

# GENESIS:Bioimaging-Cyro Genetic Electron Imaging

Muhammad Noor ul haq<sup>a1</sup>, Usama Shahzad Khan<sup>b1</sup>, Talha Sial<sup>c1</sup>, and Farooq Hussain<sup>d1</sup>

<sup>1</sup>*Department of Electrical Engineering, UET, KSK*

A specific criteria is used for en-closer of tools in Cyro-Genetic Electron Microscope tool package. Software which are included are based on this specific criteria.

- Publication Date (Later than 2010)
- Freeware License without any restrictions
- Linux Based
- Offline

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<sup>a</sup>2017-EE-298                      noorhaq55@gmail.com  
<https://orcid.org/0000-0002-0503-0335>  
<sup>b</sup>2017-EE-292                      eng.usamakhan887@gmail.com  
<https://orcid.org/0000-0002-6989-2911>  
<sup>c</sup>2017-EE-340                      sialtalha1234@gmail.com  
<https://orcid.org/0000-0002-0639-7227>  
<sup>d</sup>2017-EE-316                      farooqhussain264@gmail.com  
<https://orcid.org/0000-0002-8844-4452>

Sr. no	Software /Tool Name	Linux Based	Pub. Date	Free	Offline	Plug-ins	Installed
<b>Image Preprocessing</b>							
<b>Image Acquisition</b>							
1	Cryo-EM Cloud Tools[1]	✓	✓	✓	✓		✓
2	Legion[2]	✓		✓	✓		
3	Mr. T[3]	✓		✓	✓		
4	SerialEM[4]	✓		✓	✓		
5	UCSFIImage[5]	✓	✓	✓	✓		✓
<b>Image Enhancement</b>							
6	Amira 3D [6]	✓	✓	✓	✓		✓
7	bfactor[7]	✓		✓	✓		
8	BioImageXD[8]	✓	✓	✓	✓		✓
9	diffmap [9]	✓	✓	✓	✓		✓
10	Distortion Correction[10]	✓		✓	✓		
11	EM-Bfactor [11]	✓	✓	✓	✓		
12	EMHP [12]	✓	✓	✓	✓		
13	FASTDEF [13]	✓	✓	✓	✓		
14	FindDQE [14]	✓	✓	✓	✓		
15	goCTF[15]	✓	✓	✓	✓		
16	Huygens[16]	✓	✓	✓	✓		
17	IMAGIC [17]	✓	✓	✓	✓		
18	mag-distortion-correct [18]	✓	✓	✓	✓		
19	mag-distortion-estimate [19]	✓	✓	✓	✓		
20	MotionCorr[20]	✓	✓	✓	✓		✓
21	normscan	✓	✓	✓	✓		✓
22	RELION [21]	✓	✓	✓	✓		
23	SPHIRE [22]	✓	✓	✓	✓		
24	TIFFStripper [23]	✓	✓	✓	✓		
25	TransSPHIRE [24]	✓	✓	✓	✓		✓
26	Unblur [20]	✓	✓	✓	✓		✓
27	VolumeRover [25]	✓	✓	✓	✓		
28	Z-Spacing [26]	✓	✓	✓	✓		
<b>Image Visualization</b>							
29	Amira 3D Software[27]	✓	✓	✓	✓		✓
30	BioImageXD [28]	✓	✓	✓	✓		
<b>Image Segmentation</b>							
57	mincRmms[47]	✓	✓	✓	✓		✓
<b>Image Processing</b>							
<b>CTF estimation/correction</b>							
43	2dX [38]	✓		✓	✓		✓
44	dsTEM [39]	✓	✓	✓	✓		✓
45	CTFFIND [40]	✓	✓	✓	✓		✓
46	e2boxer.py [41]	✓	✓	✓	✓		✓
47	Eos [42]	✓	✓	✓	✓		✓
48	FASTDEF[13]	✓	✓	✓	✓		✓
49	FitCTF [43]	✓	✓	✓	✓	✓	✓
50	Frealign [44]	✓	✓	✓	✓		✓
51	Gctf [45]	✓	✓	✓	✓		✓
52	IMAGIC [17]	✓	✓	✓	✓		✓
53	SPHIRE [22]	✓	✓	✓	✓		✓
54	System for Processing Image data from Electron Microscope [46]	✓		✓	✓		✓
55	TransSPHIRE [24]	✓	✓	✓	✓		✓
56	UCSFIImage [5]	✓	✓	✓	✓		✓
<b>Drift Correction</b>							
38	MotionCor2 [20]	✓	✓	✓	✓		✓
39	SPHIRE [22]	✓	✓	✓	✓		✓
40	TransSPHIRE [24]	✓	✓	✓	✓		✓
41	Unblur[36]	✓	✓	✓	✓		✓
42	Zorro-Drift correction [37]	✓	✓	✓	✓		✓
<b>Image Segmentation</b>							
31	Bsoft [29]	✓		✓	✓		✓
32	Drishti [30]	✓	✓	✓	✓		✓
33	EM-SURFER [31]	✓	✓	✓	✓		✓
34	Extended Depth of Field[32]	✓	✓	✓	✓		✓
35	Gorgon [33]	✓	✓	✓	✓		✓
36	Image SXM[34]	✓	✓	✓	✓		✓
37	Volume Rover [35]	✓	✓	✓	✓		✓

Sr. no	Software /Tool Name	Linux Based	Pub. Date	Free	Offline	Plug-ins	Installed
58	Graph cuts[48]	✓		✓	✓		
59	CDeep3M[49]	✓	✓	✓		✓	
60	SegEM[50]	✓	✓	✓	✓	✓	
61	A-Fast-Forward-Algorithm[51]	✓	✓	✓	✓	✓	
62	Stomata Counter[51]	✓	✓	✓			
63	AxonDeepSeg[52]	✓	✓		✓		
64	AutoThreshold[53]	✓	✓	✓			✓
65	E-Snake[54]	✓	✓		✓		
66	Interactive H Watershed[55]		✓	✓	✓		
67	dive[56]	✓	✓	✓	✓		
68	IPLT[57]	✓			✓		
69	sofsem-cardiac-cell-segmenter[58]	✓	✓	✓	✓	✓	
70	DeepEM3D[59]	✓	✓	✓	✓	✓	
71	Amira 3D Software for Life Sciences[60]	✓			✓		
72	Annotation and Segmentation[61]			✓	✓		
73	GALA[62]	✓	✓	✓	✓		
74	NeuroProof[63]	✓	✓	✓	✓		✓
75	BioImageXD[28]	✓	✓	✓	✓		✓
76	ilastik[64]	✓	✓	✓	✓		✓
77	Free-D[65]	✓	✓	✓	✓		
78	SPIDER[66]	✓		✓	✓		
Image registration							
79	BioImageXD[28]	✓	✓	✓	✓		✓
80	Elastic Alignment and Montage[67]	✓		✓	✓		
81	EM aligner[68]	✓	✓	✓	✓	✓	
82	FOCUS[69]	✓		✓	✓		
83	Free-D[65]	✓		✓	✓		
84	Register Virtual Stack Slices[70]	✓	✓	✓	✓		✓
Serial block face imaging 3D reconstruction							
85	Amira 3D Software for Life Sciences[71]	✓			✓		
86	Elastic Alignment and Montage[72]	✓		✓	✓		
87	EM aligner[68]	✓	✓	✓	✓	✓	
3D Macromolecule Reconstruction							
88	2dX[73]	✓		✓	✓		

Sr. no	Software /Tool Name	Linux Based	Pub. Date	Free	Offline	Plug-ins	Installed
89	cisTem[74]	✓	✓	✓	✓		✓
90	cryoSparc[75]	✓	✓		✓		
91	EMAN[76]	✓		✓	✓		✓
92	EMringer[77]	✓	✓	✓	✓		
93	FOCUS[78]	✓		✓	✓		
94	Frealign[79]	✓	✓	✓	✓		✓
95	Gorgon[33]	✓	✓	✓	✓		✓
96	MAGIC[80]	✓	✓	✓	✓		✓
97	ROME[81]	✓	✓	✓	✓		✓
98	Scipion[82]	✓	✓	✓	✓		✓
99	SerialEM[4]	✓	✓	✓	✓		✓
100	RELION[21]	✓	✓	✓	✓		✓
101	SPRING[40]	✓	✓	✓	✓		✓
102	SPARX[83]	✓	✓	✓	✓		✓
103	SPHIRE[22]	✓	✓	✓	✓		
104	SubspaceEM[84]	✓	✓		✓	✓	
105	SPIDER[85]	✓		✓	✓		
106	Volume Rover [25]	✓	✓	✓	✓		✓
3D refinement							
107	ROME[81]	✓	✓	✓	✓		✓
108	SPHIRE[22]						
Structural Analysis							
Neuron Tracing							
109	NeuronJ[86]	✓		✓	✓		✓
110	UltraTracer[87]	✓	✓	✓	✓		✓
111	FARSIGHT[88]	✓	✓	✓	✓		✓
112	Aivia[89]		✓	✓	✓		
113	NeuroProof[90]	✓	✓	✓	✓	✓	
114	RhoANA[91]	✓	✓	✓	✓		
115	webKnossos[92]	✓	✓	✓	✓		
116	Amira 3D[27]	✓	✓	✓	✓	✓	
117	DeepEM3D[59]	✓	✓	✓	✓		
118	Viking[93]	✓	✓	✓	✓		
119	Reconstruct[94]	✓	✓	✓	✓		
120	ELEKTRONN[95]	✓	✓	✓	✓		✓
121	AxonTracer[96]	✓	✓	✓	✓	✓	
122	SegEM[97]	✓	✓	✓	✓		✓
123	SpineLab[98]	✓	✓	✓	✓		✓
Biological Network Reconstruction							
124	Mr.T[99]	✓		✓	✓		✓
125	FARSIGHT[88]	✓	✓	✓	✓		
126	EMFit[100]	✓		✓	✓		✓
127	UROX[101]	✓		✓	✓		✓

Sr. no	Software /Tool Name	Linux Based	Pub. Date	Free	Offline	Plug-ins	Installed
Single particle Analysis							
128	EMAN[76]	✓		✓	✓		
129	IMAGIC[80]	✓	✓	✓	✓		
130	SPIDER[85]	✓		✓	✓		
131	Frealign[102]	✓		✓	✓		
132	SPARX[83]	✓	✓	✓	✓		✓
133	Unblur[103]	✓	✓	✓	✓		✓
134	Scipion[82]	✓	✓	✓	✓		✓
135	EMringer[77]	✓	✓	✓	✓		✓
136	cyoSPARC[75]	✓	✓	✓	✓		
137	IMIRS[104]	✓		✓	✓		
138	Ruby-Helix[105]	✓		✓	✓		
139	RosettaES[106]	✓			✓		
140	SPRING[40]	✓	✓		✓		
141	MulticolorSPR[107]	✓	✓		✓		
142	cisTEM[74]	✓	✓	✓	✓		
143	3DEM Benchmark[108]	✓	✓	✓	✓		
144	DeepEM[59]	✓		✓	✓		✓
Structure Orientation							
145	FibrilTool[109]	✓	✓	✓	✓		✓
146	Directionality[110]	✓					
Morphometric Analysis							
147	IMAGIC[80]	✓		✓	✓		
148	Free-D[65]	✓		✓	✓		
149	Bsoft[29]	✓		✓	✓		
150	FracLac[111]	✓	✓	✓	✓		✓
151	BioImageXD[28]	✓	✓	✓	✓		✓
152	ImageSXM[112]	✓	✓	✓	✓		
153	Diameter-J[113]	✓	✓	✓	✓		
154	GSA	✓				✓	
155	ImageAnalyser[114]	✓	✓		✓		
156	VolumeRover[25]	✓		✓	✓		
157	Amira 3D[27]	✓					
158	TEM						
159	Exosome[115]	✓		✓	✓		
160	Flynotyper[116]	✓	✓	✓	✓		✓
161	Reconstruct[94]	✓		✓	✓		
162	NeuroMorph[27]	✓	✓	✓	✓		
163	Fourier Analysis[117]	✓		✓	✓		
164	Gorgon[118]	✓	✓	✓	✓		✓
165	MapBone	✓		✓	✓		
166	Structure[119]						
167	ImageSXM[112]						

Sr. no	Software /Tool Name	Linux Based	Pub. Date	Free	Offline	Plug-ins	Installed
Image Classification							
165	GSA Image Analyser[120]	✓			✓		
166	Stomata Counter[121]	✓		✓			
167	Cell Counter[122]	✓		✓	✓		
168	superAngle[123]	✓		✓	✓	✓	
Particle Picking							
169	RELIO[124]	✓	✓	✓	✓		✓
170	EMAN[125]	✓	✓	✓	✓	✓	✓
171	Frealign[102]	✓		✓	✓	✓	
172	cyoSPARC[75]	✓		✓	✓		
173	SPHIRE[83]	✓		✓	✓		
174	cisTEM[74]	✓	✓	✓	✓	✓	✓
Image Simulation							
175	EMAN[125]	✓	✓	✓	✓	✓	✓
176	IMAGIC[80]	✓		✓	✓		
177	e2boxer.py[126]	✓		✓	✓		
178	TMacS[127]	✓		✓	✓		
179	Gautonatch[128]	✓		✓	✓		
180	DoG Picker[127]	✓		✓	✓		
181	FindEM[128]	✓		✓	✓		
182	TiltPicker[127]	✓		✓	✓		
183	Xmipp[129]	✓	✓	✓	✓		✓
184	SPHIRE[22]	✓	✓	✓	✓	✓	✓
185	cisTEM[74]	✓	✓	✓	✓	✓	✓
186	DeepPicker[130]	✓	✓	✓	✓		
187	gEMPicker[131]	✓	✓	✓	✓	✓	✓
188	crYOLO[132]	✓	✓	✓	✓		
189	Signature[133]	✓		✓	✓		
190	APPLE	✓		✓	✓		
191	Picker[134]	✓		✓	✓		
Data Management and Annotation							
192	BrainVISA[136]	✓		✓	✓	✓	
193	Project for Electron cryo-Microscopy[137]	✓	✓	✓	✓		✓
194	Cytomine[138]	✓	✓	✓	✓	✓	✓

Sr. no	Software Name	/Tool	Linux Based	Pub. Date	Free	Offline	Plug- ins	Installed
195	Summovie[74]		✓	✓	✓	✓		✓
196	phenomelmpute[139]		✓	✓	✓	✓	✓	
197	NeuroMorph-Other		✓	✓	✓	✓		✓
198	Tools[140]							
	Viking[93]		✓	✓		✓	✓	

Sr. no	Software Name	/Tool	Linux Based	Pub. Date	Free	Offline	Plug- ins	Installed
199	NeuroMorph-3D		✓	✓	✓	✓		✓
	Drawing[140]							
200	Raveler[141]		✓	✓	✓	✓	✓	
	Scientific							
201	Animation		✓		✓	✓		
	Integration							
	Library							
202	PC2MRC		✓		✓	✓		

Table 1: This table displays all of the tools installed, with there Sizes.

Sr. No	Software/Tool Name	Size
Image Pre-Processing		
Image Acquisition		
1	Cyro-EM Cloud Tools	347MB
Image Enhancement		
2	BFactor	493KB
3	Diffmap	183KB
4	Find DQE	8.5MB
5	Relion	2.8MB
Image Visualization		
6	BioImage XD	110MB
7	Drishti	2.2MB
Drift Correction		
8	MotionCor2	1.8MB
9	TranSPHIRE	883KB
10	Gctf	303MB
CTF estimation		
11	Frealign	143MB
12	cisTEM	382MB
13	Gctf	303MB
Image Processing		
Image Segmentation		
14	Auto-Threshold	18KB
Image Registration		
15	BioImageXD	110MB
16	Virtual Stack	27KB
3D Macro-molecules		
17	cisTEM	382MB
18	EMringer	256KB
19	Frealix	47MB
20	Gorgon	62.9KB
3D refinement		
21	ROME	169MB

Structural Analysis		
Particle Picking		
22	EMAN2	12MB
23	DeepPicker	416KB
24	cisTEM	382MB
25	Xmipp	7.3MB
Neuron Tracing		
26	FARSIGHT	69MB
Structure Orientation		
27	FibrilTool	5.11MB
Image Classification		
28	RELION	2.8MB
29	EMAN	12MB
30	cisTEM	382MB
Biological Reconstruction		
31	FARSIGHT	69MB
Single Particle Analysis		
32	Unblur	9.3MB
33	Scipion	29MB
34	EMringer	256KB
Morphometric Analysis		
35	Gorgon	62.9KB
36	Flynotyper	167MB
37	BioImage XD	110MB
38	Fraclac	13.1MB
Image Data Management		
Data Annotation		
39	Cytomine	161.5MB
40	Summovie	9.6MB
41	NeuroMorph	131MB
42	CCP-EM	716MB

Table 3: Tools with Matlab Plugins

Sr	Tool
1	FitCTF
2	SegEM
3	Connection Algorithm
4	DeepEM3D
5	sbfsem-cardiac-cell-segmeter
6	EM-Aligner
7	SubspaceEM
8	RhoANA
9	DeepEM
10	MIB
11	Diameter J
12	Superangle
13	EMAN
14	Frealign
15	cisTEM
16	gEMpicker
17	ApplePicker
18	BrainVisa
19	phenomelmpute
20	Viking
21	NeuroMorph-othertools
22	Viking
23	NeuroMorph3D Drawing
24	Raveler Scientific Animation

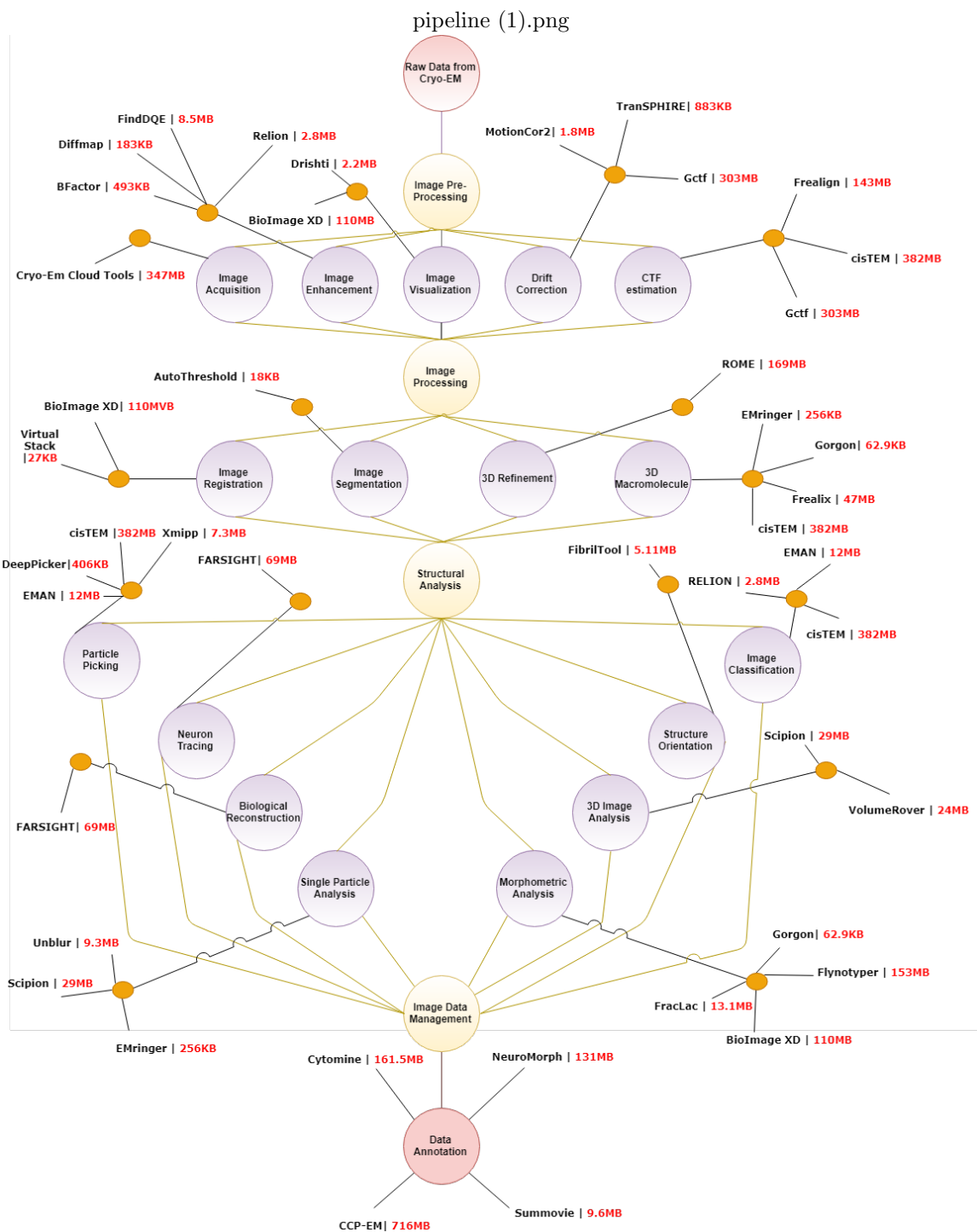


Figure 1: The fig. represents an overview of the Cryo-Electron Microscope data analysis pipeline. The softwares installed in GENESIS along each category are mentioned in it.



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