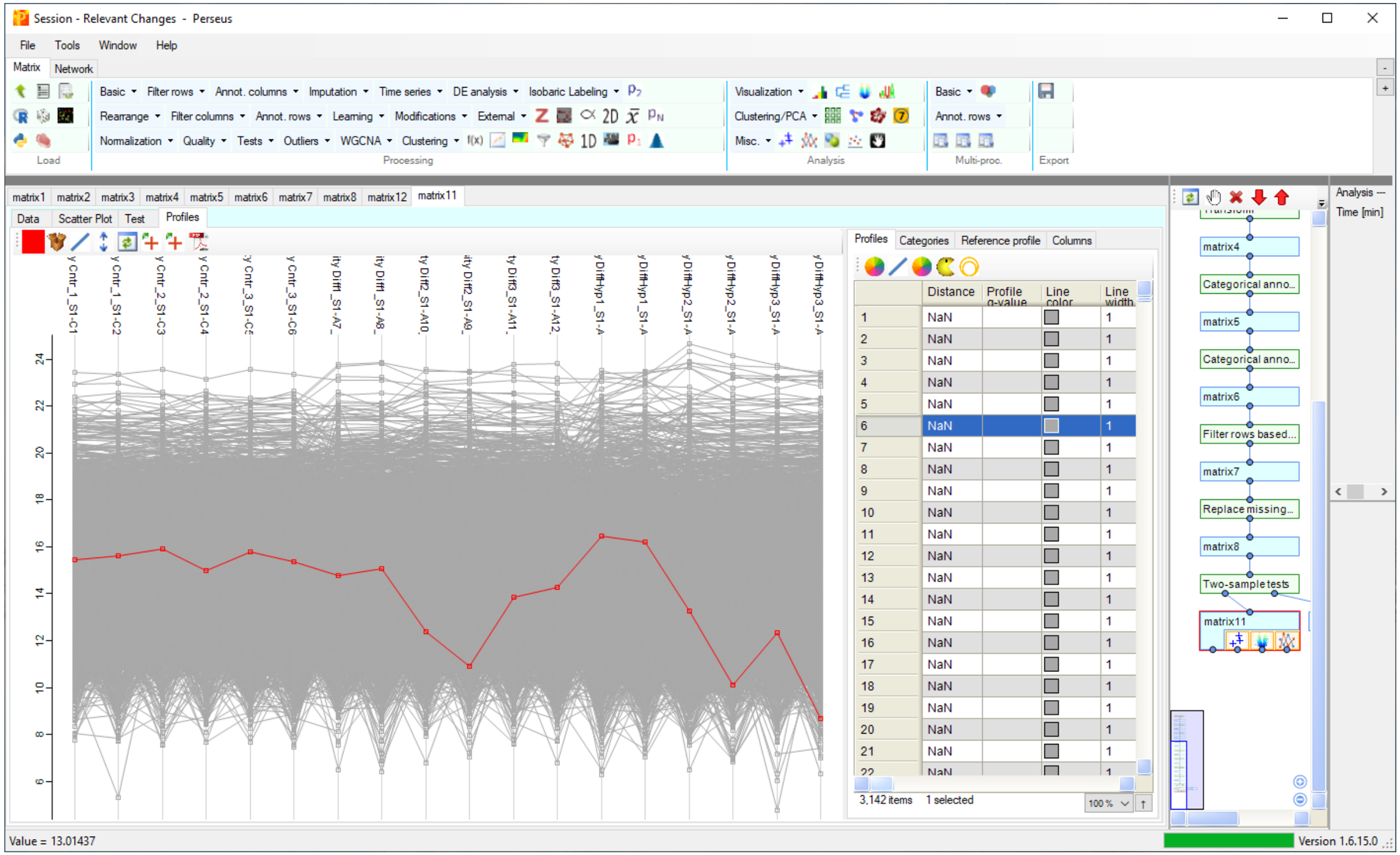
Perseus

Statistical Data Analysis - Visualisation: Time Course Analysis - **Visualisation. > Profile Plot**



Perseus

Statistical Data Analysis - Visualisation: Time Course Analysis - **Visualisation. > Profile Plot**



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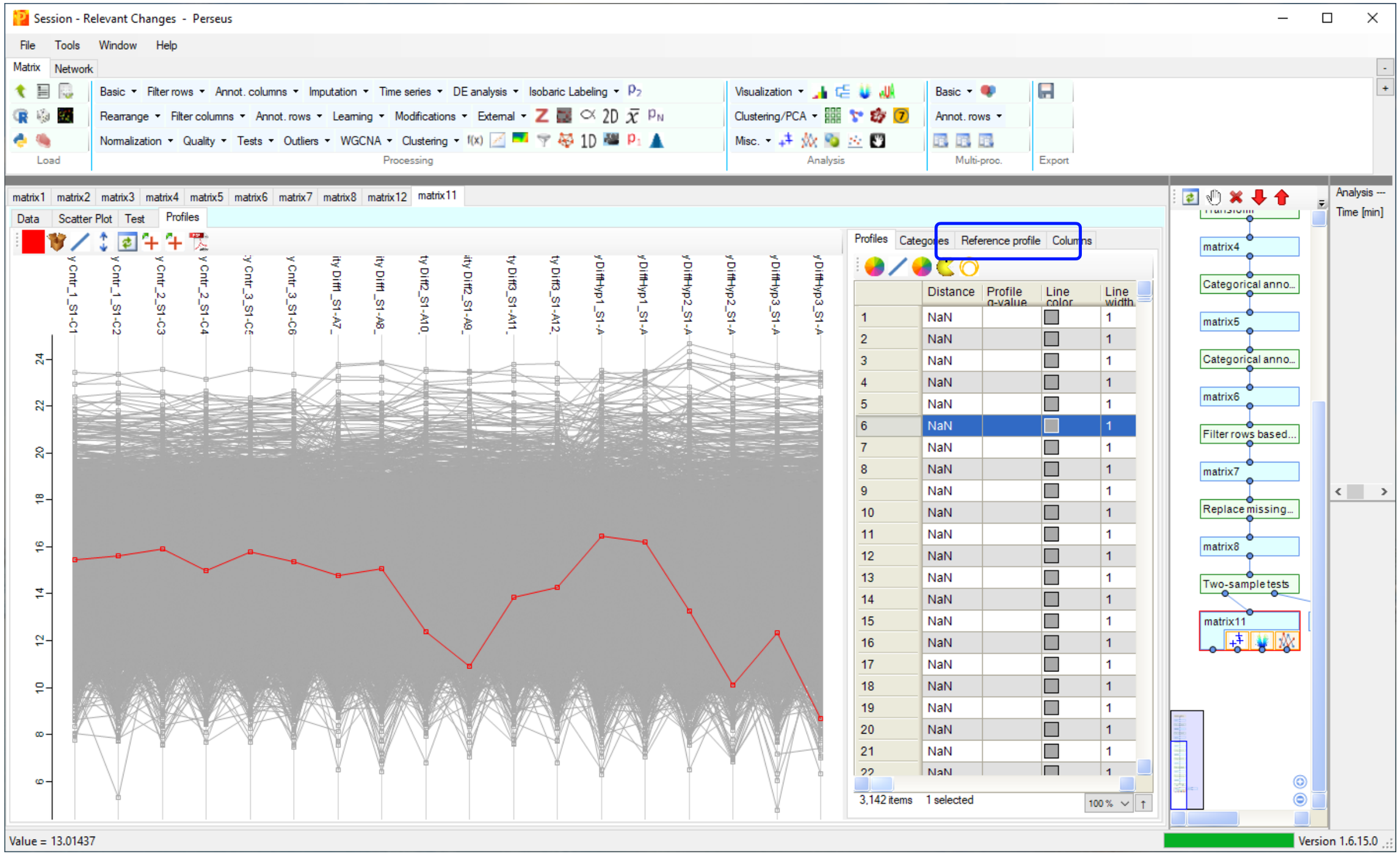
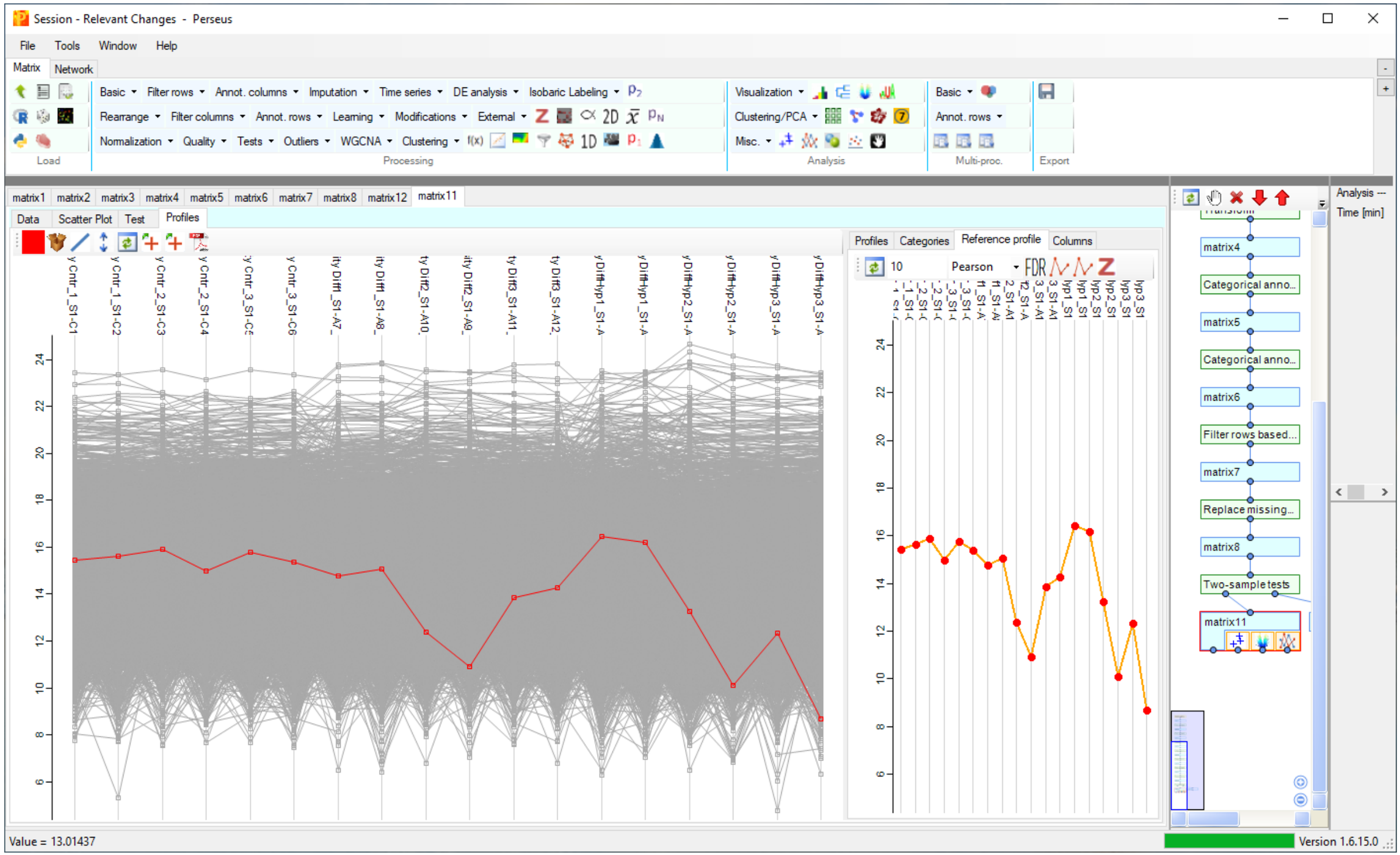
Statistical Data Analysis - Visualisation: Time Course Analysis - **Visualisation. > Profile Plot**



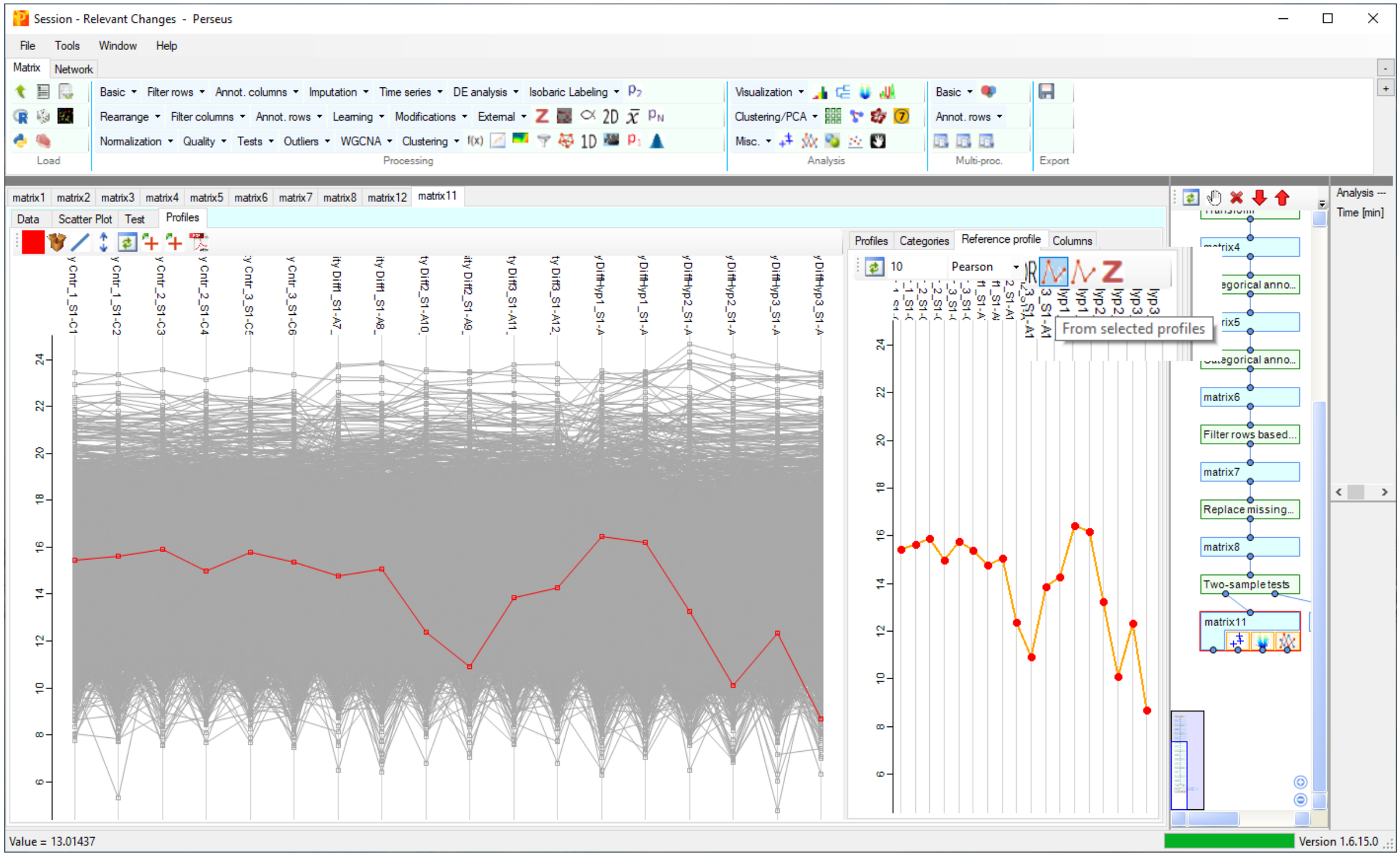
Perseus

Statistical Data Analysis - Visualisation: Time Course Analysis - **Visualisation. > Profile Plot**



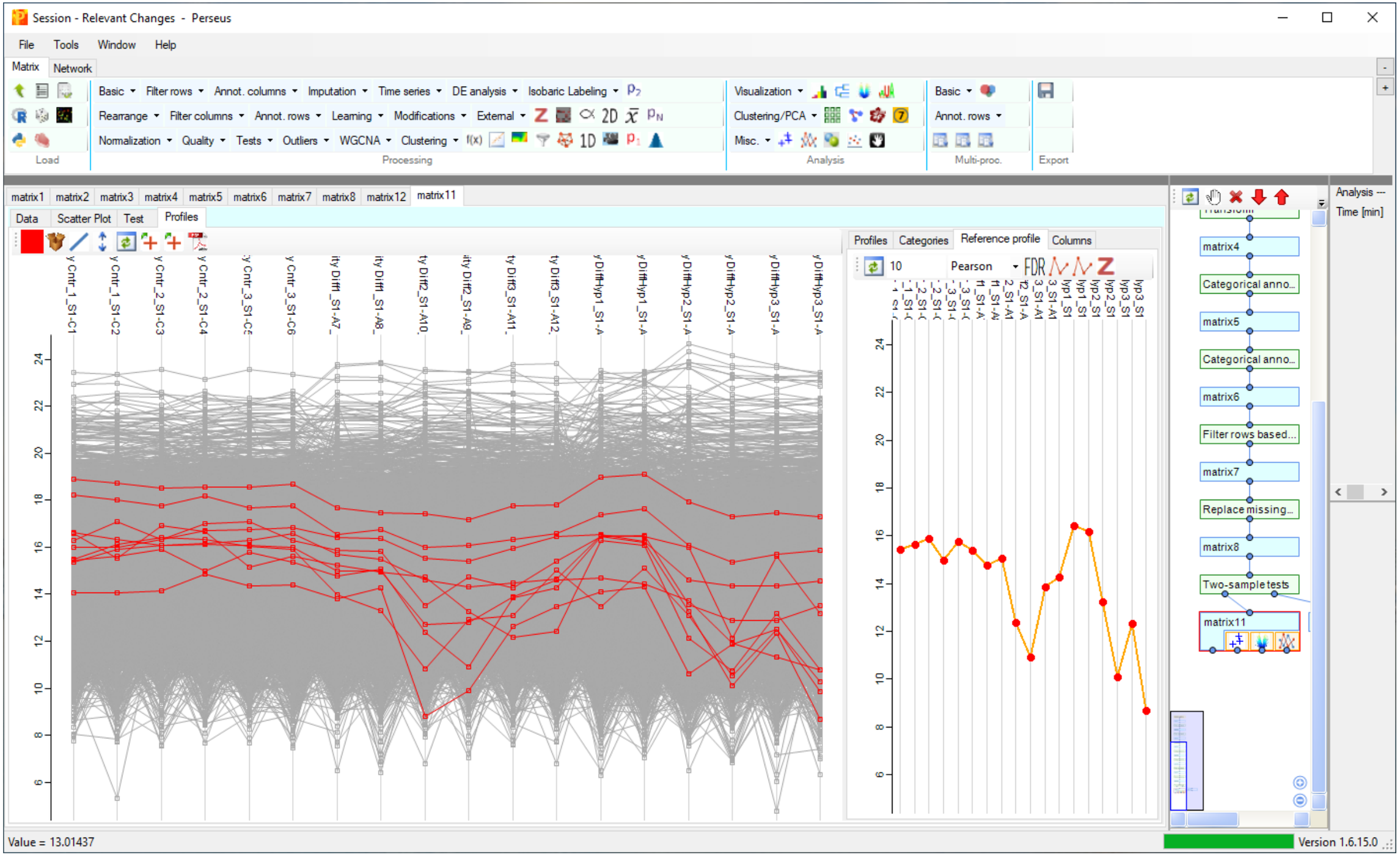
Perseus

Statistical Data Analysis - Visualisation: Time Course Analysis - **Visualisation. > Profile Plot**



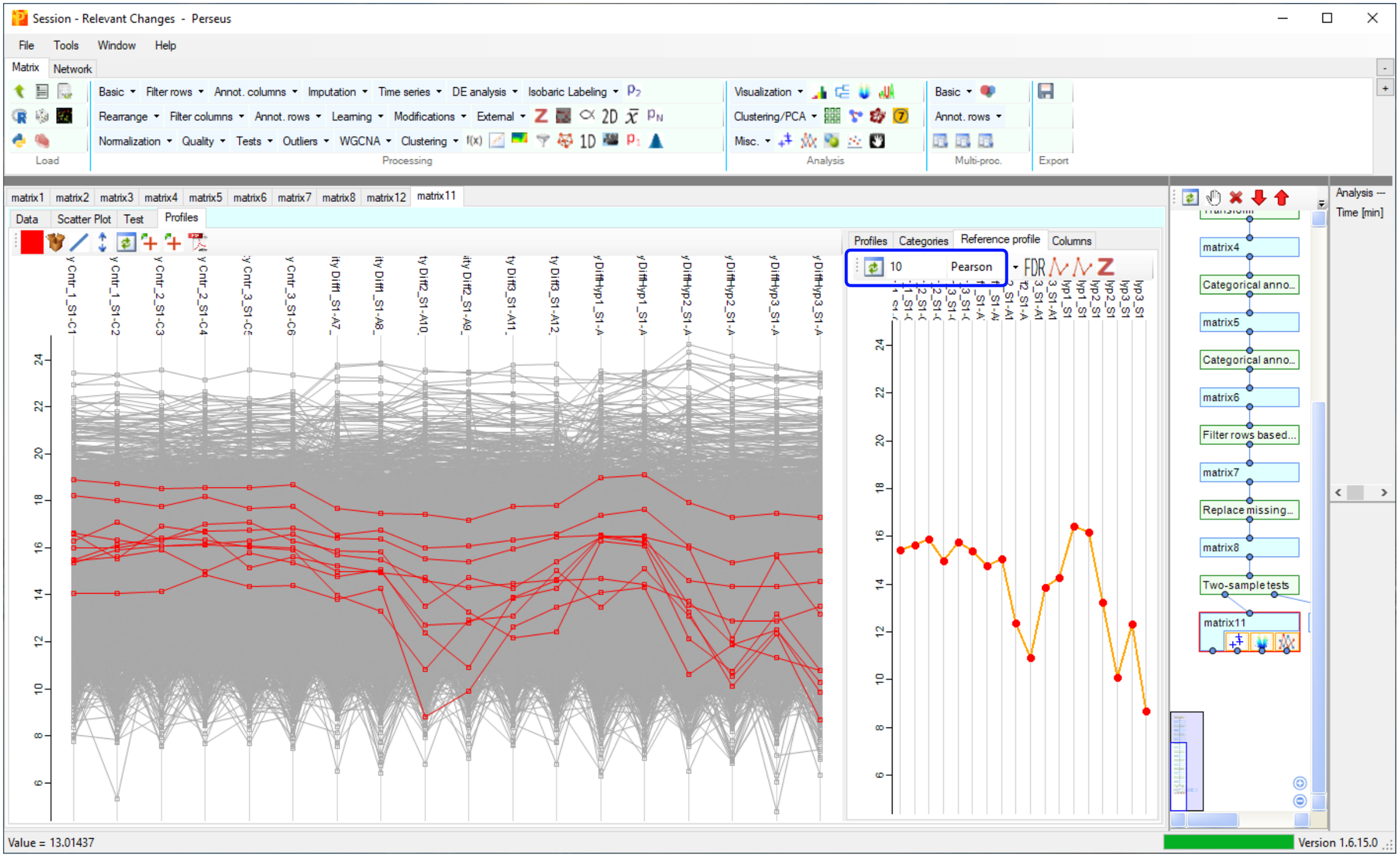
Perseus

Statistical Data Analysis - Visualisation: Time Course Analysis - **Visualisation. > Profile Plot**



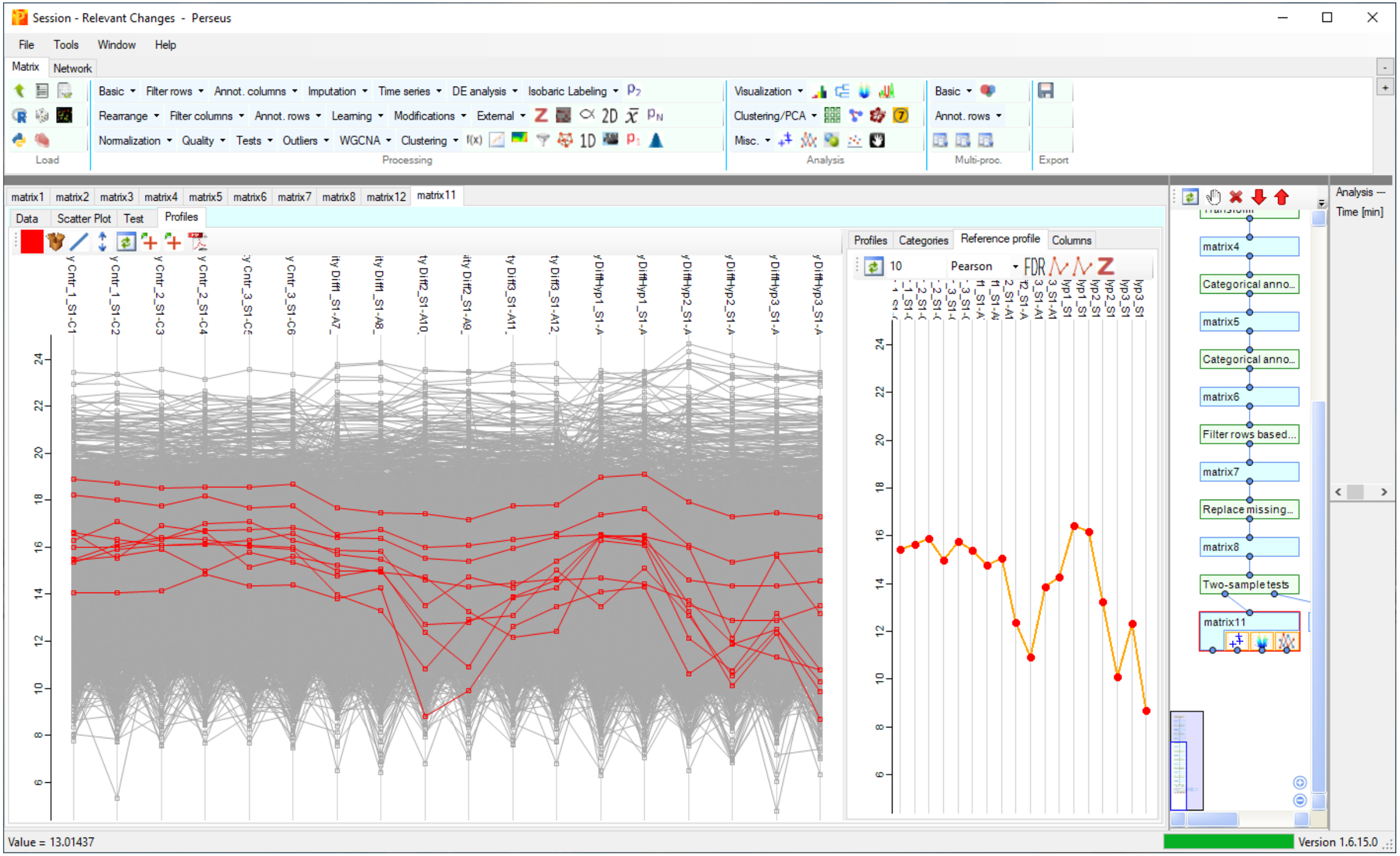
Perseus

Statistical Data Analysis - Visualisation: Time Course Analysis - **Visualisation. > Profile Plot**



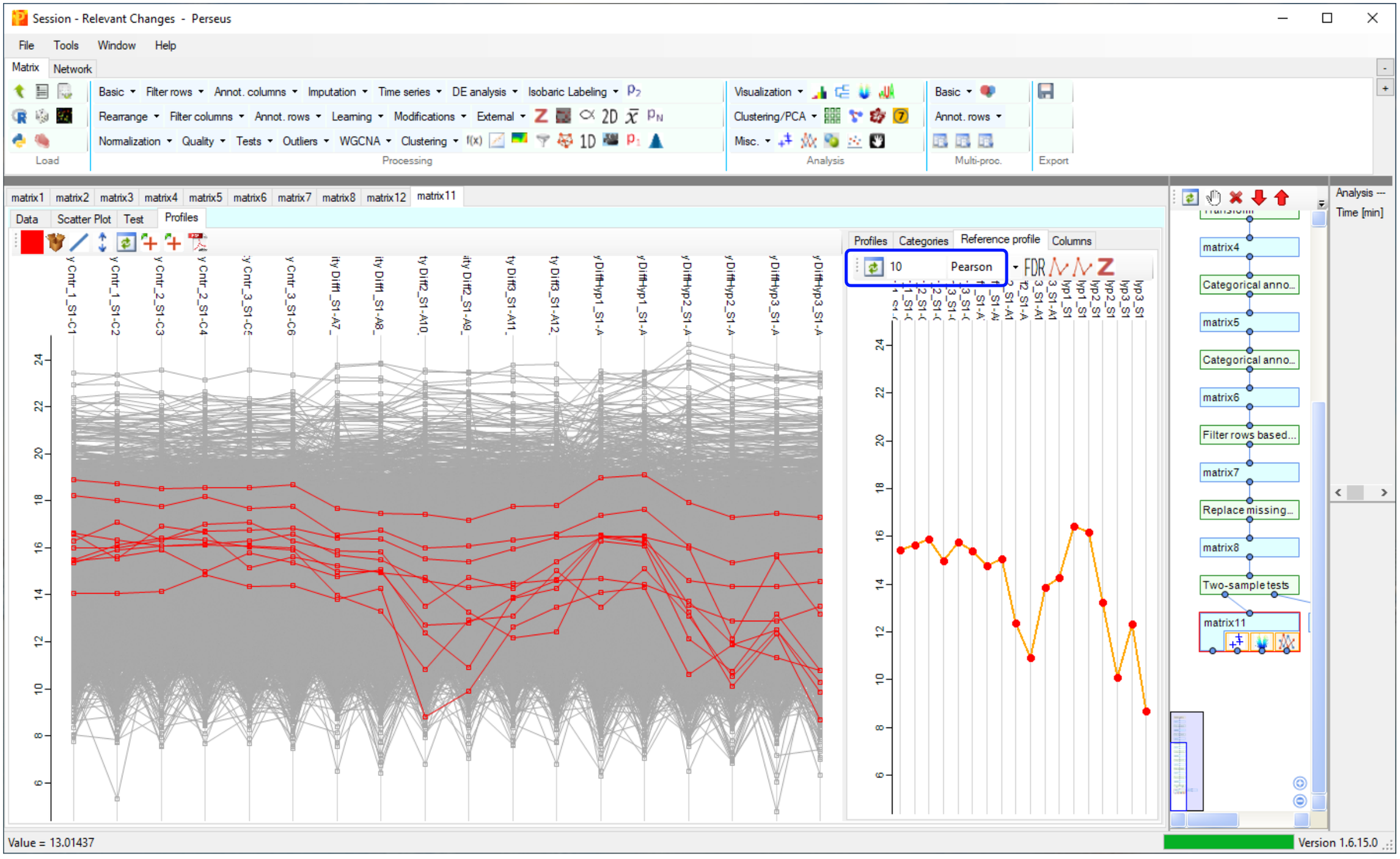
Perseus

Statistical Data Analysis - Visualisation: Time Course Analysis - **Visualisation. > Profile Plot**



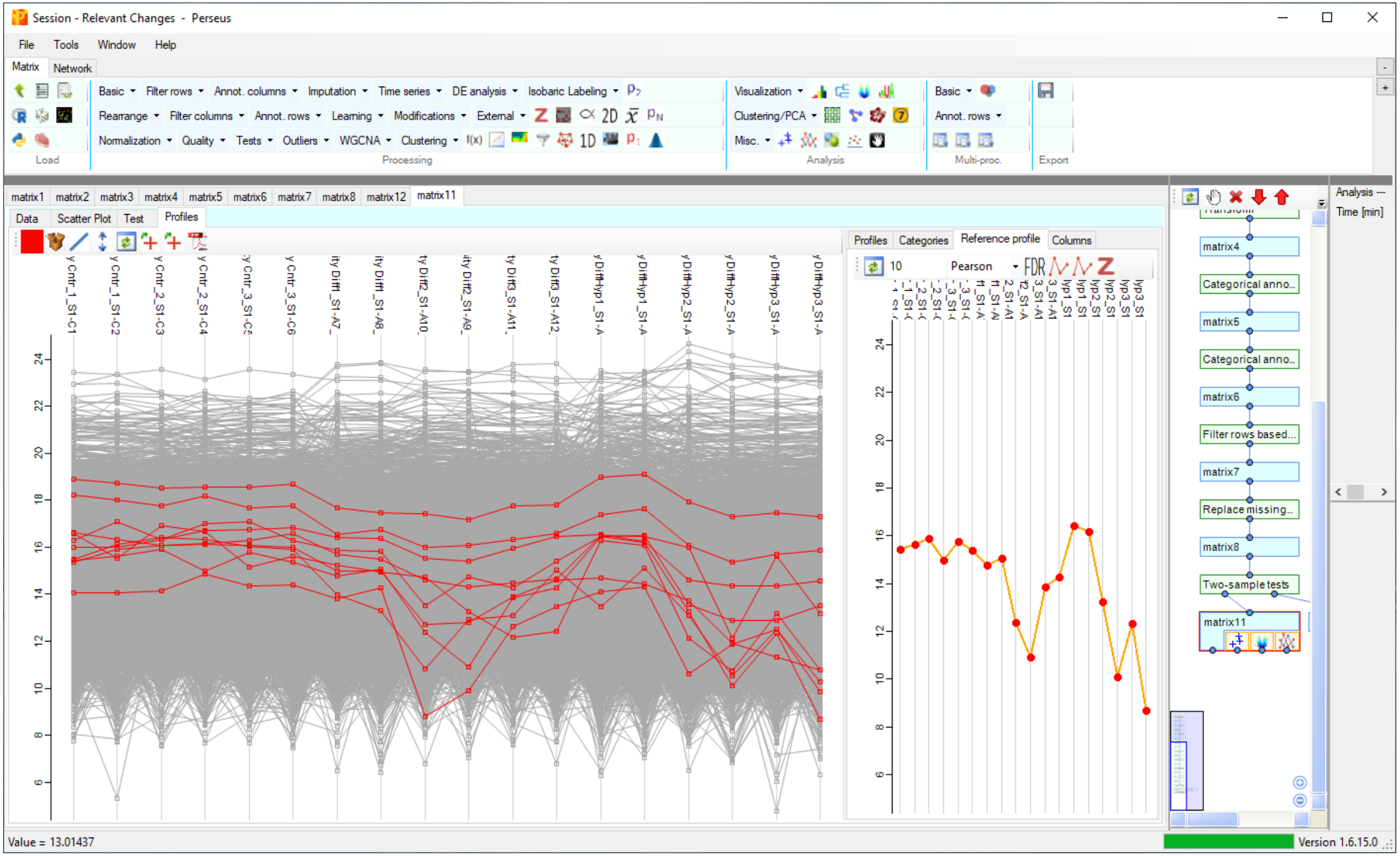
Perseus

Statistical Data Analysis - Visualisation: Time Course Analysis - **Visualisation. > Profile Plot**



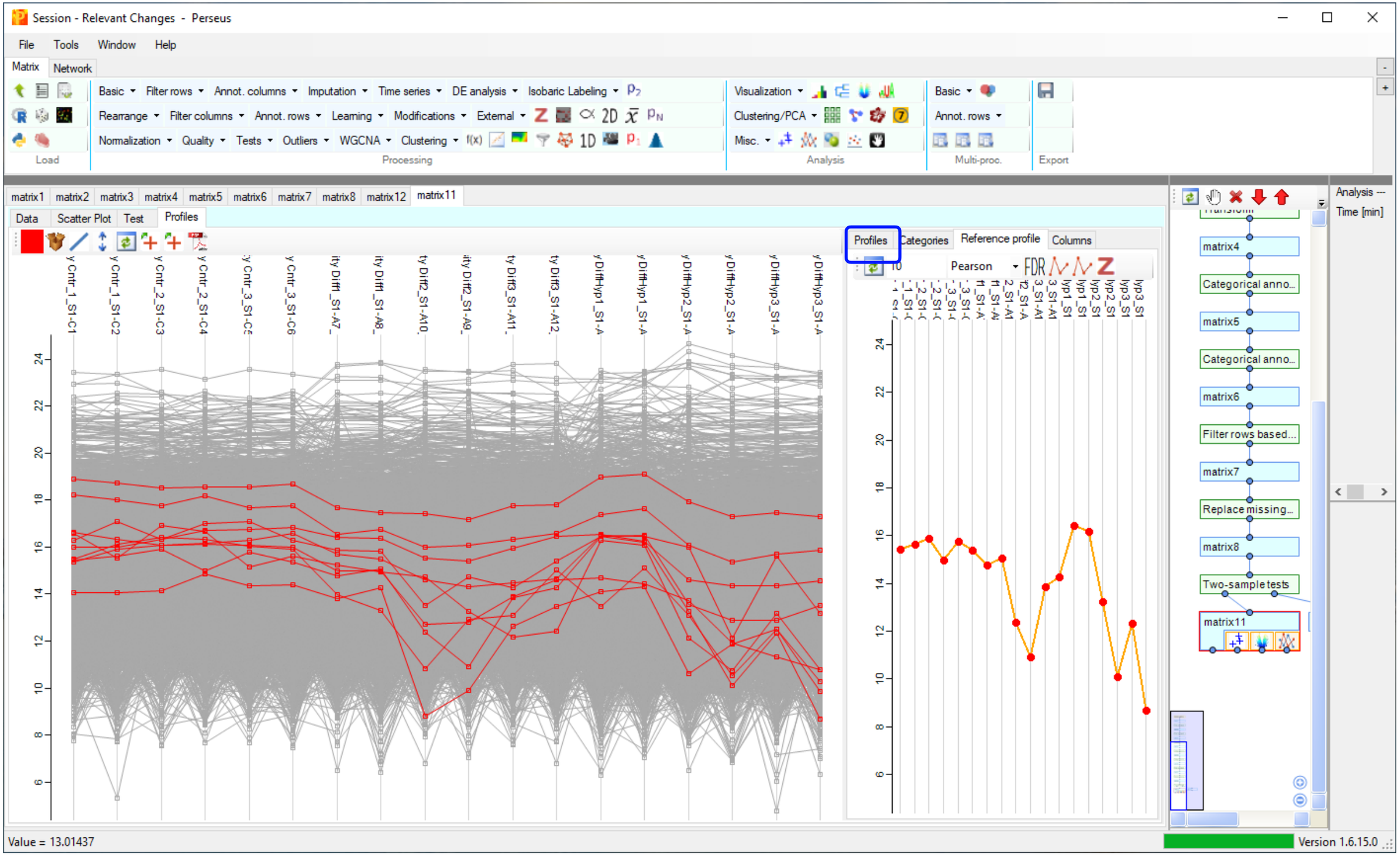
Perseus

Statistical Data Analysis - Visualisation: Time Course Analysis - **Visualisation. > Profile Plot**



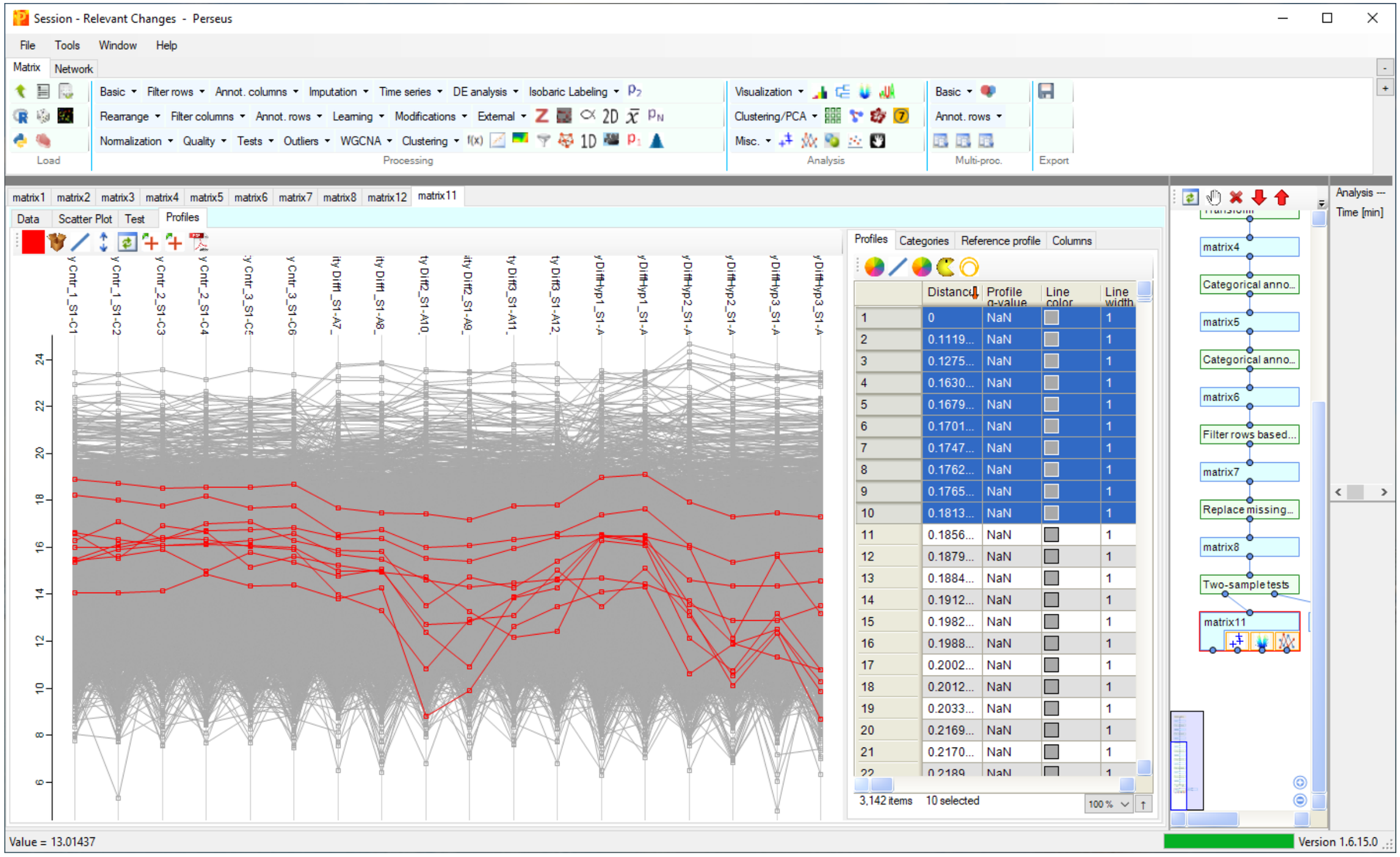
Perseus

Statistical Data Analysis - Visualisation: Time Course Analysis - **Visualisation. > Profile Plot**



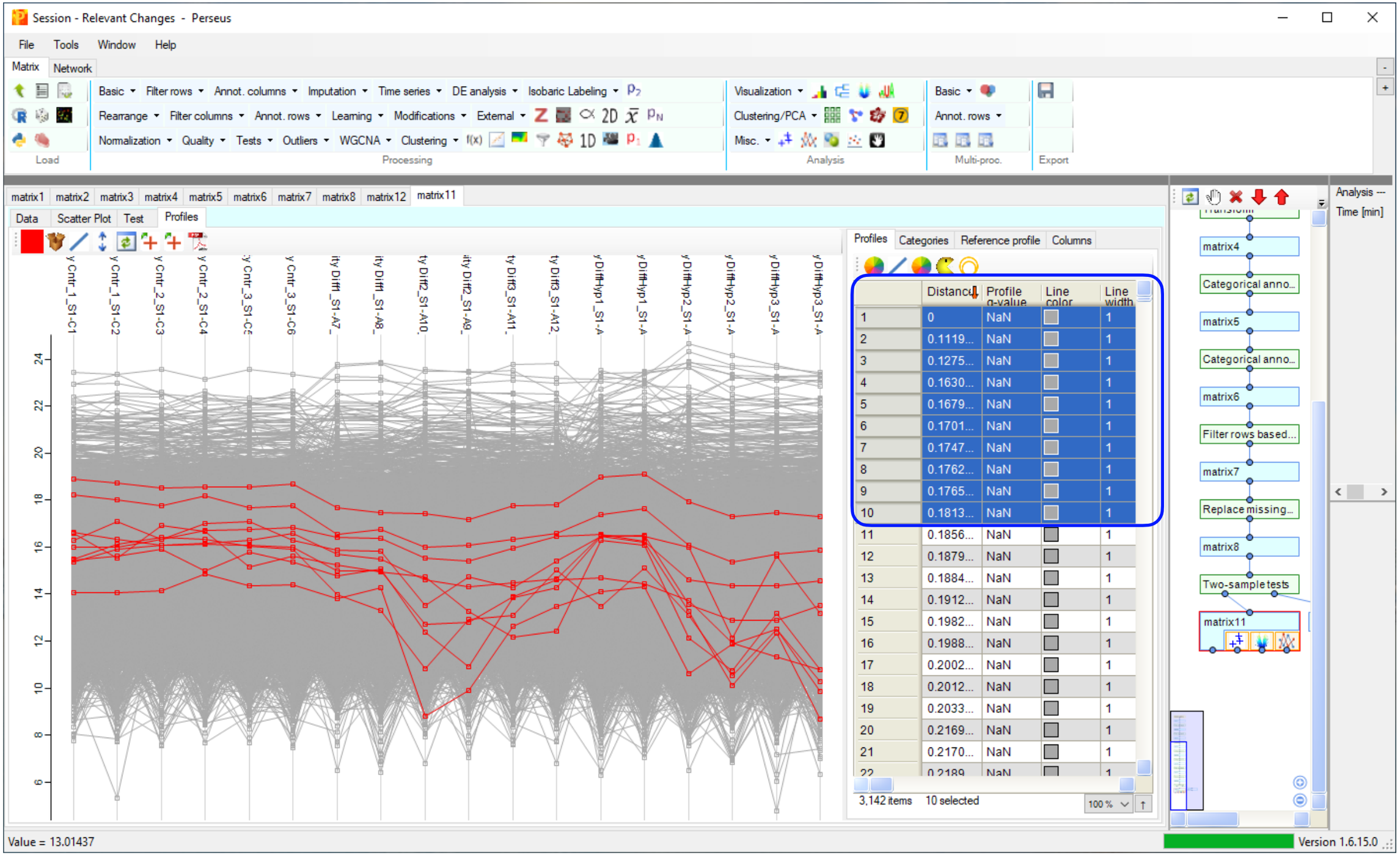
Perseus

Statistical Data Analysis - Visualisation: Time Course Analysis - **Visualisation. > Profile Plot**



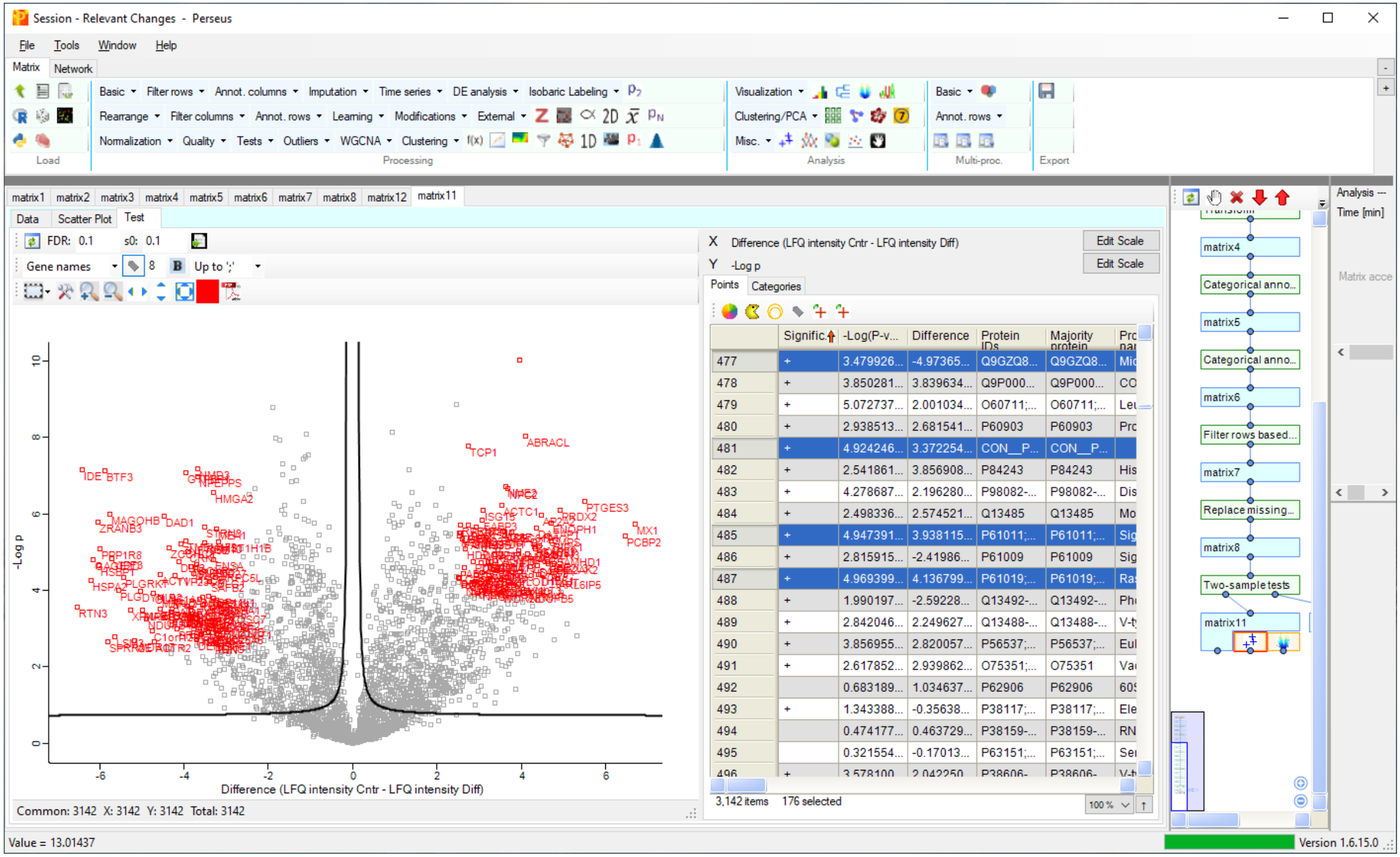
Perseus

Statistical Data Analysis - Visualisation: Time Course Analysis - **Visualisation. > Profile Plot**



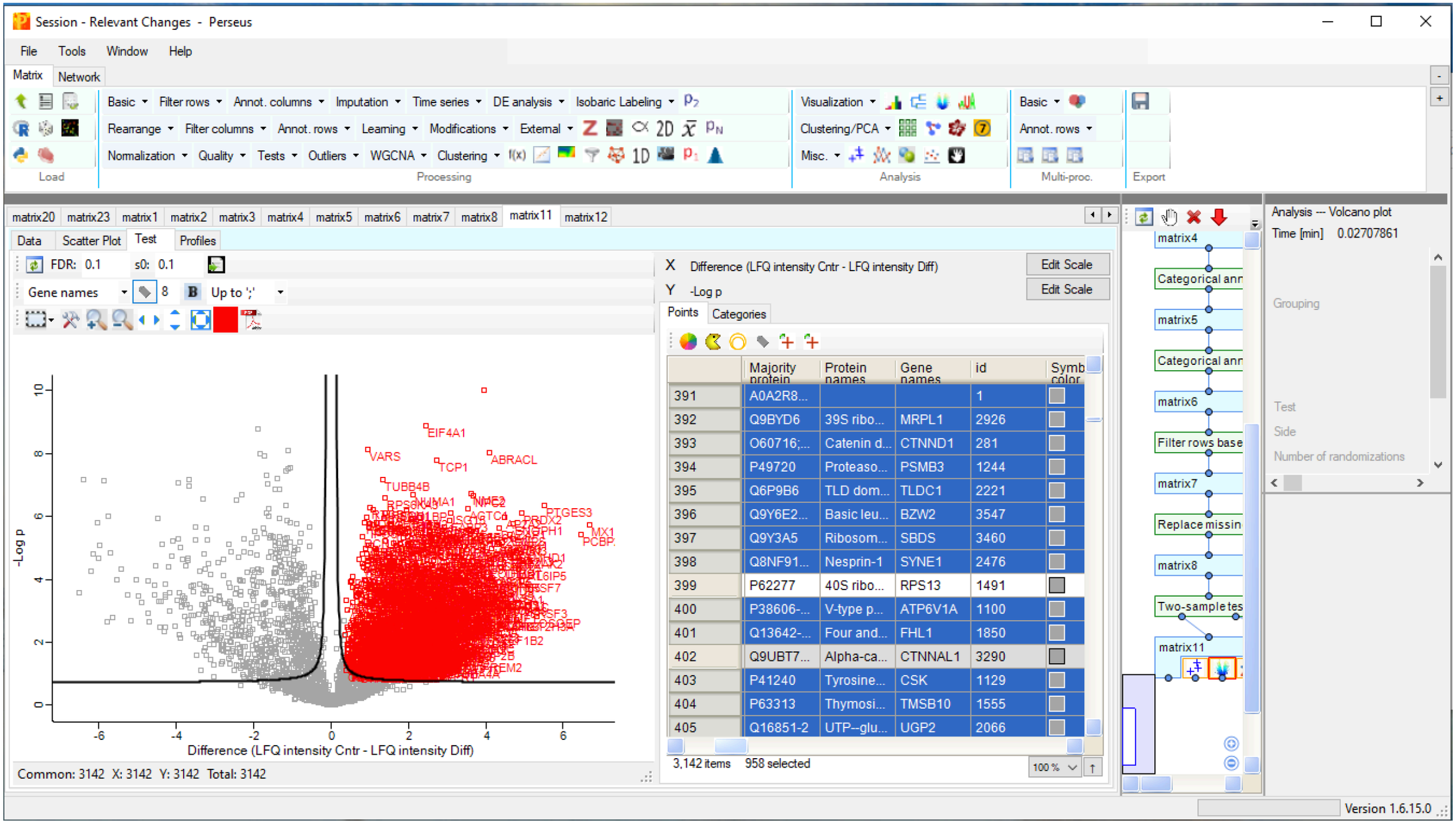
Perseus

Statistical Data Analysis - Visualisation: Intensity Difference - Statistical Significance - **Misc. > Volcano plot**



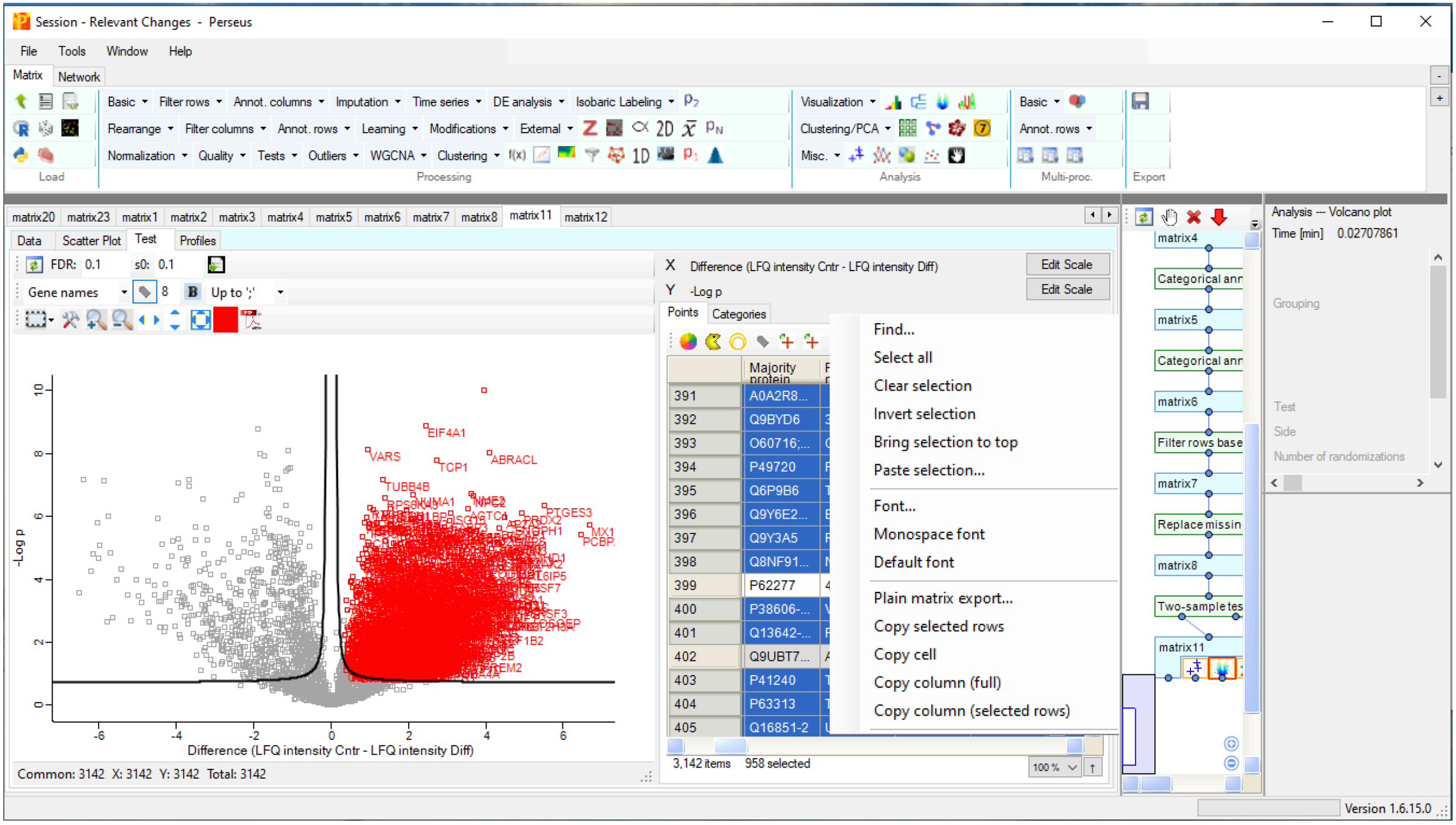
Perseus

Statistical Data Analysis - Visualisation: Intensity Difference - Statistical Significance - **Right Click onto the Table > Copy Selected Rows**



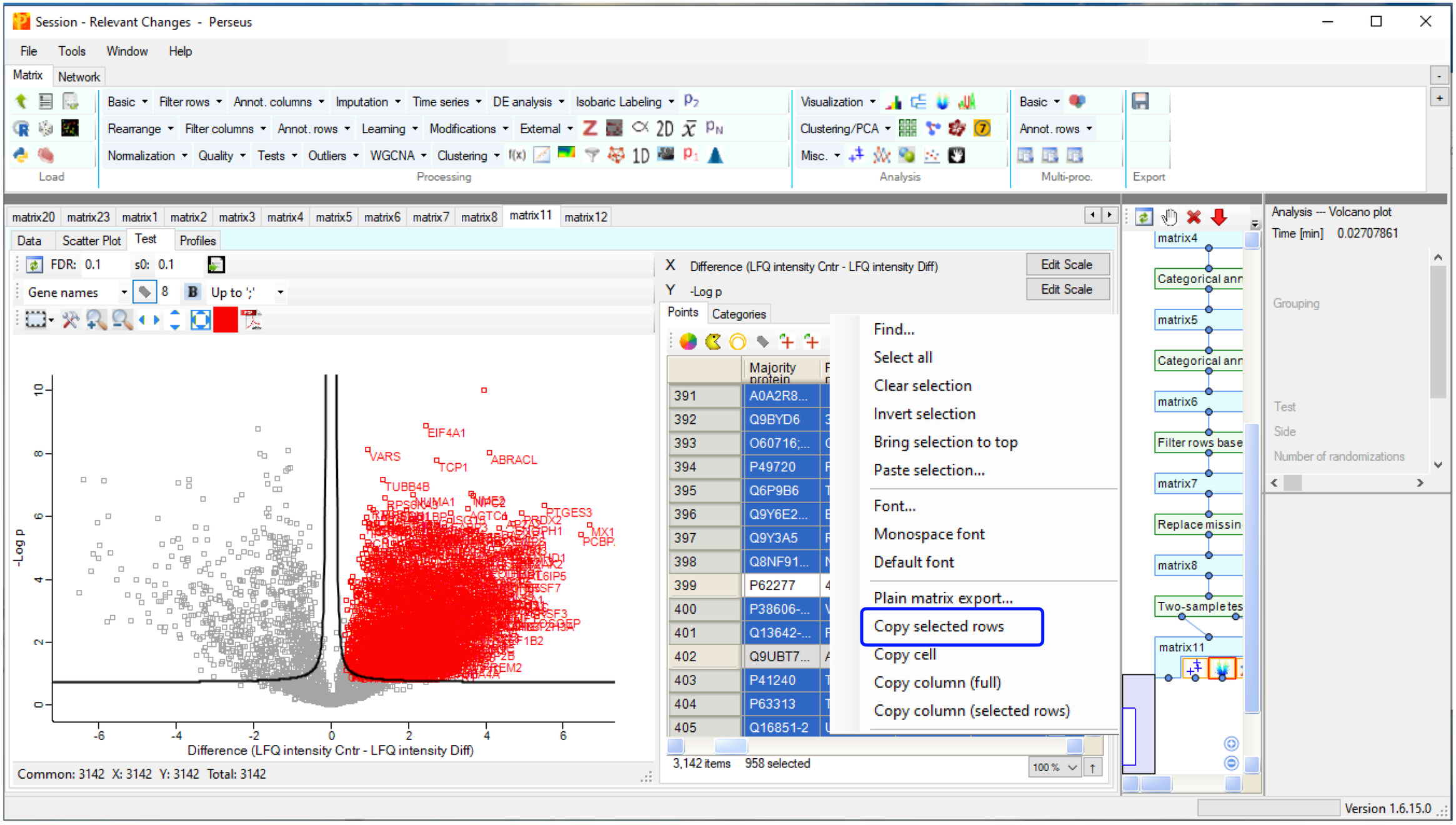
Perseus

Statistical Data Analysis - Visualisation: Intensity Difference - Statistical Significance - **Right Click onto the Table > Copy Selected Rows**



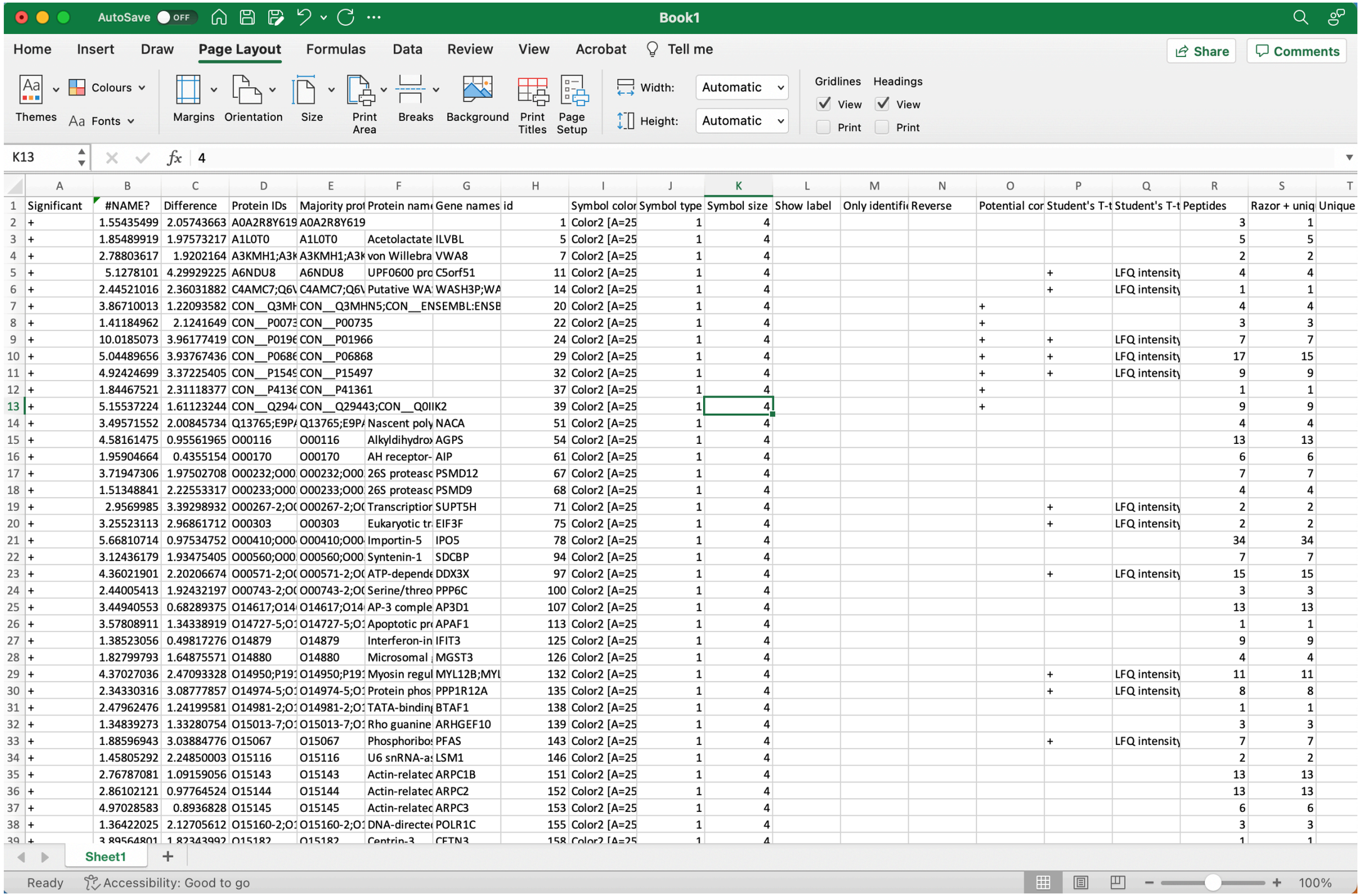
Perseus

Statistical Data Analysis - Visualisation: Intensity Difference - Statistical Significance - **Right Click onto the Table > Copy Selected Rows**



Excel

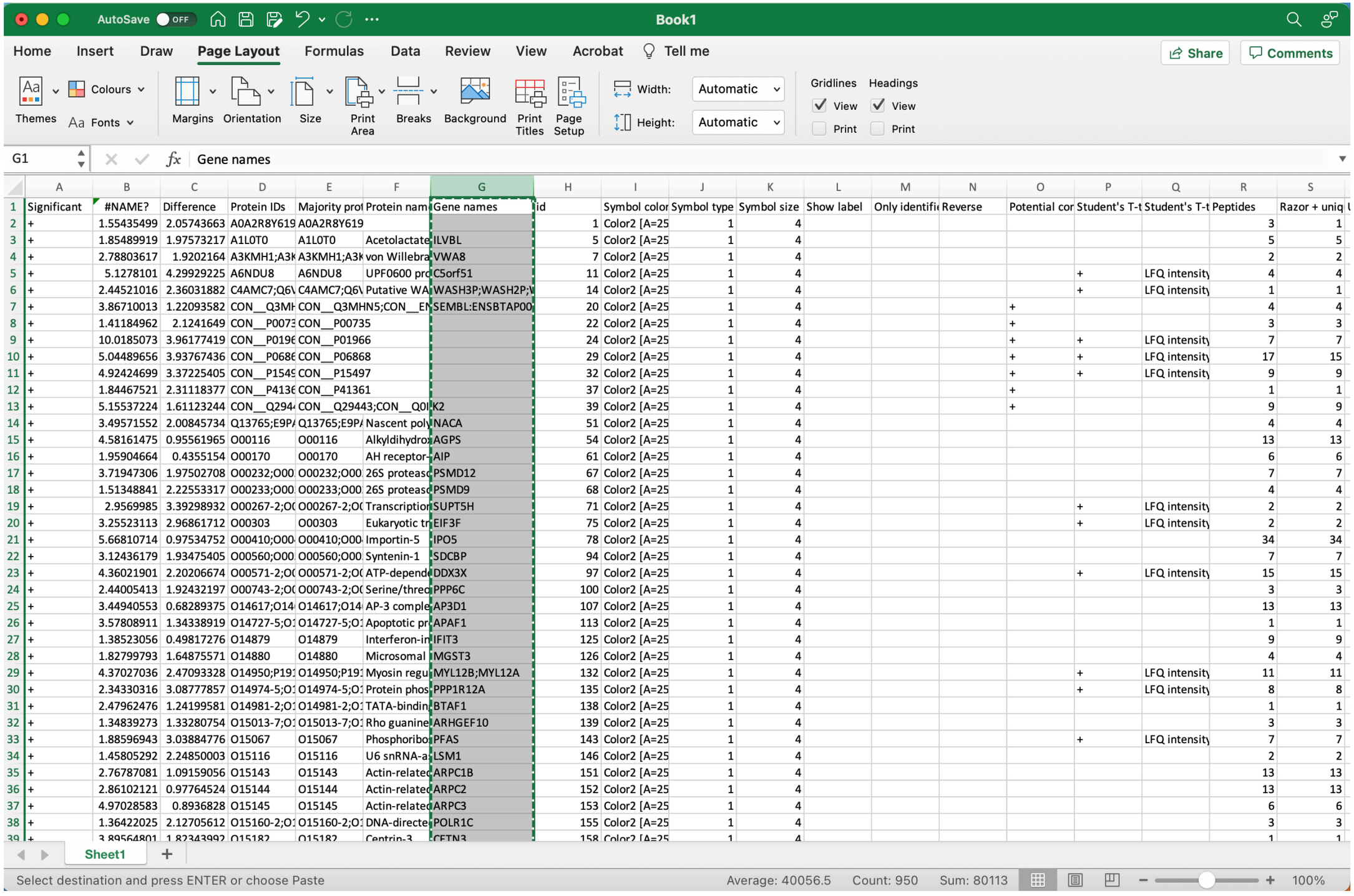
Statistical Data Analysis - Visualisation: Network & Pathway Analysis



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
1	Significant	#NAME?	Difference	Protein IDs	Majority prot	Protein nam	Gene names	id	Symbol color	Symbol type	Symbol size	Show label	Only identifi	Reverse	Potential cor	Student's T-t	Student's T-t	Peptides	Razor + uniq	Unique
2	+	1.55435499	2.05743663	A0A2R8Y619	A0A2R8Y619			1	Color2 [A=25	1	4							3	1	
3	+	1.85489919	1.97573217	A1L0T0	A1L0T0	Acetolactate	ILVBL	5	Color2 [A=25	1	4							5	5	
4	+	2.78803617	1.9202164	A3KMH1;A3K	A3KMH1;A3K	von Willebra	VWA8	7	Color2 [A=25	1	4							2	2	
5	+	5.1278101	4.29929225	A6NDU8	A6NDU8	UPF0600 pro	C5orf51	11	Color2 [A=25	1	4					+	LFQ intensity	4	4	
6	+	2.44521016	2.36031882	C4AMC7;Q6V	C4AMC7;Q6V	Putative WA	WASH3P;WA	14	Color2 [A=25	1	4					+	LFQ intensity	1	1	
7	+	3.86710013	1.22093582	CON__Q3MH	CON__Q3MHN5;CON__ENSEMBL:ENSB			20	Color2 [A=25	1	4				+			4	4	
8	+	1.41184962	2.1241649	CON__P0073	CON__P00735			22	Color2 [A=25	1	4				+			3	3	
9	+	10.0185073	3.96177419	CON__P0196	CON__P01966			24	Color2 [A=25	1	4				+	+	LFQ intensity	7	7	
10	+	5.04489656	3.93767436	CON__P0686	CON__P06868			29	Color2 [A=25	1	4				+	+	LFQ intensity	17	15	
11	+	4.92424699	3.37225405	CON__P1549	CON__P15497			32	Color2 [A=25	1	4				+	+	LFQ intensity	9	9	
12	+	1.84467521	2.31118377	CON__P4136	CON__P41361			37	Color2 [A=25	1	4				+			1	1	
13	+	5.15537224	1.61123244	CON__Q2944	CON__Q29443;CON__Q0IIK2			39	Color2 [A=25	1	4				+			9	9	
14	+	3.49571552	2.00845734	Q13765;E9PA	Q13765;E9PA	Nascent poly	NACA	51	Color2 [A=25	1	4							4	4	
15	+	4.58161475	0.95561965	O00116	O00116	Alkyldihydro	AGPS	54	Color2 [A=25	1	4							13	13	
16	+	1.95904664	0.4355154	O00170	O00170	AH receptor-	AIP	61	Color2 [A=25	1	4							6	6	
17	+	3.71947306	1.97502708	O00232;O00	O00232;O00	26S proteasc	PSMD12	67	Color2 [A=25	1	4							7	7	
18	+	1.51348841	2.22553317	O00233;O00	O00233;O00	26S proteasc	PSMD9	68	Color2 [A=25	1	4							4	4	
19	+	2.9569985	3.39298932	O00267-2;O0	O00267-2;O0	Transcriptior	SUPT5H	71	Color2 [A=25	1	4					+	LFQ intensity	2	2	
20	+	3.25523113	2.96861712	O00303	O00303	Eukaryotic tr	EIF3F	75	Color2 [A=25	1	4					+	LFQ intensity	2	2	
21	+	5.66810714	0.97534752	O00410;O00	O00410;O00	Importin-5	IPO5	78	Color2 [A=25	1	4							34	34	
22	+	3.12436179	1.93475405	O00560;O00	O00560;O00	Syntenin-1	SDCBP	94	Color2 [A=25	1	4							7	7	
23	+	4.36021901	2.20206674	O00571-2;O0	O00571-2;O0	ATP-depende	DDX3X	97	Color2 [A=25	1	4					+	LFQ intensity	15	15	
24	+	2.44005413	1.92432197	O00743-2;O0	O00743-2;O0	Serine/threo	PPP6C	100	Color2 [A=25	1	4							3	3	
25	+	3.44940553	0.68289375	O14617;O14	O14617;O14	AP-3 comple	AP3D1	107	Color2 [A=25	1	4							13	13	
26	+	3.57808911	1.34338919	O14727-5;O1	O14727-5;O1	Apoptotic pr	APAF1	113	Color2 [A=25	1	4							1	1	
27	+	1.38523056	0.49817276	O14879	O14879	Interferon-in	IFIT3	125	Color2 [A=25	1	4							9	9	
28	+	1.82799793	1.64875571	O14880	O14880	Microsomal	MGST3	126	Color2 [A=25	1	4							4	4	
29	+	4.37027036	2.47093328	O14950;P19	O14950;P19	Myosin regul	MYL12B;MYL	132	Color2 [A=25	1	4					+	LFQ intensity	11	11	
30	+	2.34330316	3.08777857	O14974-5;O1	O14974-5;O1	Protein phos	PPP1R12A	135	Color2 [A=25	1	4					+	LFQ intensity	8	8	
31	+	2.47962476	1.24199581	O14981-2;O1	O14981-2;O1	TATA-binding	BTAF1	138	Color2 [A=25	1	4							1	1	
32	+	1.34839273	1.33280754	O15013-7;O1	O15013-7;O1	Rho guanine	ARHGEF10	139	Color2 [A=25	1	4							3	3	
33	+	1.88596943	3.03884776	O15067	O15067	Phosphoribo	PFAS	143	Color2 [A=25	1	4					+	LFQ intensity	7	7	
34	+	1.45805292	2.24850003	O15116	O15116	U6 snRNA-as	LSM1	146	Color2 [A=25	1	4							2	2	
35	+	2.76787081	1.09159056	O15143	O15143	Actin-relatec	ARPC1B	151	Color2 [A=25	1	4							13	13	
36	+	2.86102121	0.97764524	O15144	O15144	Actin-relatec	ARPC2	152	Color2 [A=25	1	4							13	13	
37	+	4.97028583	0.8936828	O15145	O15145	Actin-relatec	ARPC3	153	Color2 [A=25	1	4							6	6	
38	+	1.36422025	2.12705612	O15160-2;O1	O15160-2;O1	DNA-directe	POLR1C	155	Color2 [A=25	1	4							3	3	
39	+	3.89564801	1.82343992	O15182	O15182	Centrin-3	CETN3	158	Color2 [A=25	1	4							1	1	

Excel

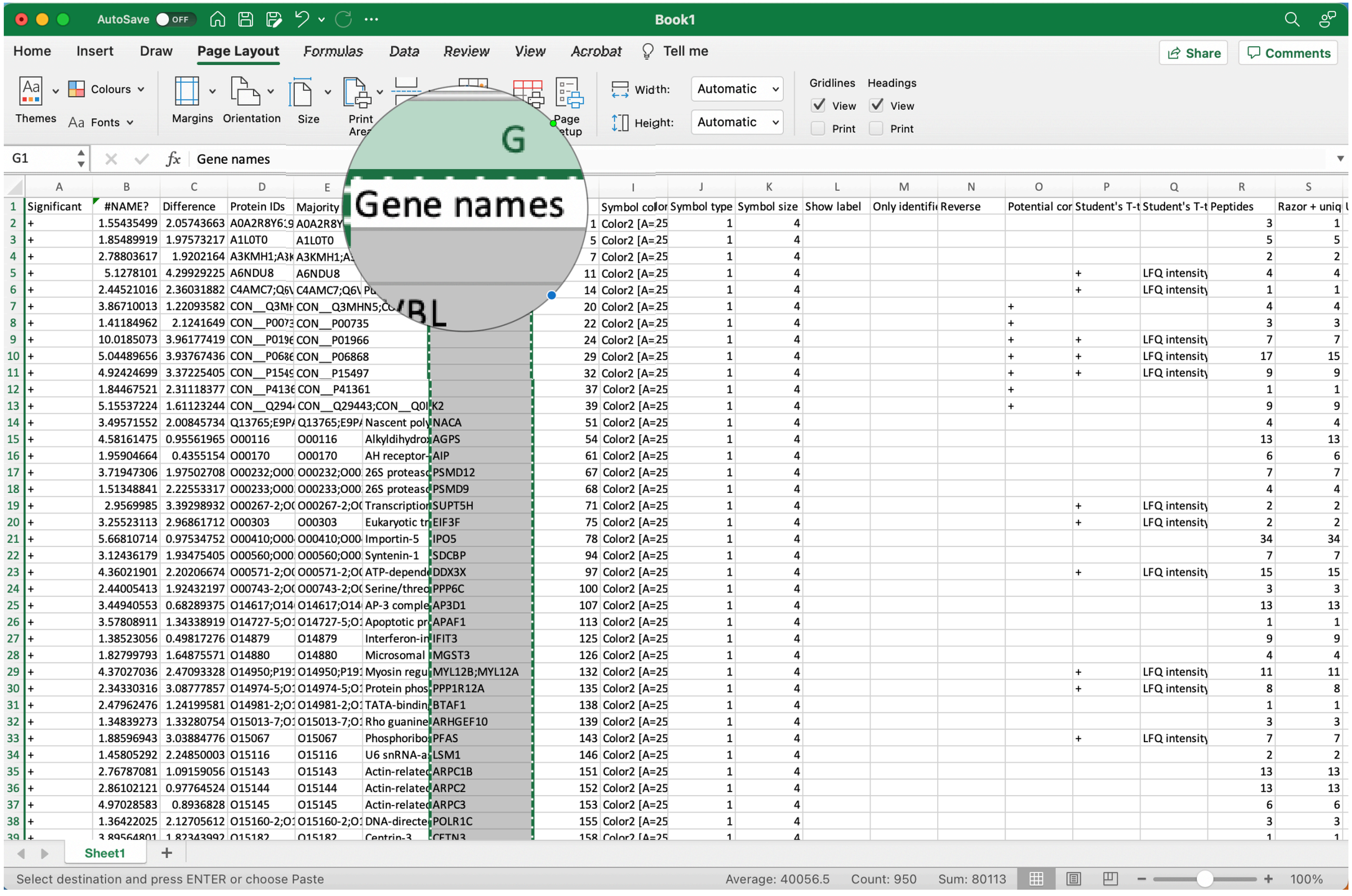
Statistical Data Analysis - Visualisation: Network & Pathway Analysis



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
1	Significant	#NAME?	Difference	Protein IDs	Majority prot	Protein nam	Gene names	id	Symbol color	Symbol type	Symbol size	Show label	Only identifi	Reverse	Potential cor	Student's T-t	Student's T-t	Peptides	Razor + uniq
2	+	1.55435499	2.05743663	A0A2R8Y619	A0A2R8Y619			1	Color2 [A=25	1	4							3	1
3	+	1.85489919	1.97573217	A1L0T0	A1L0T0	Acetolactate	ILVBL	5	Color2 [A=25	1	4							5	5
4	+	2.78803617	1.9202164	A3KMH1;A3K	A3KMH1;A3K	von Willebra	VWA8	7	Color2 [A=25	1	4							2	2
5	+	5.1278101	4.29929225	A6NDU8	A6NDU8	UPF0600 pro	C5orf51	11	Color2 [A=25	1	4					+	LFQ intensity	4	4
6	+	2.44521016	2.36031882	C4AMC7;Q6V	C4AMC7;Q6V	Putative WA	WASH3P;WASH2P;V	14	Color2 [A=25	1	4					+	LFQ intensity	1	1
7	+	3.86710013	1.22093582	CON__Q3MH	CON__Q3MH	N5;CON__EN	SEMBL:ENSBTAP00	20	Color2 [A=25	1	4				+			4	4
8	+	1.41184962	2.1241649	CON__P0073	CON__P00735			22	Color2 [A=25	1	4				+			3	3
9	+	10.0185073	3.96177419	CON__P0196	CON__P01966			24	Color2 [A=25	1	4				+	+	LFQ intensity	7	7
10	+	5.04489656	3.93767436	CON__P0686	CON__P06868			29	Color2 [A=25	1	4				+	+	LFQ intensity	17	15
11	+	4.92424699	3.37225405	CON__P1549	CON__P15497			32	Color2 [A=25	1	4				+	+	LFQ intensity	9	9
12	+	1.84467521	2.31118377	CON__P4136	CON__P41361			37	Color2 [A=25	1	4				+			1	1
13	+	5.15537224	1.61123244	CON__Q294	CON__Q29443;CON__Q0		K2	39	Color2 [A=25	1	4				+			9	9
14	+	3.49571552	2.00845734	Q13765;E9P	Q13765;E9P	Nascent poly	NACA	51	Color2 [A=25	1	4							4	4
15	+	4.58161475	0.95561965	O00116	O00116	Alkyldihydro	AGPS	54	Color2 [A=25	1	4							13	13
16	+	1.95904664	0.4355154	O00170	O00170	AH receptor-	AIP	61	Color2 [A=25	1	4							6	6
17	+	3.71947306	1.97502708	O00232;O00	O00232;O00	26S proteaso	PSMD12	67	Color2 [A=25	1	4							7	7
18	+	1.51348841	2.22553317	O00233;O00	O00233;O00	26S proteaso	PSMD9	68	Color2 [A=25	1	4							4	4
19	+	2.9569985	3.39298932	O00267-2;O0	O00267-2;O0	Transcription	SUPT5H	71	Color2 [A=25	1	4					+	LFQ intensity	2	2
20	+	3.25523113	2.96861712	O00303	O00303	Eukaryotic tr	EIF3F	75	Color2 [A=25	1	4					+	LFQ intensity	2	2
21	+	5.66810714	0.97534752	O00410;O00	O00410;O00	Importin-5	IPO5	78	Color2 [A=25	1	4							34	34
22	+	3.12436179	1.93475405	O00560;O00	O00560;O00	Syntenin-1	SDCBP	94	Color2 [A=25	1	4							7	7
23	+	4.36021901	2.20206674	O00571-2;O0	O00571-2;O0	ATP-depende	DDX3X	97	Color2 [A=25	1	4					+	LFQ intensity	15	15
24	+	2.44005413	1.92432197	O00743-2;O0	O00743-2;O0	Serine/threo	PPP6C	100	Color2 [A=25	1	4							3	3
25	+	3.44940553	0.68289375	O14617;O14	O14617;O14	AP-3 comple	AP3D1	107	Color2 [A=25	1	4							13	13
26	+	3.57808911	1.34338919	O14727-5;O1	O14727-5;O1	Apoptotic pr	APAF1	113	Color2 [A=25	1	4							1	1
27	+	1.38523056	0.49817276	O14879	O14879	Interferon-in	IFIT3	125	Color2 [A=25	1	4							9	9
28	+	1.82799793	1.64875571	O14880	O14880	Microsomal	MGST3	126	Color2 [A=25	1	4							4	4
29	+	4.37027036	2.47093328	O14950;P19	O14950;P19	Myosin regu	MYL12B;MYL12A	132	Color2 [A=25	1	4					+	LFQ intensity	11	11
30	+	2.34330316	3.08777857	O14974-5;O1	O14974-5;O1	Protein phos	PPP1R12A	135	Color2 [A=25	1	4					+	LFQ intensity	8	8
31	+	2.47962476	1.24199581	O14981-2;O1	O14981-2;O1	TATA-bindin	BTAF1	138	Color2 [A=25	1	4							1	1
32	+	1.34839273	1.33280754	O15013-7;O1	O15013-7;O1	Rho guanine	ARHGEF10	139	Color2 [A=25	1	4							3	3
33	+	1.88596943	3.03884776	O15067	O15067	Phosphoribo	PFAS	143	Color2 [A=25	1	4					+	LFQ intensity	7	7
34	+	1.45805292	2.24850003	O15116	O15116	U6 snRNA-a	LSM1	146	Color2 [A=25	1	4							2	2
35	+	2.76787081	1.09159056	O15143	O15143	Actin-relate	ARPC1B	151	Color2 [A=25	1	4							13	13
36	+	2.86102121	0.97764524	O15144	O15144	Actin-relate	ARPC2	152	Color2 [A=25	1	4							13	13
37	+	4.97028583	0.8936828	O15145	O15145	Actin-relate	ARPC3	153	Color2 [A=25	1	4							6	6
38	+	1.36422025	2.12705612	O15160-2;O1	O15160-2;O1	DNA-directe	POLR1C	155	Color2 [A=25	1	4							3	3
39	+	3.89564801	1.82343992	O15182	O15182	Centrin-3	CETN3	158	Color2 [A=25	1	4							1	1

Excel

Statistical Data Analysis - Visualisation: Network & Pathway Analysis



	Significant	#NAME?	Difference	Protein IDs	Majority			Symbol color	Symbol type	Symbol size	Show label	Only identifi	Reverse	Potential cor	Student's T-t	Student's T-t	Peptides	Razor + uniq
2	+	1.55435499	2.05743663	A0A2R8Y6;9	A0A2R8Y		1	Color2 [A=25	1	4							3	1
3	+	1.85489919	1.97573217	A1L0T0	A1L0T0		5	Color2 [A=25	1	4							5	5
4	+	2.78803617	1.9202164	A3KMH1;A3k	A3KMH1;A		7	Color2 [A=25	1	4							2	2
5	+	5.1278101	4.29929225	A6NDU8	A6NDU8		11	Color2 [A=25	1	4					+	LFQ intensity	4	4
6	+	2.44521016	2.36031882	C4AMC7;Q6\	C4AMC7;Q6\	Pu	14	Color2 [A=25	1	4					+	LFQ intensity	1	1
7	+	3.86710013	1.22093582	CON__Q3MH	CON__Q3MHN5;C	VBL	20	Color2 [A=25	1	4				+			4	4
8	+	1.41184962	2.1241649	CON__P0073	CON__P00735		22	Color2 [A=25	1	4				+			3	3
9	+	10.0185073	3.96177419	CON__P0196	CON__P01966		24	Color2 [A=25	1	4				+	+	LFQ intensity	7	7
10	+	5.04489656	3.93767436	CON__P0686	CON__P06868		29	Color2 [A=25	1	4				+	+	LFQ intensity	17	15
11	+	4.92424699	3.37225405	CON__P1549	CON__P15497		32	Color2 [A=25	1	4				+	+	LFQ intensity	9	9
12	+	1.84467521	2.31118377	CON__P4136	CON__P41361		37	Color2 [A=25	1	4				+			1	1
13	+	5.15537224	1.61123244	CON__Q294	CON__Q29443;CON__Q0	K2	39	Color2 [A=25	1	4				+			9	9
14	+	3.49571552	2.00845734	Q13765;E9P/	Q13765;E9P/	Nascent poly	NACA	51	Color2 [A=25	1	4						4	4
15	+	4.58161475	0.95561965	O00116	O00116	Alkyldihydro	AGPS	54	Color2 [A=25	1	4						13	13
16	+	1.95904664	0.4355154	O00170	O00170	AH receptor-	AIP	61	Color2 [A=25	1	4						6	6
17	+	3.71947306	1.97502708	O00232;O00	O00232;O00	26S proteasc	PSMD12	67	Color2 [A=25	1	4						7	7
18	+	1.51348841	2.22553317	O00233;O00	O00233;O00	26S proteasc	PSMD9	68	Color2 [A=25	1	4						4	4
19	+	2.9569985	3.39298932	O00267-2;O0	O00267-2;O0	Transcription	SUPT5H	71	Color2 [A=25	1	4				+	LFQ intensity	2	2
20	+	3.25523113	2.96861712	O00303	O00303	Eukaryotic tr	EIF3F	75	Color2 [A=25	1	4				+	LFQ intensity	2	2
21	+	5.66810714	0.97534752	O00410;O00	O00410;O00	Importin-5	IPO5	78	Color2 [A=25	1	4						34	34
22	+	3.12436179	1.93475405	O00560;O00	O00560;O00	Syntenin-1	SDCBP	94	Color2 [A=25	1	4						7	7
23	+	4.36021901	2.20206674	O00571-2;O0	O00571-2;O0	ATP-depende	DDX3X	97	Color2 [A=25	1	4				+	LFQ intensity	15	15
24	+	2.44005413	1.92432197	O00743-2;O0	O00743-2;O0	Serine/threo	PPP6C	100	Color2 [A=25	1	4						3	3
25	+	3.44940553	0.68289375	O14617;O14	O14617;O14	AP-3 comple	AP3D1	107	Color2 [A=25	1	4						13	13
26	+	3.57808911	1.34338919	O14727-5;O1	O14727-5;O1	Apoptotic pr	APAF1	113	Color2 [A=25	1	4						1	1
27	+	1.38523056	0.49817276	O14879	O14879	Interferon-in	IFIT3	125	Color2 [A=25	1	4						9	9
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31	+	2.47962476	1.24199581	O14981-2;O1	O14981-2;O1	TATA-bindin	BTAF1	138	Color2 [A=25	1	4						1	1
32	+	1.34839273	1.33280754	O15013-7;O1	O15013-7;O1	Rho guanine	ARHGEF10	139	Color2 [A=25	1	4						3	3
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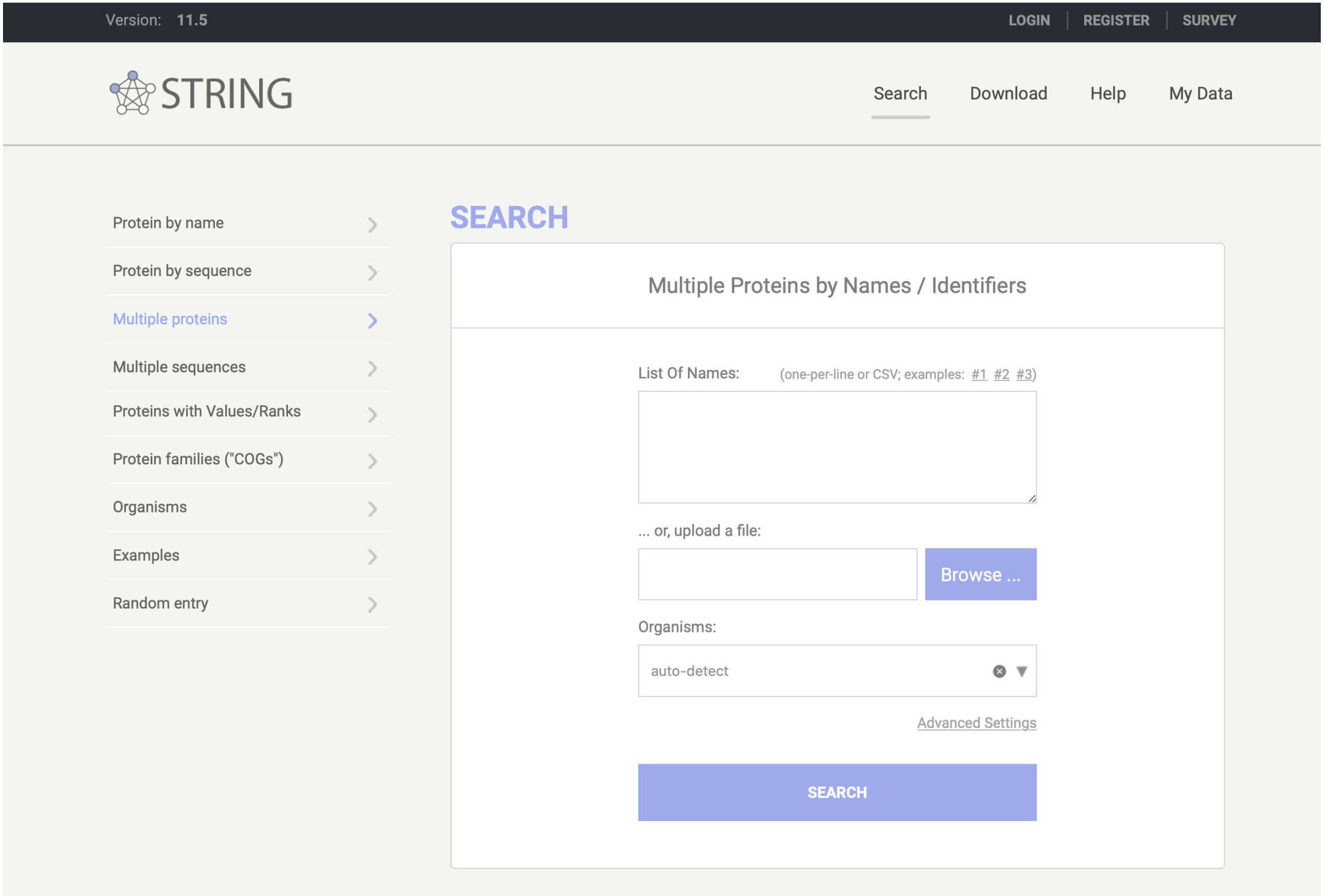
String : https://string-db.org/

STRING

Statistical Data Analysis - Visualisation: Network & Pathway Analysis



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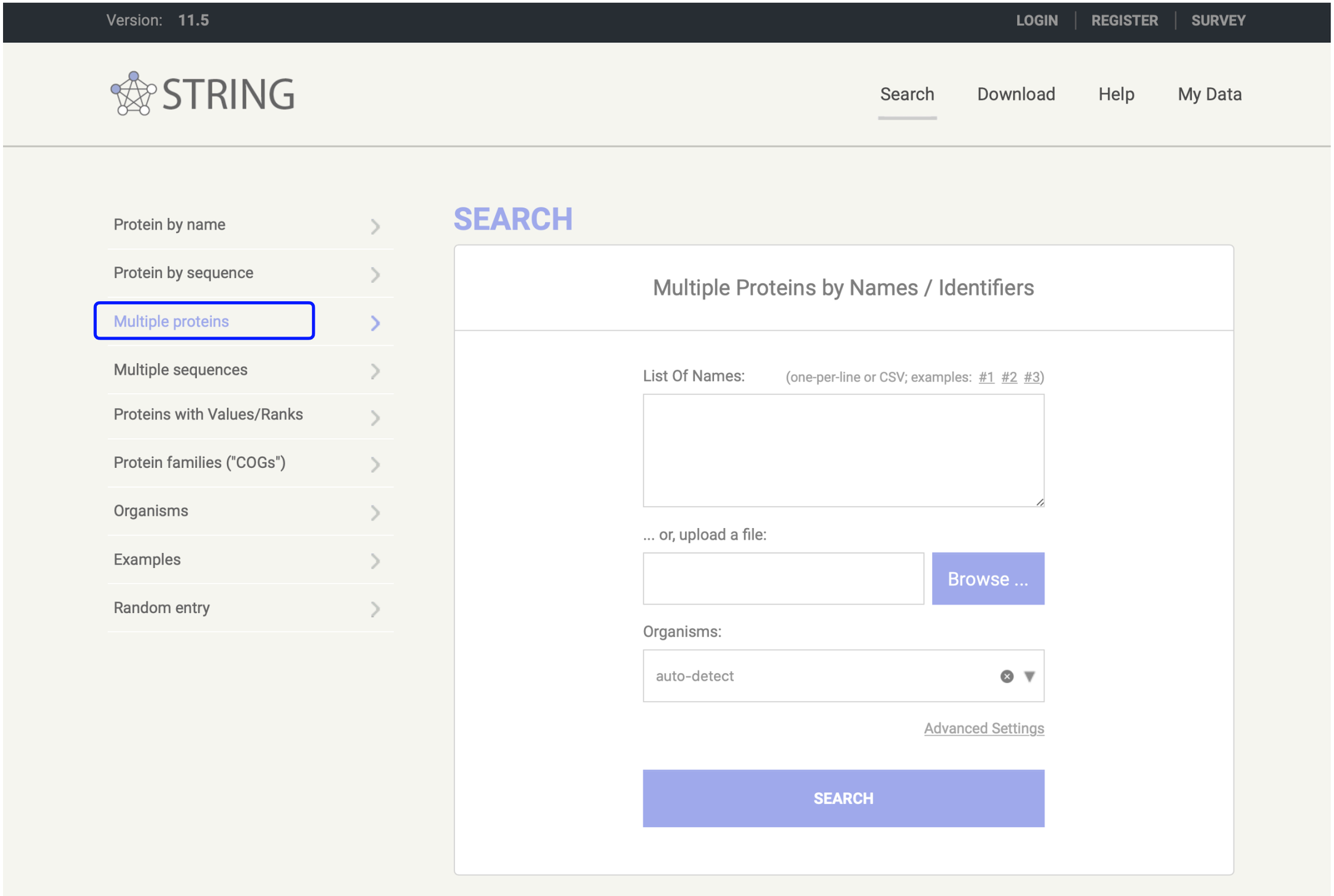

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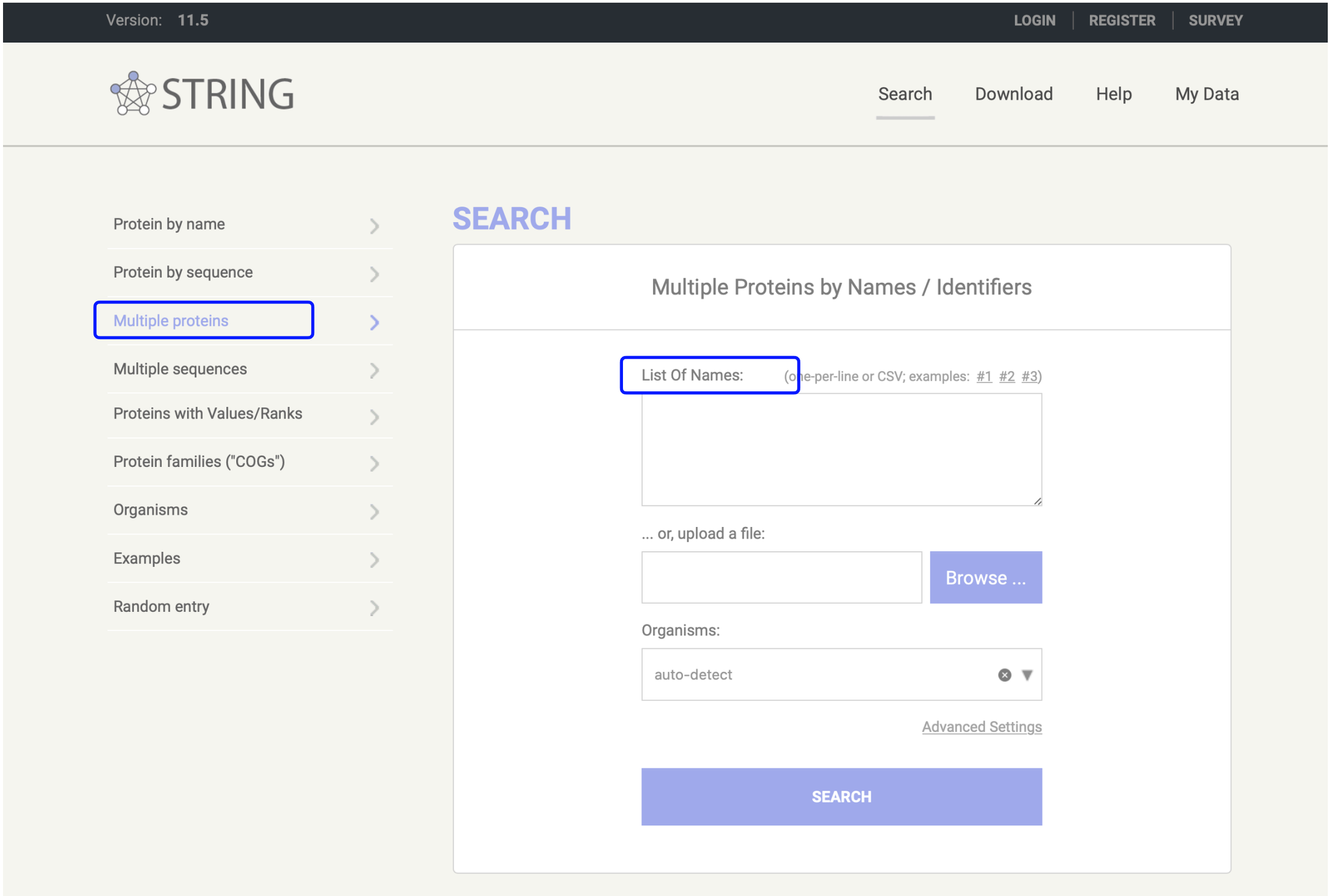

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STRING

Statistical Data Analysis - Visualisation: Network & Pathway Analysis - **Search**

Version: 11.5 LOGIN | REGISTER | SURVEY

STRING

Search Download Help My Data

- Protein by name
- Protein by sequence
- Multiple proteins
- Multiple sequences
- Proteins with Values/Ranks
- Protein families ("COGs")
- Organisms
- Examples
- Random entry

SEARCH

Multiple Proteins by Names / Identifiers

List Of Names: (one-per-line or CSV; examples: #1 #2 #3)

HDAC6
CLIP2
TJP2
DNAJB4
VTI1B
STK39
LIMD1

... or, upload a file:

Browse ...

Organisms:

auto-detect

Advanced Settings

SEARCH

String : https://string-db.org/

STRING

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Statistical Data Analysis - Visualisation: Network & Pathway Analysis - **Continue**

Version: 11.5 LOGIN | REGISTER | SURVEY

STRING Search Download Help My Data

The following proteins in *Homo sapiens* appear to match your input.
Please review the list, then click 'Continue' to proceed.

<- BACK | ↓ MAPPING | CONTINUE ->

950 query items showing page 1 of 48 • first • previous • next • last

1) 'Gene names':

- - Sorry, STRING found no proteins by this name in Homo sapiens - -

2) 'ILVBL':

☑ ILVBL - Acetolactate synthase-like protein; ilvB acetolactate synthase like

3) 'VWA8':

☑ VWA8 - Von Willebrand factor A domain-containing protein 8; Exhibits ATPase activity in vitro

4) 'C5orf51':

☑ C5orf51 - UPF0600 protein C5orf51; Chromosome 5 open reading frame 51; Belongs to the UPF0600 family

5) 'WASH3P;WASH2P;WASH1':

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6) 'NACA':

☑ NACA - Nascent polypeptide-associated complex subunit alpha, muscle-specific form; Cardiac- and muscle-specific transcription factor. May act to regulate the expression of genes involved in the development of myotubes. Plays a critical role in ventricular cardiomyocyte expansion and regulates postnatal skeletal muscle growth and regeneration. Involved in the organized assembly of thick and thin filaments of myofibril sarcomeres (By similarity)

☐ BTF3 - Transcription factor BTF3; When associated with NACA, prevents inappropriate targeting of non-secretory polypeptides to the endoplasmic reticulum (ER). Binds to nascent polypeptide chains as they emerge from the ribosome and blocks their interaction with the signal recognition particle (SRP), which normally targets nascent secretory peptides to the ER. BTF3 is also a general transcription factor that can form a stable complex with RNA polymerase II. Required for the initiation of transcription *[a.k.a. LOC102724313, NACB, OK/SW-cl.8]*

7) 'AGPS':

☑ AGPS - Alkyldihydroxyacetonephosphate synthase, peroxisomal; Catalyzes the exchange of an acyl for a long-chain alkyl group and the formation of the ether bond in the biosynthesis of ether phospholipids; Belongs to the FAD-binding oxidoreductase/transferase type 4 family

8) 'AIP':

☑ AIP - AH receptor-interacting protein; May play a positive role in AHR-mediated (aromatic hydrocarbon receptor) signaling, possibly by influencing its receptivity for ligand and/or its nuclear targeting; FKBP prolyl isomerases

String : https://string-db.org/

Statistical Data Analysis - Visualisation: Network & Pathway Analysis - **Continue**

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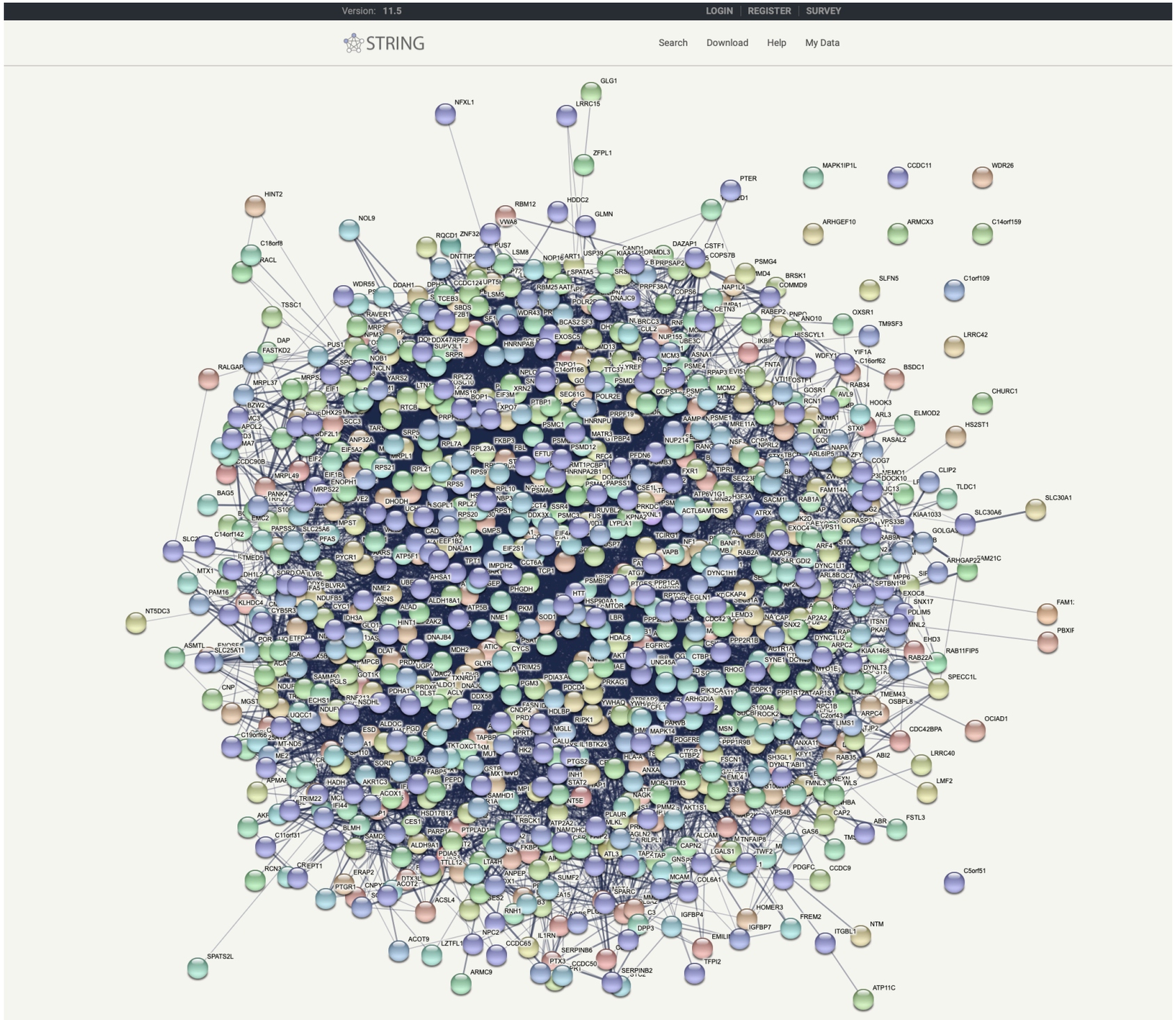

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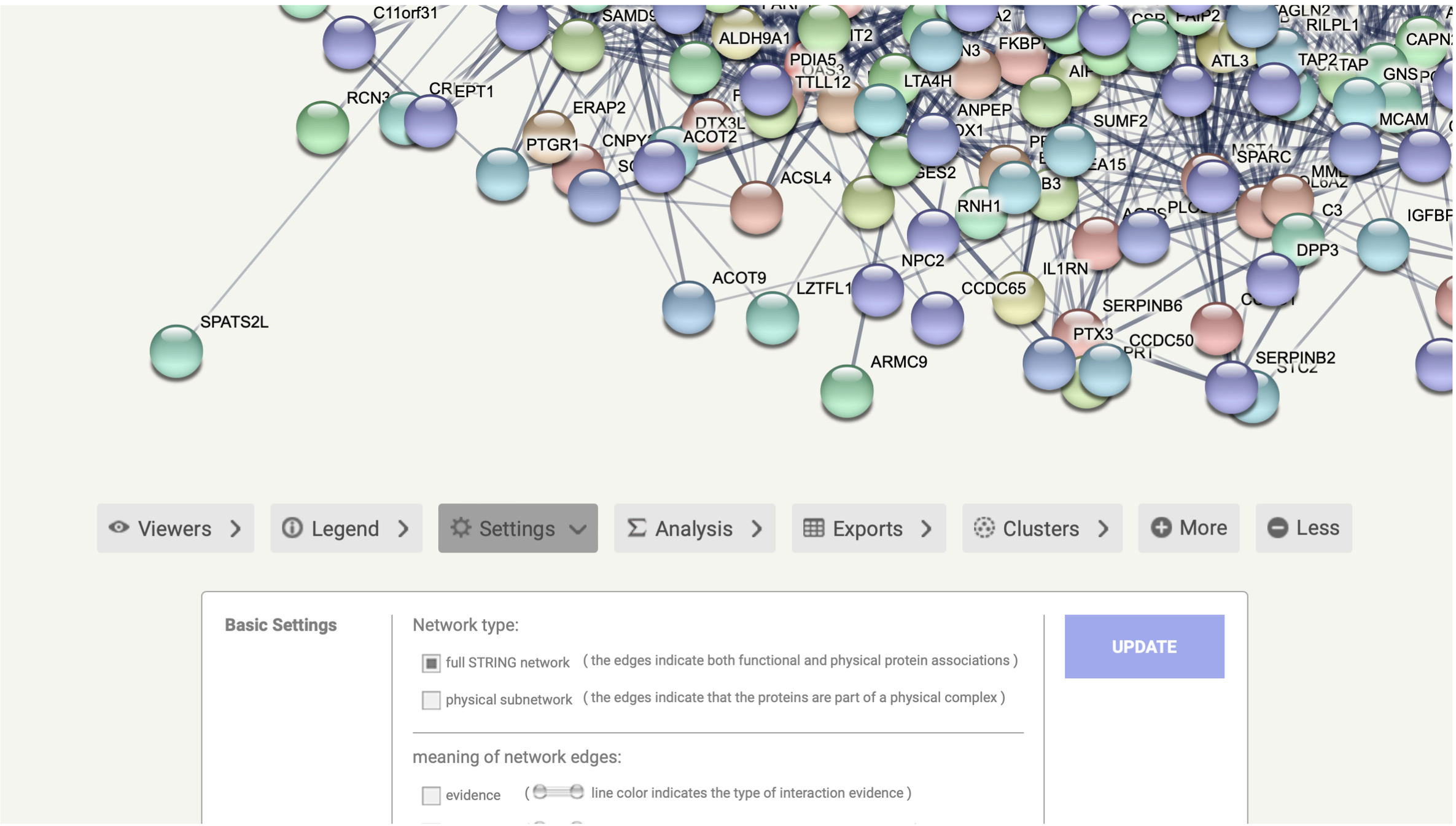

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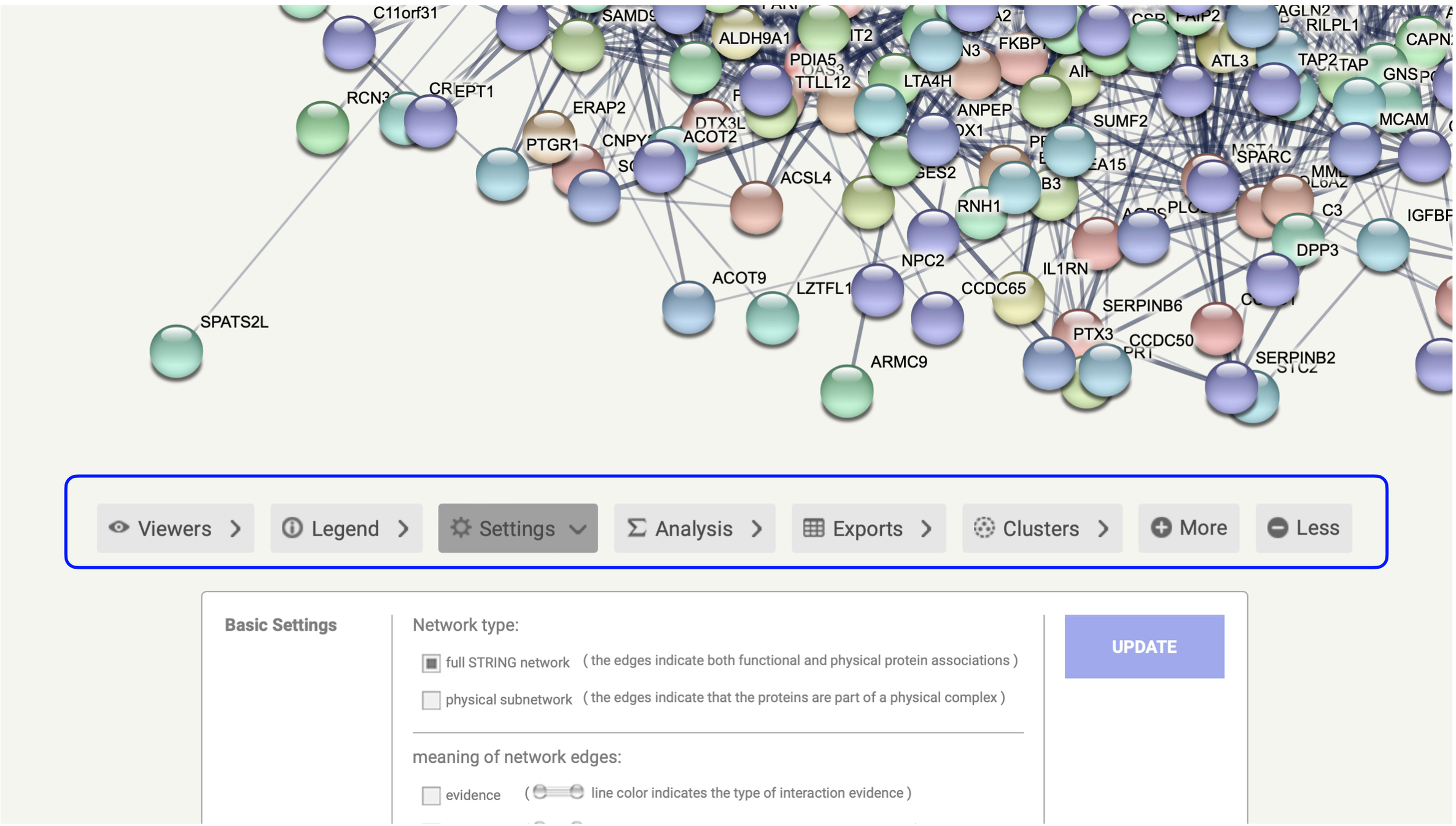

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Statistical Data Analysis - Visualisation: Network & Pathway Analysis - **Settings**

Legend | Settings | Analysis | Exports | Clusters | More

Basic Settings

Network type:

- [x] full STRING network (the edges indicate both functional and physical protein associations)
- [ ] physical subnetwork (the edges indicate that the proteins are part of a physical complex)

meaning of network edges:

- [ ] evidence (line color indicates the type of interaction evidence)
- [x] confidence (line thickness indicates the strength of data support)

active interaction sources:

- [x] Textmining
- [x] Experiments
- [x] Databases
- [x] Co-expression
- [x] Neighborhood
- [x] Gene Fusion
- [x] Co-occurrence

minimum required interaction score:

highest confidence (0.900)

max number of interactors to show:

1st shell: - none / query proteins only -

2nd shell: - none -

UPDATE

Advanced Settings

network display mode:

- [ ] static png (network is a simple bitmap image; not interactive)
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- [x] disable structure previews inside network bubbles
- [x] hide disconnected nodes in the network
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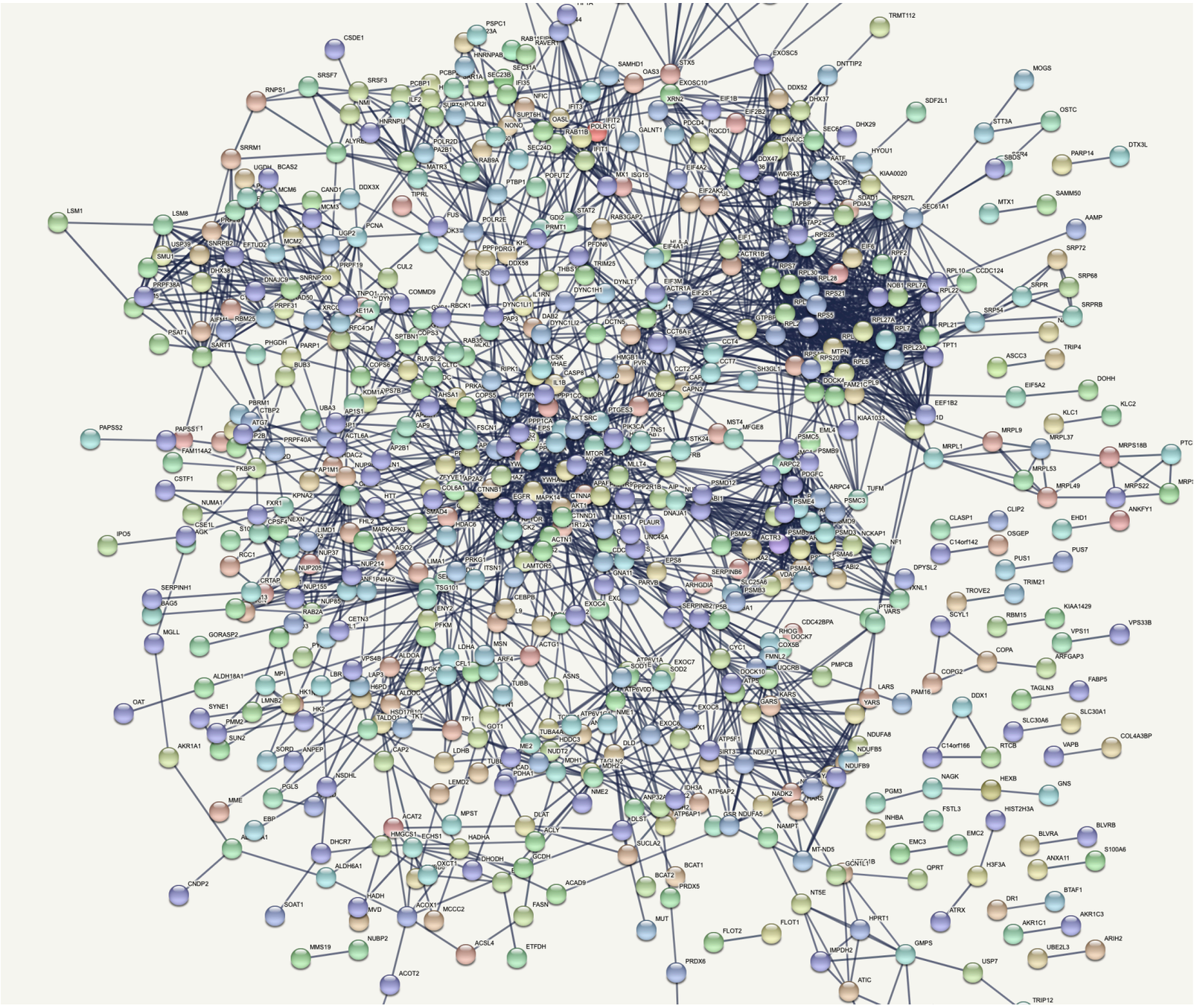
Statistical Data Analysis - Visualisation: Network & Pathway Analysis - **Settings**



String : https://string-db.org/

STRING

Statistical Data Analysis - Visualisation: Network & Pathway Analysis - **Analysis**

Viewers | Legend | Settings | Analysis | Exports | Clusters | More | Less

Network Stats

number of nodes:	915	expected number of edges:	1740
number of edges:	2321	PPI enrichment p-value:	< 1.0e-16
average node degree:	5.07	*your network has significantly more interactions than expected (what does that mean?)*	
avg. local clustering coefficient:	0.46		

Functional enrichments in your network

explain columns

Biological Process (Gene Ontology)

GO-term	description	count in network	strength	false discovery rate
GO:1905323	Telomerase holoenzyme complex assembly	3 of 4	1.21	0.0416
GO:0046967	Cytosol to endoplasmic reticulum transport	3 of 4	1.21	0.0416
GO:0035711	T-helper 1 cell activation	3 of 4	1.21	0.0416
GO:0019322	Pentose biosynthetic process	3 of 4	1.21	0.0416
GO:0009051	Pentose-phosphate shunt, oxidative branch	3 of 4	1.21	0.0416

(more ...)

Molecular Function (Gene Ontology)

GO-term	description	count in network	strength	false discovery rate
GO:0015433	ATPase-coupled peptide antigen transmembrane transport...	3 of 3	1.33	0.0481
GO:0046977	TAP binding	4 of 7	1.09	0.0353
GO:0016615	Malate dehydrogenase activity	4 of 8	1.03	0.0453
GO:0016668	Oxidoreductase activity, acting on a sulfur group of donors, ...	5 of 12	0.95	0.0256
GO:0043024	Ribosomal small subunit binding	6 of 15	0.93	0.0103

(more ...)

Cellular Component (Gene Ontology)

GO-term	description	count in network	strength	false discovery rate
GO:0042824	MHC class I peptide loading complex	5 of 7	1.18	0.0016
GO:0030122	AP-2 adaptor complex	5 of 8	1.13	0.0025
GO:0005832	Chaperonin-containing t-complex	6 of 10	1.11	0.00072
GO:0005638	Lamin filament	3 of 5	1.11	0.0364
GO:0016600	Flotillin complex	4 of 8	1.03	0.0156

(more ...)

String : https://string-db.org/

Statistical Data Analysis - Visualisation: Network & Pathway Analysis - **Analysis**

KEGG Pathways

pathway	description	count in network	strength	false discovery rate
hsa00920	Sulfur metabolism	4 of 10	0.93	0.0145
hsa03060	Protein export	8 of 23	0.87	0.00051
hsa03050	Proteasome	14 of 43	0.84	4.46e-06
hsa00051	Fructose and mannose metabolism	10 of 32	0.82	0.00019
hsa00020	Citrate cycle (TCA cycle)	9 of 29	0.82	0.00040

(more ...)

Reactome Pathways

pathway	description	count in network	strength	false discovery rate
HSA-2408550	Metabolism of ingested H2SeO4 and H2SeO3 into H2Se	4 of 4	1.33	0.0020
HSA-9686347	Microbial modulation of RIPK1-mediated regulated necrosis	3 of 4	1.21	0.0177
HSA-390450	Folding of actin by CCT/TriC	6 of 10	1.11	0.00042
HSA-77350	Beta oxidation of hexanoyl-CoA to butanoyl-CoA	3 of 5	1.11	0.0258
HSA-77348	Beta oxidation of octanoyl-CoA to hexanoyl-CoA	3 of 5	1.11	0.0258

(more ...)

WikiPathways

pathway	description	count in network	strength	false discovery rate
WP4629	Aerobic glycolysis	8 of 12	1.15	6.26e-05
WP4804	Cholesterol biosynthesis with skeletal dysplasias	4 of 7	1.09	0.0176
WP134	Pentose phosphate metabolism	4 of 7	1.09	0.0176
WP5049	Glycolysis in senescence	6 of 11	1.07	0.0021
WP2453	TCA cycle and deficiency of pyruvate dehydrogenase compl...	7 of 16	0.97	0.0017

(more ...)

Disease-gene associations (DISEASES)

disease	description	count in network	strength	false discovery rate
DOID:5212	Congenital disorder of glycosylation	12 of 58	0.65	0.0208
DOID:2978	Carbohydrate metabolic disorder	20 of 135	0.5	0.0096
DOID:700	Mitochondrial metabolism disease	23 of 173	0.45	0.0102
DOID:655	Inherited metabolic disorder	76 of 726	0.35	1.02e-06
DOID:0014667	Disease of metabolism	91 of 997	0.29	7.48e-06

(more ...)

Tissue expression (TISSUES)

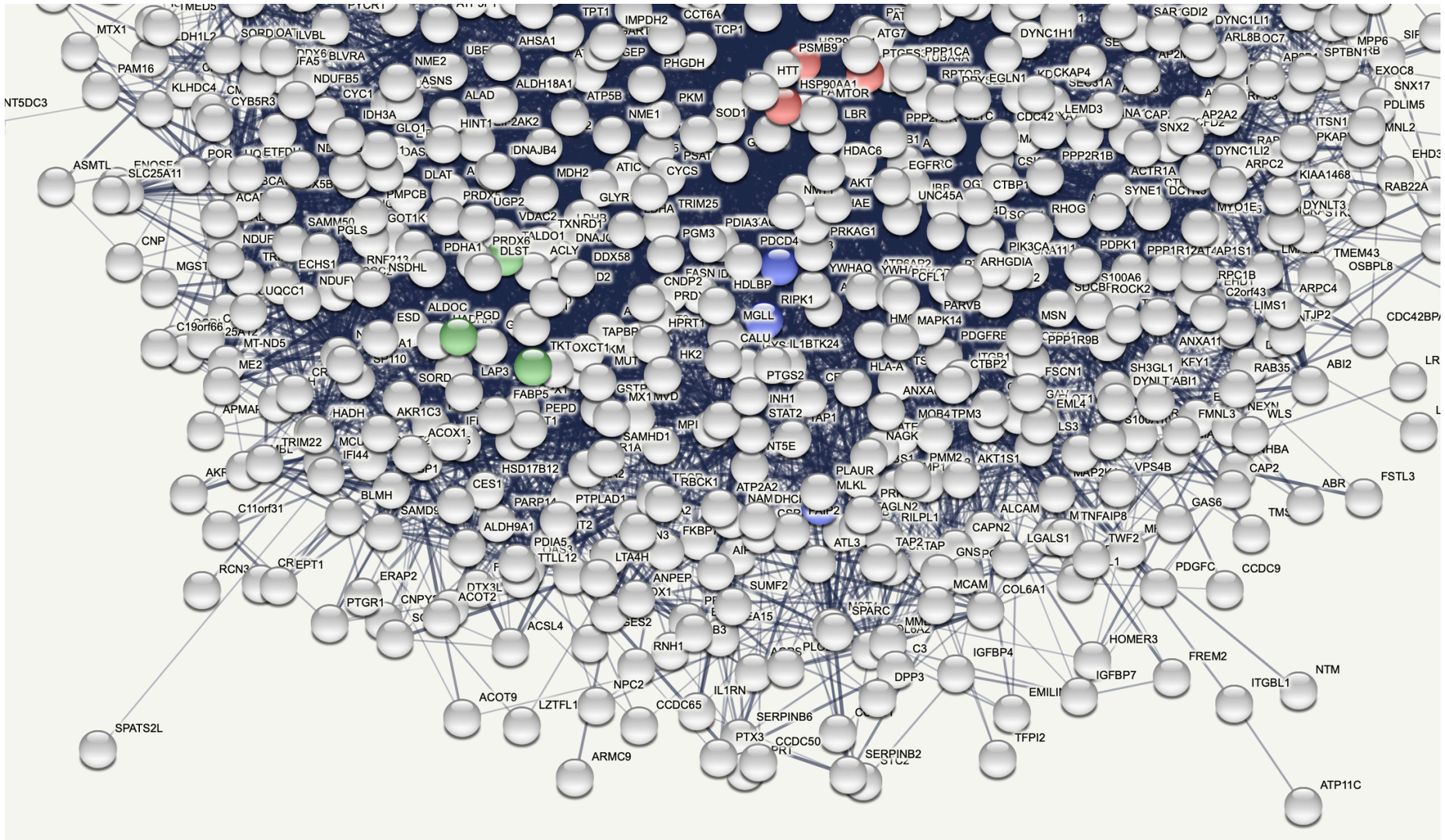
tissue	description	count in network	strength	false discovery rate
BTO:0003914	Interstitial cell of cajal	5 of 15	0.85	0.0239
BTO:0000772	Lymphoblast	73 of 235	0.82	5.42e-31
BTO:0001702	Left atrium	19 of 61	0.82	4.52e-08
BTO:0004238	Interstitial cell	18 of 64	0.78	4.24e-07
BTO:0000862	Heart ventricle	23 of 84	0.77	7.89e-09

(more ...)

String : https://string-db.org/

STRING

Statistical Data Analysis - Visualisation: Network & Pathway Analysis - **Analysis**



Viewers › | Legend › | Settings › | Analysis ⌄ | Exports › | Clusters › | More | Less

Network Stats

number of nodes:	915	expected number of edges:	7748
number of edges:	11780	PPI enrichment p-value:	< 1.0e-16
average node degree:	25.7	*your network has significantly more interactions than expected (what does that mean?)*	
avg. local clustering coefficient:	0.337		

Functional enrichments in your network

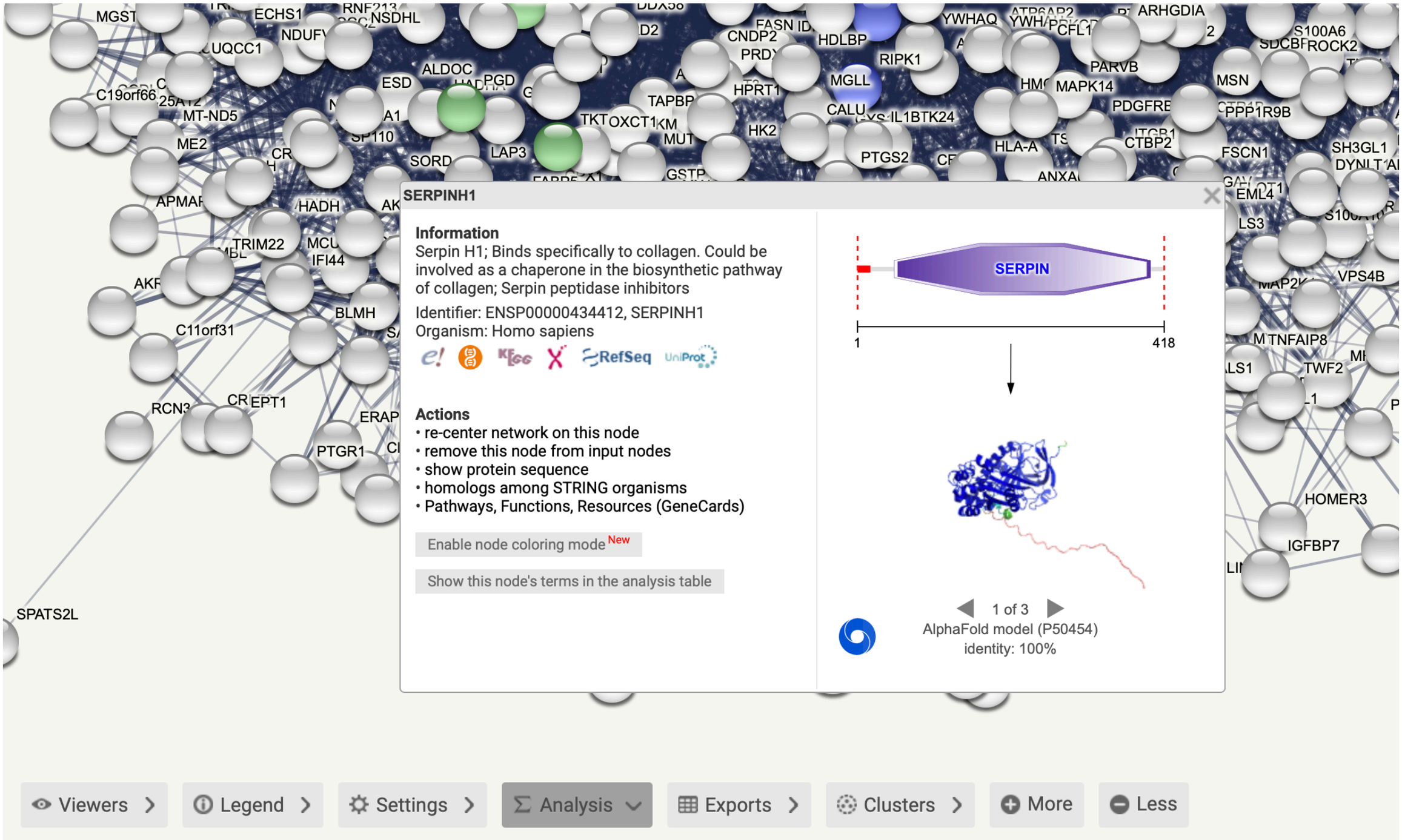
explain columns

›	Biological Process (Gene Ontology)			
GO-term	*description*	*count in network*	*strength*	*false discovery rate*
GO:1905323	Telomerase holoenzyme complex assembly	3 of 4	1.21	0.0416
GO:0046967	Cytosol to endoplasmic reticulum transport	3 of 4	1.21	0.0416
GO:0035711	T-helper 1 cell activation	3 of 4	1.21	0.0416
GO:0019322	Pentose biosynthetic process	3 of 4	1.21	0.0416
GO:0009051	Pentose-phosphate shunt, oxidative branch	3 of 4	1.21	0.0416

String : https://string-db.org/

STRING

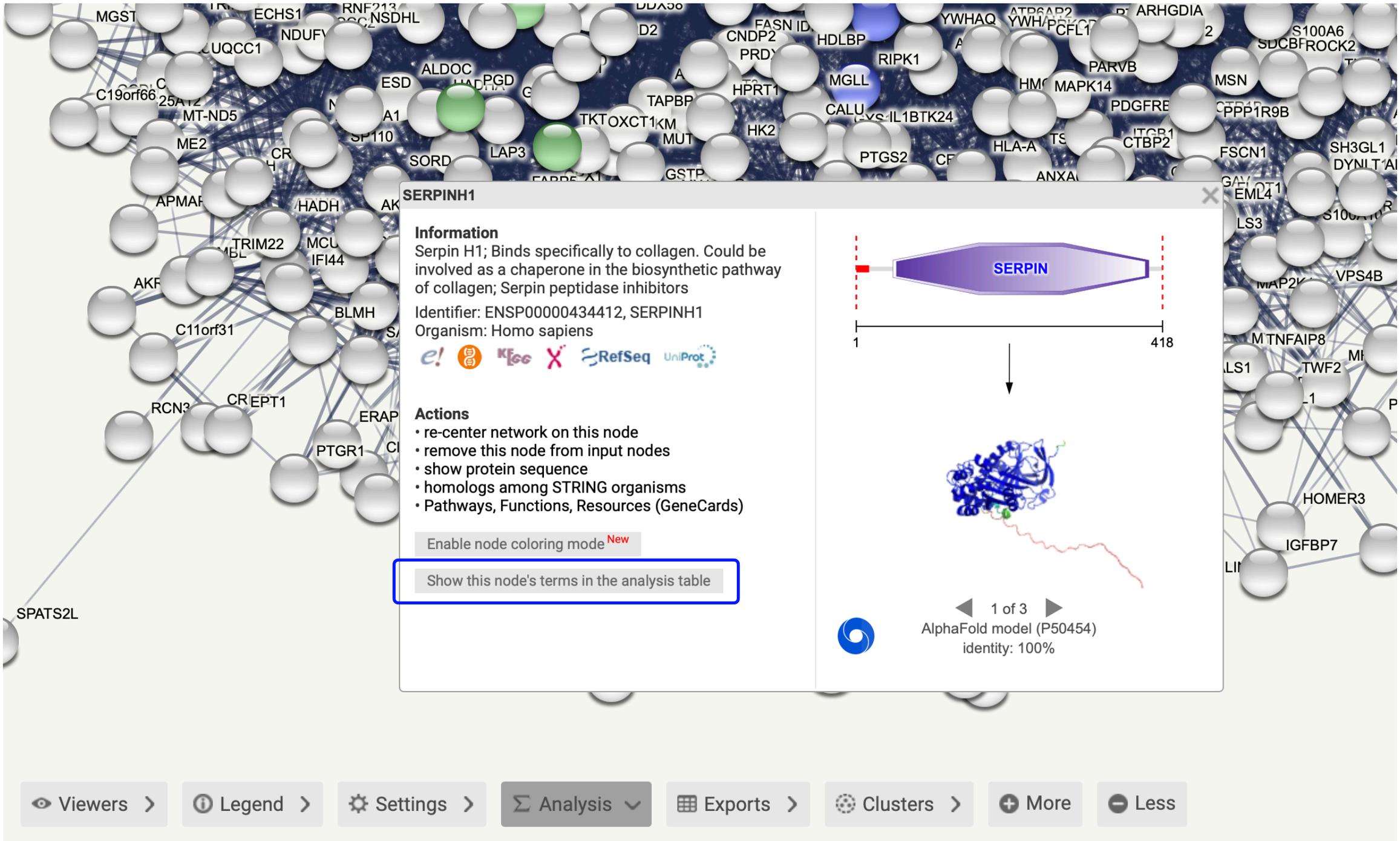
Statistical Data Analysis - Visualisation: Network & Pathway Analysis - **Analysis**



String : https://string-db.org/

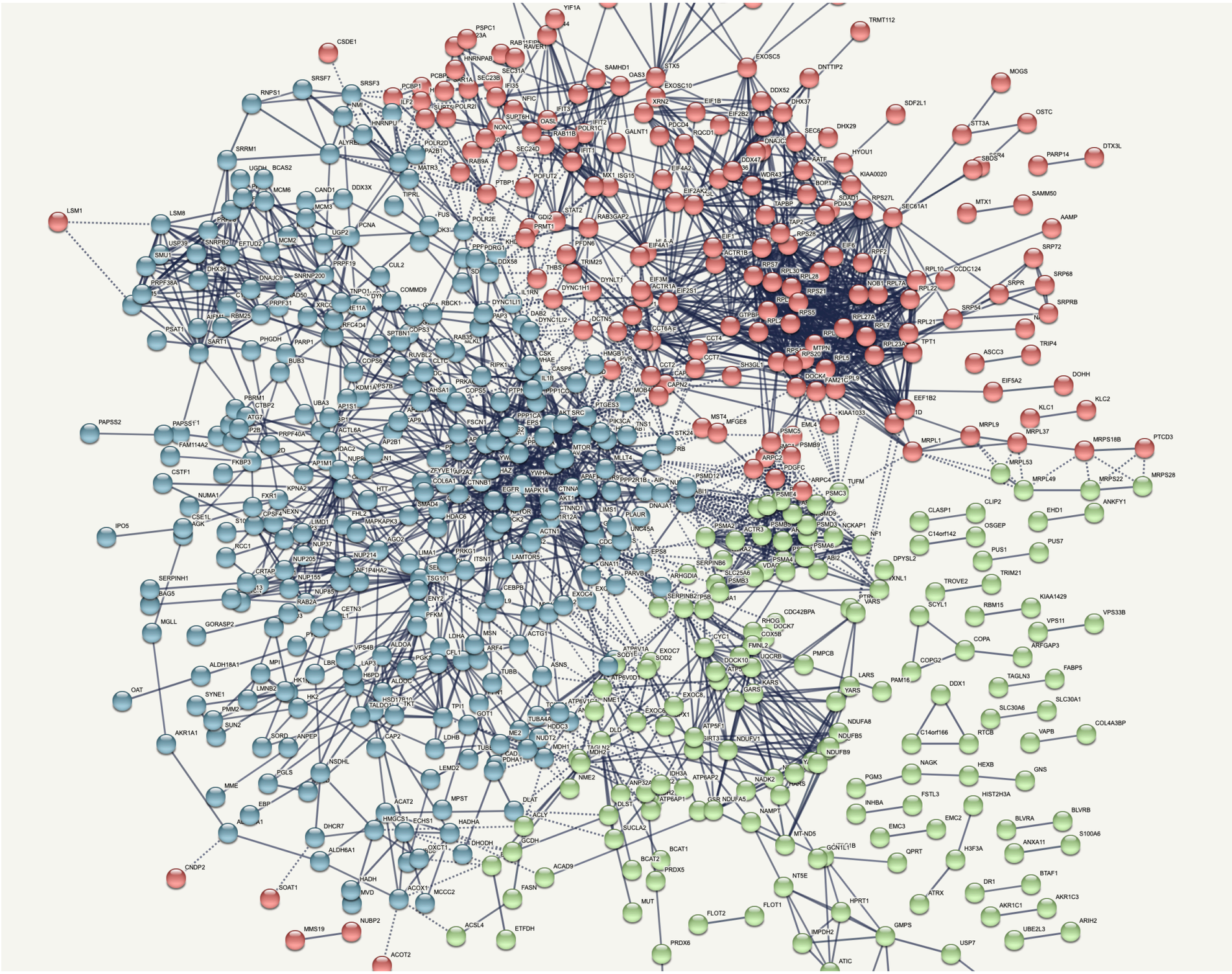
STRING

Statistical Data Analysis - Visualisation: Network & Pathway Analysis - **Analysis**



String : https://string-db.org/

Statistical Data Analysis - Visualisation: Network & Pathway Analysis - **Cluster**



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