Quadrangulation through Morse-Parameterization Hybridization (Supplemental material)

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In this supplemental material to our ACM SIGGRAPH'18 paper, we provide a few added details on our contribution, and give results on the tests we performed for a large series of meshes.

1 RELATION BETWEEN MSC AND QUAD

Fig. 1 depicts how a Morse function generates a quad mesh through its dual Morse-Smale complex.
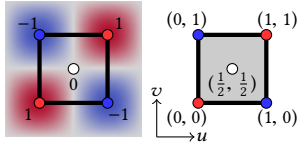

Fig. 1. Left: a dual Morse-Smale complex; Right: its corresponding quad.

2 LOCAL REMESHING

In the quad extraction in Q_R, some local remeshing can be done to improve the quality as mentioned in the conclusion section of our paper. In our implementation, we apply the operations shown in Fig. 2 to improve the quality of quads for Q_S. These four operations generally improve the scaled Jacobian of quads, but other quad improvement methods can be used instead. In the tables, we list the statistics without remeshing operations between parentheses.
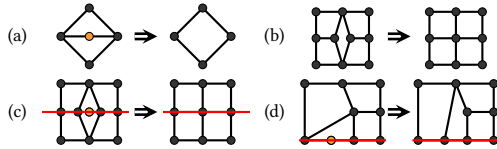

Fig. 2. Local remeshing operations employed in Q_S. Red lines are features.

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3 STRESS TEST

In order to test the robustness of our approach, we used random cross fields as input, and our method still gets pure quad meshes out of it, see Fig. 3. For the model (bottom of Fig. 3) with features, our method also gets a quad mesh aligned with features. Similarly, using principal directions as the input field creates the expected anisotropy, see Fig. 4.
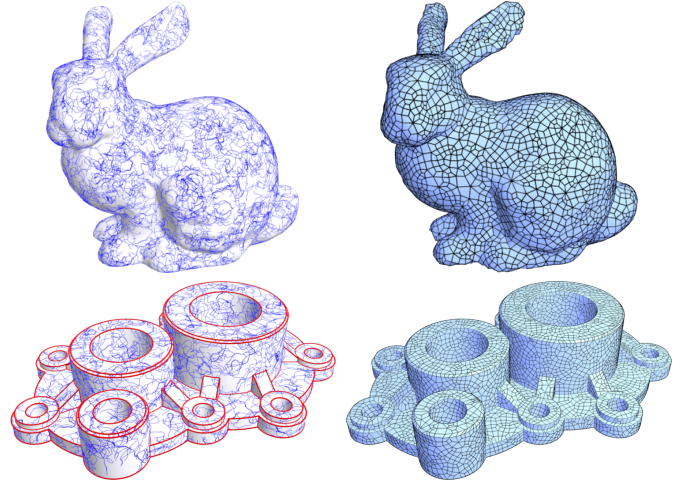

Fig. 3. Stress test with random cross fields. Left: visualization of a random cross field (tracing lines); Right: our resulting pure quad mesh.
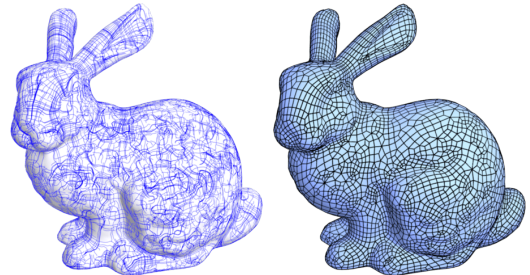

Fig. 4. Stress test with principal directions as the input cross field. Left: visualization of a cross field computed through local principal curvature directions; Right: our resulting pure quad mesh.

Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time(s)
Bunny(Random)	111364	4606	0.8154	25145	2769	0.7413	0.8799	100	51.03
Bunny(Random-PC)	111364	6606	0.8688	5253	2331	0.648	0.7477	75.15	64.24
Cover	111822	12081	0.8294	14042	5486	0.6644	0.7947	98.99	80.46

Table 1. Dataset statistics of stress test.

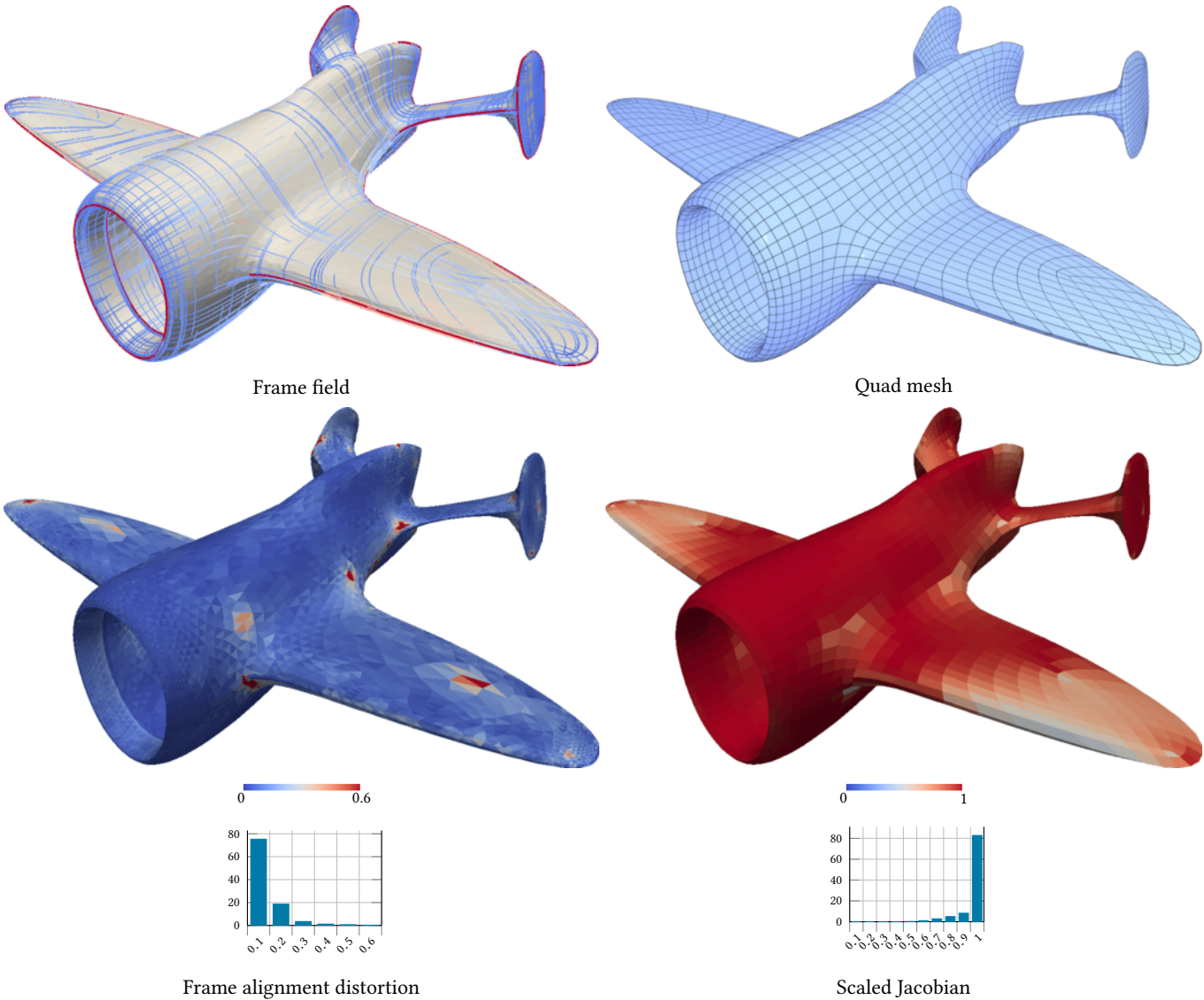| Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.	Time
btorus(a,ours)	34768	9158	0.9744	138	278	0.09817	0.1121	8.907	15.78
btorus(b,ours)	60656	9080	0.9752	138	279	0.09601	0.1106	7.937	23.66
btorus(c,ours)	276926	9158	0.973	138	327	0.09823	0.1143	6.789	82.38
btorus(a,wave)	34768	5264	0.8201	138	2416	-	-	-	9.4
btorus(b,wave)	60656	8577	0.8996	138	2383	-	-	-	11.82
btorus(c,wave)	276926	9254	0.9752	138	300	-	-	-	85
david(a,ours)	51730	13349	0.9547	622	1041	0.1387	0.1601	19.98	31.97
david(b,ours)	98136	13422	0.9549	622	1078	0.1348	0.1564	17.14	42.46
david(c,ours)	437478	13474	0.9541	622	1074	0.1381	0.1599	14.24	138.3
david(a,wave)	51730	7274	0.7946	622	3678	-	-	-	9.16
david(b,wave)	98136	12832	0.8929	622	3543	-	-	-	16.88
david(c,wave)	437478	13637	0.9537	622	1120	-	-	-	135.2
rabbit(a,ours)	11872	8455	0.9921	50	110	0.04642	0.05257	5.275	5.37
rabbit(b,ours)	53616	8451	0.9926	50	96	0.04369	0.04964	2.635	17.49
rabbit(c,ours)	214092	8466	0.9925	50	100	0.04523	0.05208	2.33	65.98
rabbit(a,wave)	11872	1237	0.7694	50	708	-	-	-	3.34
rabbit(b,wave)	53616	7305	0.8922	50	2396	-	-	-	12.15
rabbit(c,wave)	214092	8450	0.9925	50	100	-	-	-	62.96
retinal(a,ours)	7596	4235	0.9922	18	44	0.06245	0.07094	3.424	3.23
retinal(b,ours)	31208	4237	0.9914	18	52	0.06354	0.07208	2.578	9.24
retinal(c,ours)	128550	4271	0.9912	18	56	0.06202	0.07174	2.102	42.28
retinal(a,wave)	7596	901	0.7824	18	512	-	-	-	1.79
retinal(b,wave)	31208	4069	0.9235	18	927	-	-	-	5
retinal(c,wave)	128550	4274	0.992	18	45	-	-	-	31.81
venus(a,ours)	5524	2587	0.9758	18	28	0.05259	0.05913	4.618	2.77
venus(b,ours)	20680	2588	0.9746	18	28	0.05032	0.05702	2.278	5.74
venus(c,ours)	80910	2592	0.9754	18	22	0.04649	0.05354	1.792	28.58
venus(a,wave)	5524	456	0.749	18	281	-	-	-	1.88
venus(b,wave)	20680	2455	0.896	18	618	-	-	-	3.46
venus(c,wave)	80910	2581	0.975	18	27	-	-	-	19.9
knot(a,ours)	6162	2722	0.9904	0	32	0.08173	0.09296	3.235	2.47
knot(b,ours)	24536	2735	0.9899	0	40	0.07978	0.09172	1.981	6.75
knot(c,ours)	97792	2734	0.9894	0	36	0.08219	0.09425	1.564	26.45
knot(a,wave)	6162	625	0.6252	0	371	-	-	-	1.97
knot(b,wave)	24536	2695	0.9214	0	527	-	-	-	4.32
knot(c,wave)	97792	2742	0.9879	0	44	-	-	-	26.6
helmet(a,ours)	6238	2906	0.9753	31	73	0.067	0.07749	6.154	3.73
helmet(b,ours)	25848	2904	0.9748	31	93	0.07417	0.08493	4.978	8.87
helmet(c,ours)	103660	2901	0.9749	31	84	0.07966	0.08946	4.125	35.44
helmet(a,wave)	6238	627	0.679	31	384	-	-	-	2.46
helmet(b,wave)	25848	2926	0.864	31	952	-	-	-	4.74
helmet(c,wave)	103660	2979	0.9592	31	166	-	-	-	32.47
hand2(a,ours)	4600	2374	0.9664	36	60	0.07113	0.07972	7.303	2.98
hand2(b,ours)	18724	2385	0.9649	36	55	0.07113	0.08166	5.303	6.83
hand2(c,ours)	75632	2384	0.9644	36	53	0.07081	0.08143	4.193	25.25
hand2(a,wave)	4600	409	0.7142	36	256	-	-	-	1.72
hand2(b,wave)	18724	2299	0.8626	36	690	-	-	-	3.26
hand2(c,wave)	75632	2389	0.9609	36	76	-	-	-	20.69

Table 2. Statistics of timecost comparison with wave-based method.

4 DATASET RESULTS

The remainder of this supplement presents 144 results, using a variety of input meshes and frame fields. For each result, we show the pure quad mesh that our approach generates, along with the scaled Jacobian (both as a field over the mesh and as a histogram), and the frame alignment distortion (here also, both as a field over the mesh and as a histogram). We conclude this document with a table recapping all the relevant information on these examples, including number of quads and timing (in seconds). All the tests are ran in Intel Xeon CPU $E5-2630$ with at most 12 threads.

Input. The input of our implementation is a triangular mesh (orientable manifold, only one connected component), a frame field (each face of the input mesh has one frame, which is not degenerated), an optional feature line set (subset of edges in the input triangular mesh).

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian

Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
aircraft-m	24920	3807(3824)	0.9444(0.9378)	54	87(113)	0.07466	0.0862	5.97	9.07	0.2692

Fig. 5. Model: aircraft-m

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
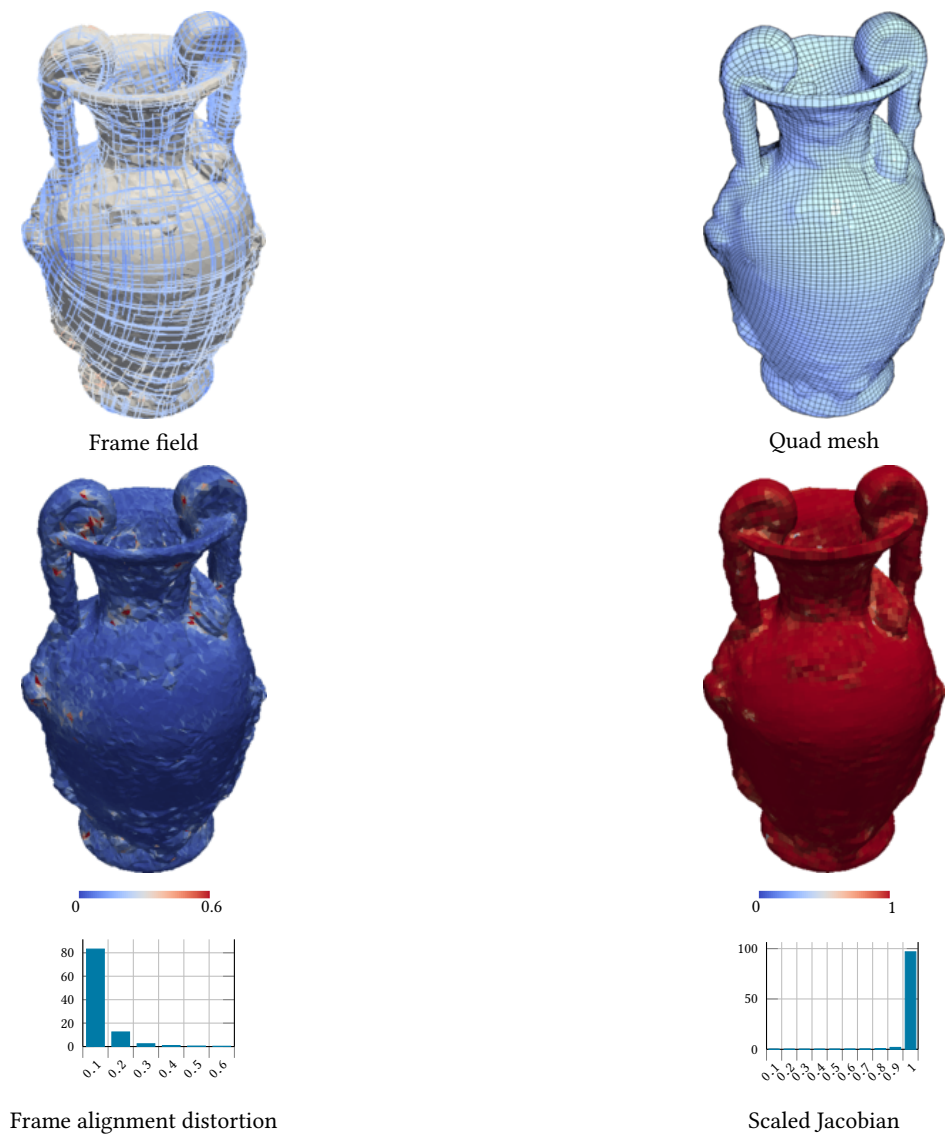
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
amphora	27570	11714(11802)	0.9819(0.9712)	261	255(434)	0.06318	0.07123	6.994	13.93	0.2215

Fig. 6. Model: amphora

Frame field

Quad mesh

0   0.6

Frame alignment distortion

0   1

Scaled Jacobian
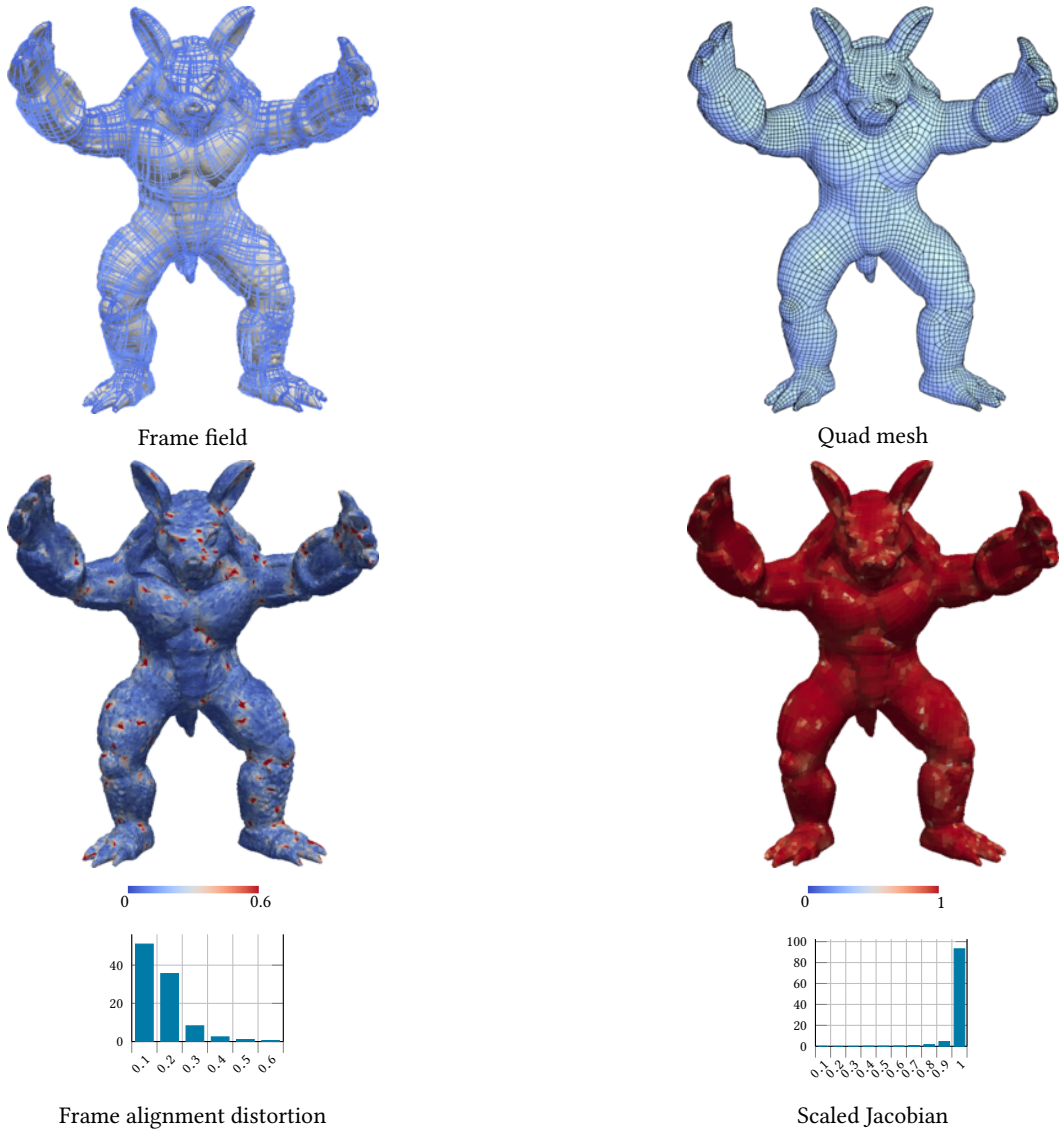
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
armadillo	43160	10821(10904)	0.9687(0.9565)	267	532(707)	0.113	0.129	11.67	21.85	-

Fig. 7. Model: armadillo

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
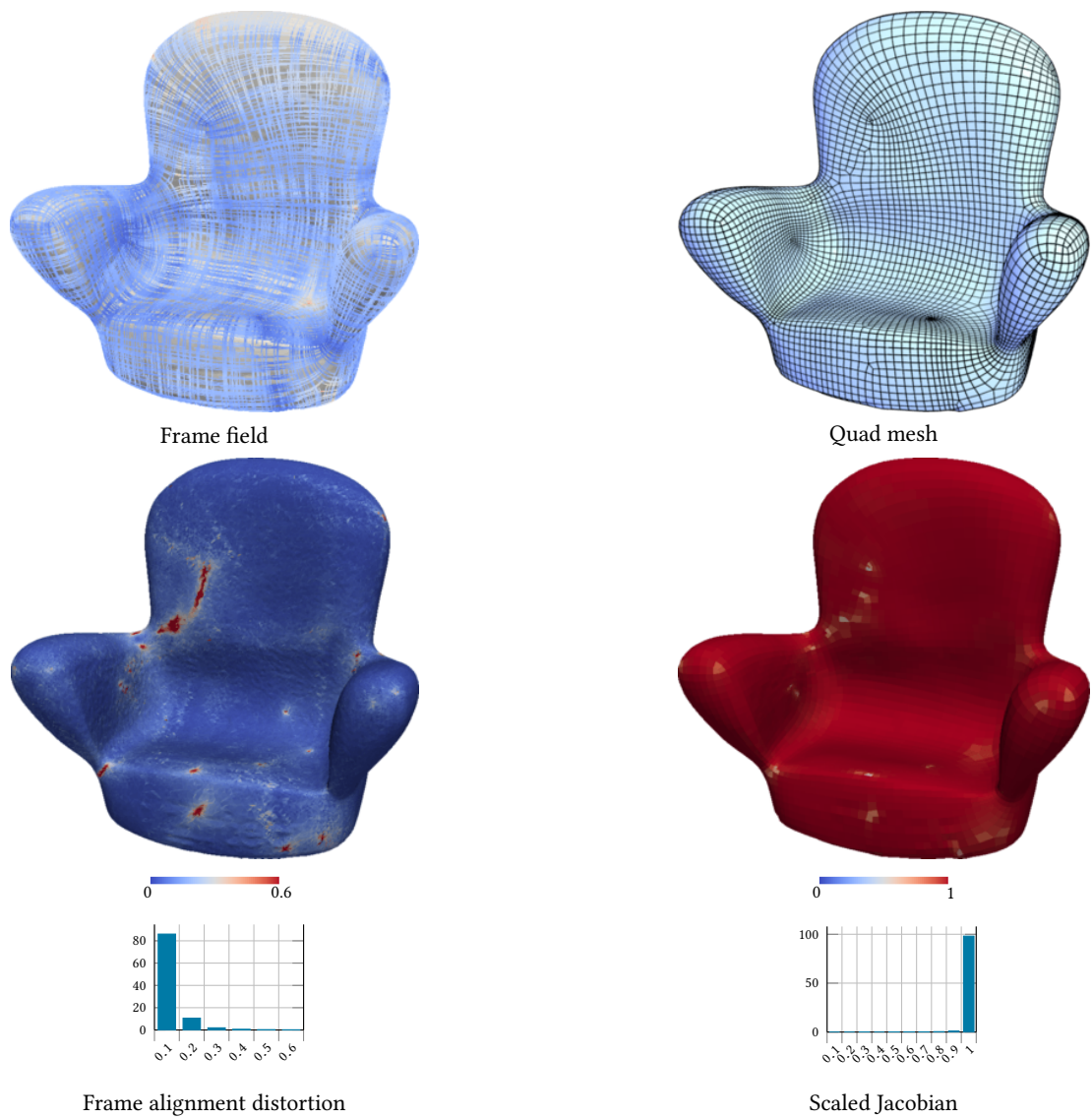
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
armchair	100000	8845(8862)	0.9913(0.9883)	36	121(158)	0.05498	0.06517	2.395	27.81	-

Fig. 8. Model: armchair

Frame field

Quad mesh

0 — 0.6

Frame alignment distortion

0 — 1

Scaled Jacobian
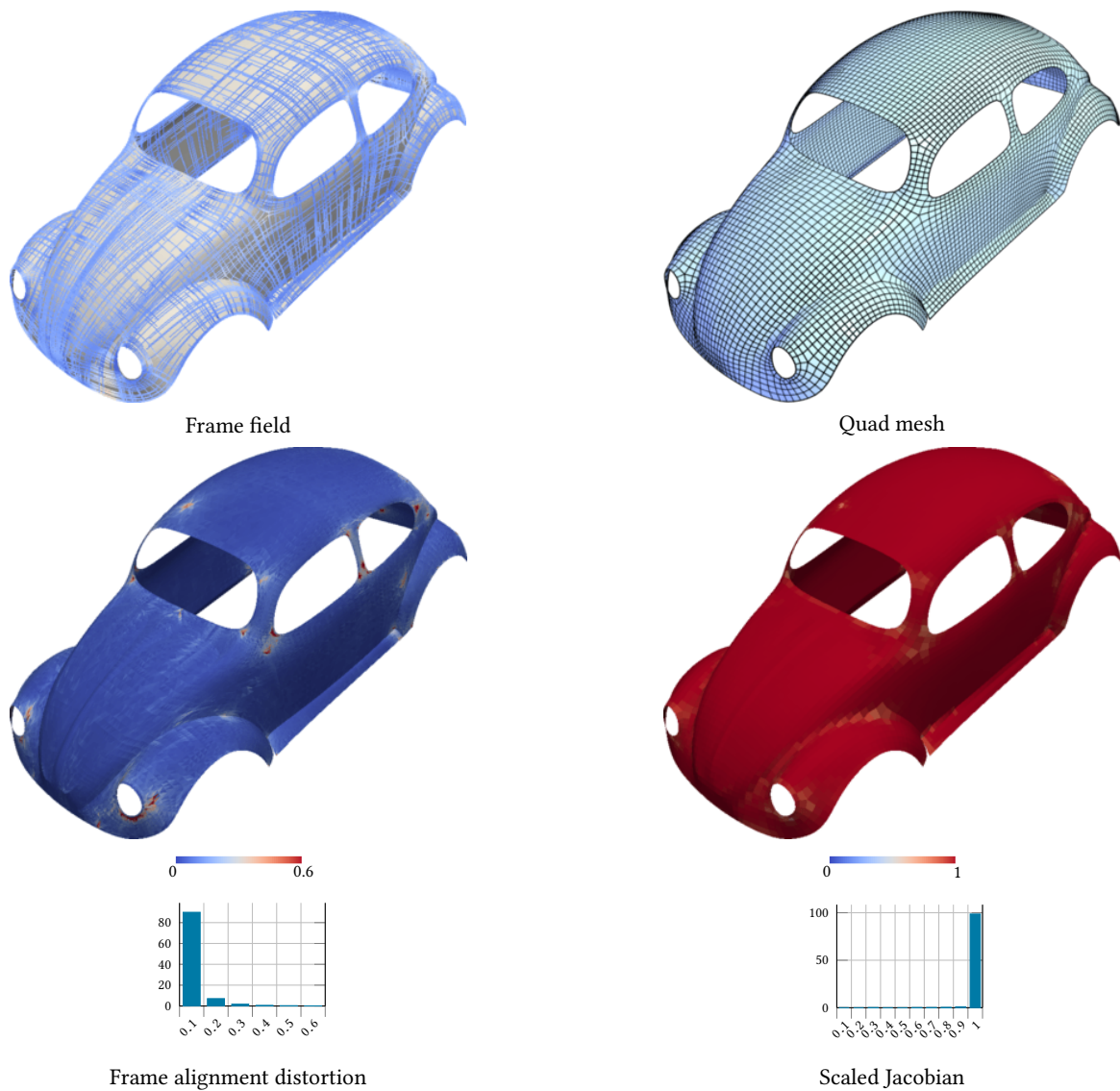
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
beetle-refined	46044	6748(6764)	0.9932(0.9888)	53	85(126)	0.0473	0.05321	3.921	18.07	0.2867

Fig. 9. Model: beetle_refined

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
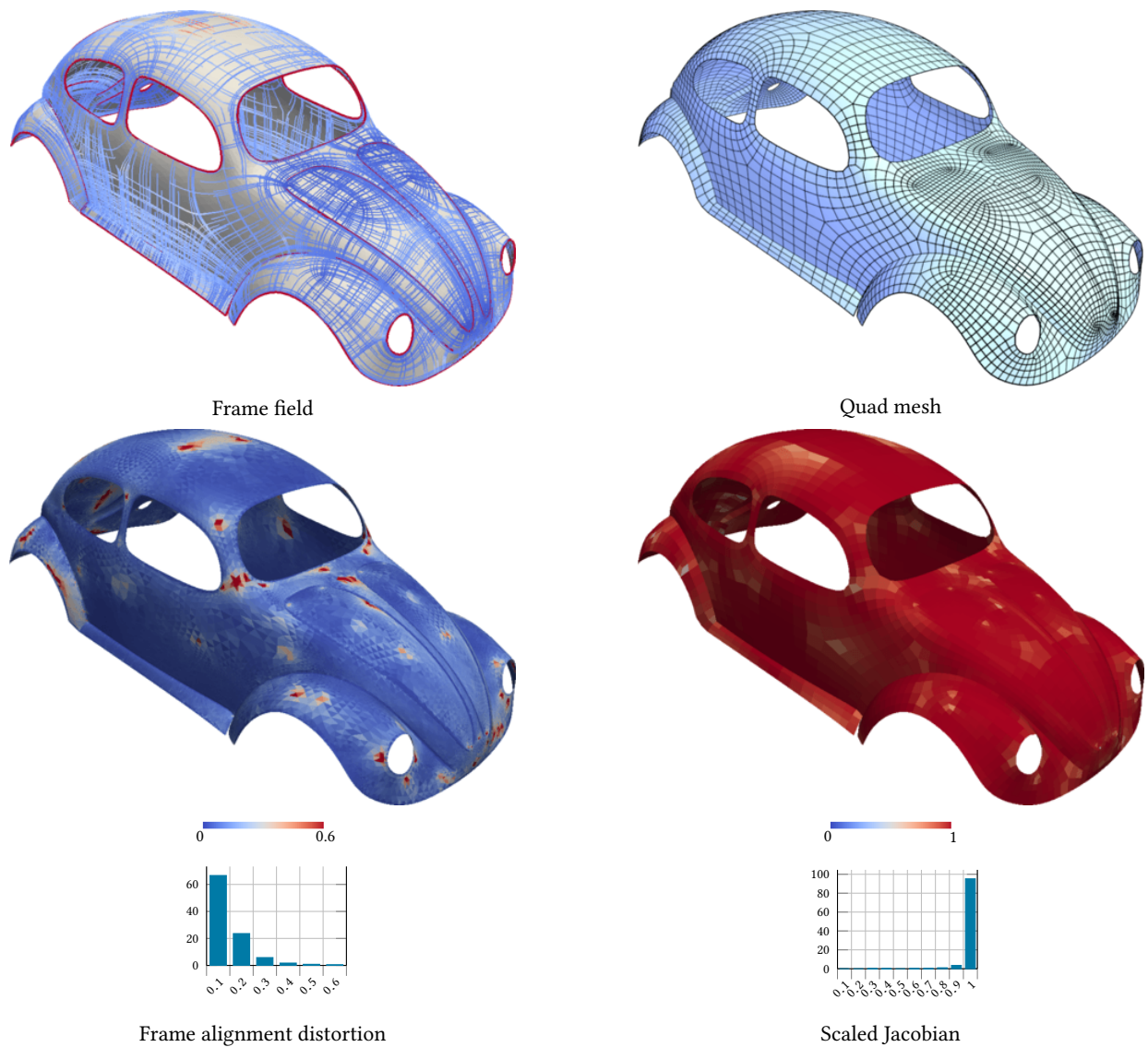
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
beetle-new-re	46925	4024(4036)	0.9767(0.9715)	62	124(153)	0.09364	0.1052	9.326	15.48	0.3916

Fig. 10. Model: beetle_new_re

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian

Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
beetle-re2	42468	2559(2565)	0.9825(0.9782)	60	76(92)	0.08631	0.09667	8.775	12.79	0.4465

Fig. 11. Model: beetle_re2

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
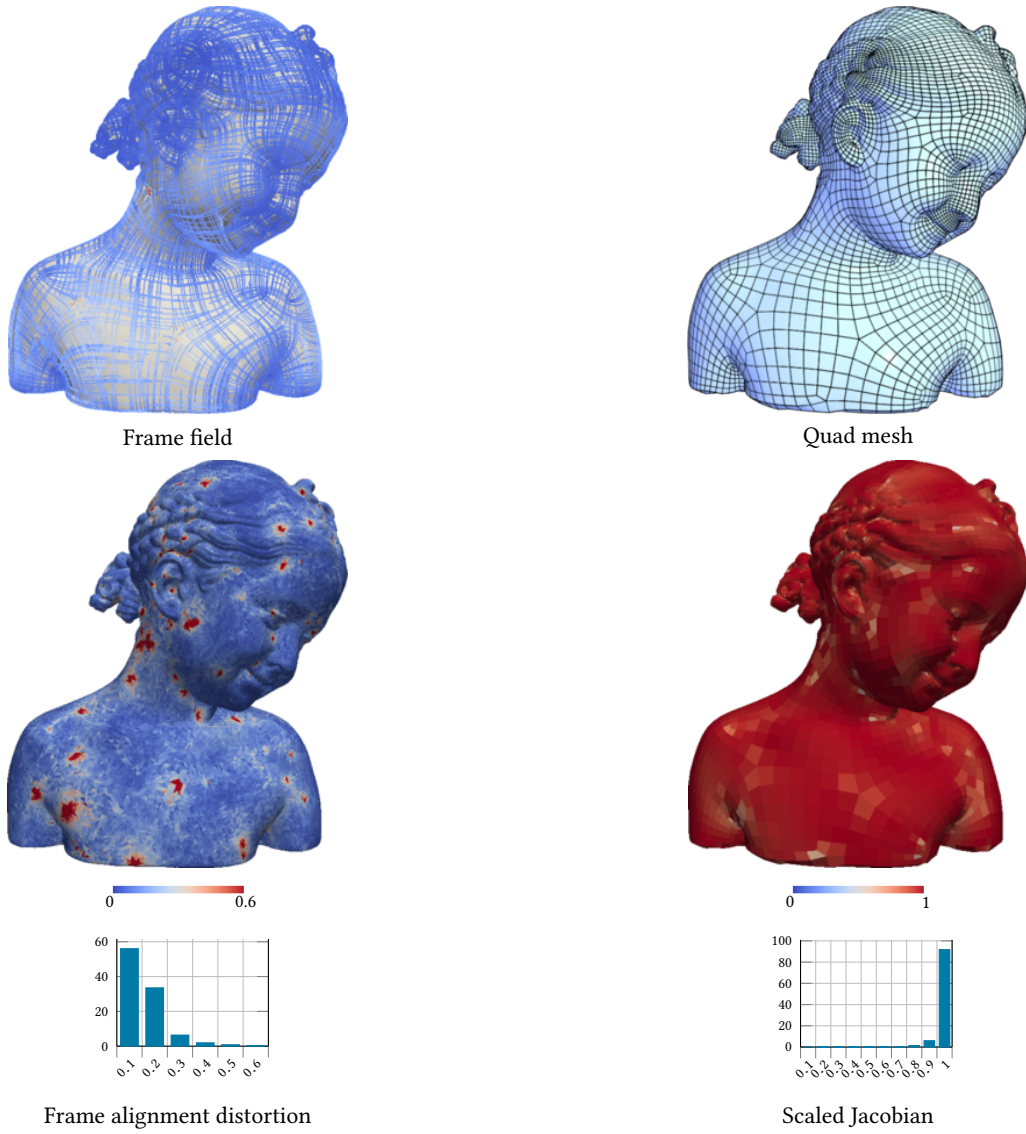
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
bimba100K	100000	9200(9232)	0.9618(0.9561)	145	369(441)	0.1064	0.1223	7.759	34.03	-

Fig. 12. Model: bimba100K

Frame field

Quad mesh

0   0.6

Frame alignment distortion

0   1

Scaled Jacobian
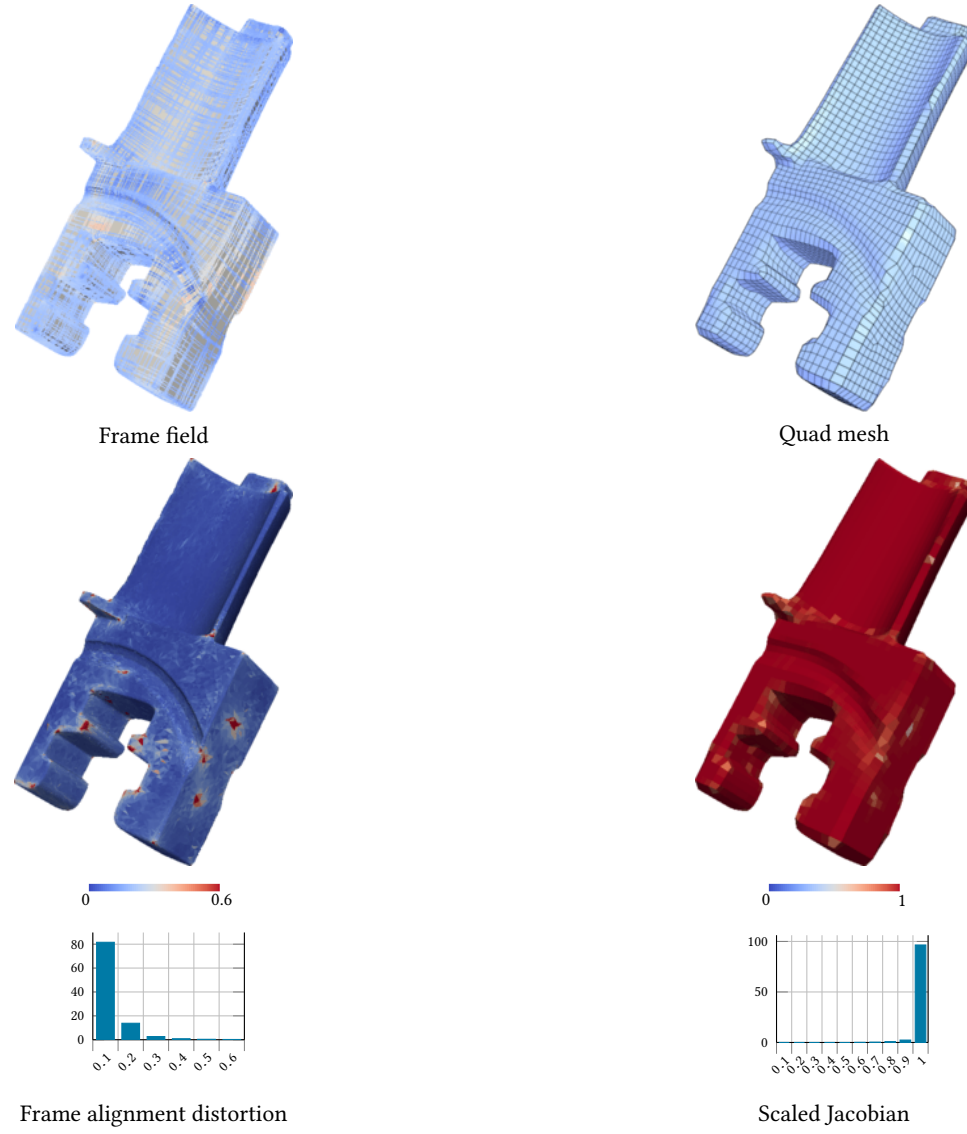
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
blade	58546	3117(3127)	0.986(0.9821)	107	96(118)	0.07257	0.08247	7.995	20.14	-

Fig. 13. Model: blade

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
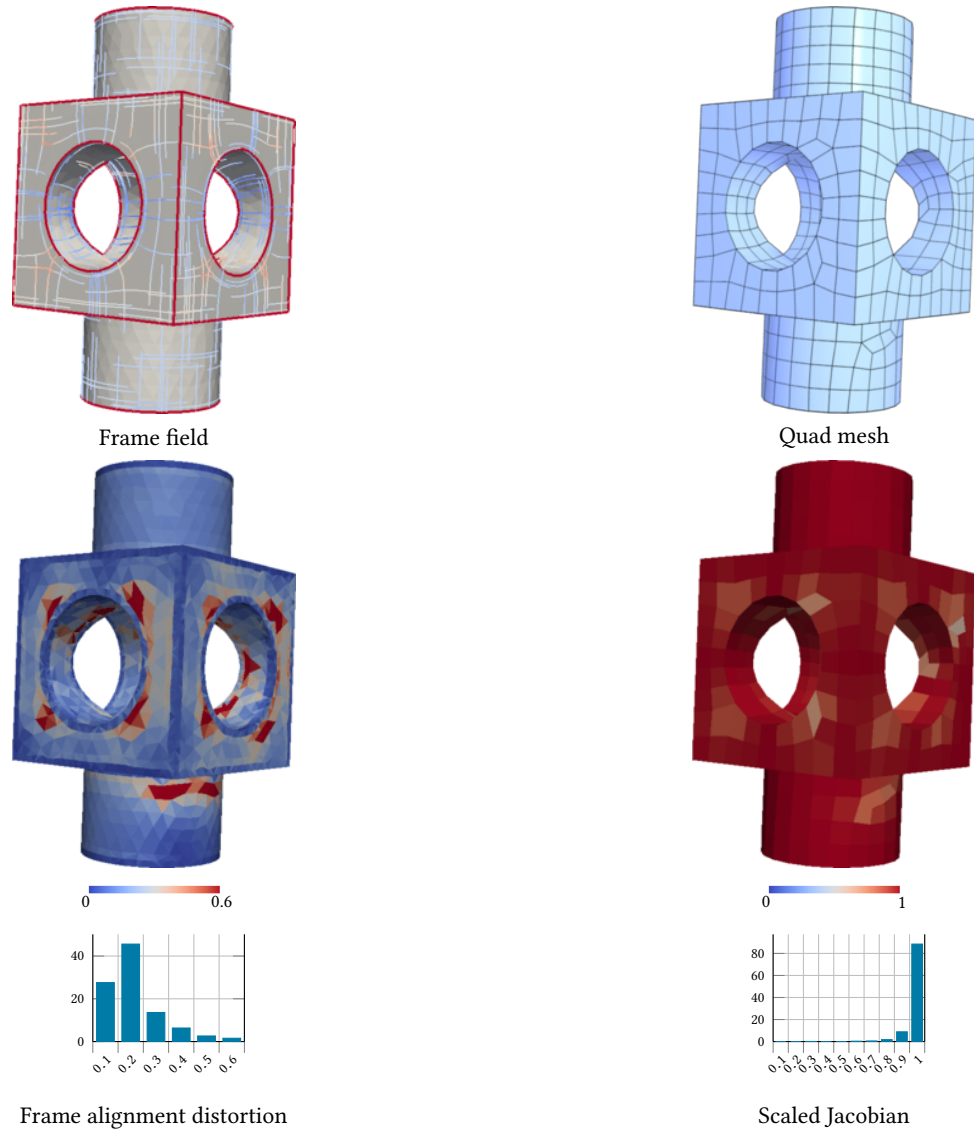
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
block-Lp	10904	928(937)	0.966(0.9507)	48	72(92)	0.1649	0.1813	18.38	3.87	0.4483

Fig. 14. Model: block_Lp

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
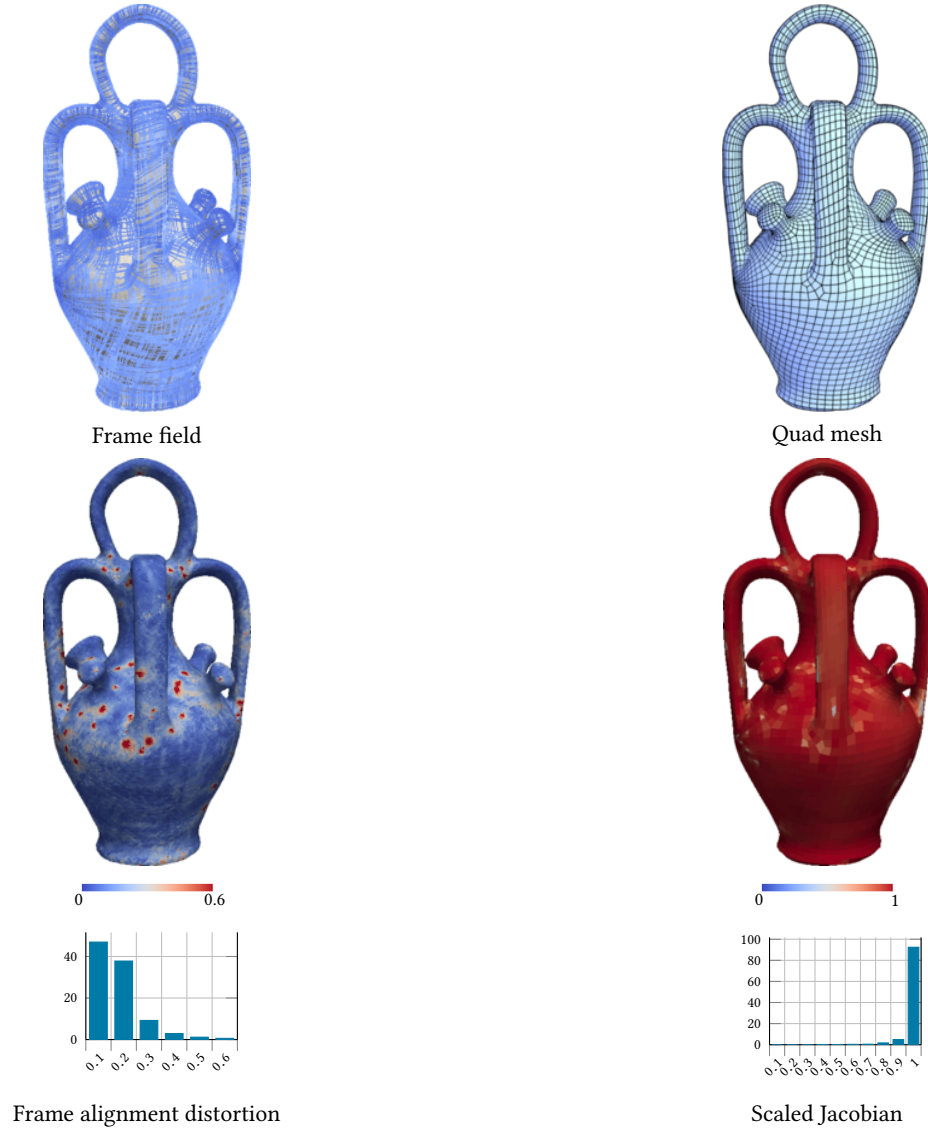
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
botijo	82332	6601(6633)	0.9658(0.958)	140	339(408)	0.1186	0.1401	10.21	27.38	-

Fig. 15. Model: botijo

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
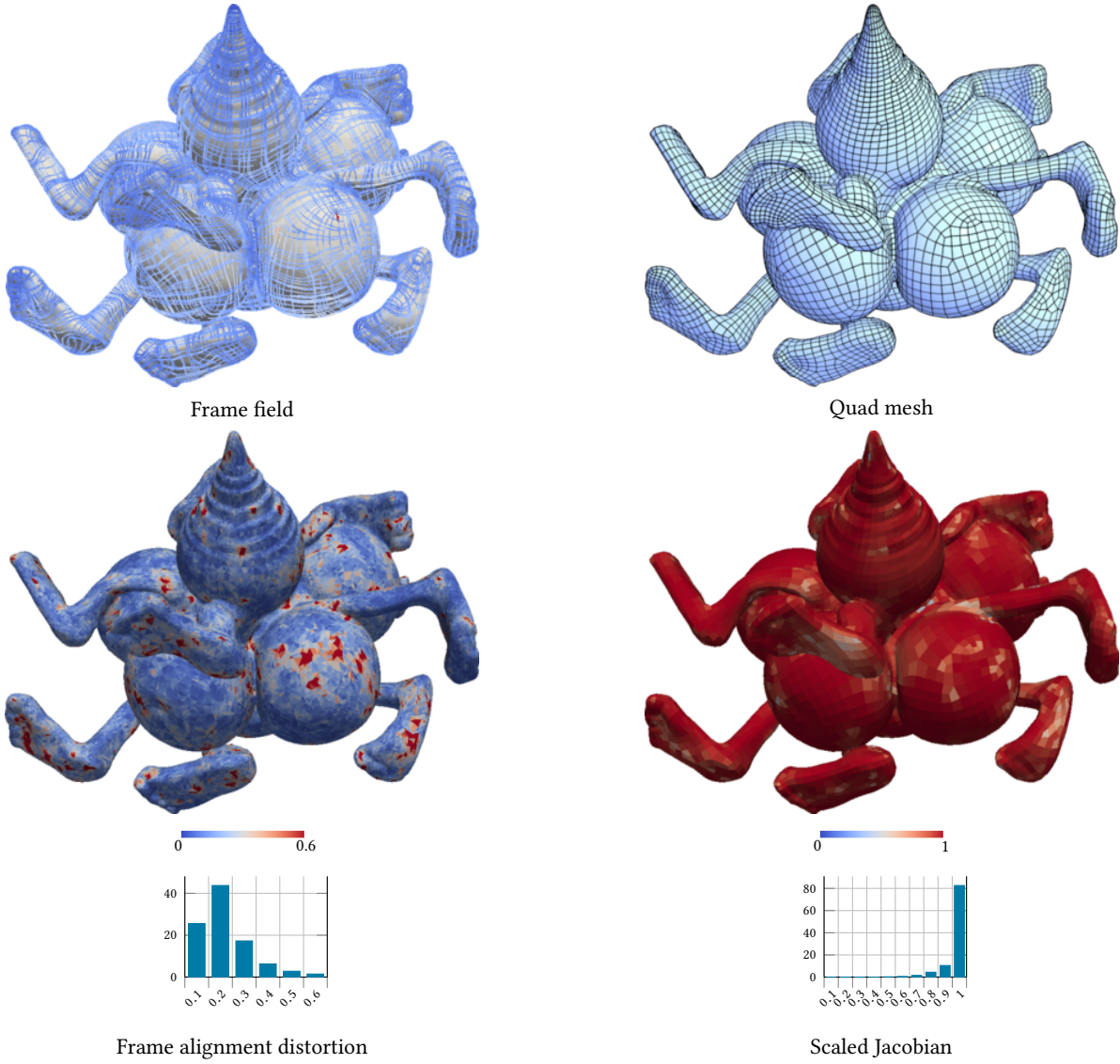
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
bozbezbozzel100K	100000	13628(13893)	0.9435(0.914)	892	1407(1898)	0.1657	0.1936	23.5	48.71	-

Fig. 16. Model: bozbezbozzel100K

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
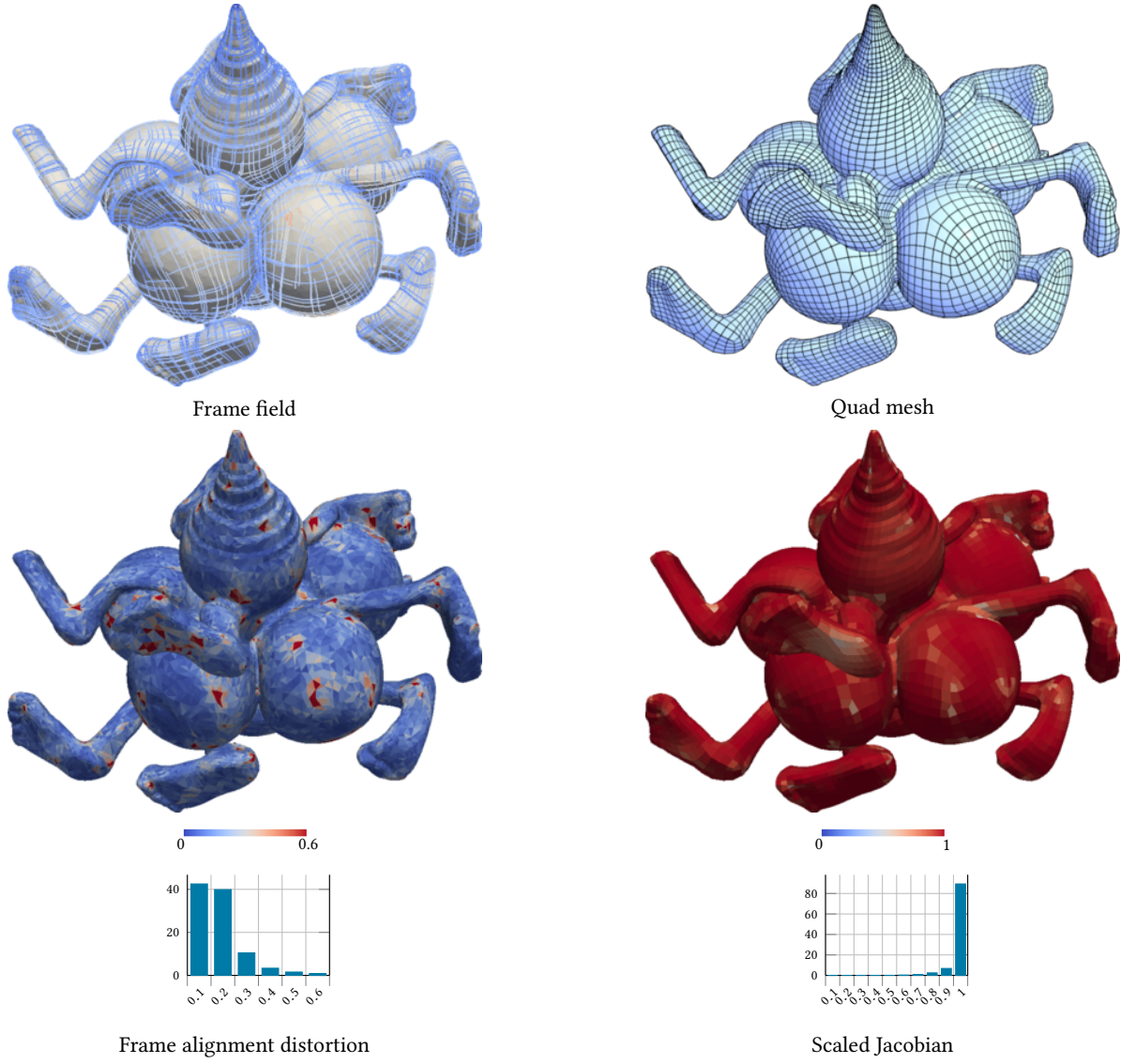
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
bozbezbozzel50K	50000	13702(13898)	0.9609(0.9393)	505	863(1263)	0.1254	0.1447	14.87	25.9	-

Fig. 17. Model: bozbezbozzel50K

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
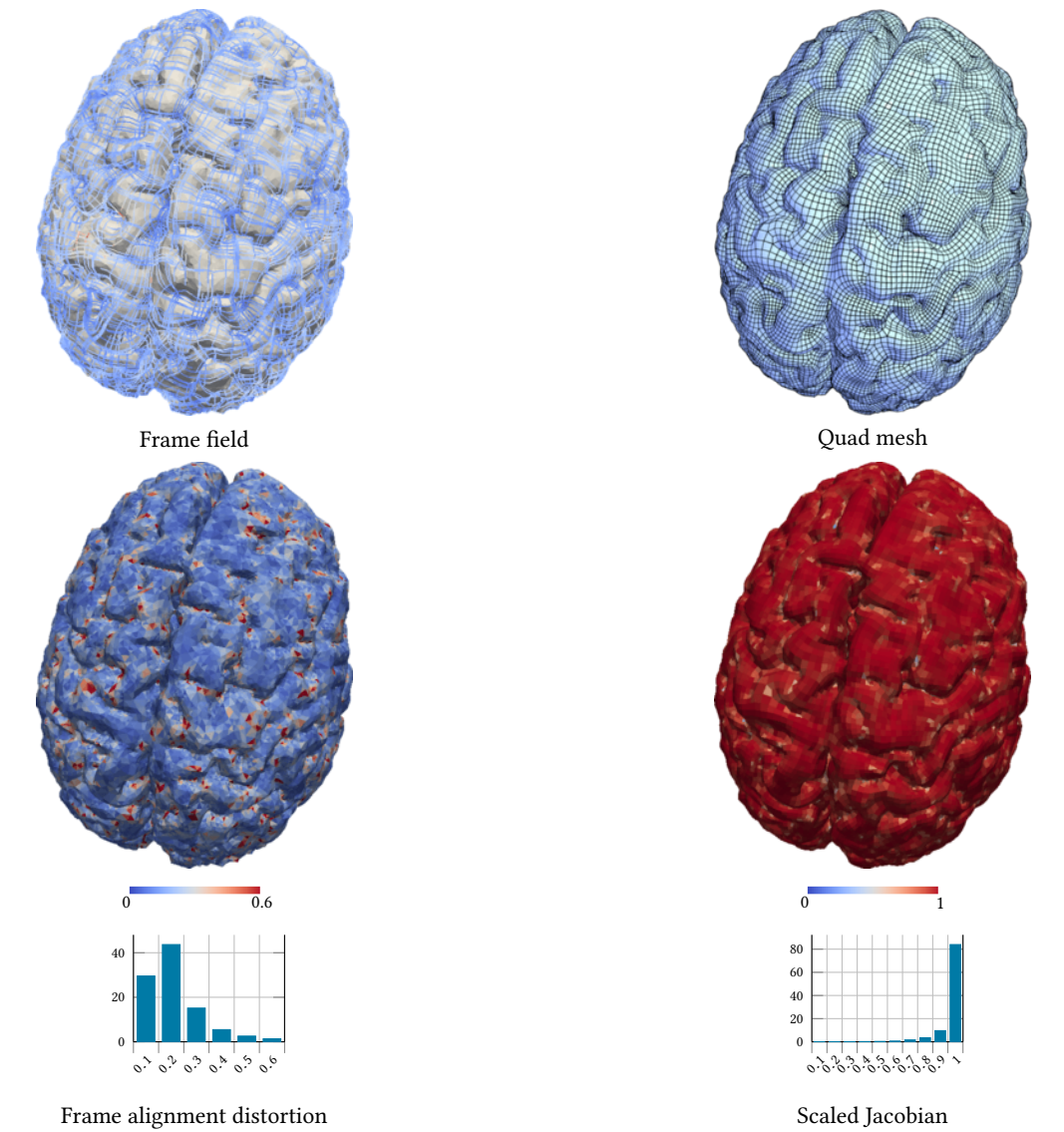
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
brain100k	100000	37501(38411)	0.9427(0.9123)	4316	4330(5905)	0.1546	0.1772	31.25	118.6	-

Fig. 18. Model: brain100k

Frame field

Quad mesh

0   0.6

0   1

Frame alignment distortion

Scaled Jacobian
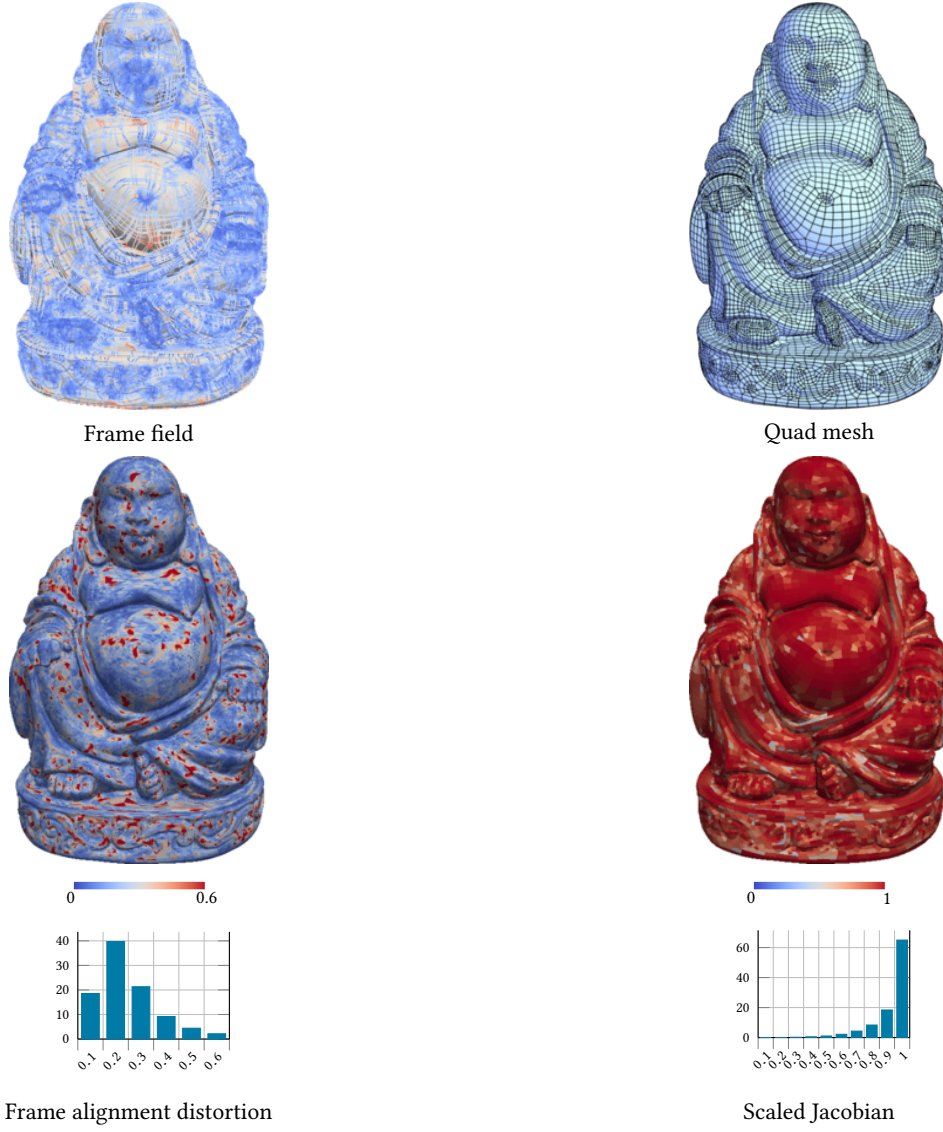
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
buddha	126524	14962(15245)	0.8945(0.8641)	2374	2748(3285)	0.1995	0.2315	39.21	71.75	-

Fig. 19. Model: buddha

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
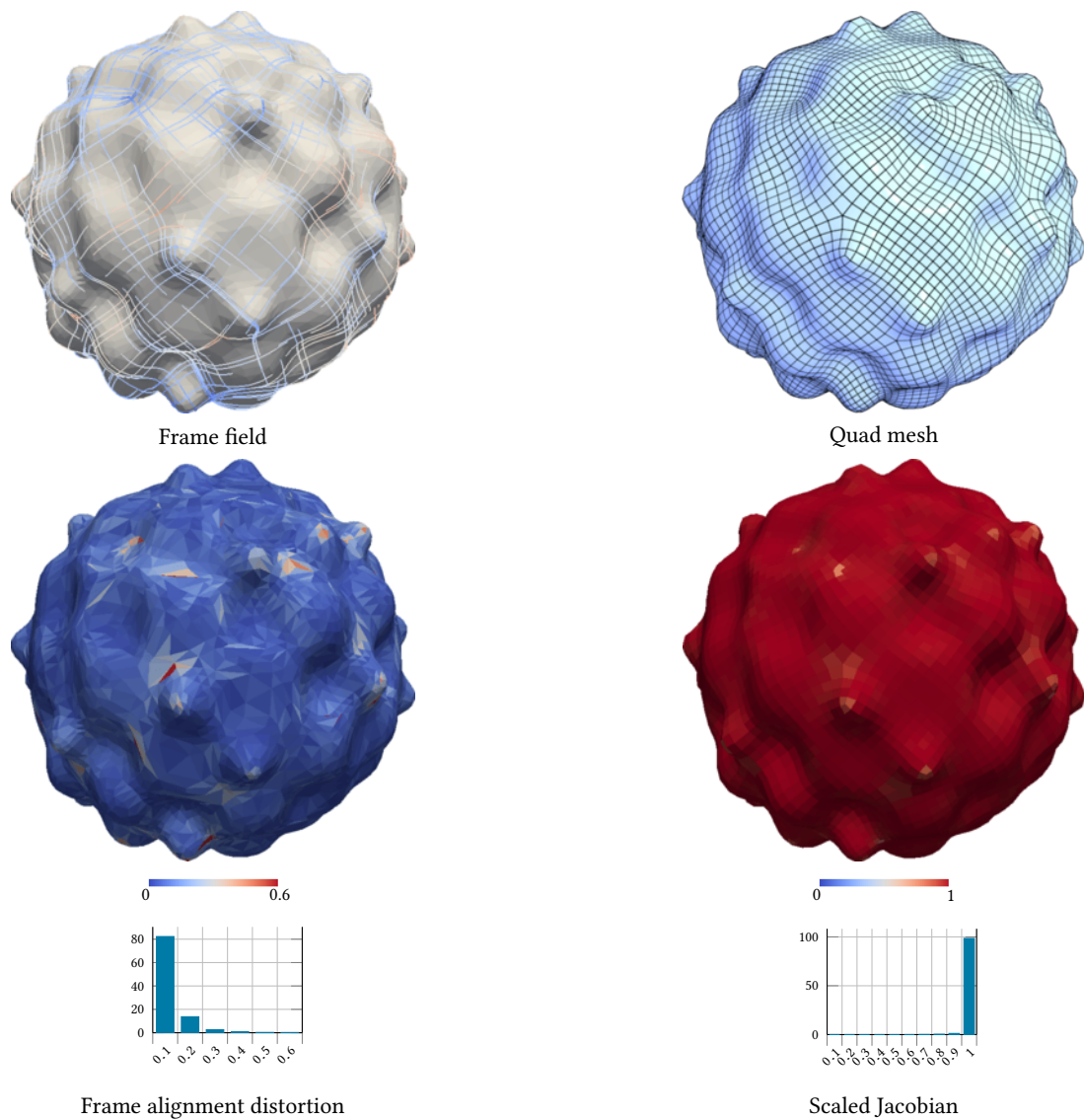
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
bumpy-sphere	11444	6835(6865)	0.9912(0.9841)	44	93(161)	0.06589	0.0739	4.437	5.08	-

Fig. 20. Model: bumpy_sphere

Frame field

Quad mesh

0   0.6

0   1

Frame alignment distortion

Scaled Jacobian
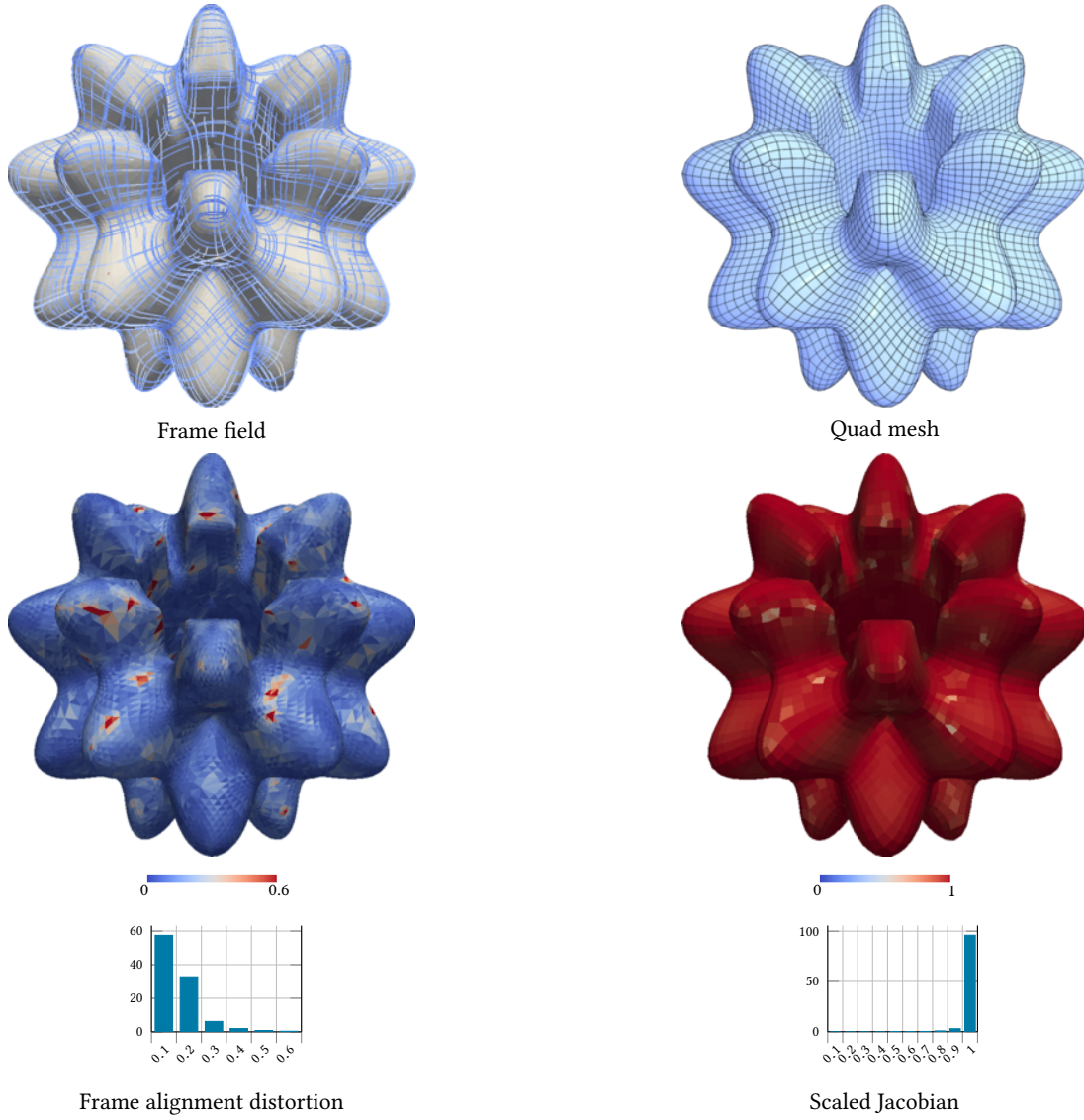
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
bumpy-torus	33630	9165(9211)	0.9749(0.9665)	138	280(379)	0.09897	0.1129	9.434	14.05	-

Fig. 21. Model: bumpy_torus

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
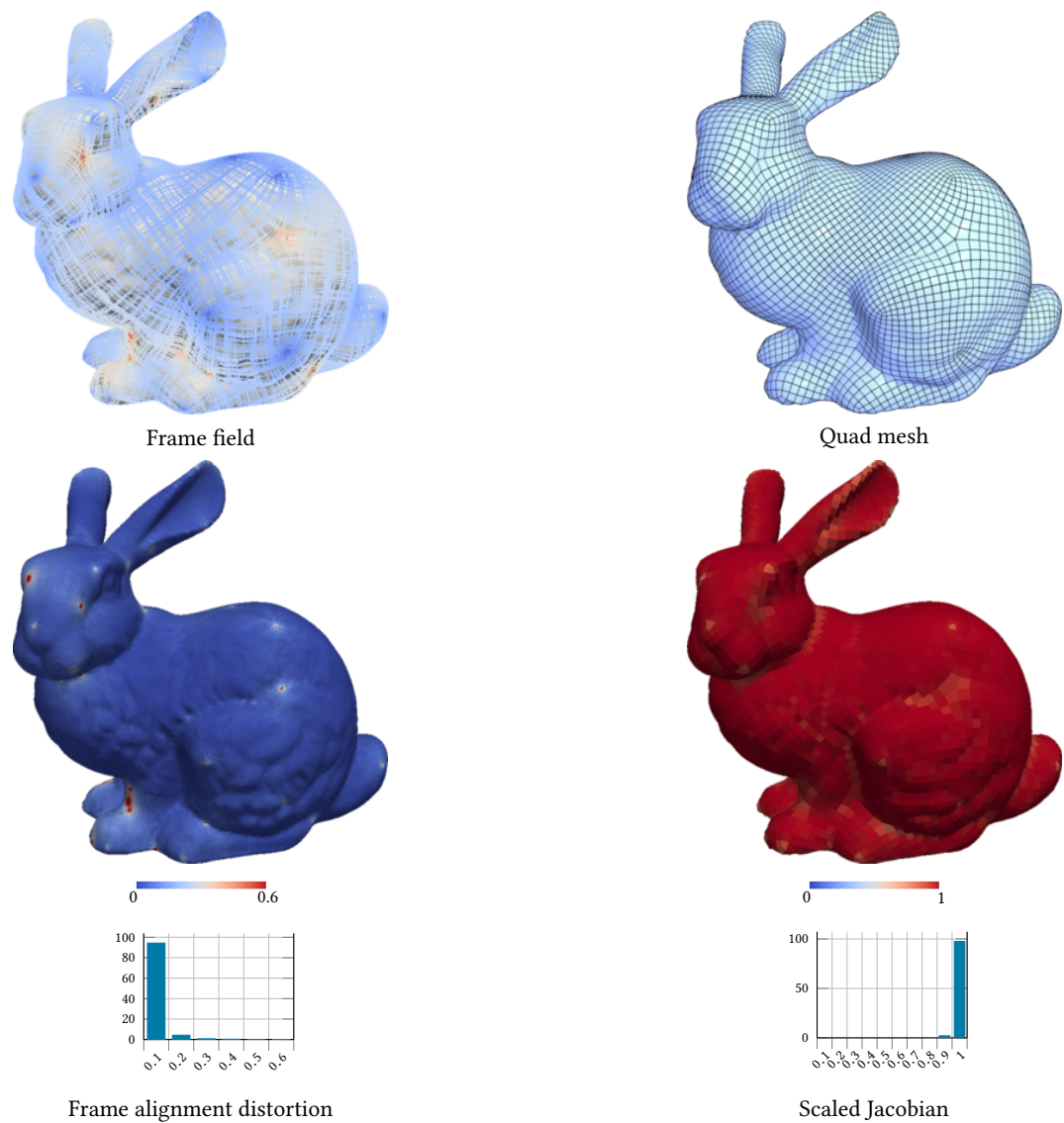
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
bunnyBotsch	111364	6738(6740)	0.9879(0.9874)	70	88(92)	0.03765	0.04293	3.277	38.38	-

Fig. 22. Model: bunnyBotsch
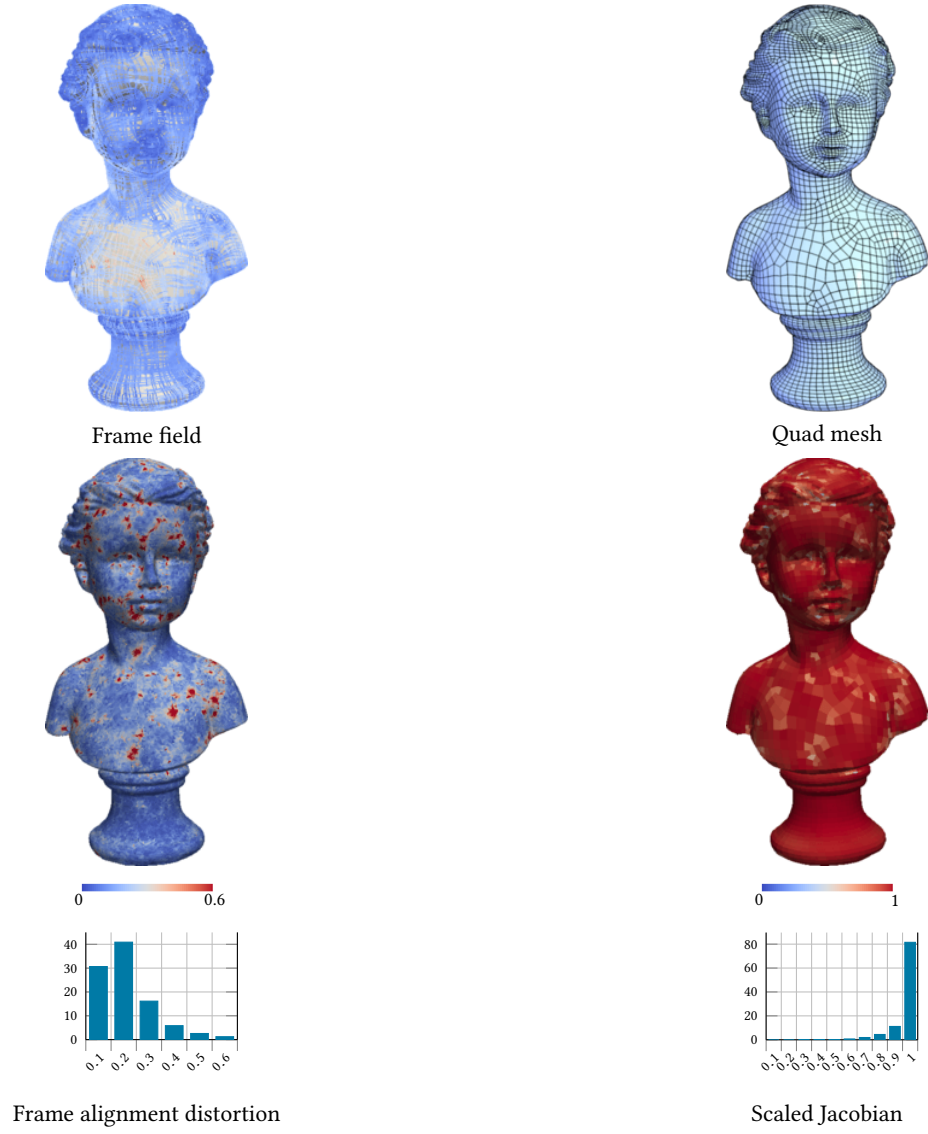
Frame field

Quad mesh

0   0.6

0   1

Frame alignment distortion

Scaled Jacobian

Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
buste	100000	8949(9102)	0.9395(0.9112)	544	900(1195)	0.1595	0.187	21.06	38.89	-

Fig. 23. Model: buste

Frame field

Quad mesh

0   0.6

0   1

Frame alignment distortion

Scaled Jacobian
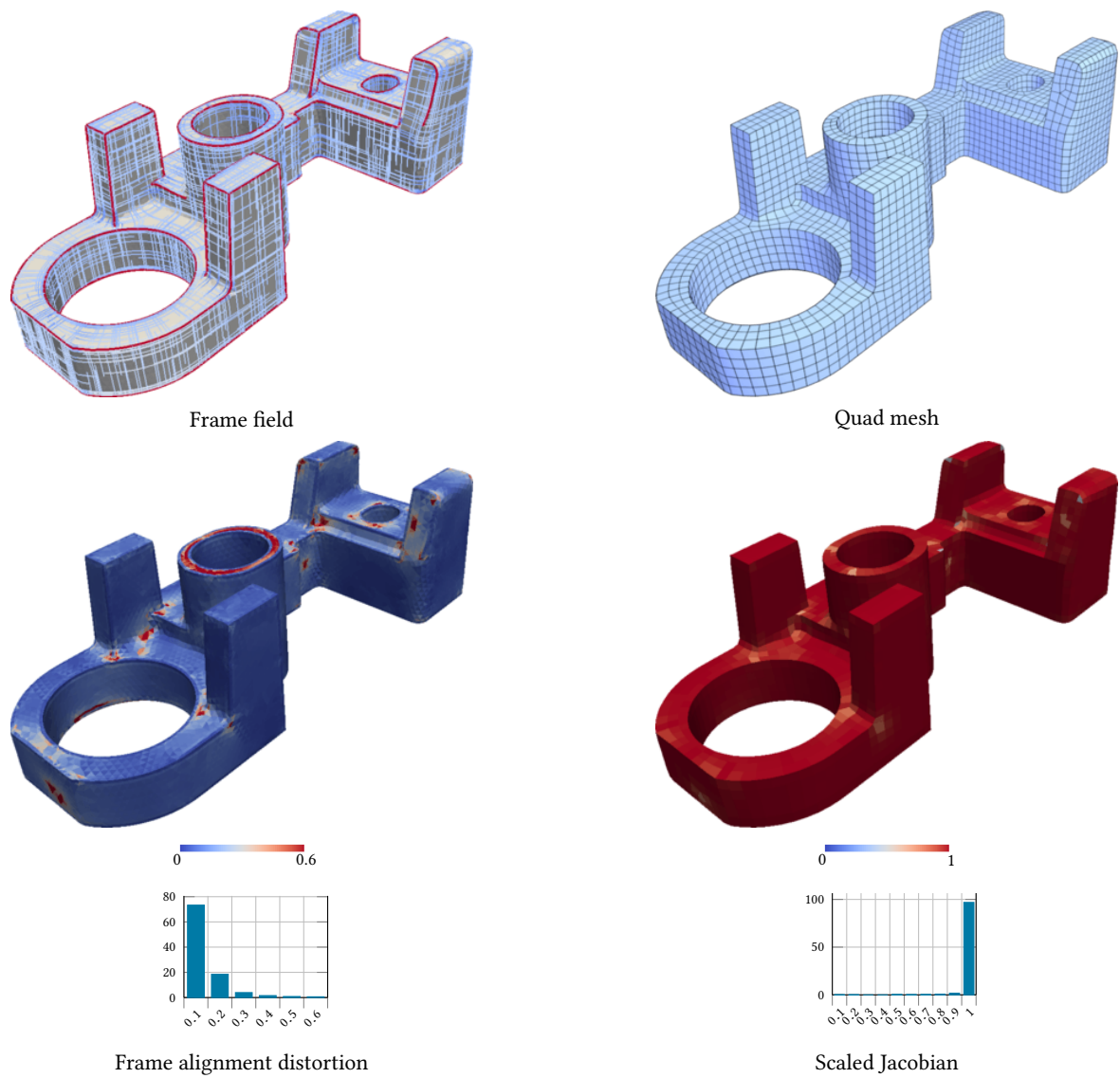
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
cad5	37336	4919(4928)	0.9866(0.983)	76	134(156)	0.08959	0.09906	5.633	12.36	0.2736

Fig. 24. Model: cad5
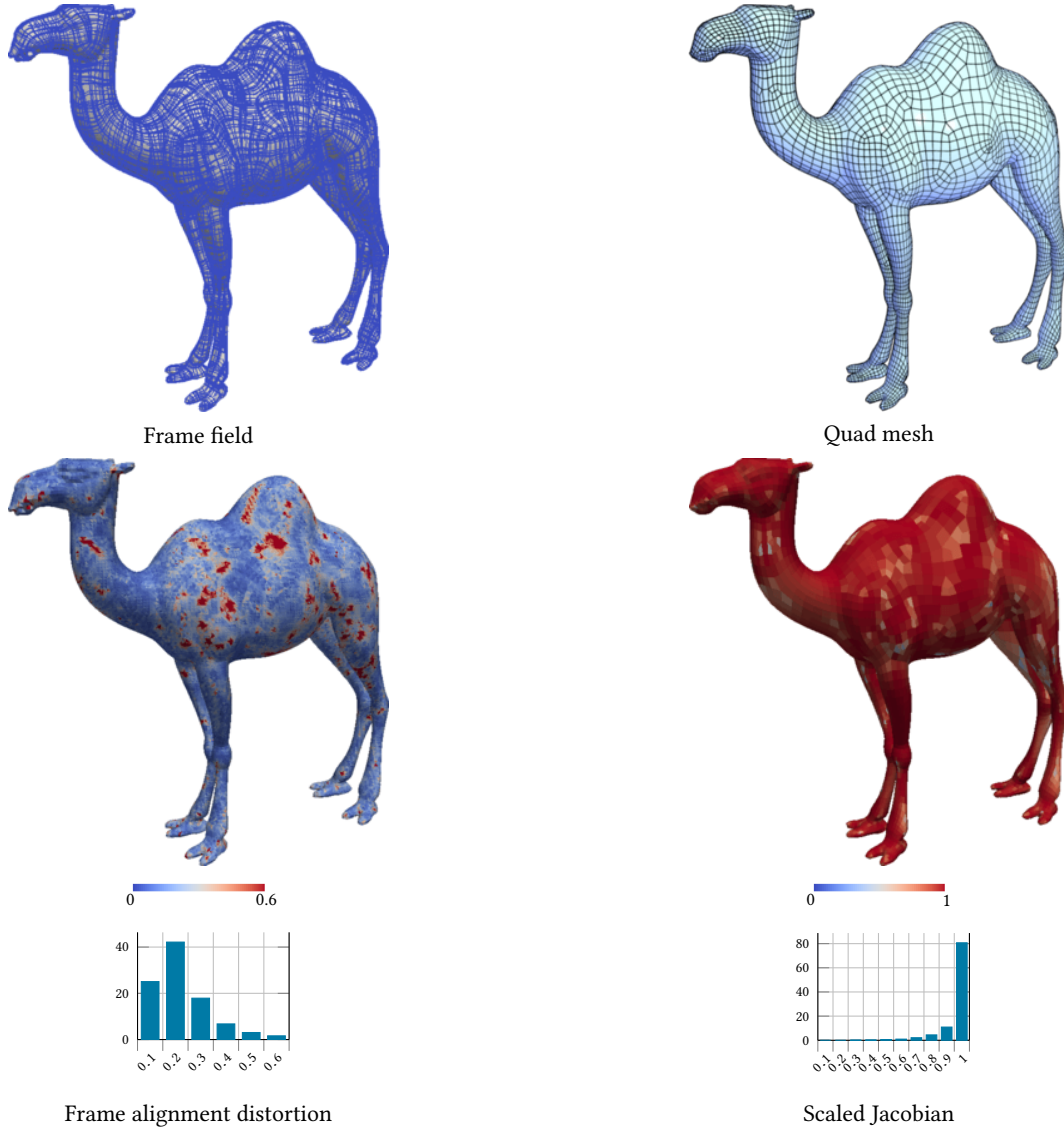
Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian

Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
camel	69092	7190(7403)	0.9348(0.8897)	423	672(1119)	0.1943	0.2232	26.08	32.1	-

Fig. 25. Model: camel

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian

Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
camille-hand100K	100000	7690(7728)	0.9889(0.9798)	192	116(204)	0.06279	0.07388	6.184	28.23	-
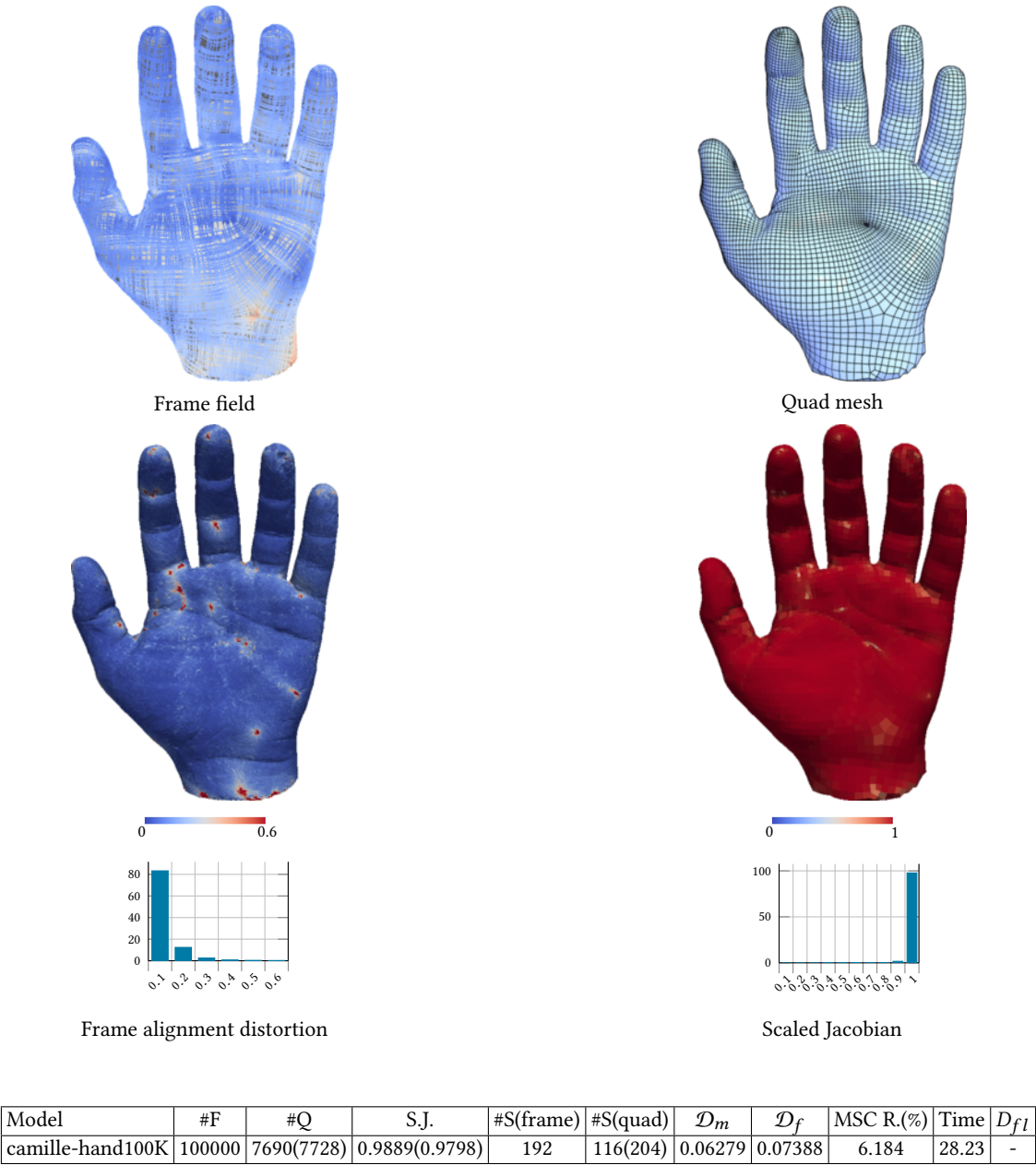
Fig. 26. Model: camille_hand100K

Frame field
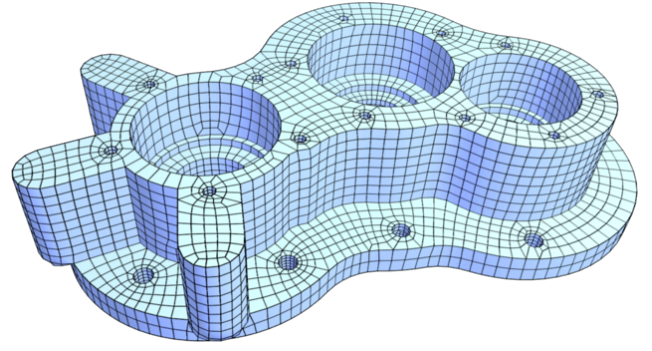
Quad mesh

0   0.6

Frame alignment distortion

0   1
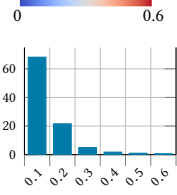
Scaled Jacobian

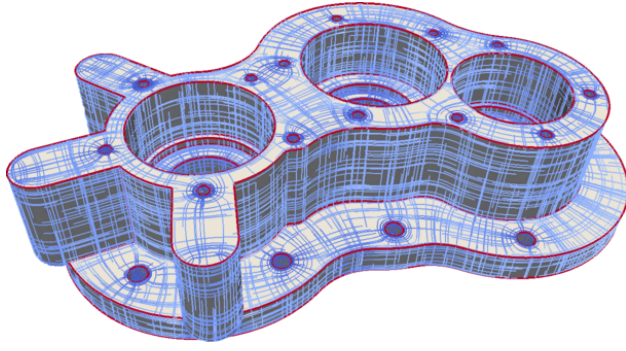| Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
carter30k-mod	79310	8186(8213)	0.9805(0.9752)	252	308(368)	0.0987	0.1083	6.821	31.73	0.355

Fig. 27. Model: carter30k-mod

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
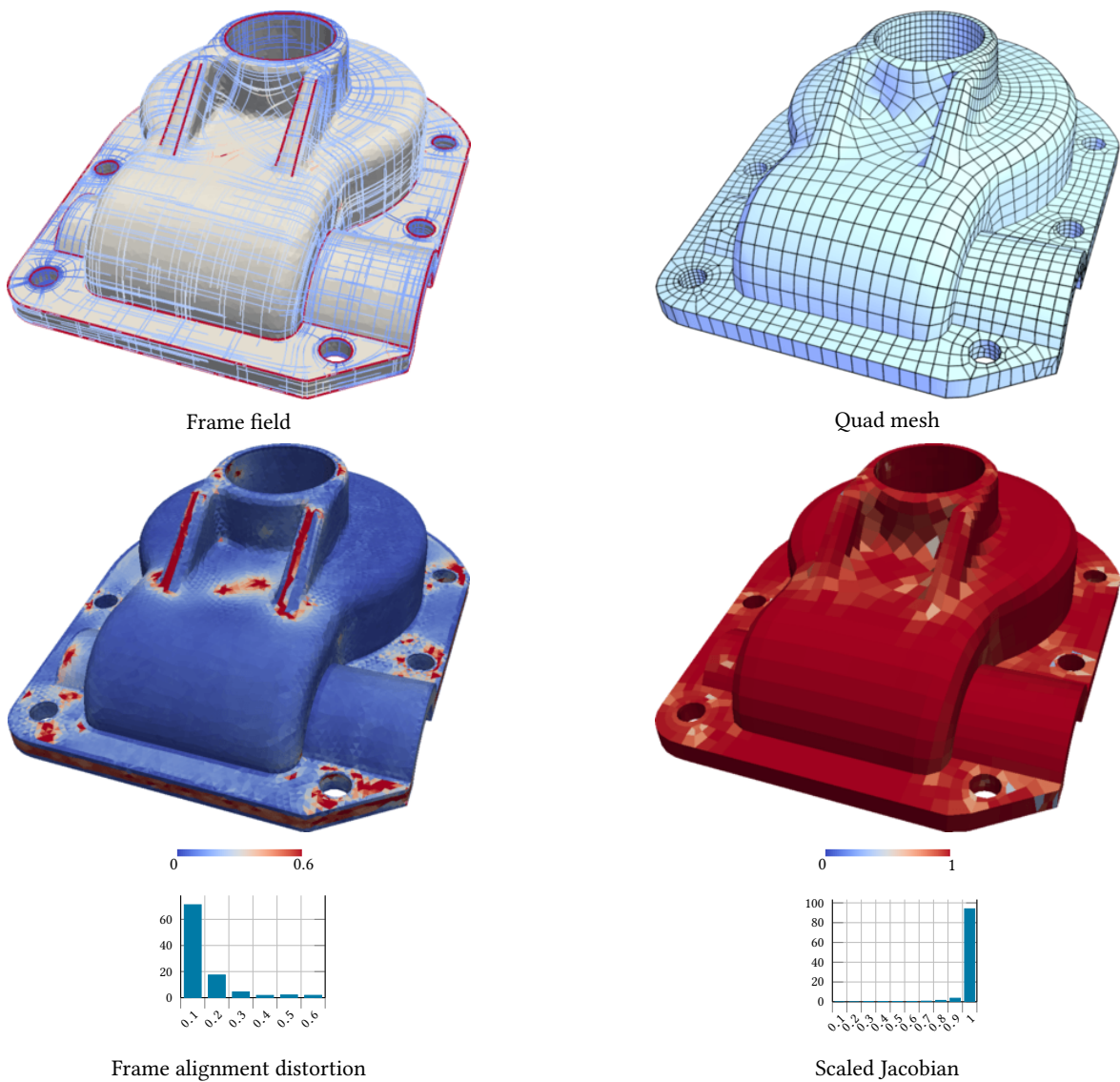
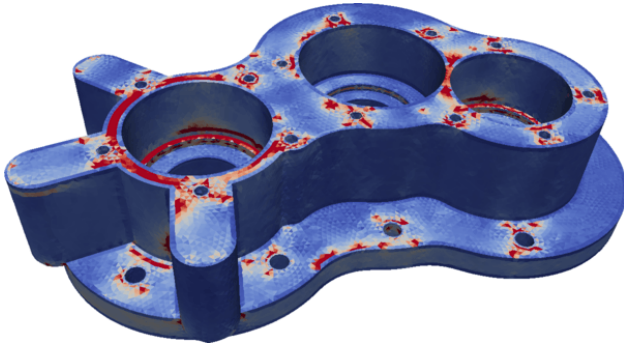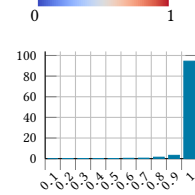| Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
cast40k	52388	5089(5106)	0.978(0.972)	104	201(237)	0.0973	0.1069	7.914	19.28	0.3554

Fig. 28. Model: cast40k

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
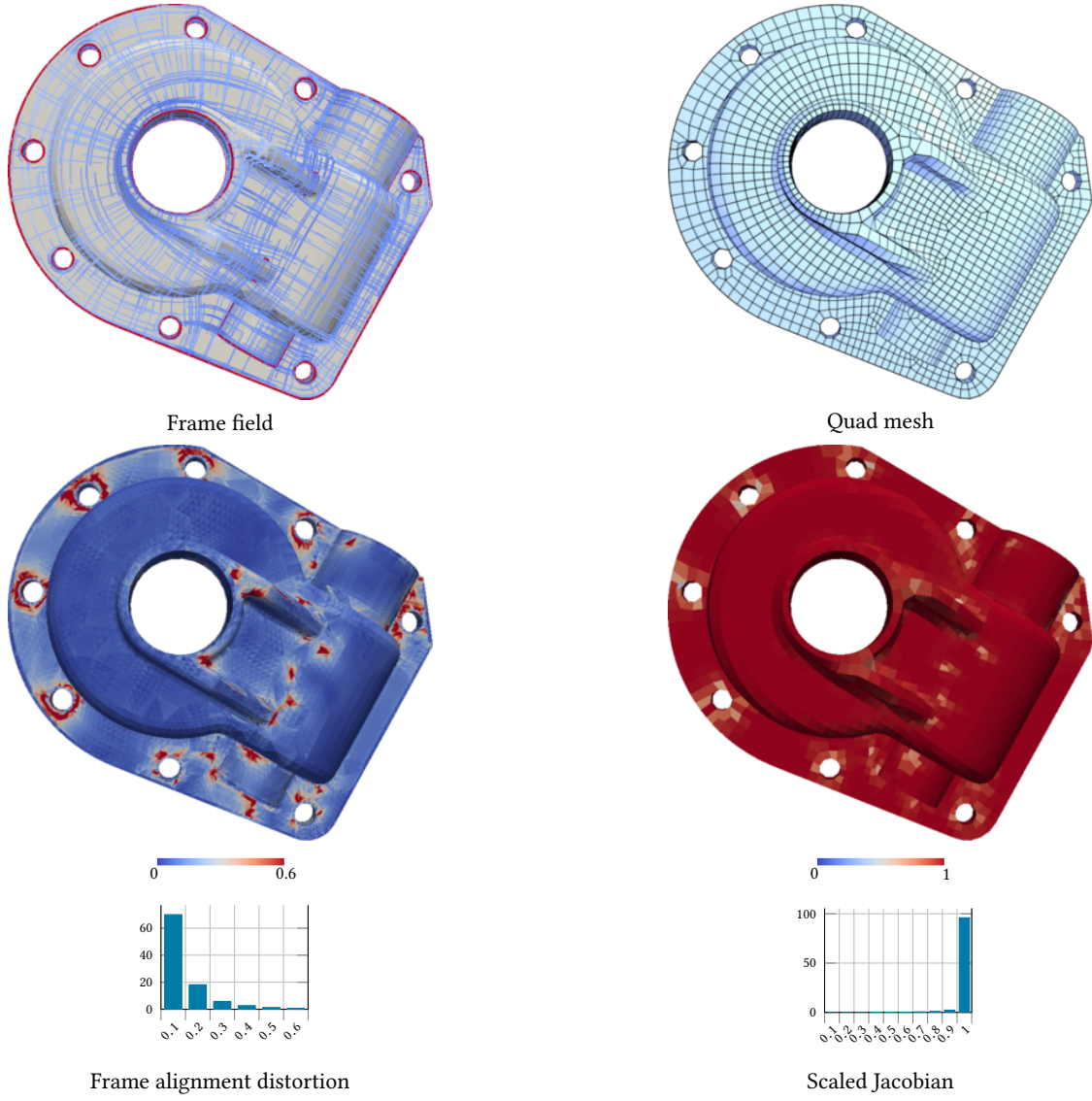
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
casting-refined	54174	6260(6284)	0.985(0.9778)	104	224(274)	0.09622	0.1065	6.875	19.4	0.3513

Fig. 29. Model: casting_refined

Frame field

Quad mesh

0   0.6

Frame alignment distortion

0   1

Scaled Jacobian
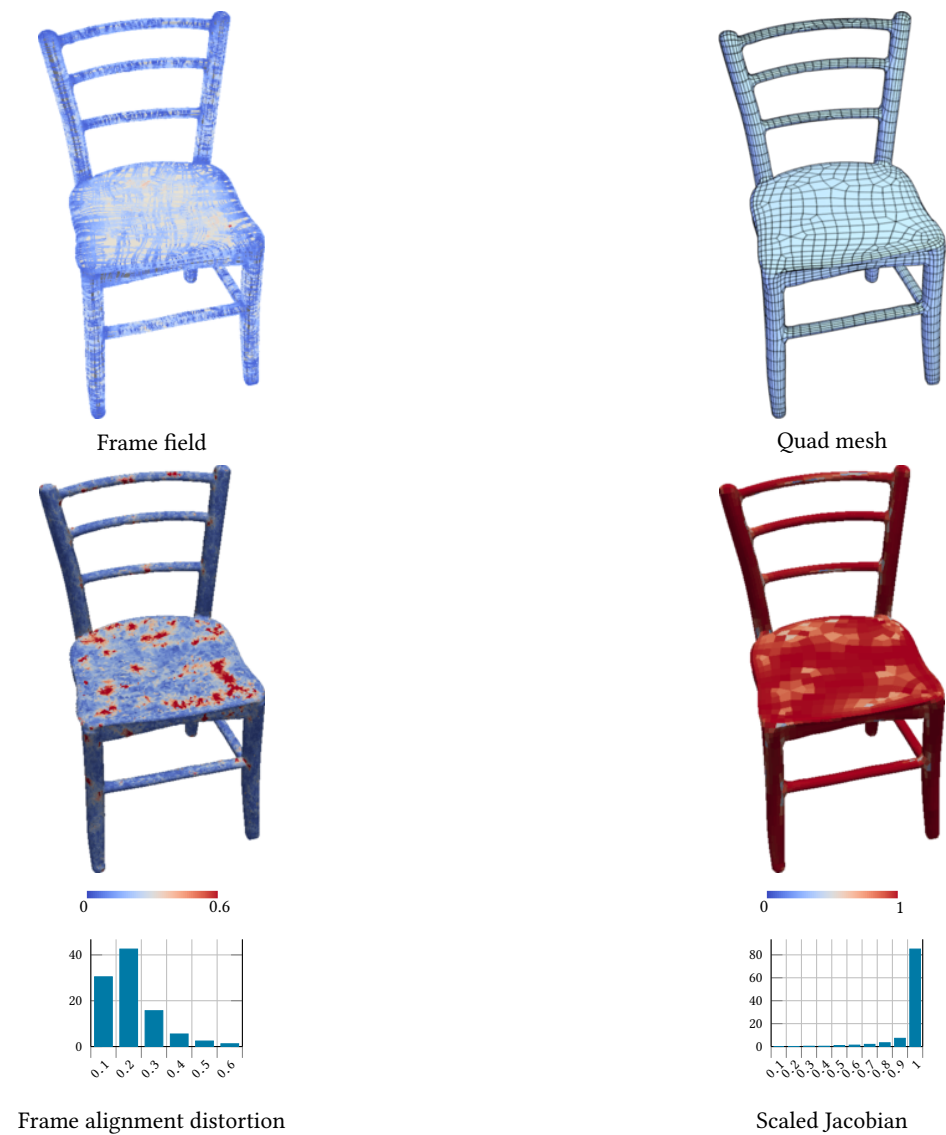
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
chair	100000	5115(5150)	0.9468(0.9347)	246	341(418)	0.1585	0.1841	16.09	36.8	-

Fig. 30. Model: chair
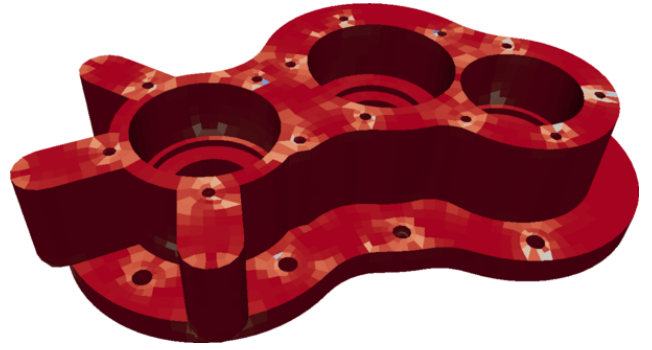
Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
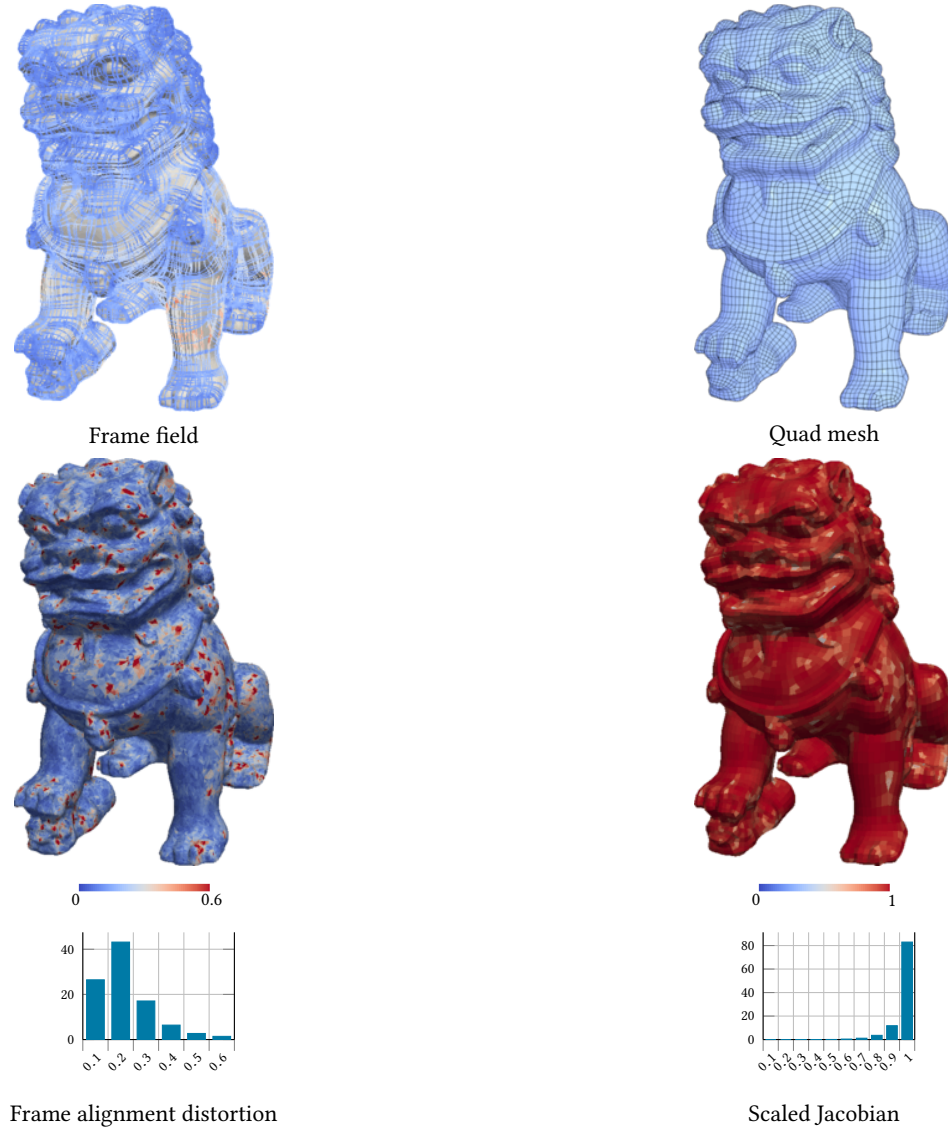
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
chinese-lion100K	100034	14933(15190)	0.9449(0.918)	933	1622(2194)	0.1624	0.1911	24.38	50.99	3.414e-14

Fig. 31. Model: chinese_lion100K
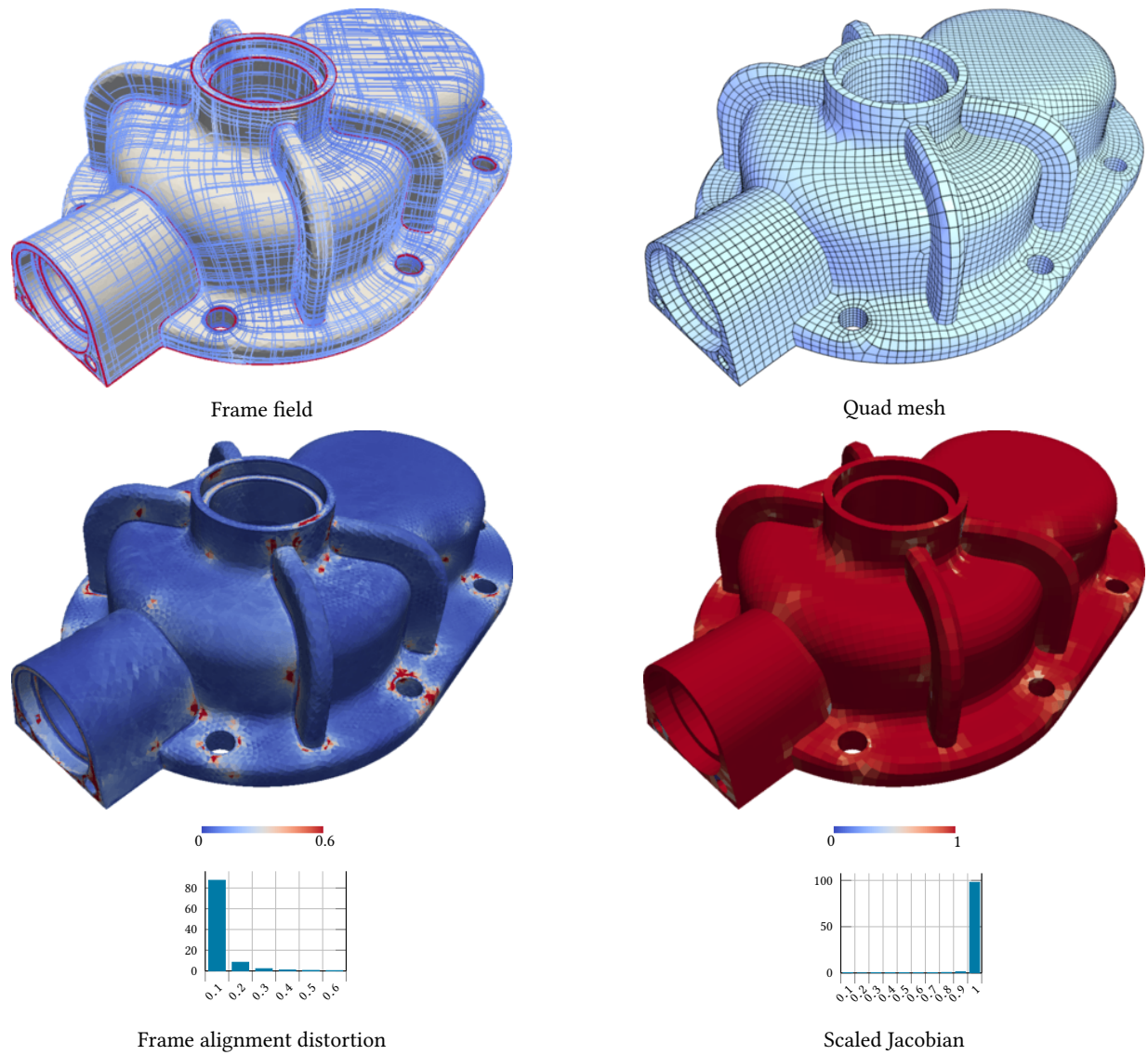
Frame field


Quad mesh

Frame alignment distortion

Scaled Jacobian

Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
cognit30k	89350	15769(15793)	0.9906(0.988)	138	256(308)	0.05355	0.05969	4.088	28.59	0.2217

Fig. 32. Model: cognit30k

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
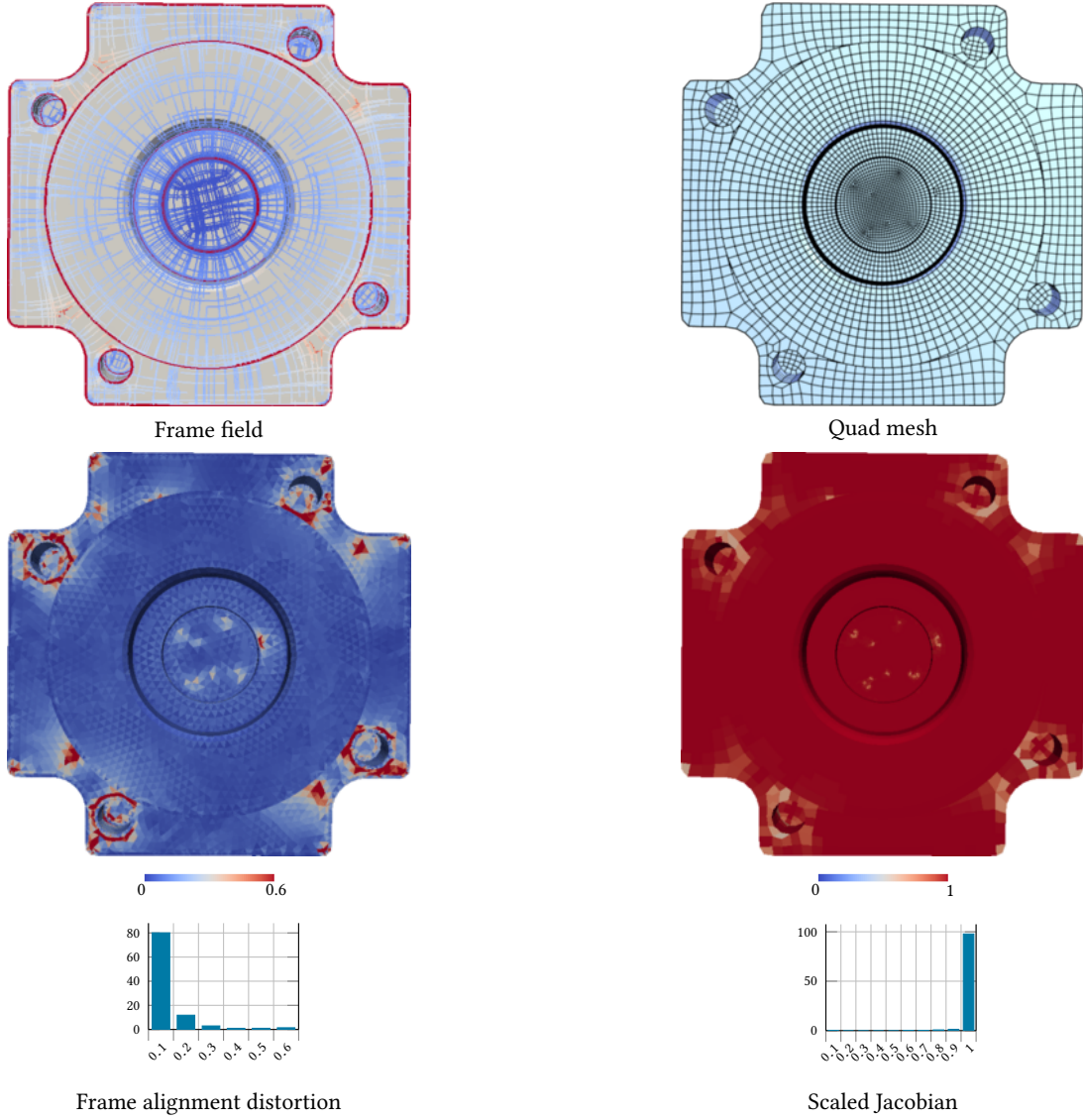
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
coverrear-Lp	50990	7997(8020)	0.993(0.988)	64	130(179)	0.07701	0.08309	4.704	19.62	0.3751

Fig. 33. Model: coverrear_Lp

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
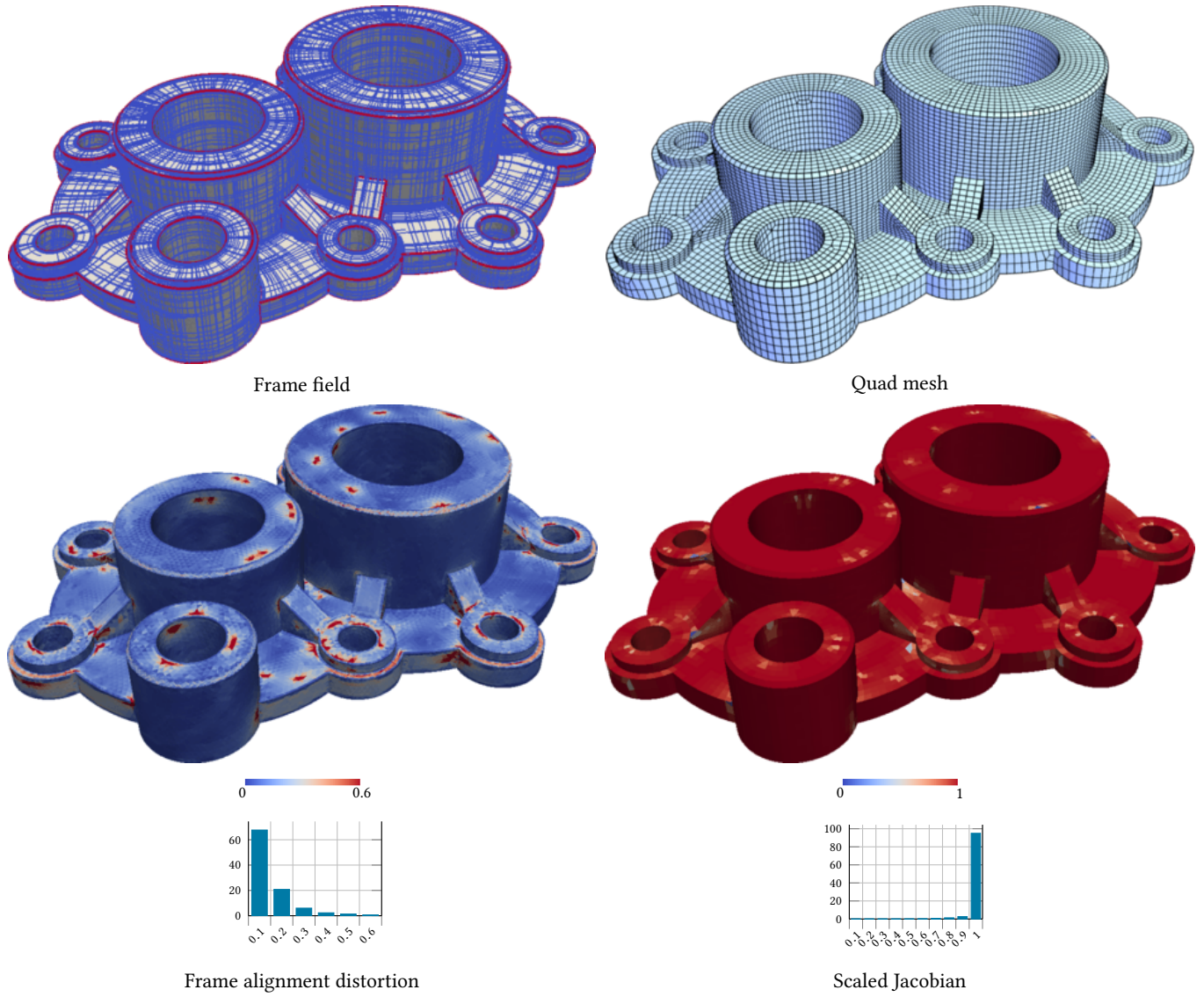
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
cover-small	140914	21278(21356)	0.9806(0.9746)	189	669(816)	0.09825	0.1095	5.03	49.12	0.1923

Fig. 34. Model: cover_small

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
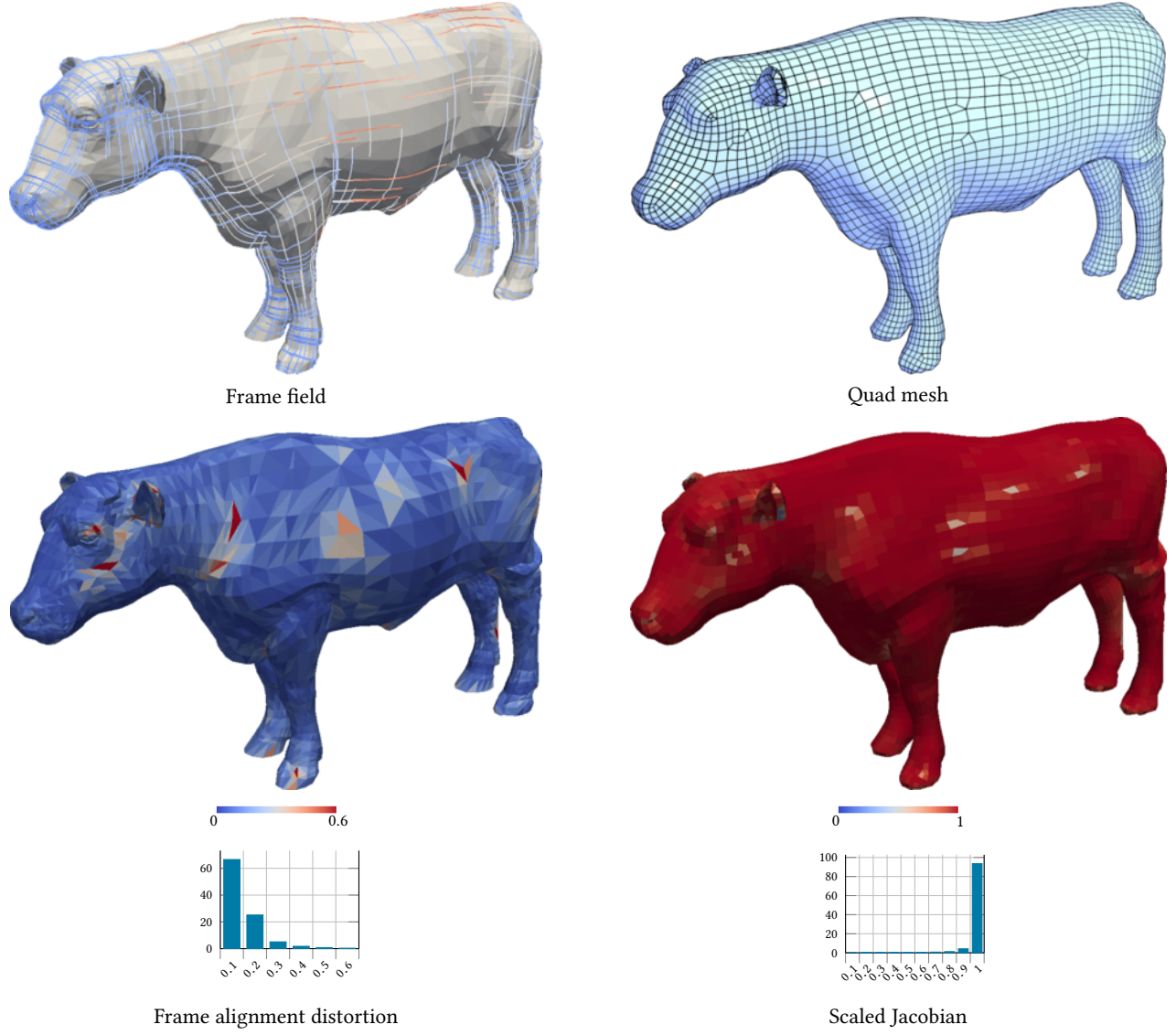
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
cow2	8626	5382(5420)	0.9722(0.9621)	70	159(246)	0.08913	0.1003	9.123	6.12	–

Fig. 35. Model: cow2

Frame field

Quad mesh

0   0.6

Frame alignment distortion

0   1

Scaled Jacobian
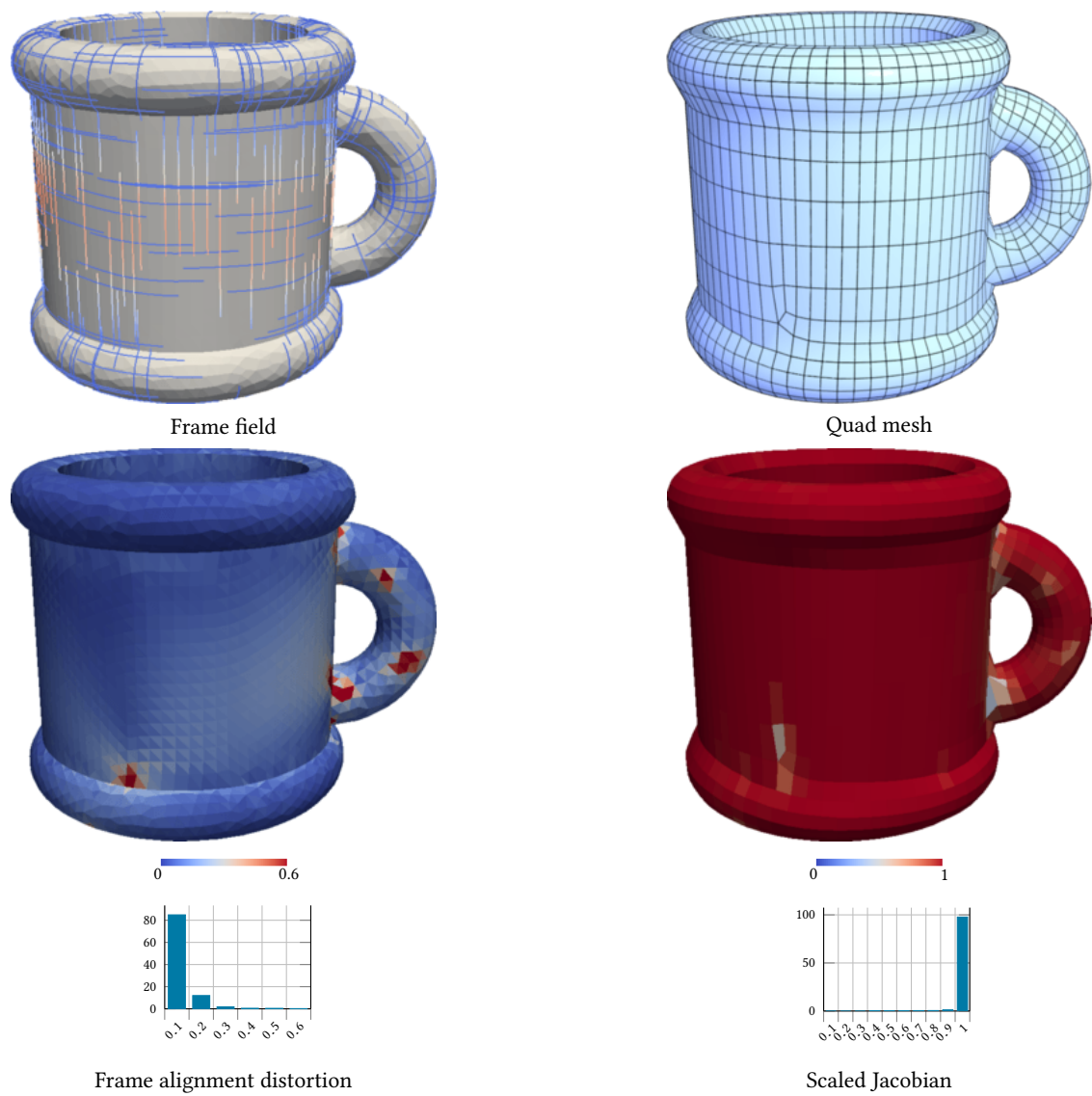
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
cup	11340	2261(2266)	0.9905(0.9866)	12	27(39)	0.05572	0.06824	2.847	3.57	-

Fig. 36. Model: cup

Frame field

Quad mesh

0   0.6

Frame alignment distortion

0   1

Scaled Jacobian
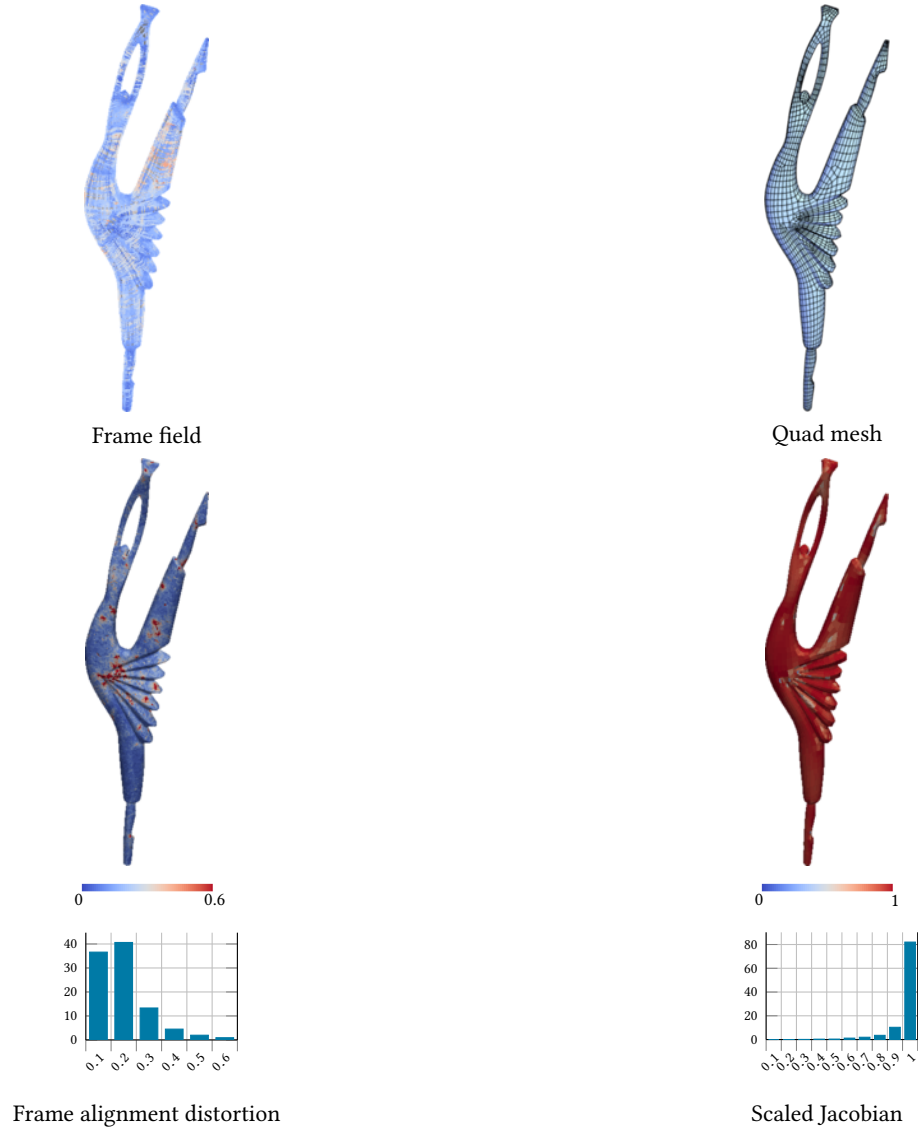
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
dancer-25k	49996	3225(3273)	0.9324(0.9076)	115	239(331)	0.1454	0.1705	12.41	17.09	-

Fig. 37. Model: dancer_25k

Frame field

Quad mesh

0   0.6

Frame alignment distortion

0   1

Scaled Jacobian
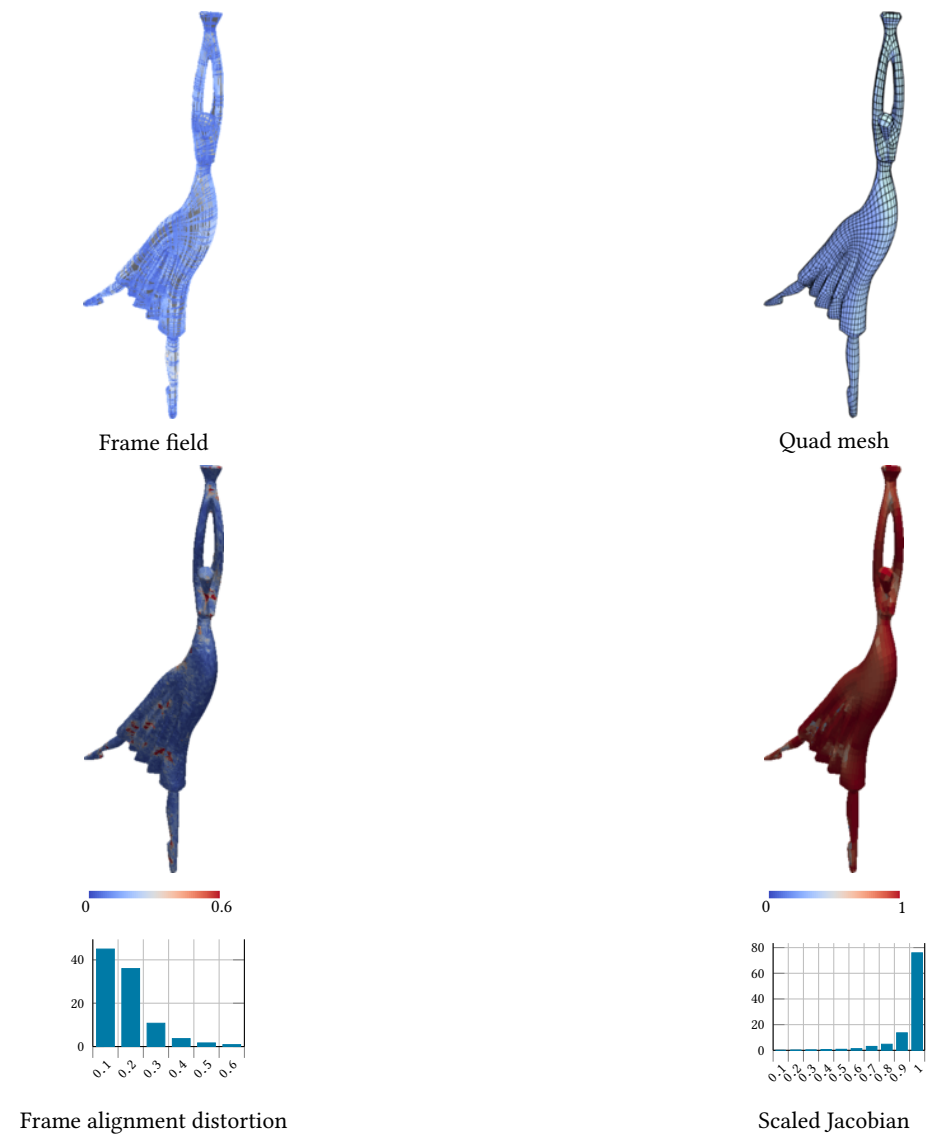
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
dancer2	18292	2587(2625)	0.9219(0.8974)	117	168(254)	0.1394	0.1597	13.75	7.34	-

Fig. 38. Model: dancer2

Frame field

Quad mesh

0   0.6

Frame alignment distortion

0   1

Scaled Jacobian
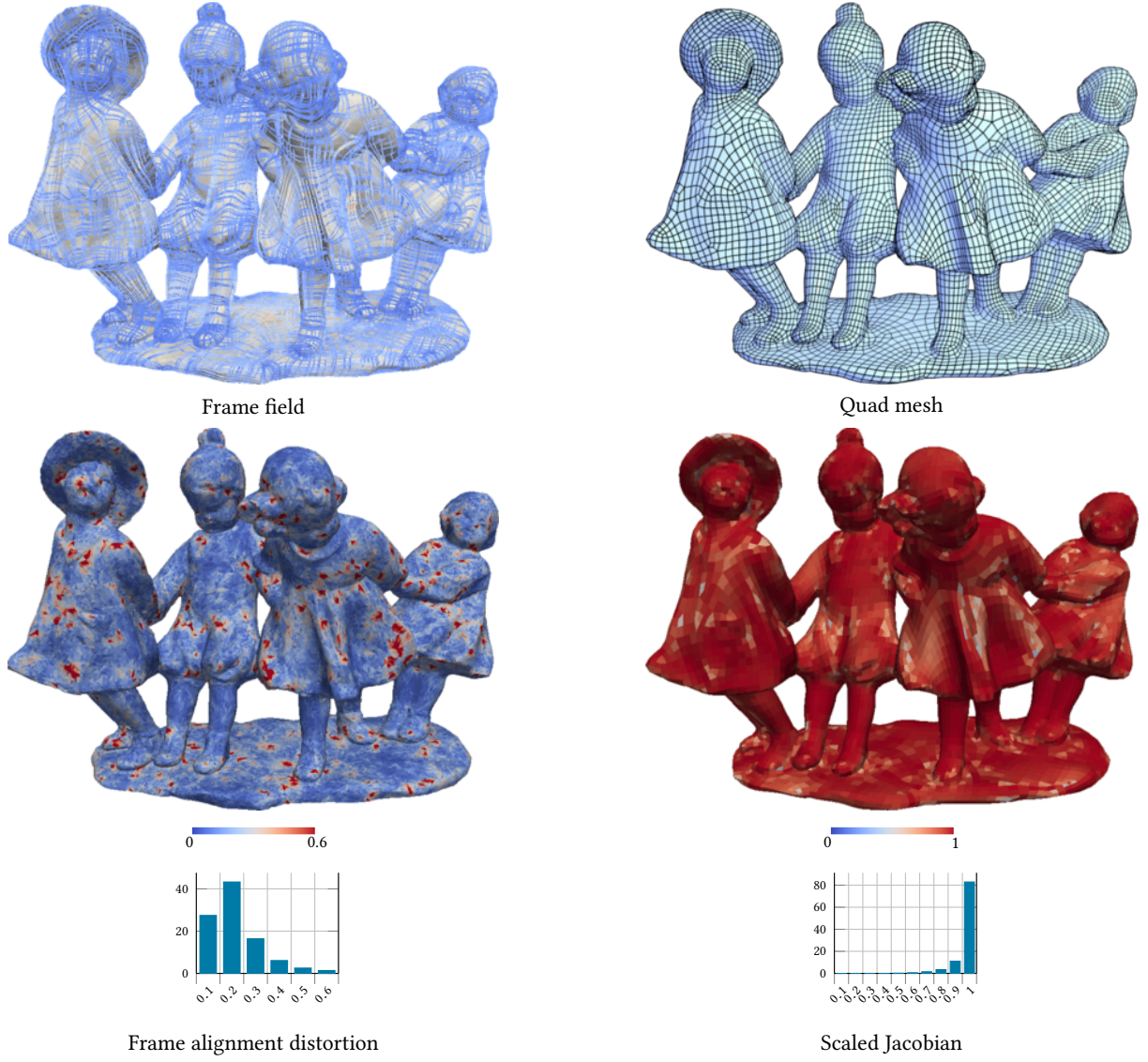
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
dancing-children100K	100000	14317(14577)	0.9416(0.9125)	754	1366(1847)	0.1629	0.1902	22.32	54.44	-

Fig. 39. Model: dancing_children100K

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
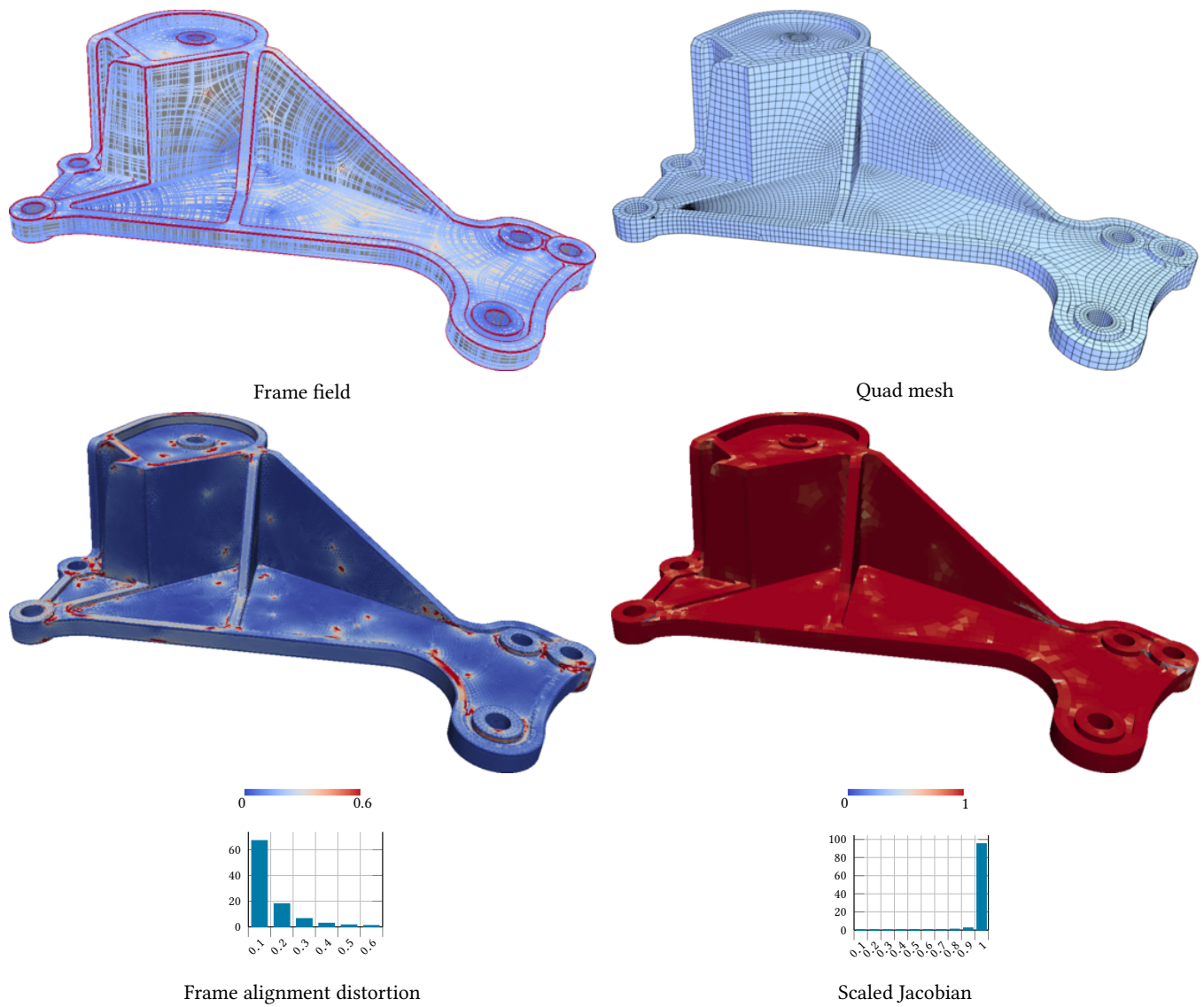
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
datatech-2	130956	15107(15183)	0.979(0.9703)	212	527(718)	0.1185	0.1305	7.622	52.36	0.2873

Fig. 40. Model: datatech_2

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
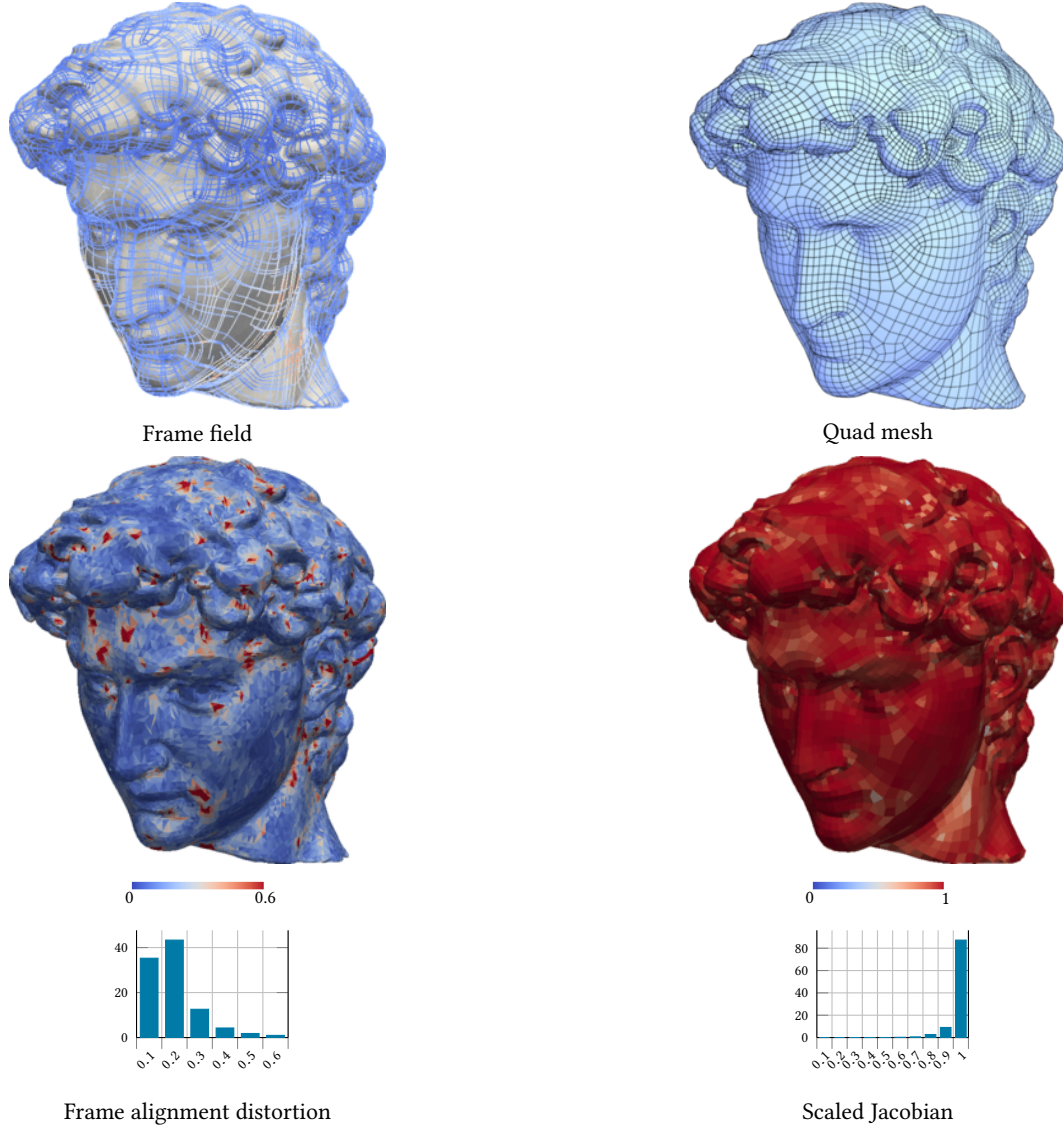
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
david	50864	13316(13572)	0.9541(0.924)	622	1066(1612)	0.1392	0.1604	19.84	32.22	-

Fig. 41. Model: david

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
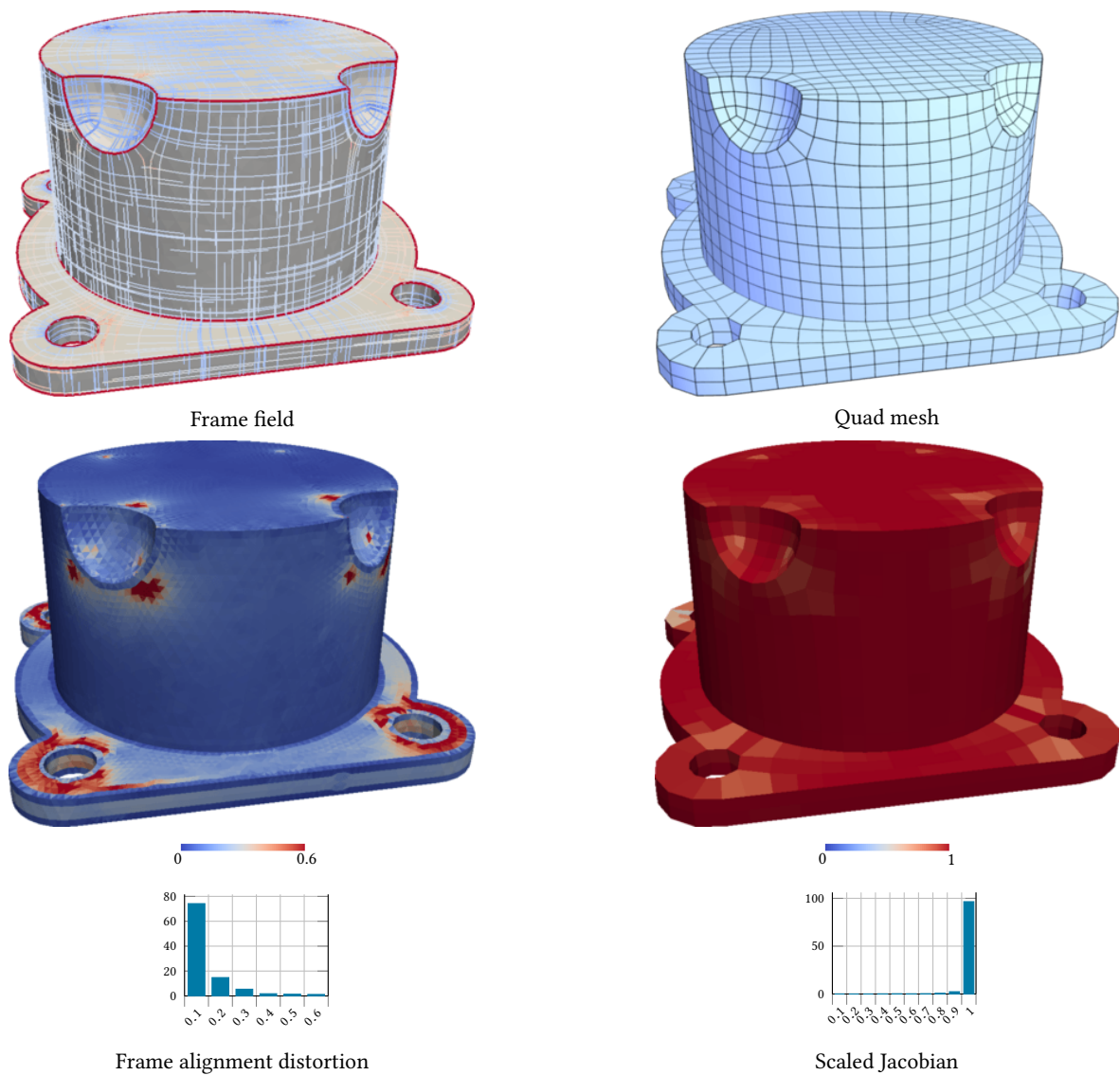
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
deckel40k	42962	2950(2958)	0.9855(0.9809)	62	86(103)	0.08635	0.09491	6.324	14.22	0.7567

Fig. 42. Model: deckel40k

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
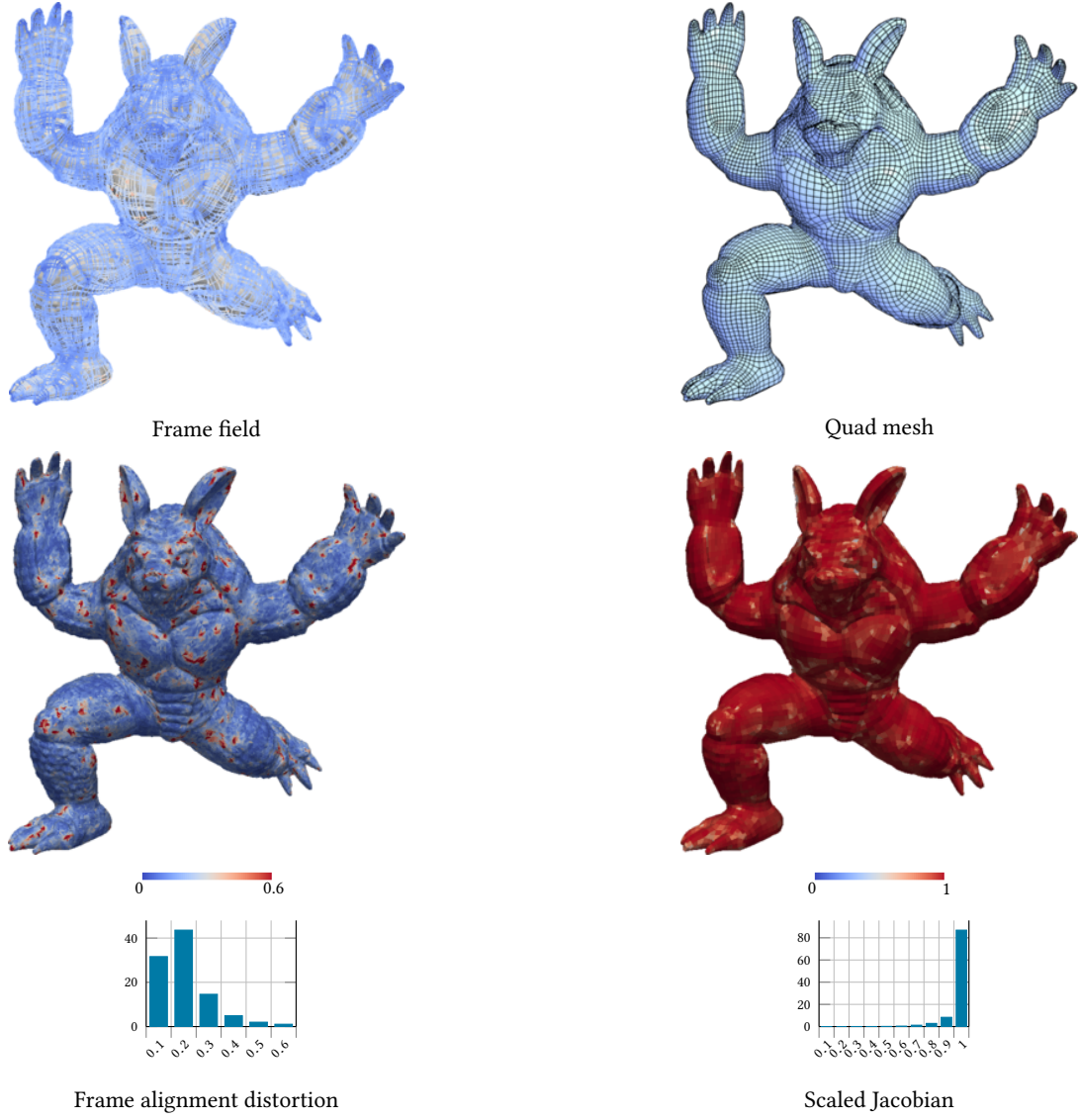
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
deformed-armadillo	100000	13998(14191)	0.9523(0.9306)	731	1208(1569)	0.1486	0.1736	18.38	44.82	-

Fig. 43. Model: deformed_armadillo

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
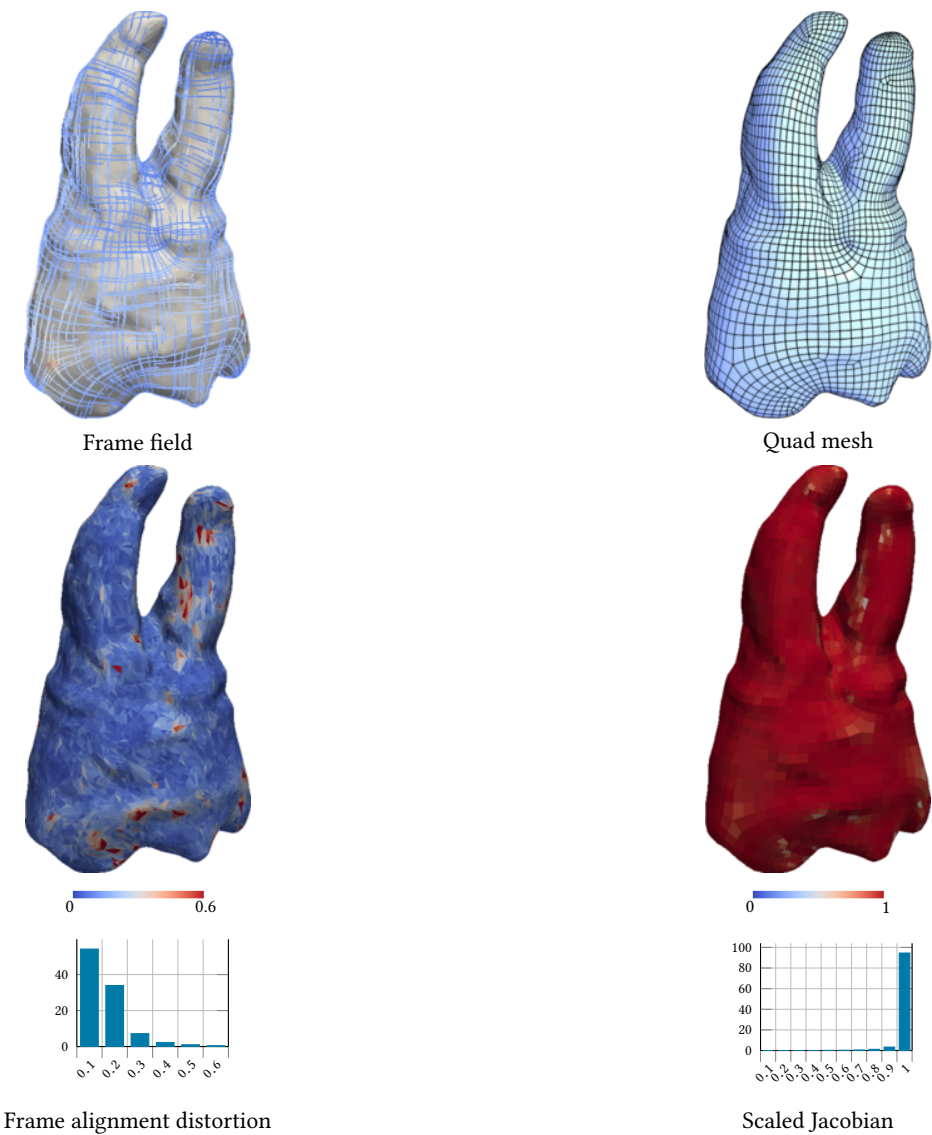
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
dente	18670	4419(4465)	0.9741(0.957)	41	160(257)	0.1064	0.1236	7.806	8.08	-

Fig. 44. Model: dente

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
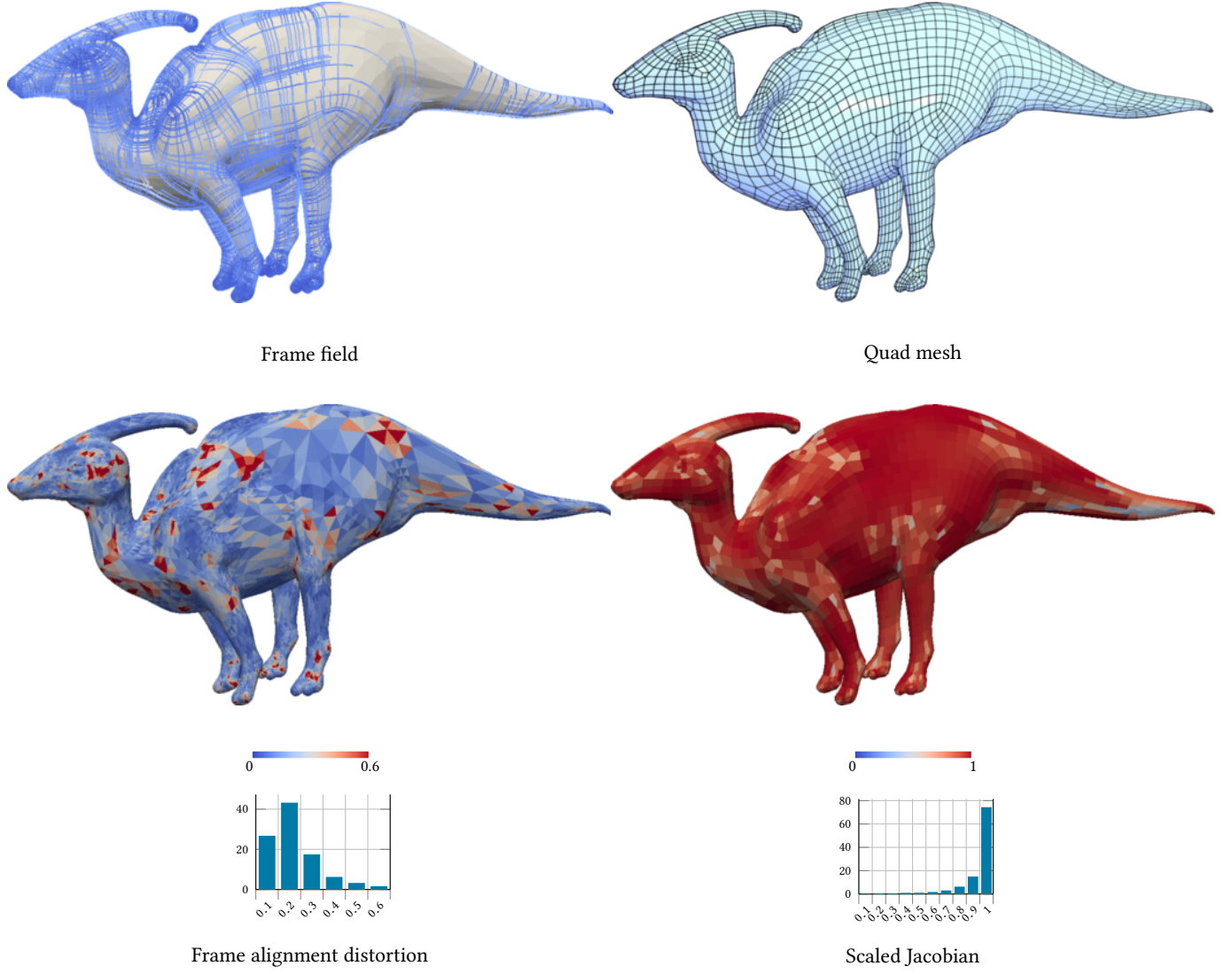
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
dilo	54344	4154(4218)	0.9165(0.8914)	254	435(555)	0.1654	0.1913	24	23.29	-

Fig. 45. Model: dilo

Frame field

Quad mesh

0   0.6

Frame alignment distortion

0   1

Scaled Jacobian
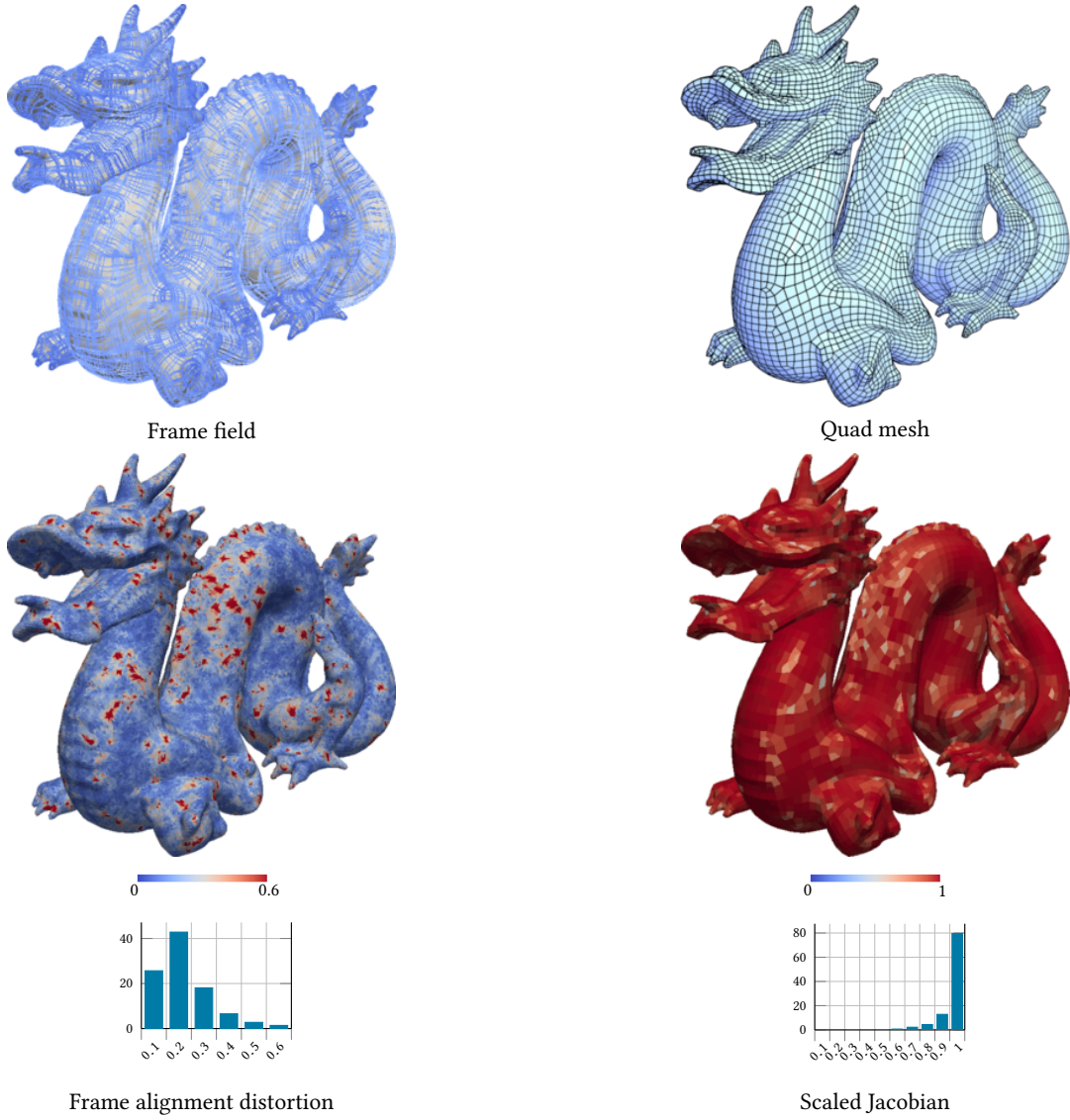
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
dragonstand-recon100K	104358	10349(10521)	0.9365(0.9108)	875	1279(1620)	0.1668	0.1958	24.71	47.35	-

Fig. 46. Model: dragonstand_recon100K

Frame field

Quad mesh

0 — 0.6

0 — 1

Frame alignment distortion

Scaled Jacobian
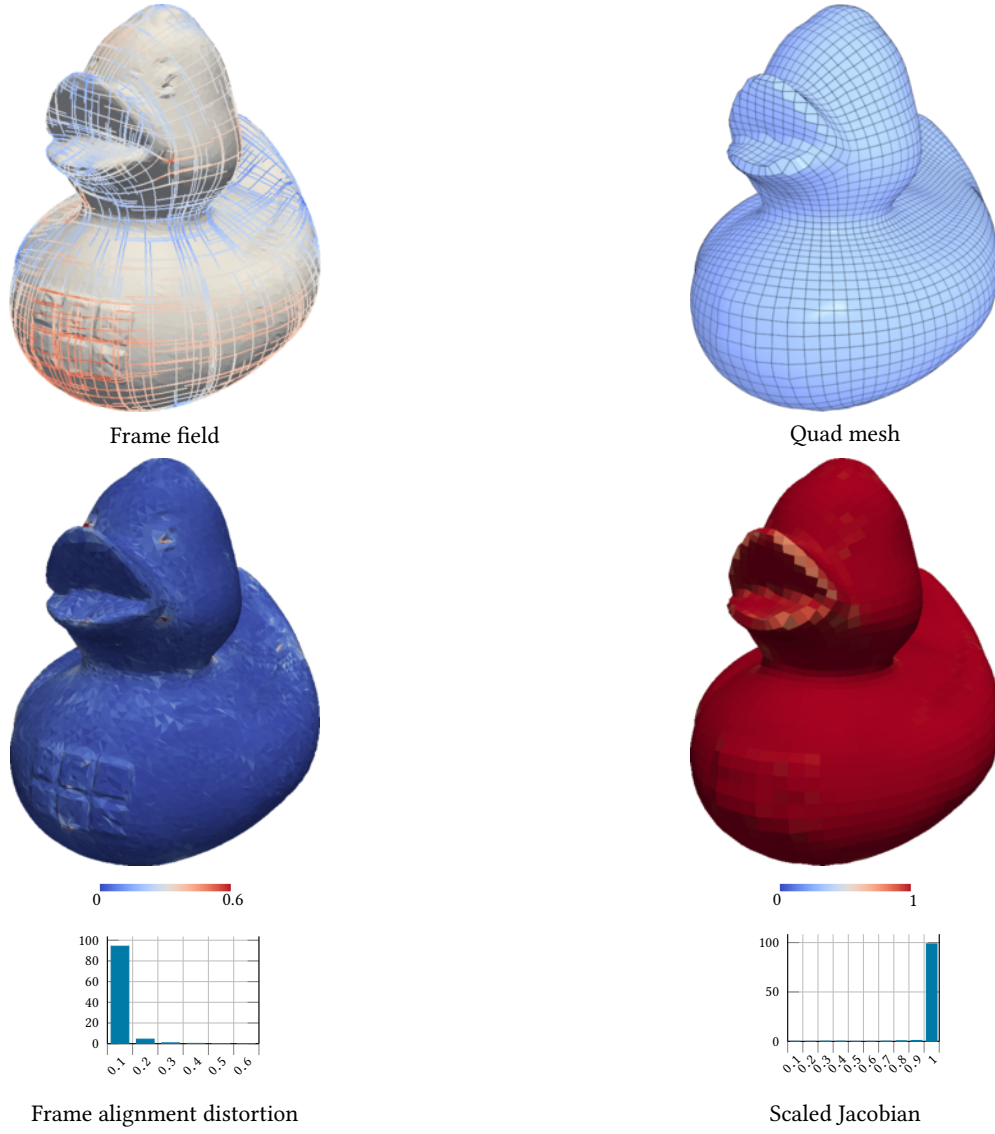
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
duck	19276	5200(5211)	0.9939(0.99)	33	32(59)	0.03682	0.0428	2.326	6.54	-

Fig. 47. Model: duck

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
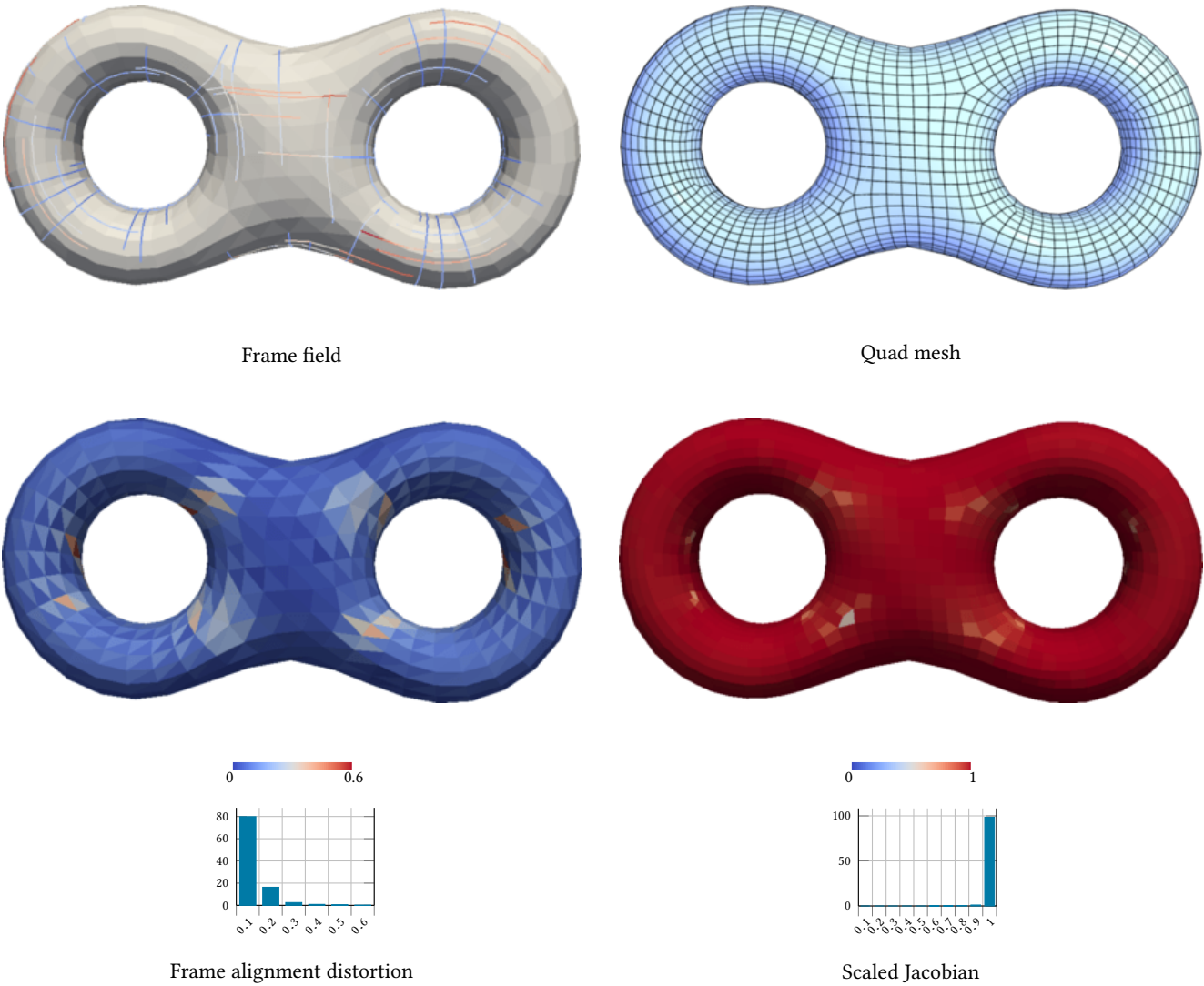
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
eight	1536	2856(2862)	0.99(0.9862)	8	38(55)	0.07125	0.07552	6.01	1.95	-

Fig. 48. Model: eight

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
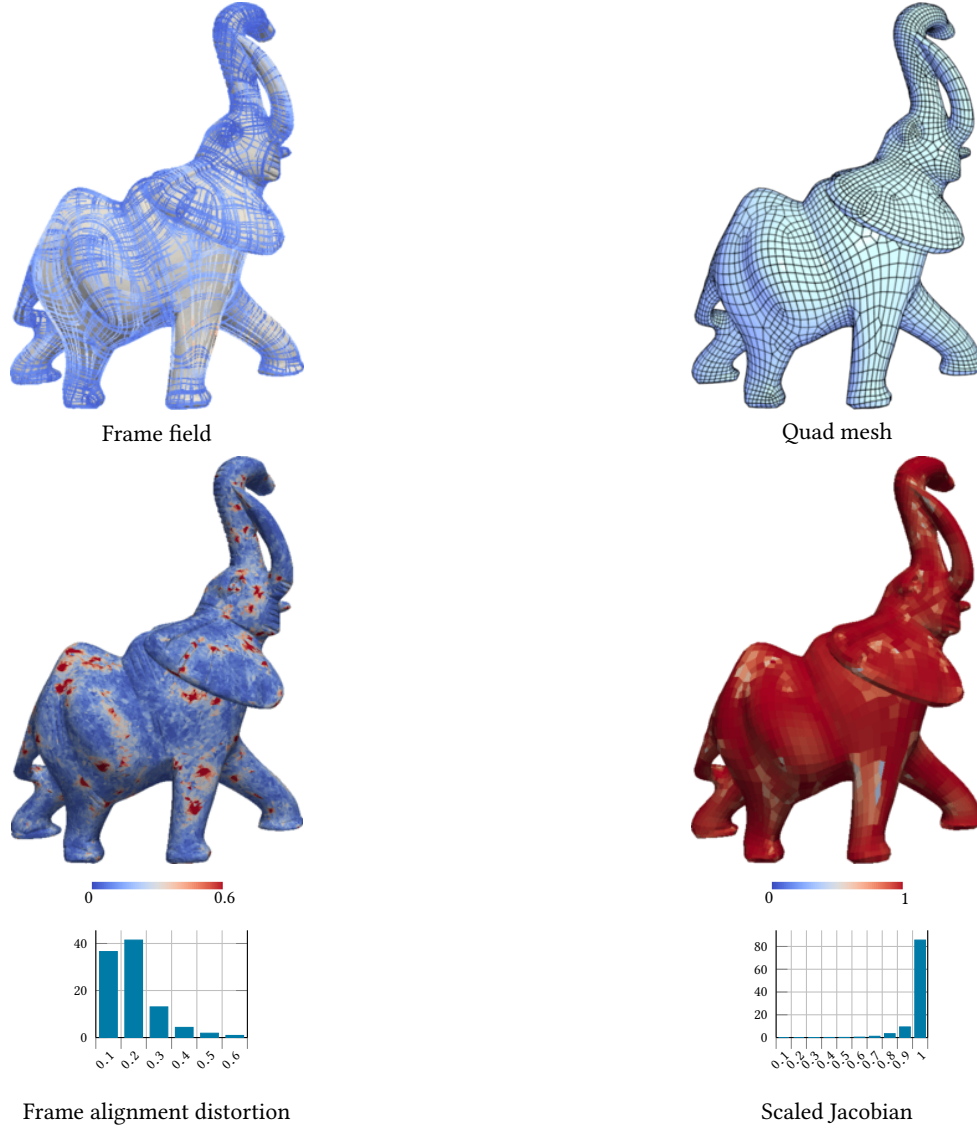
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
elephant	49918	6789(6869)	0.9503(0.9302)	240	452(611)	0.1401	0.1633	15.37	22	-

Fig. 49. Model: elephant

Frame field

Quad mesh

0　0.6

Frame alignment distortion

0　1

Scaled Jacobian
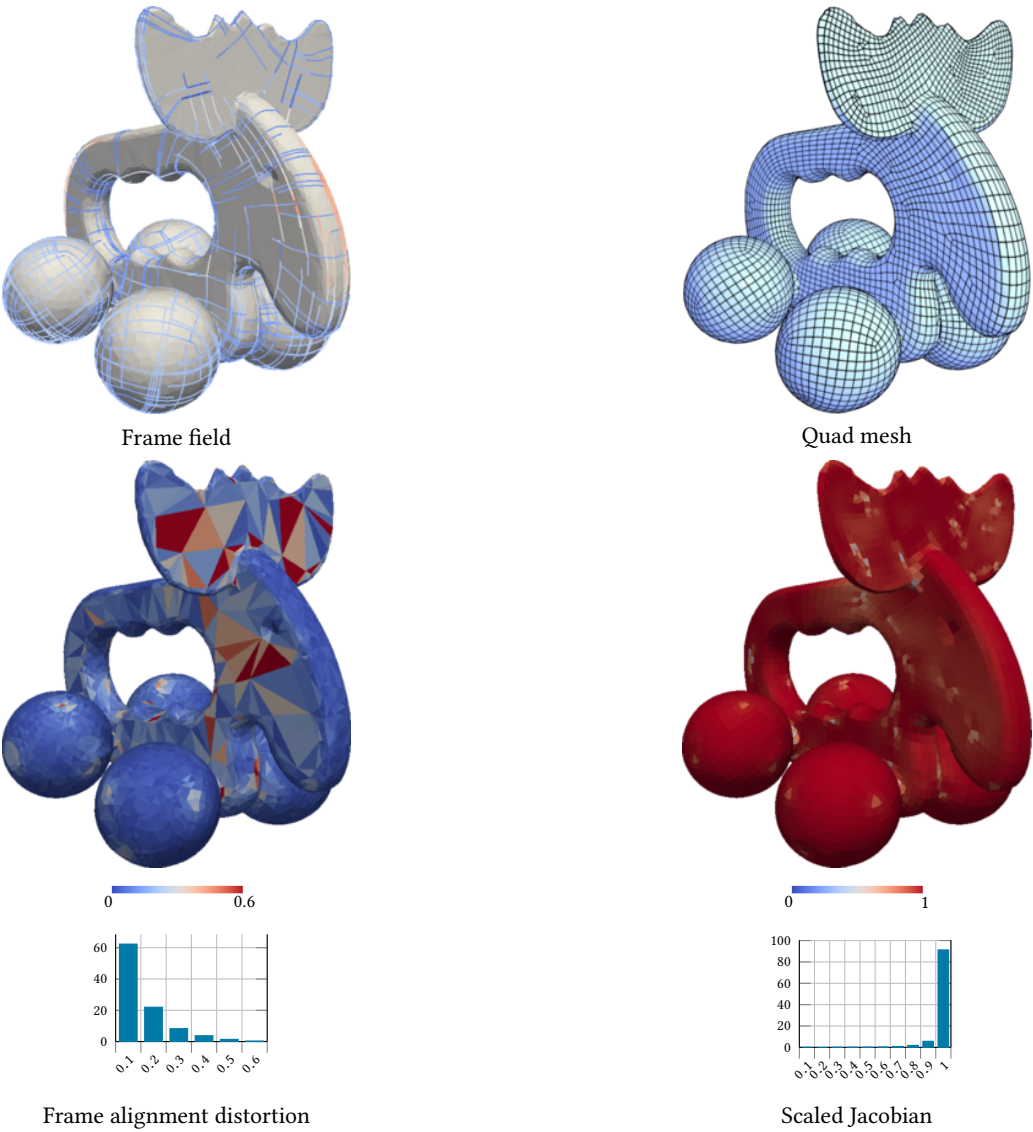
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
elk	10388	7421(7559)	0.9676(0.9363)	84	279(607)	0.1051	0.1179	15.19	13.12	-

Fig. 50. Model: elk

Frame field

Quad mesh

0　　　0.6

Frame alignment distortion

0　　　1

Scaled Jacobian
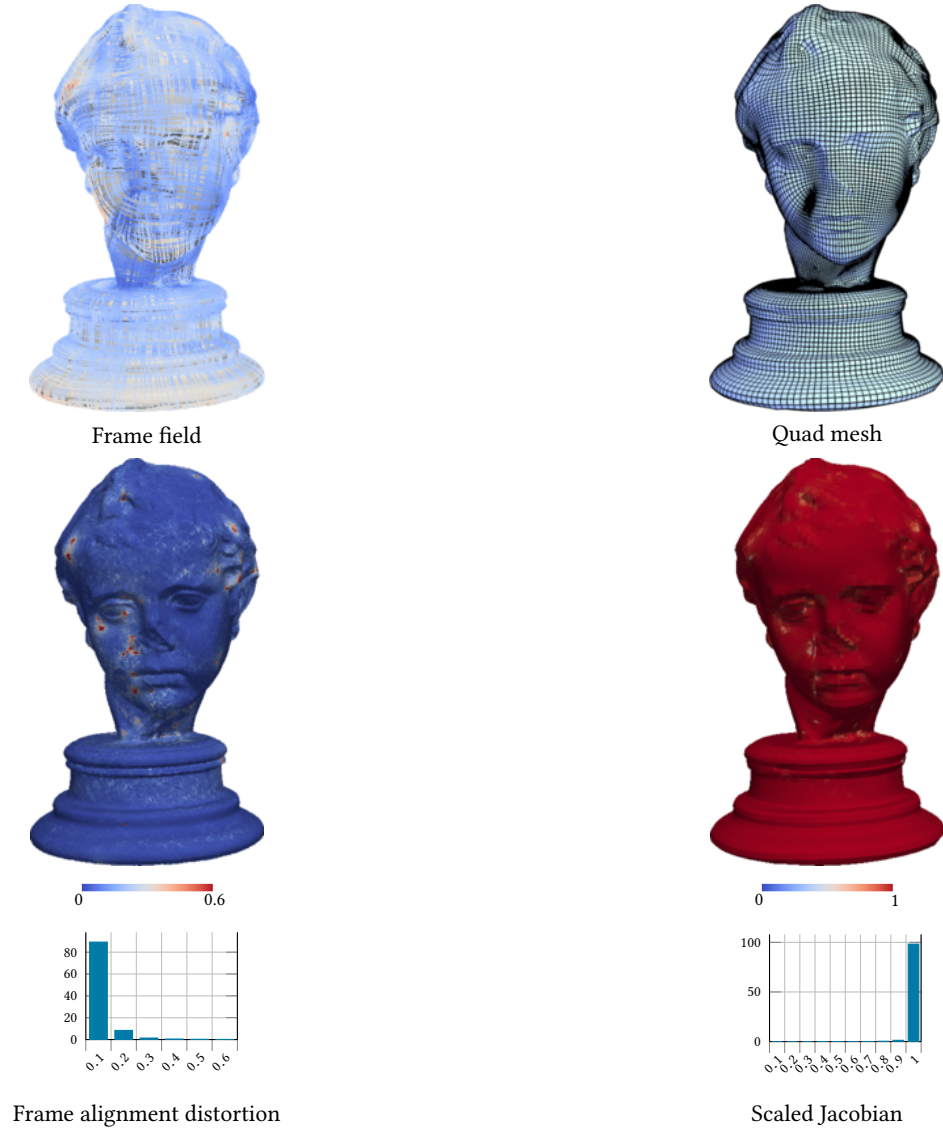
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
eros100K	100000	19155(19193)	0.9905(0.987)	132	224(303)	0.04693	0.05554	2.957	42.8	-

Fig. 51. Model: eros100K

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
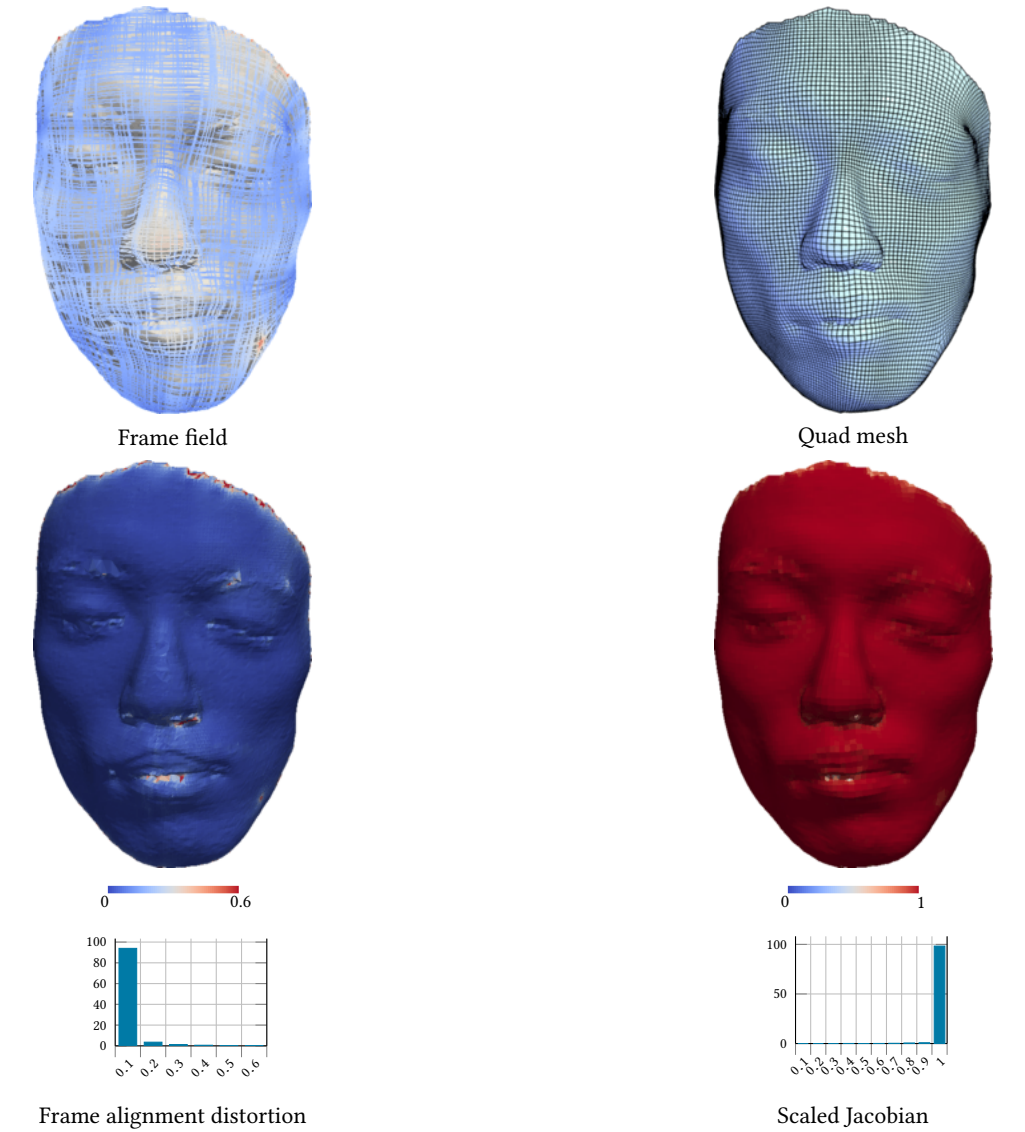
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
face-YO	32489	9258(9276)	0.993(0.9899)	25	189(230)	0.03168	0.03586	3.14	11.91	0.3207

Fig. 52. Model: face-YO

Frame field

Quad mesh

0   0.6

0   1

Frame alignment distortion

Scaled Jacobian
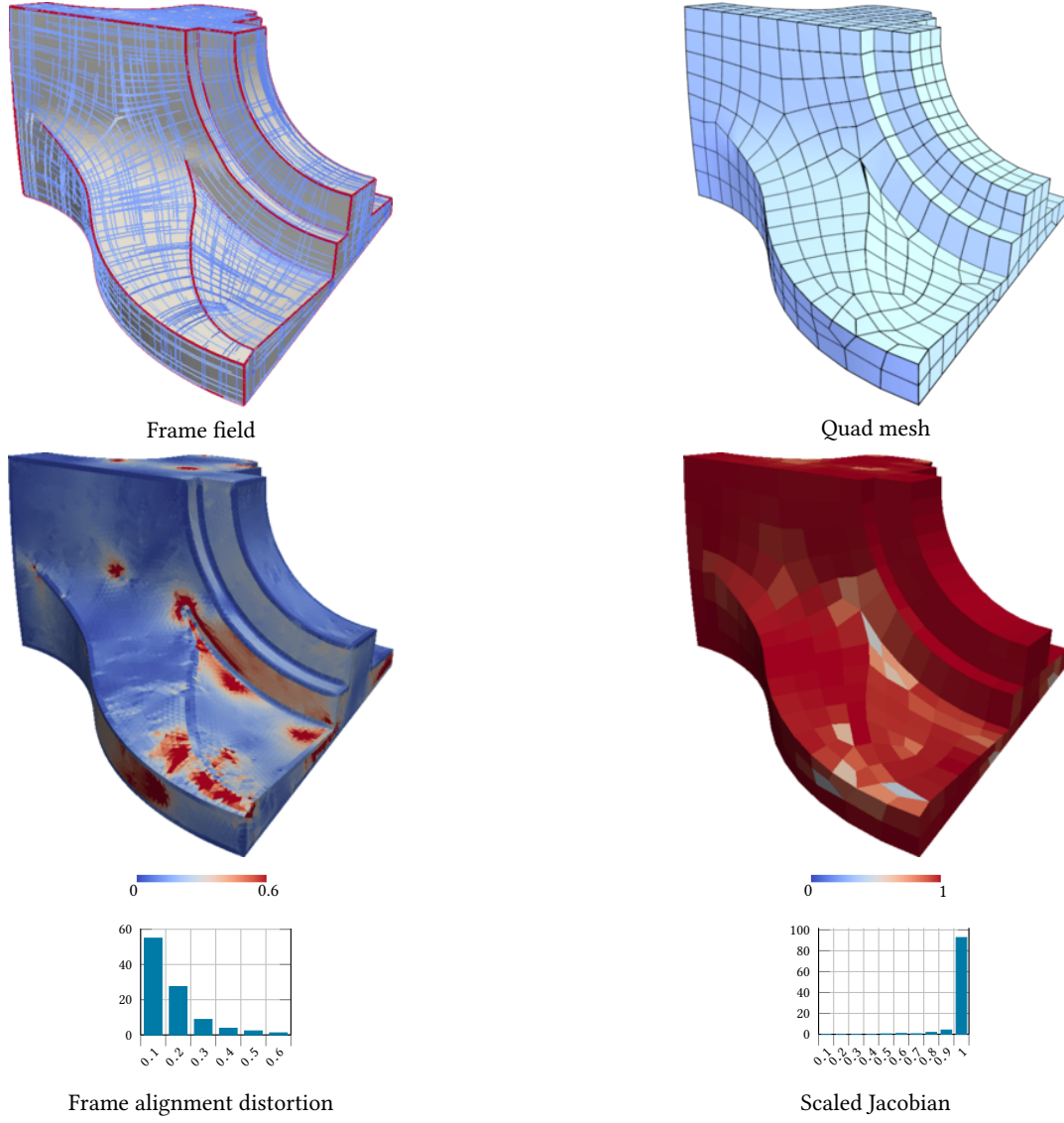
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
fandisk30k	30078	816(819)	0.9731(0.9672)	32	66(72)	0.1274	0.1433	6.884	8.57	0.4456

Fig. 53. Model: fandisk30k

Frame field

Quad mesh

0   0.6

Frame alignment distortion

0   1

Scaled Jacobian
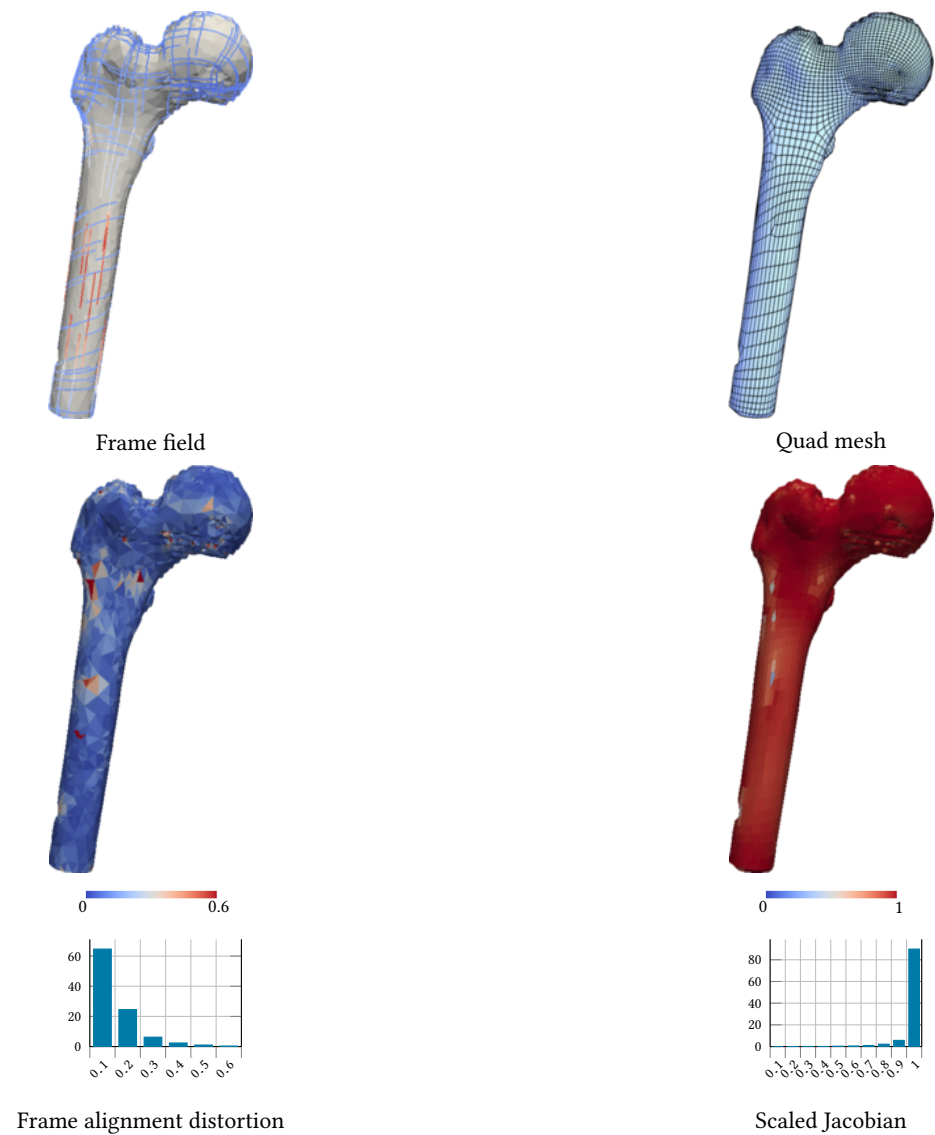
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
femur	7798	6568(6764)	0.9573(0.9201)	570	413(771)	0.09864	0.1115	15.07	11.38	–

Fig. 54. Model: femur
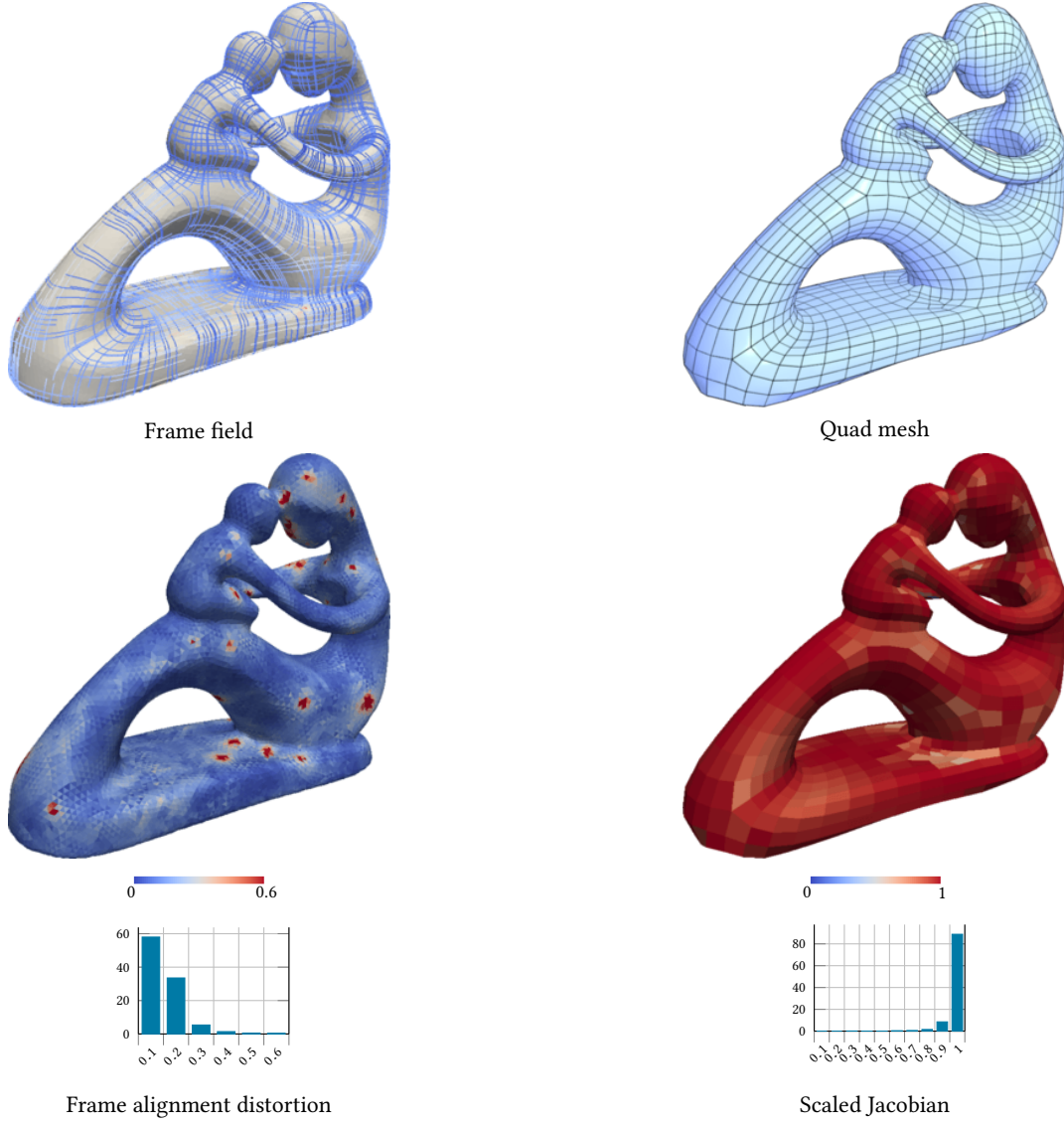
Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian

Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
fertility-tri	27954	2248(2254)	0.9585(0.9534)	54	92(103)	0.09782	0.1144	9.431	10.53	-

Fig. 55. Model: fertility_tri
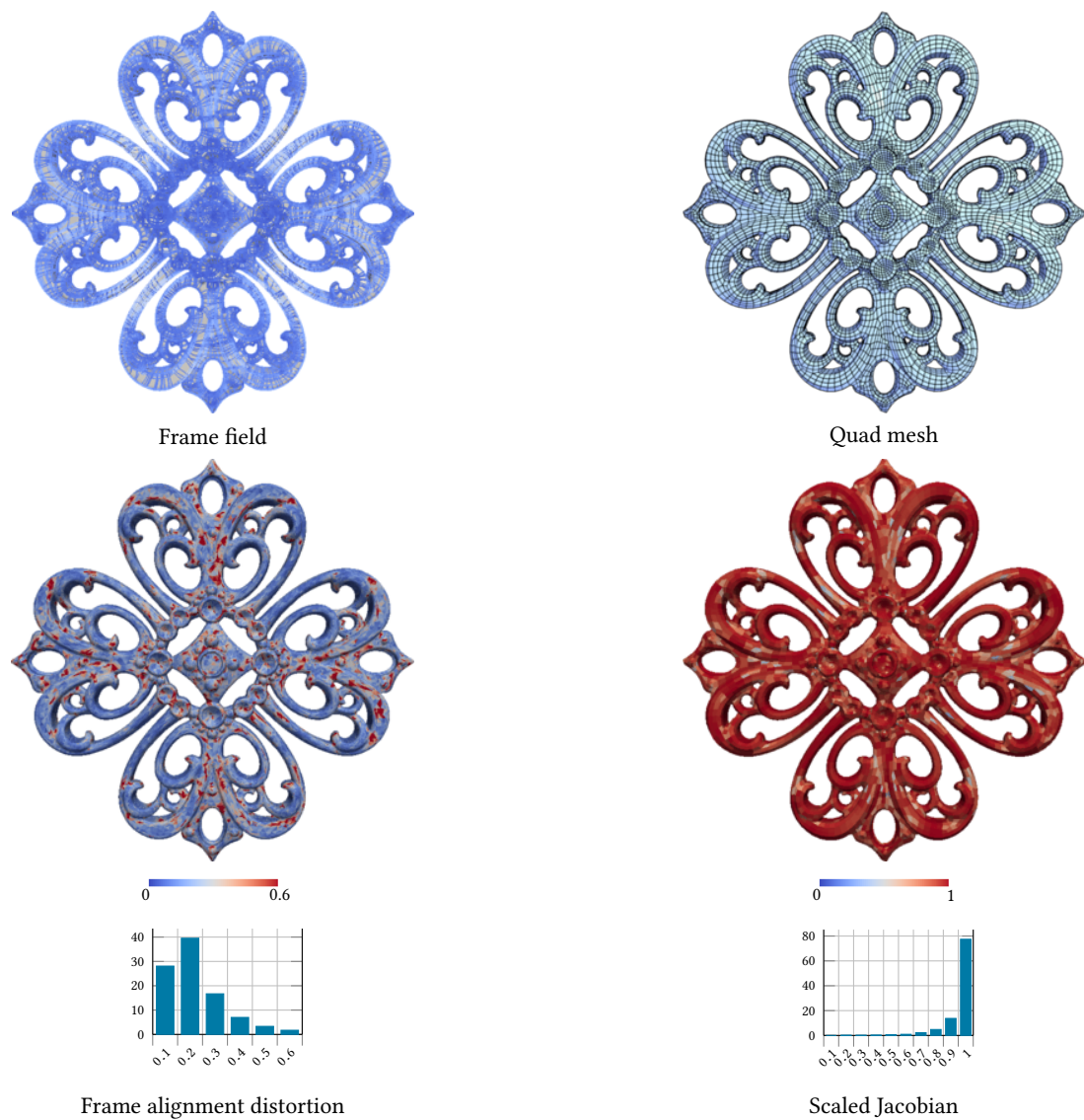
Frame field

Quad mesh

0   0.6

Frame alignment distortion

0   1

Scaled Jacobian

Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
filigree100k	100000	12242(12617)	0.9281(0.8853)	1211	1628(2344)	0.1779	0.2053	28.24	54.34	-

Fig. 56. Model: filigree100k

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
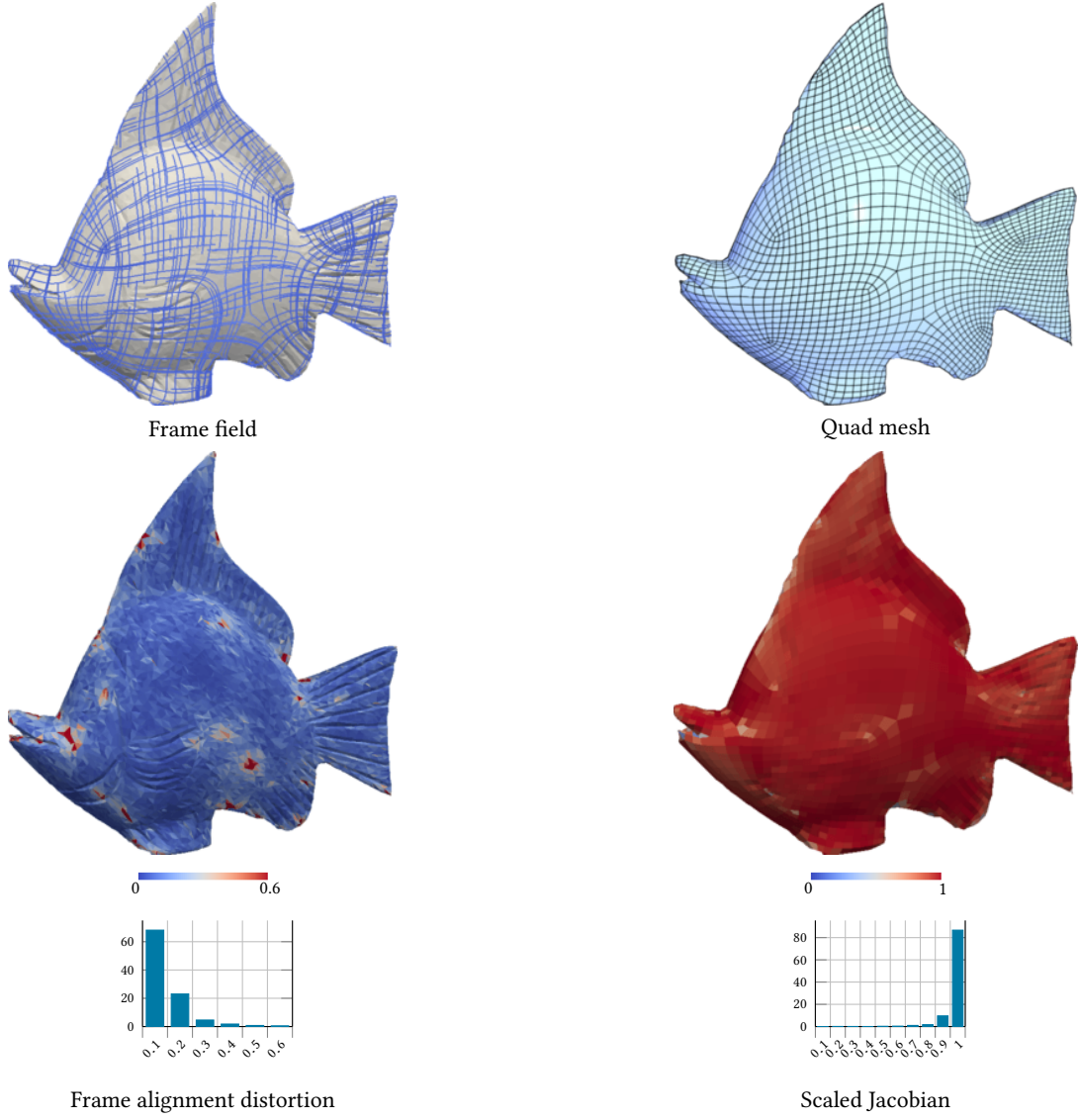
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
fish	15145	3948(3998)	0.9438(0.925)	69	168(263)	0.1122	0.1258	8.924	7.02	0.4911

Fig. 57. Model: fish

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
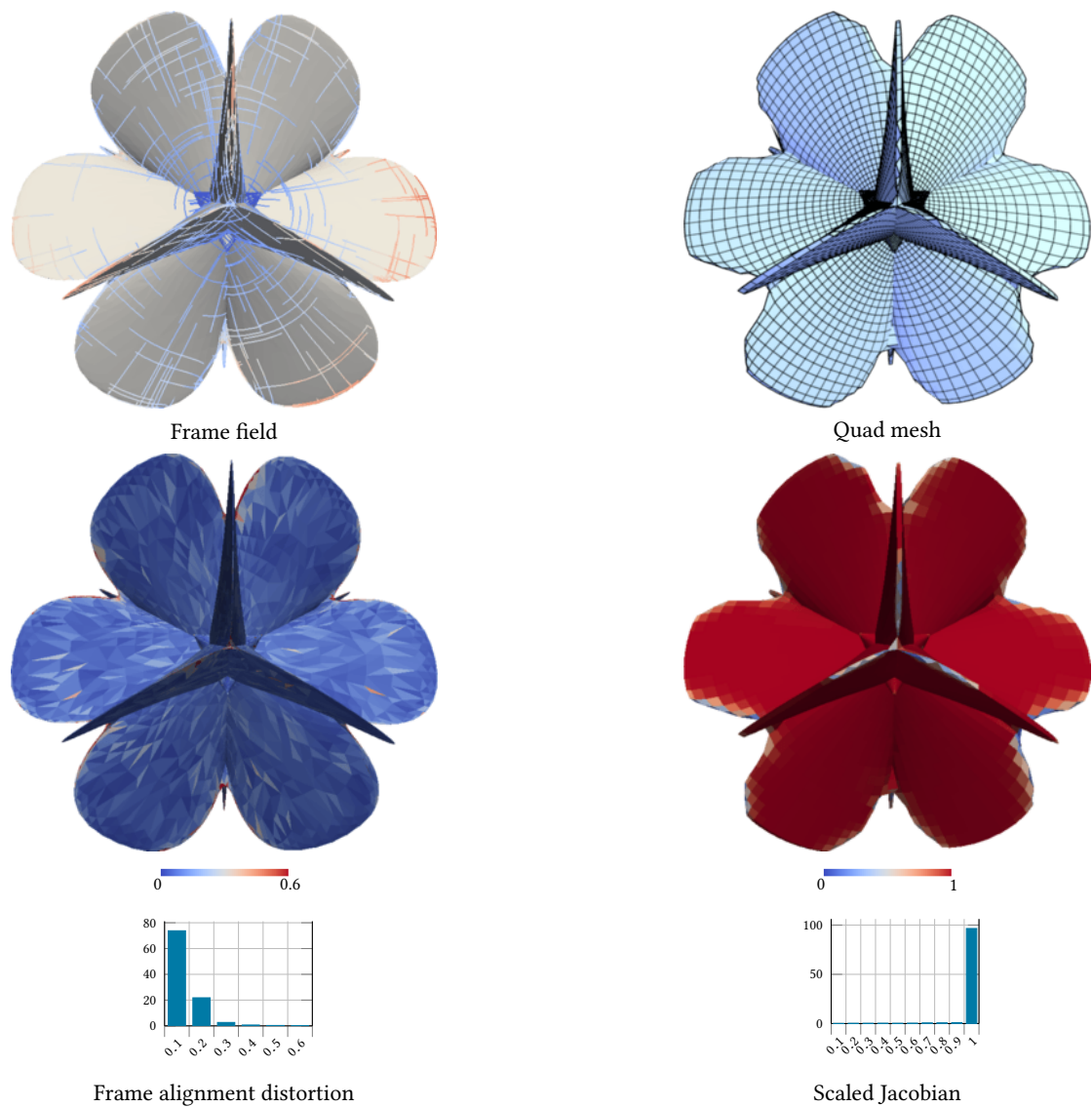
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
focal-octa	20156	17622(17800)	0.9828(0.9694)	164	241(588)	0.1042	0.1148	6.308	16.42	-

Fig. 58. Model: focal-octa

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
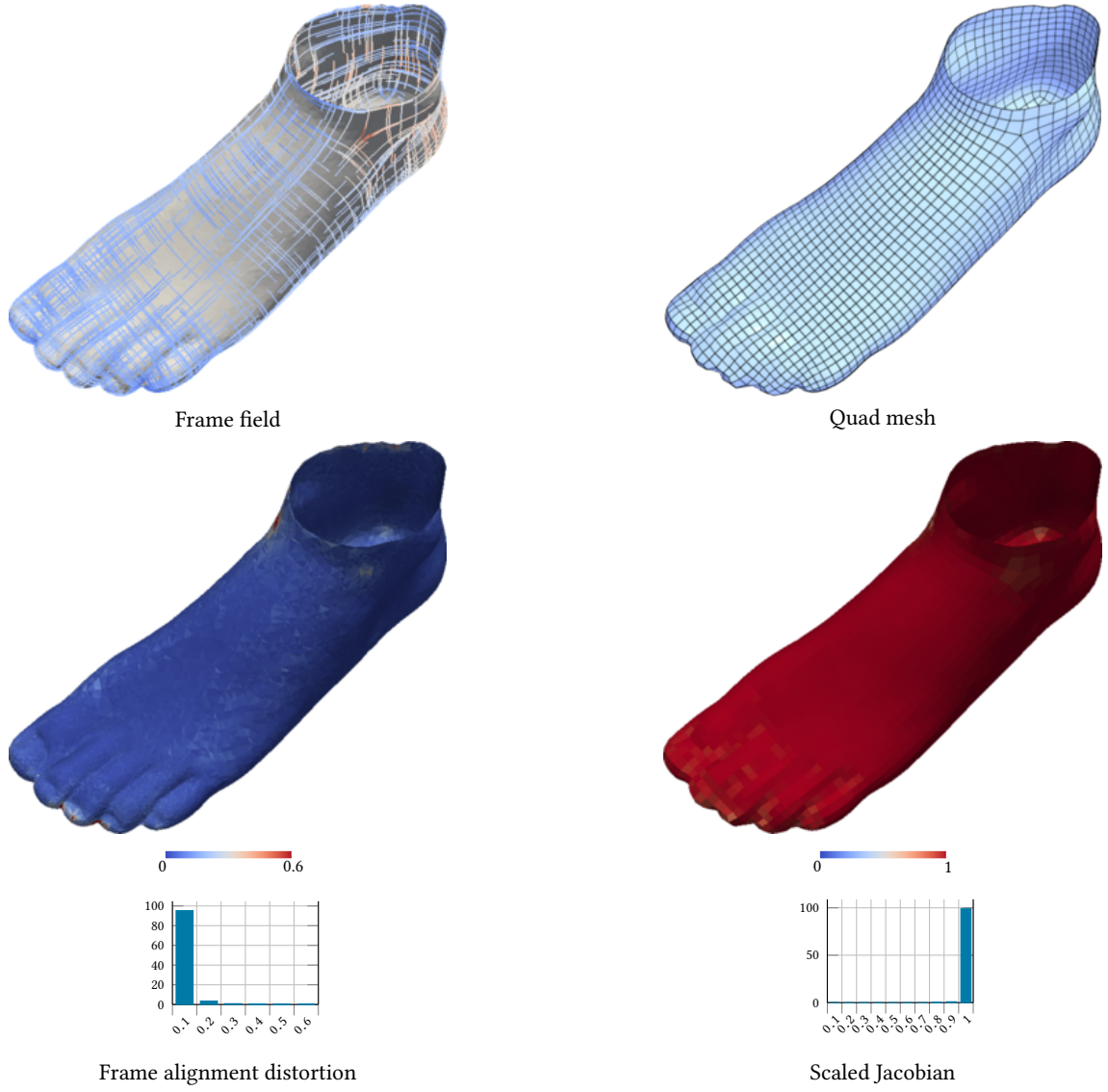
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
foot	20423	2402(2404)	0.9952(0.9937)	12	16(20)	0.03506	0.04046	1.746	6.69	0.2449

Fig. 59. Model: foot

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
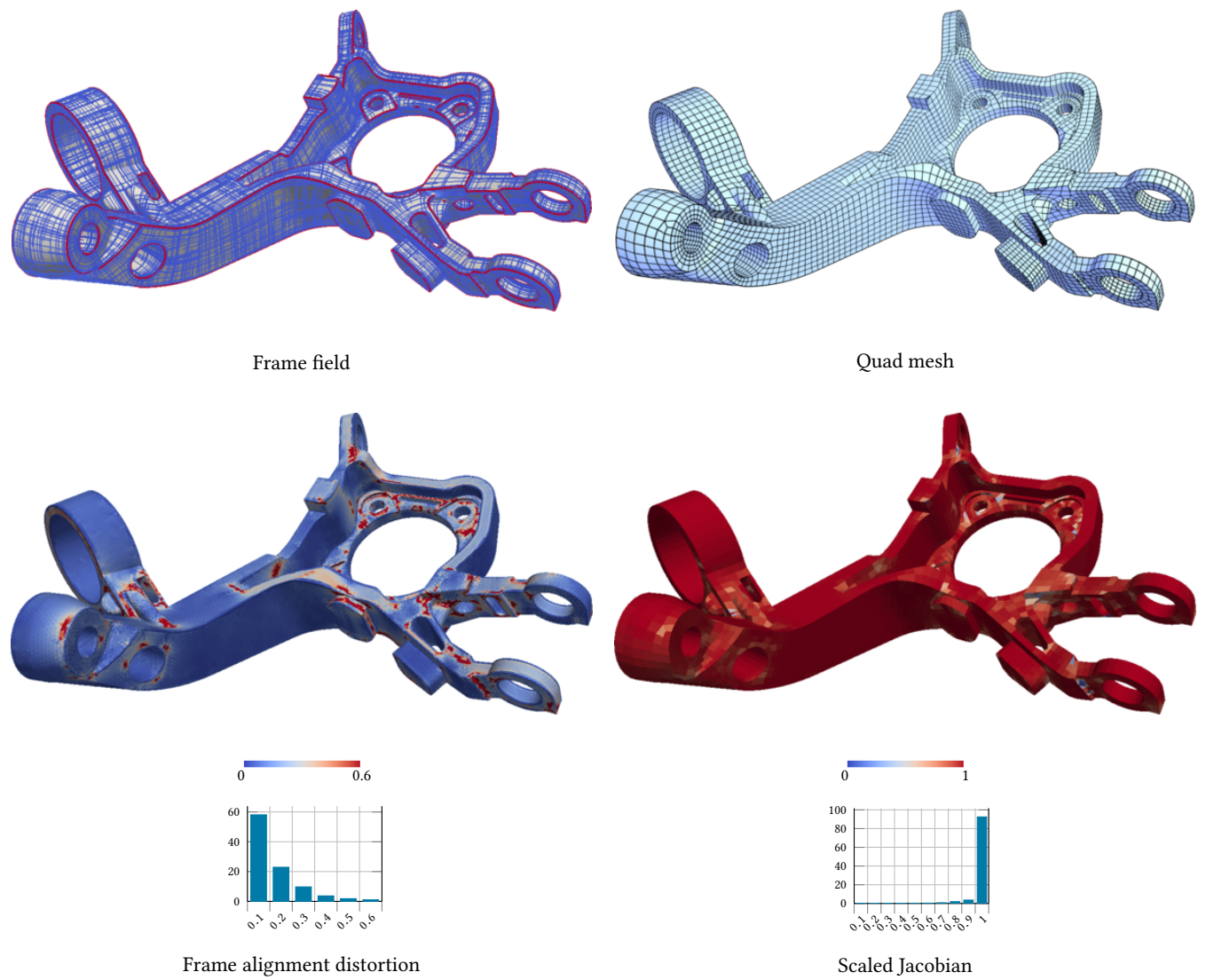
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
fusee-Lp	102692	9048(9091)	0.9673(0.959)	263	486(585)	0.1472	0.1605	8.912	37.63	0.2856

Fig. 60. Model: fusee_Lp

Frame field

Quad mesh

0   0.6

0   1

Frame alignment distortion

Scaled Jacobian
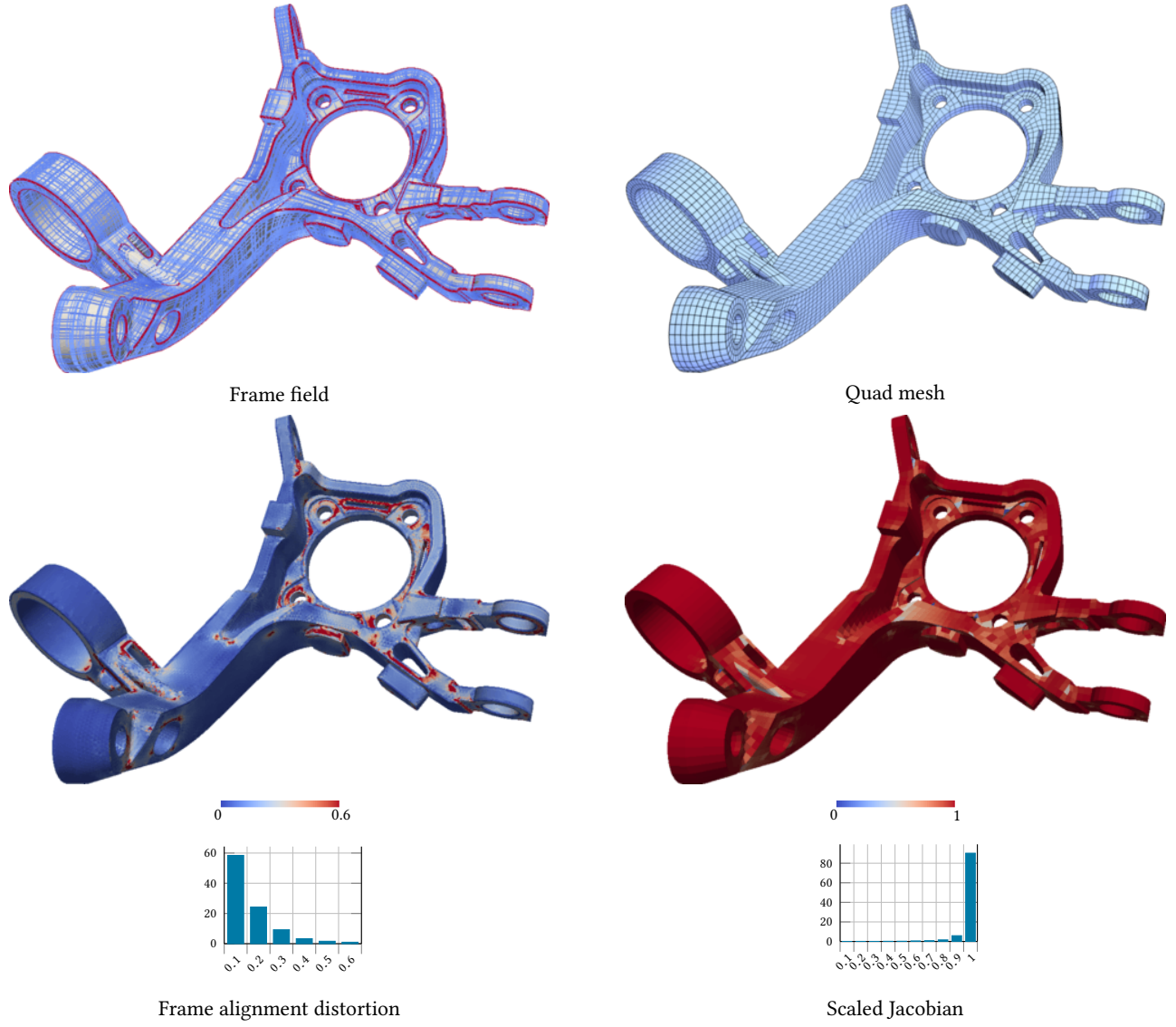
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
fusee	107050	9050(9104)	0.9648(0.9545)	258	451(564)	0.1269	0.1398	7.689	40.35	0.1953

Fig. 61. Model: fusee

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
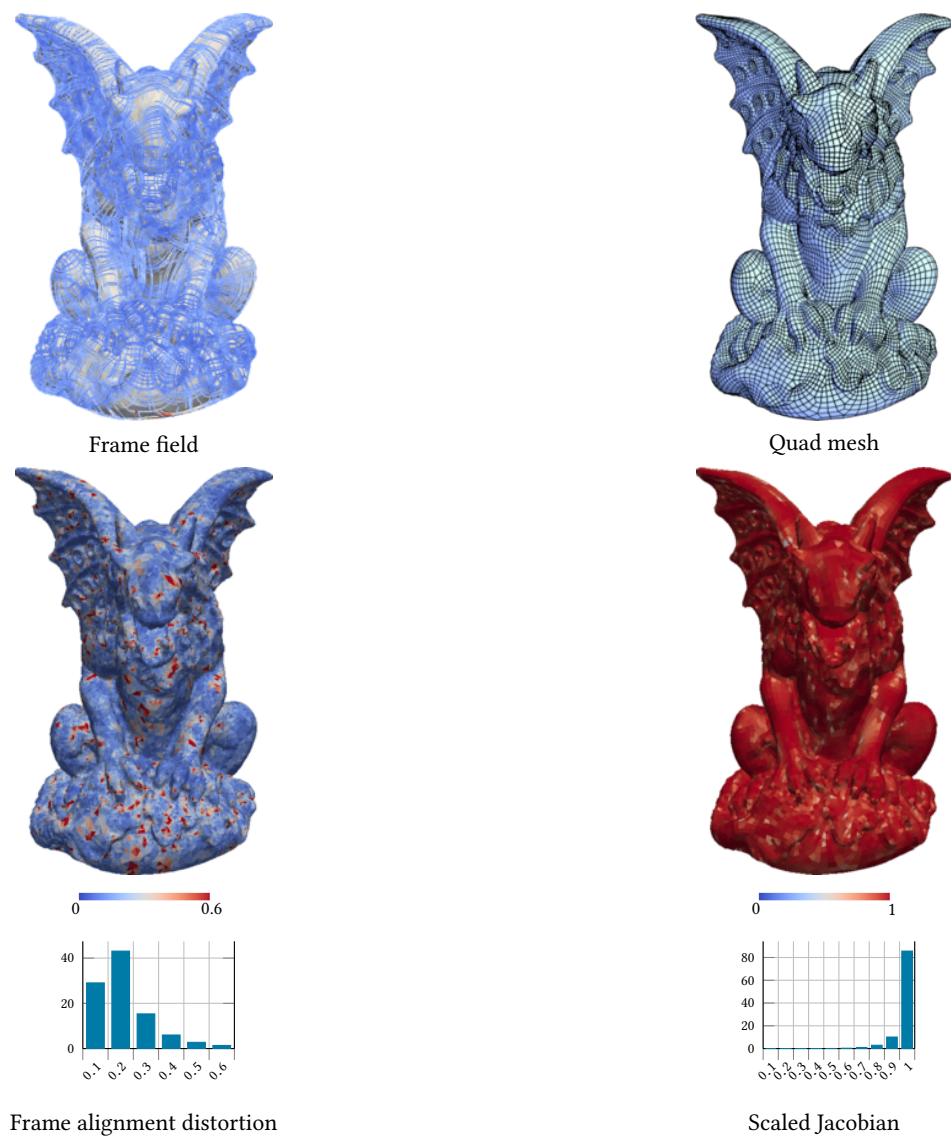
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
gargoyle100K	100000	21418(21765)	0.9499(0.9228)	1269	1985(2715)	0.1564	0.1813	23.75	67	-

Fig. 62. Model: gargoyle100K

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
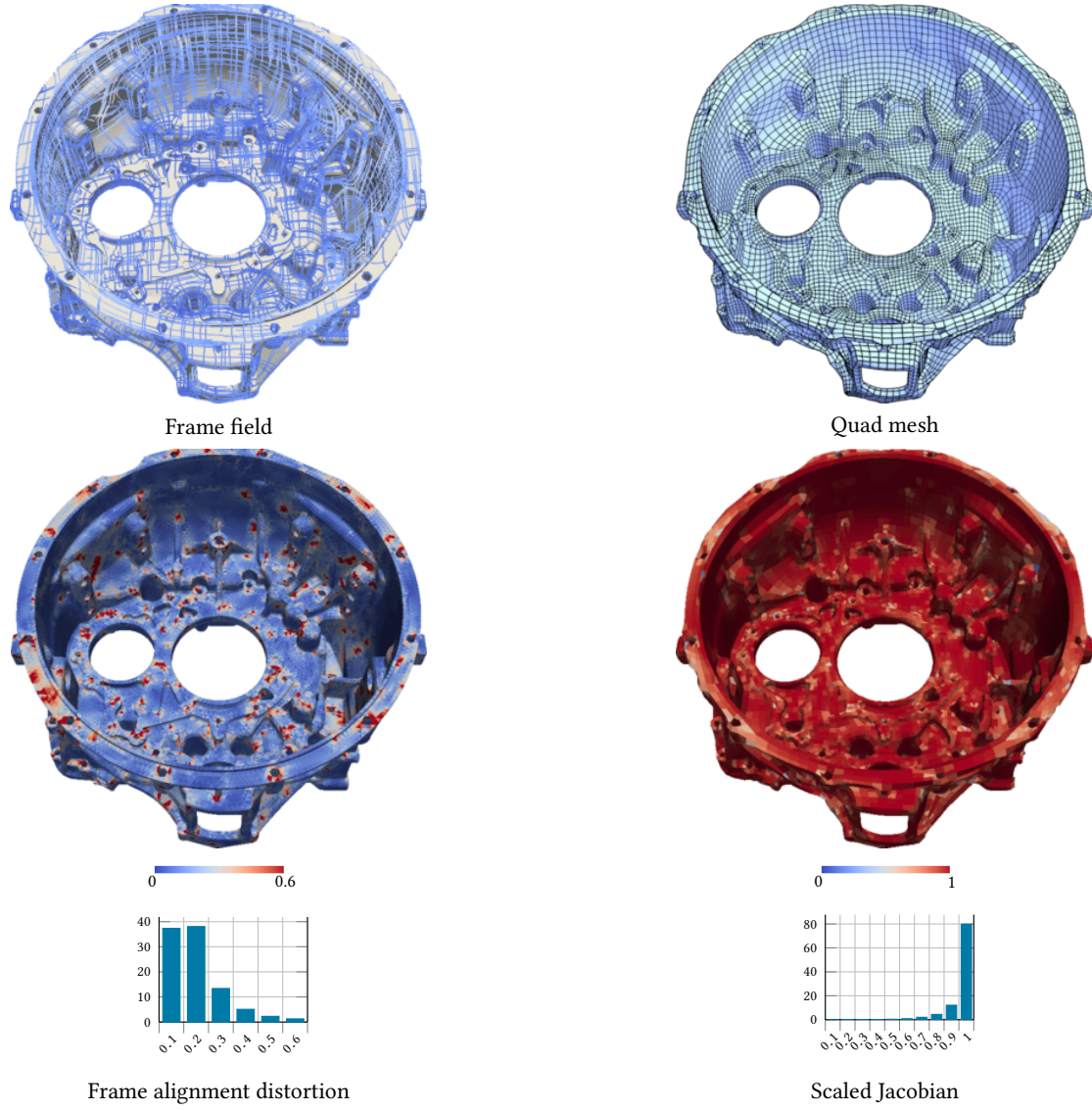
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
gearbox	128606	26244(26694)	0.9357(0.9104)	2567	3064(4014)	0.1464	0.1698	26.21	89.92	-

Fig. 63. Model: gearbox

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
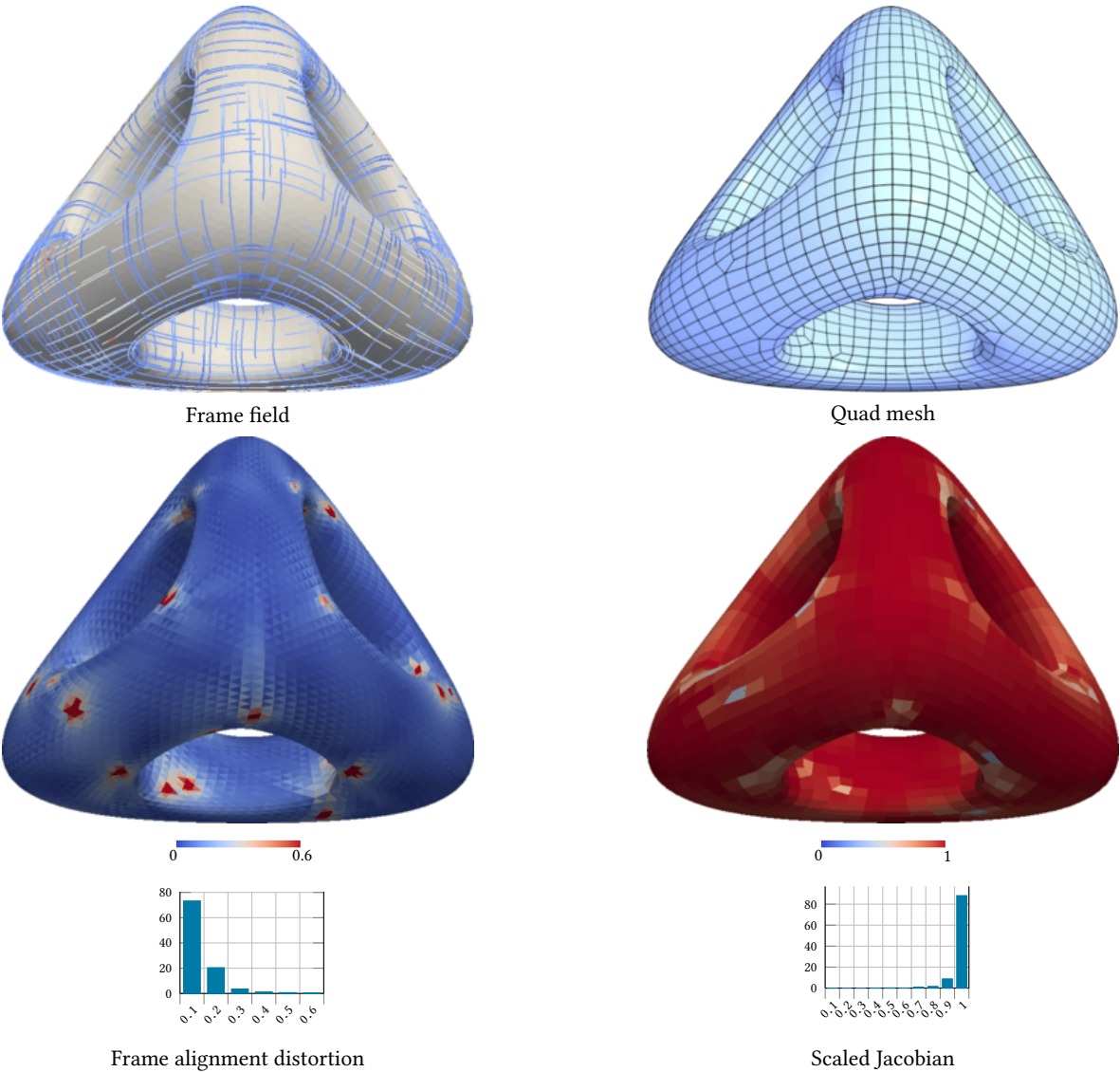
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
genus3	13312	2463(2466)	0.9588(0.9577)	22	63(68)	0.07812	0.09302	6.687	4.38	-

Fig. 64. Model: genus3

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
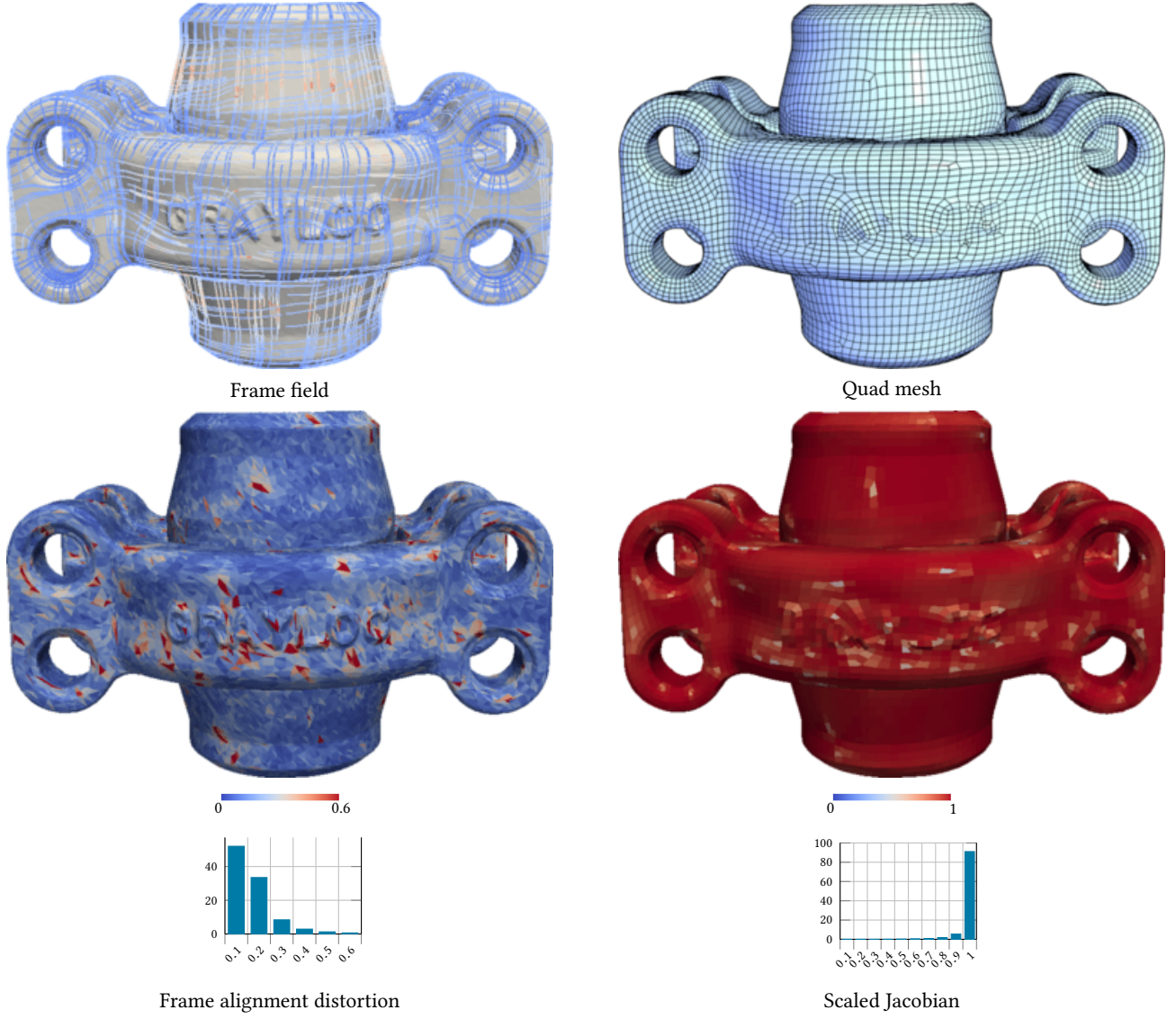
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
grayloc	68580	23666(24004)	0.9638(0.9422)	298	1048(1711)	0.1143	0.132	10.02	43.42	-

Fig. 65. Model: grayloc

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
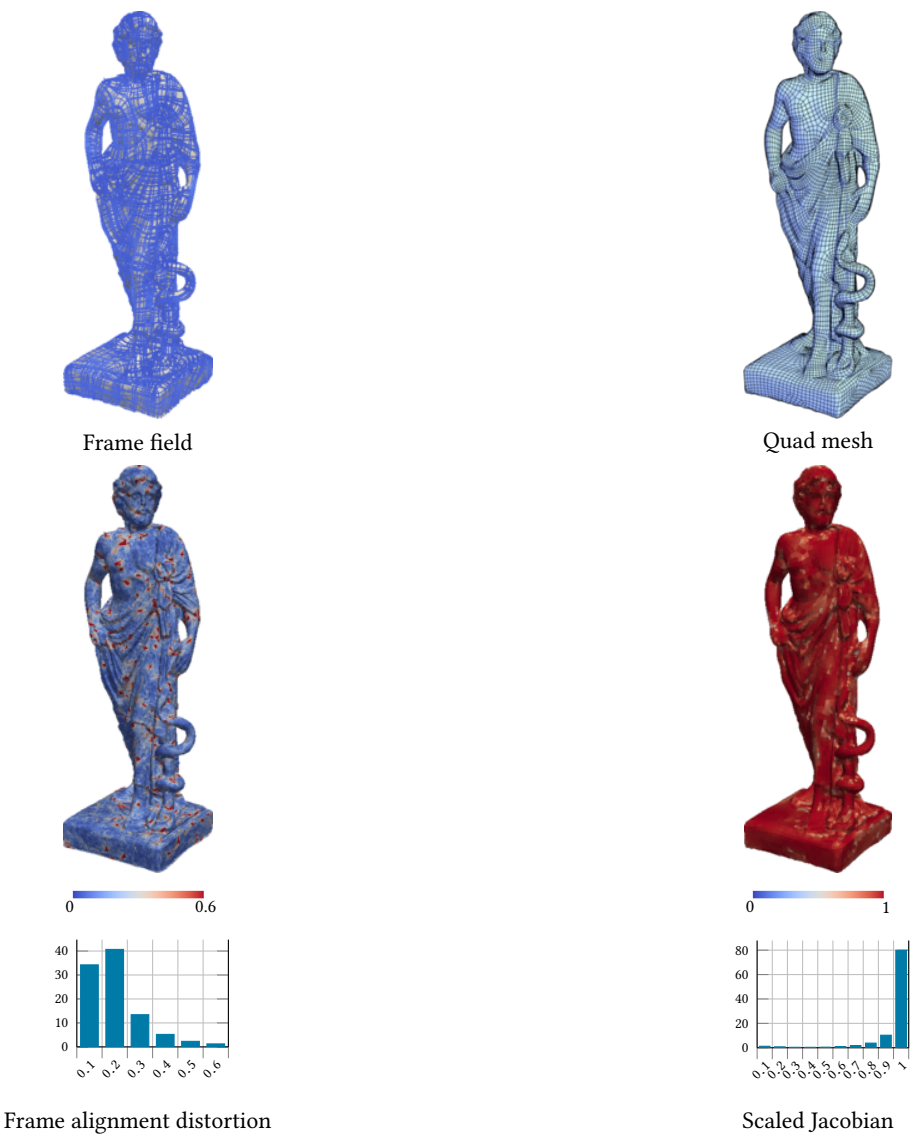
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
greek-sculpture	50000	12709(13346)	0.9157(0.852)	571	1275(2406)	0.1918	0.2157	22.11	55.3	-

Fig. 66. Model: greek_sculpture

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
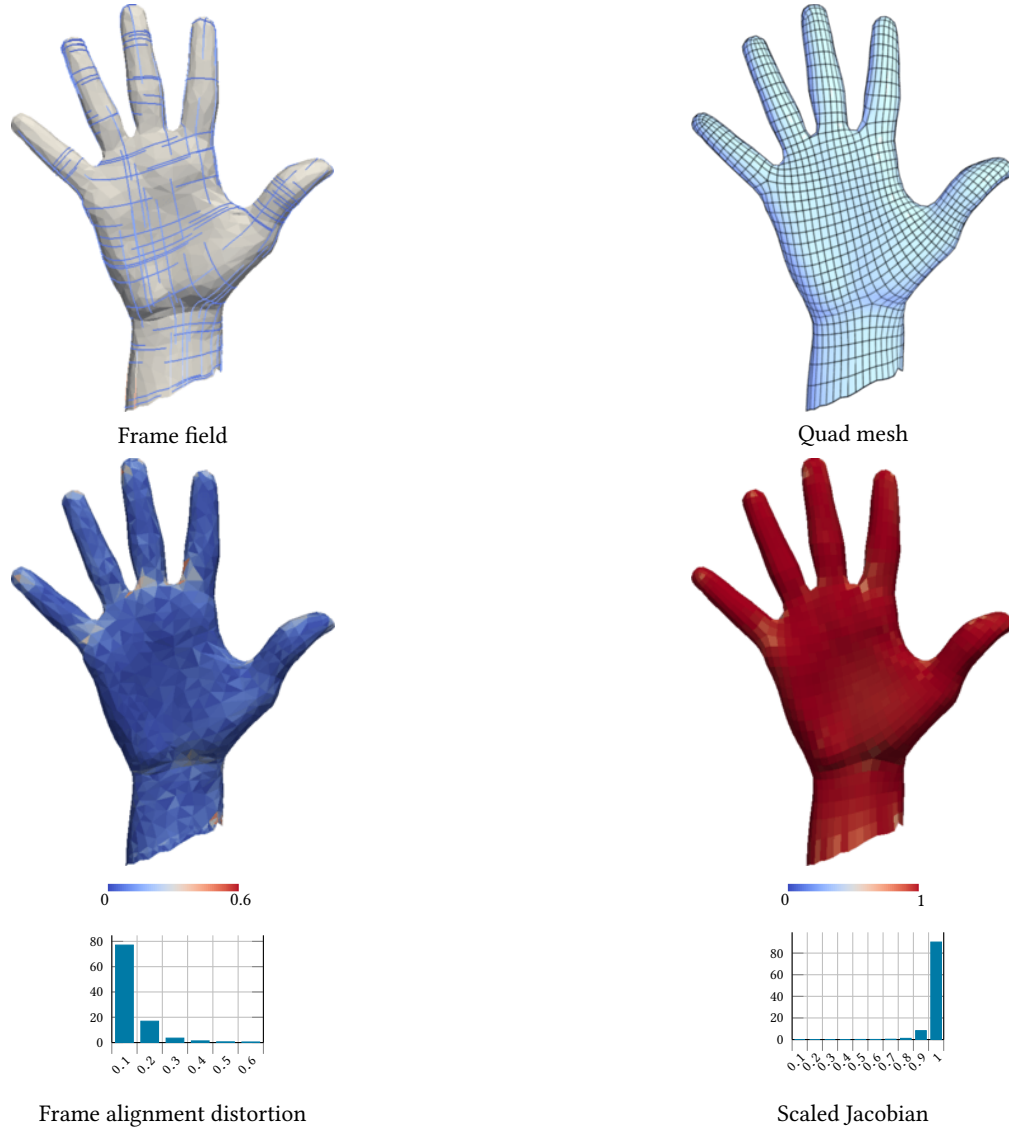
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
hand	3426	2368(2389)	0.9672(0.9516)	36	62(115)	0.07542	0.08435	8.535	2.48	0.4104

Fig. 67. Model: hand
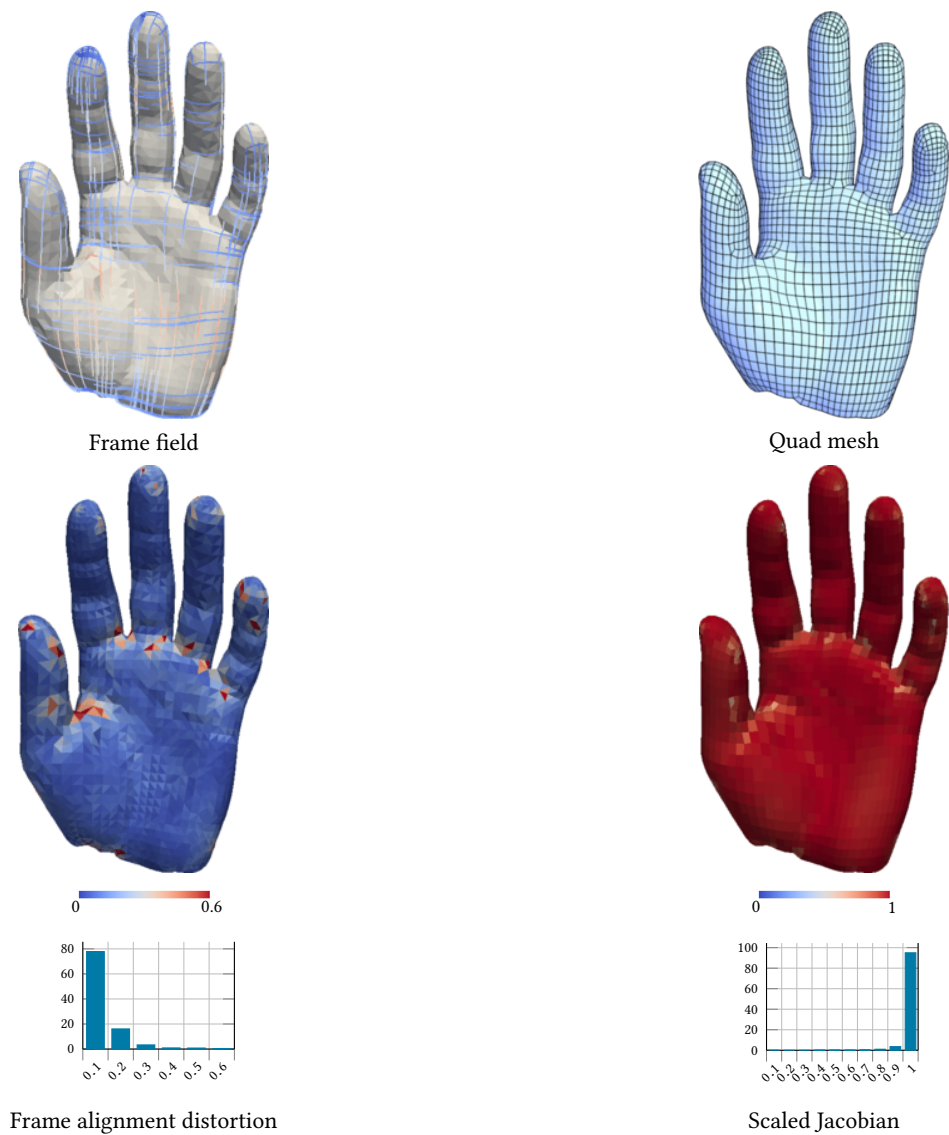
Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian

Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
hand-olivier	7175	3313(3344)	0.9769(0.9629)	38	82(143)	0.07542	0.08527	6.821	3.76	0.3649

Fig. 68. Model: hand_olivier

Frame field

Quad mesh

0   0.6

Frame alignment distortion

0   1

Scaled Jacobian
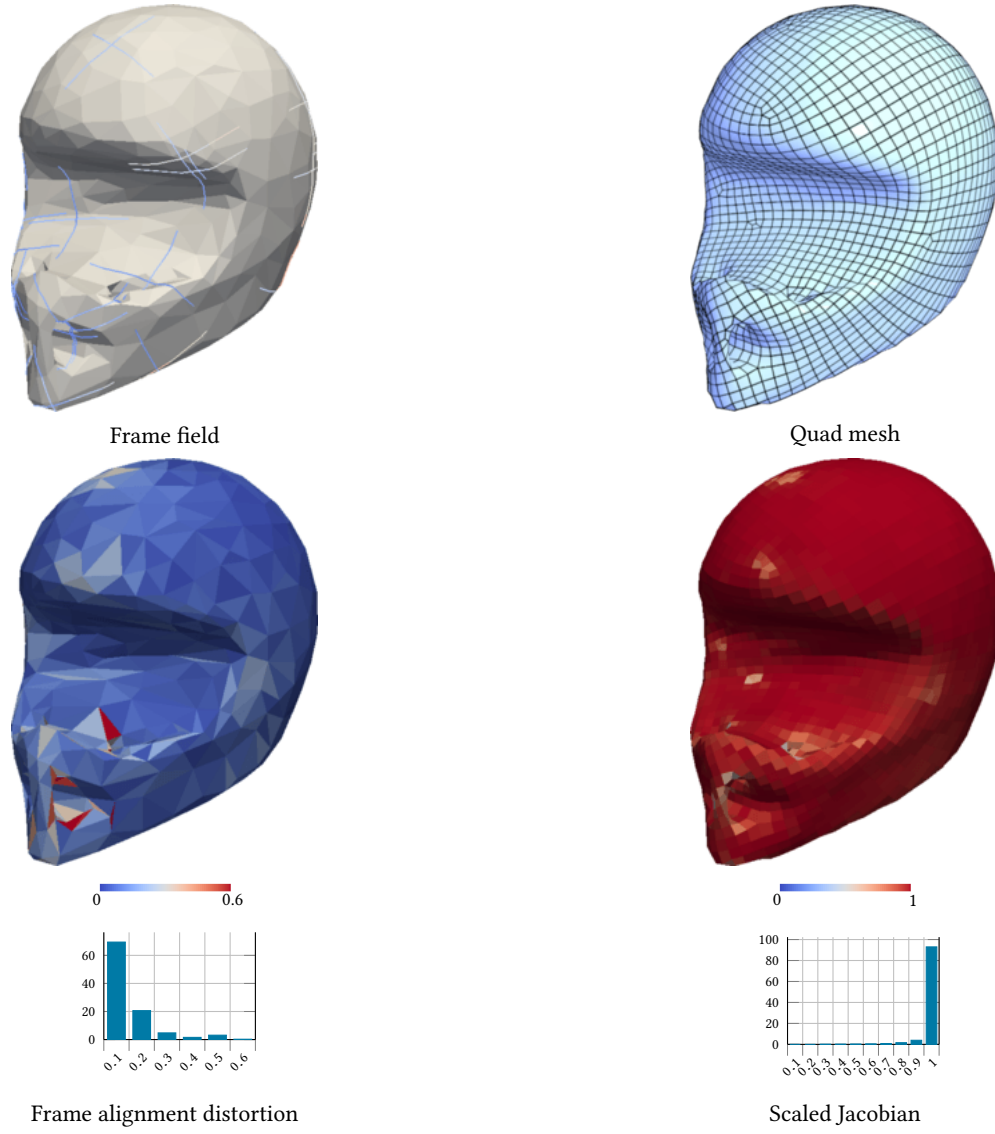
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
helmet	1000	2855(2959)	0.9719(0.9153)	31	104(323)	0.09014	0.09775	15.81	3.63	-

Fig. 69. Model: helmet

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
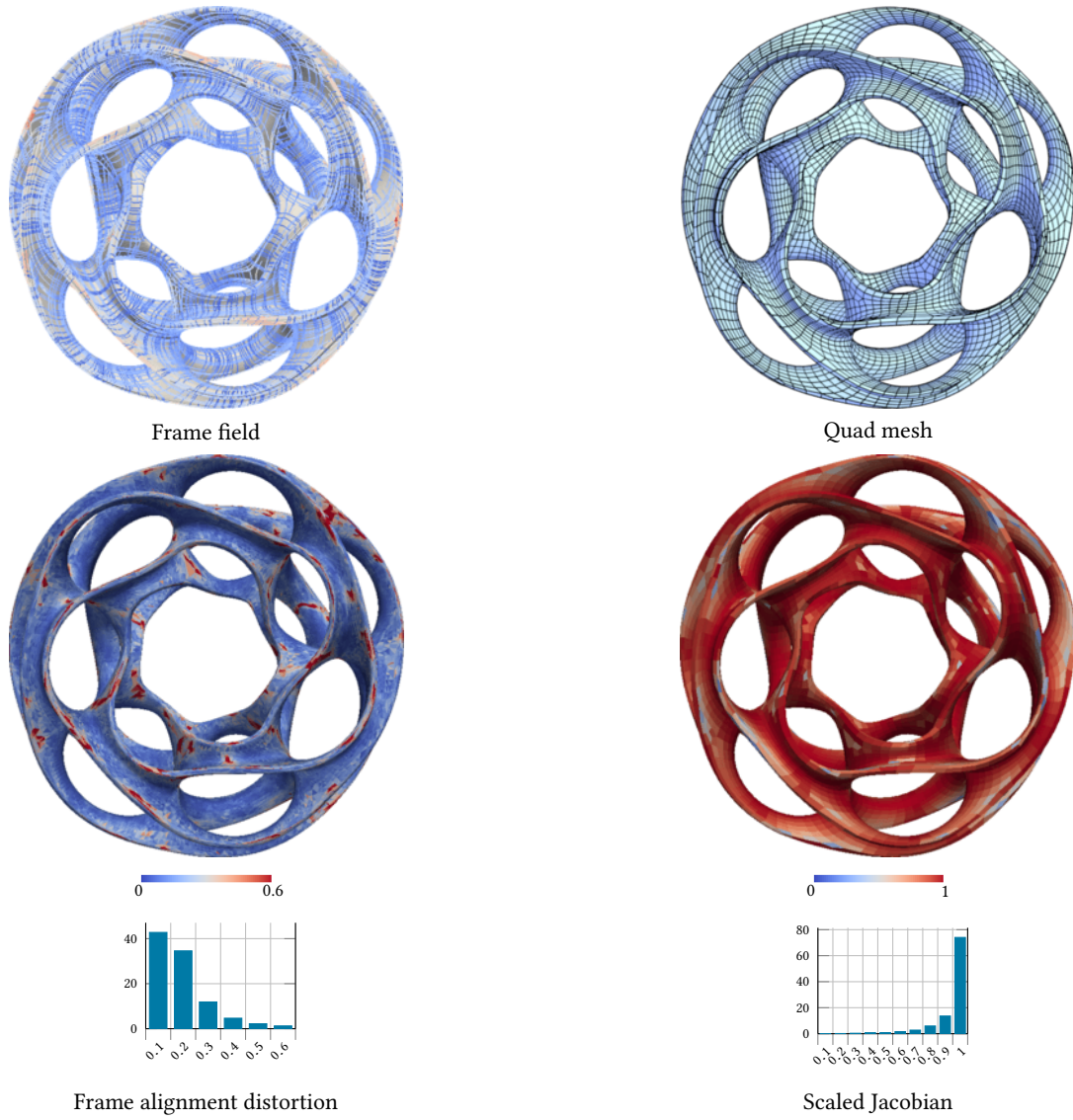
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
heptoroid100k	100000	11106(11245)	0.9147(0.8934)	219	657(934)	0.144	0.169	13.69	33.37	–

Fig. 70. Model: heptoroid100k

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
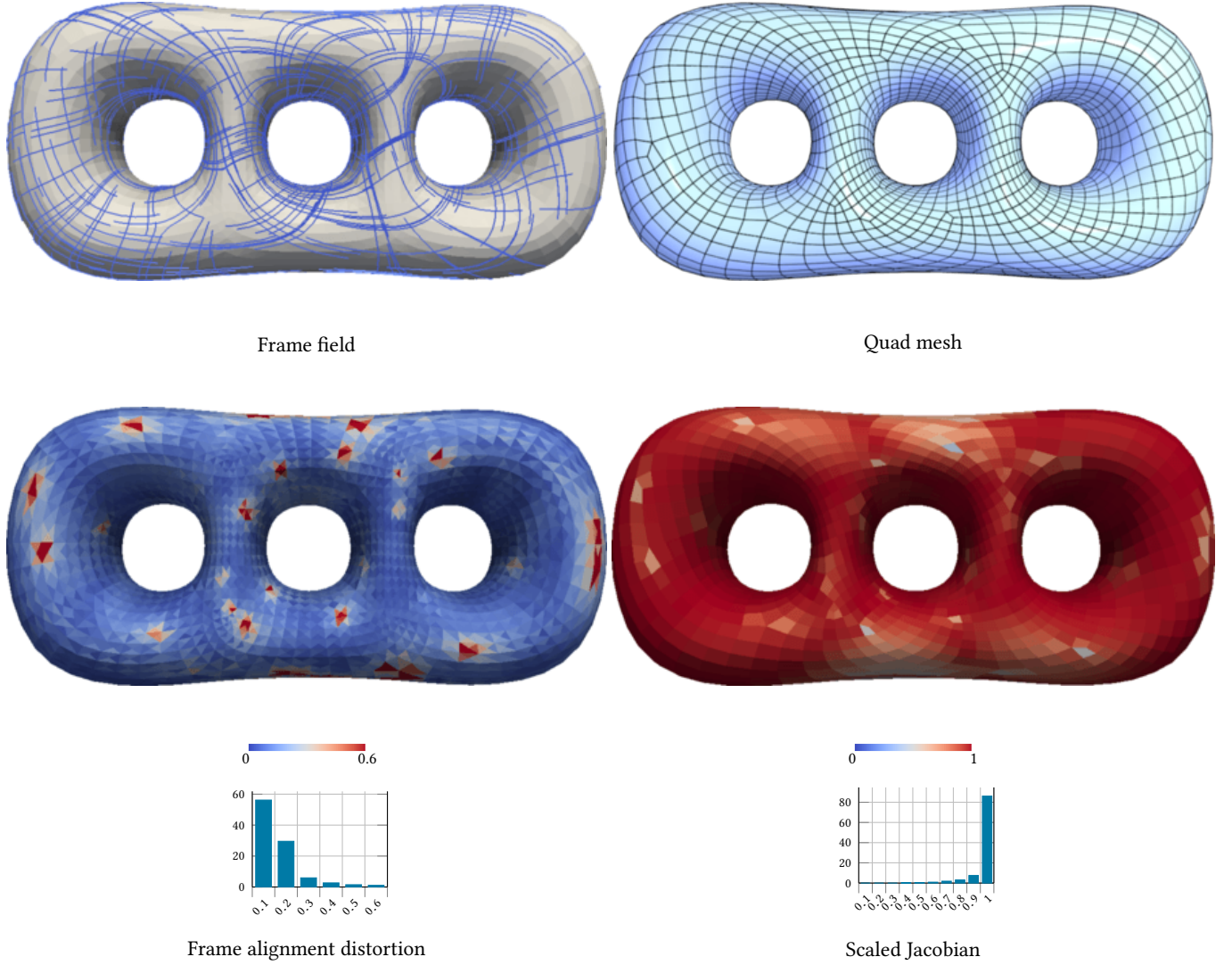
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
holes3	11776	3018(3032)	0.9533(0.947)	26	112(137)	0.1372	0.1555	11.12	4.61	-

Fig. 71. Model: holes3

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
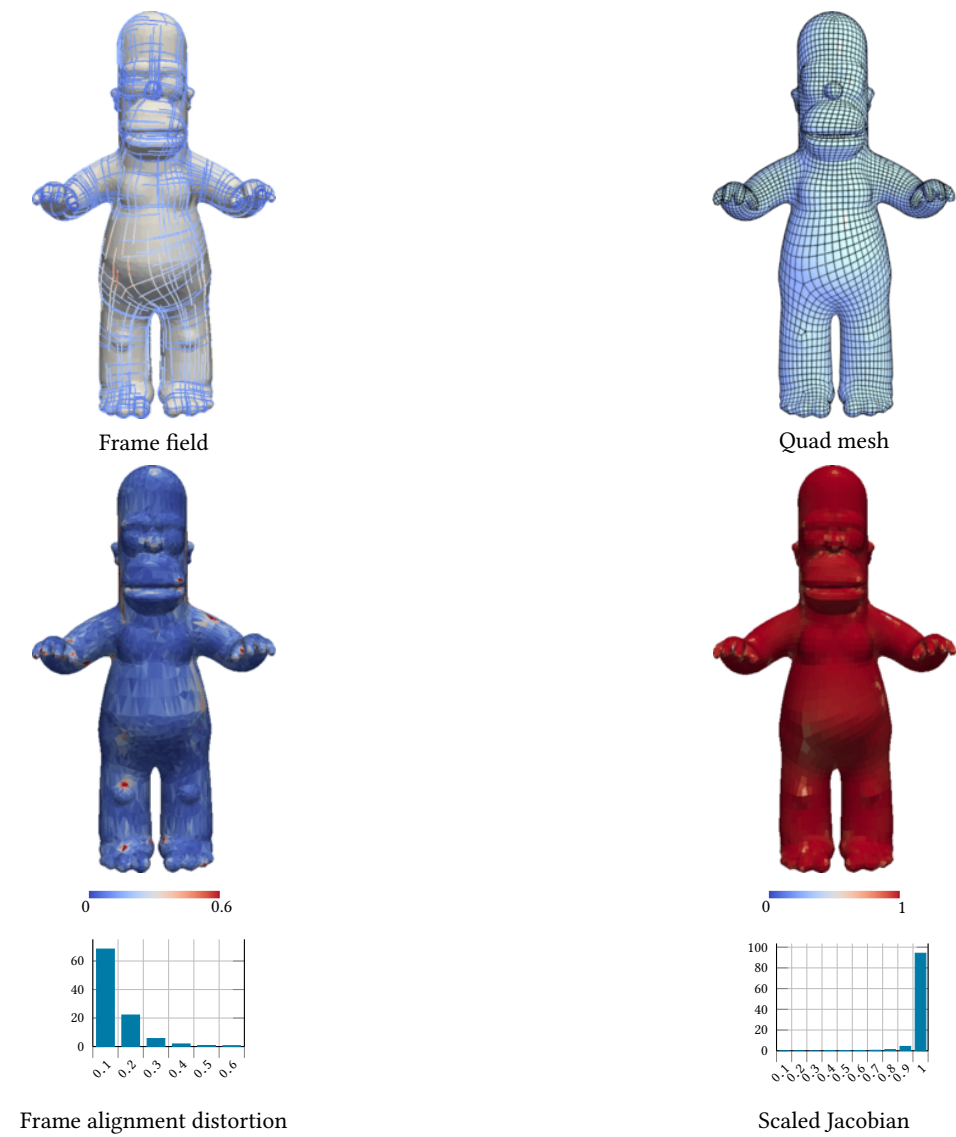
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
homer	10202	5376(5453)	0.9739(0.9521)	124	226(371)	0.09271	0.1027	10.93	7.21	-

Fig. 72. Model: homer

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
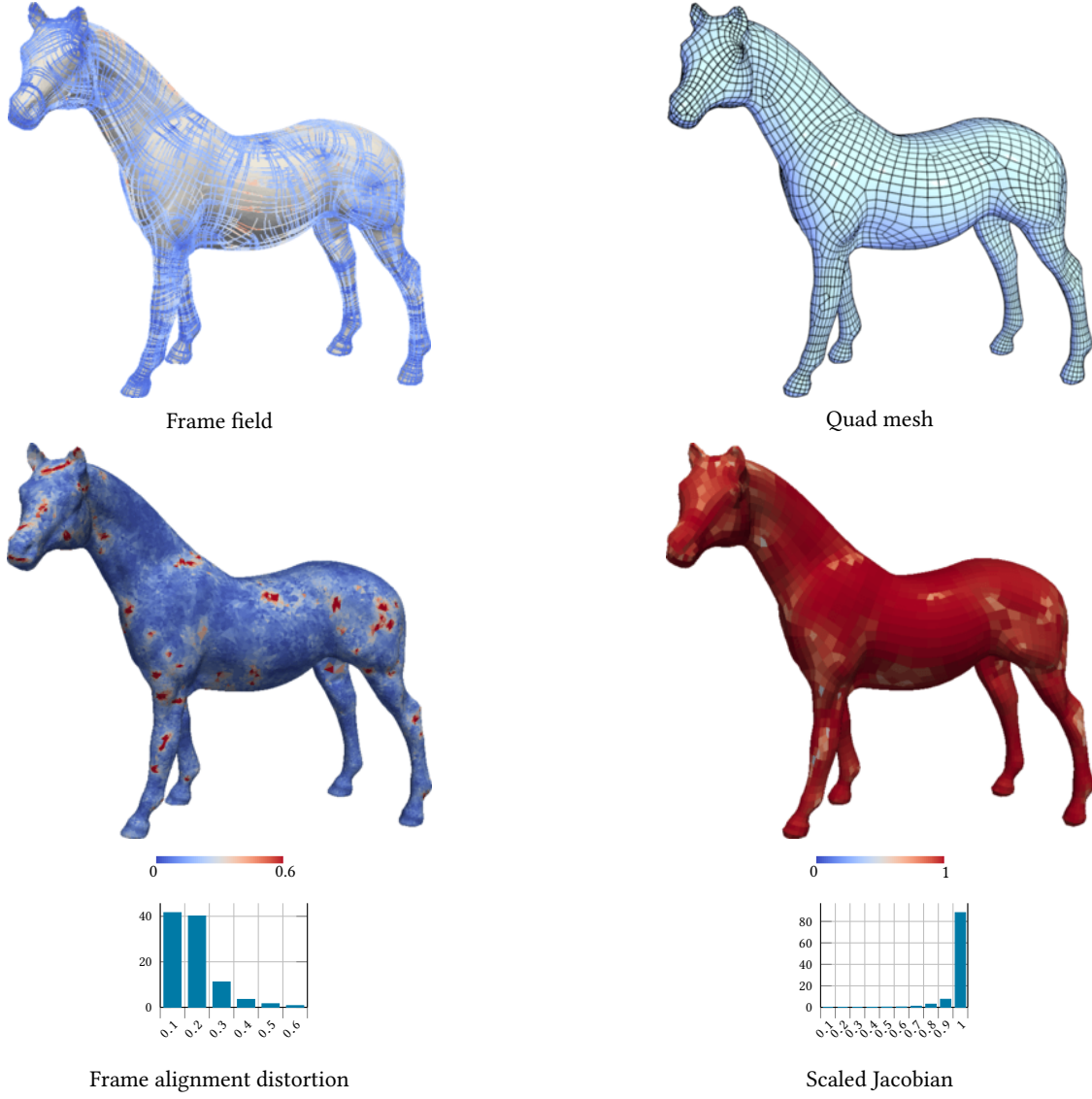
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
horse	39698	4509(4534)	0.9562(0.9463)	144	278(337)	0.1267	0.1484	14.96	14.69	–

Fig. 73. Model: horse

Frame field

Quad mesh

0　　　　0.6

0　　　　1

Frame alignment distortion

Scaled Jacobian
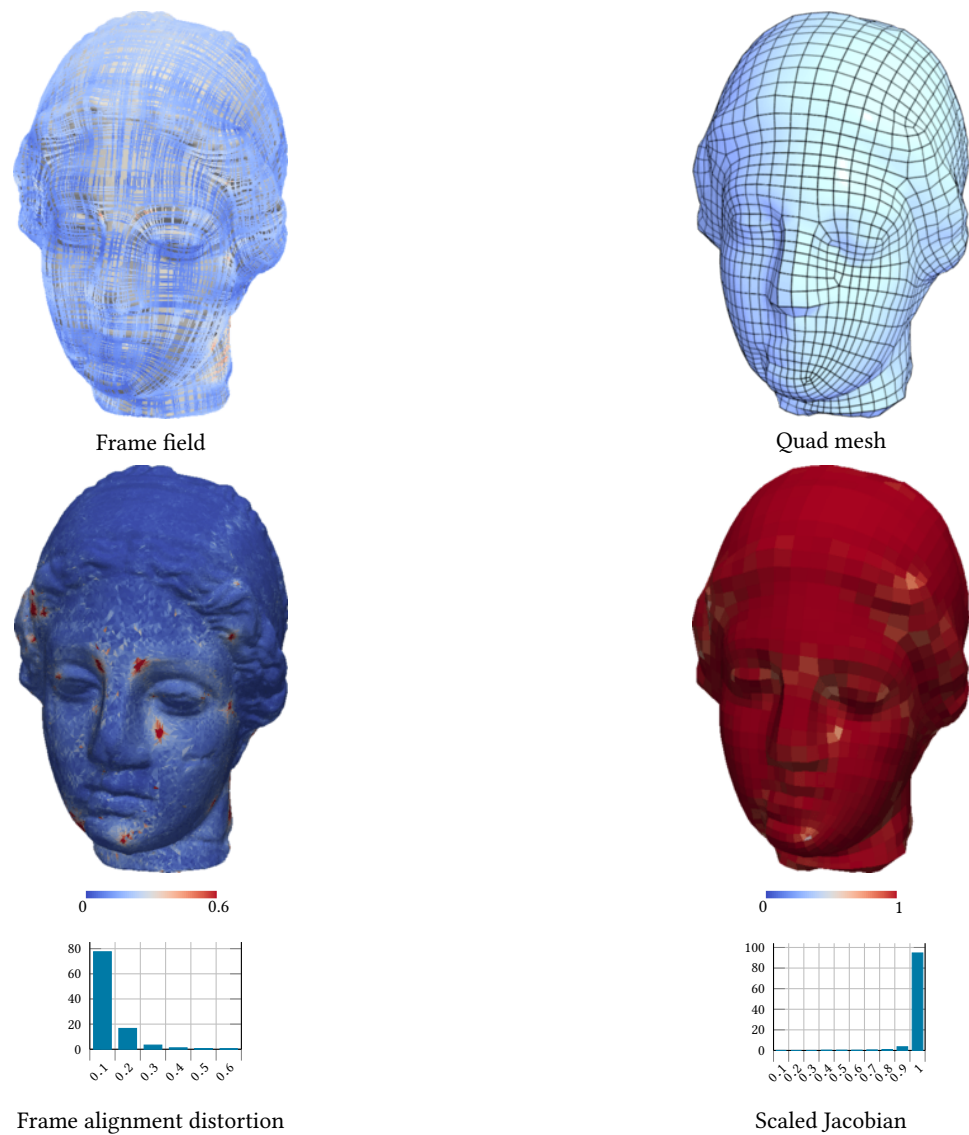
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
igea100k	100000	3012(3027)	0.9768(0.9689)	74	95(127)	0.07385	0.08676	6.183	31.95	-

Fig. 74. Model: igea100k

Frame field

Quad mesh

0   0.6

Frame alignment distortion

0   1

Scaled Jacobian
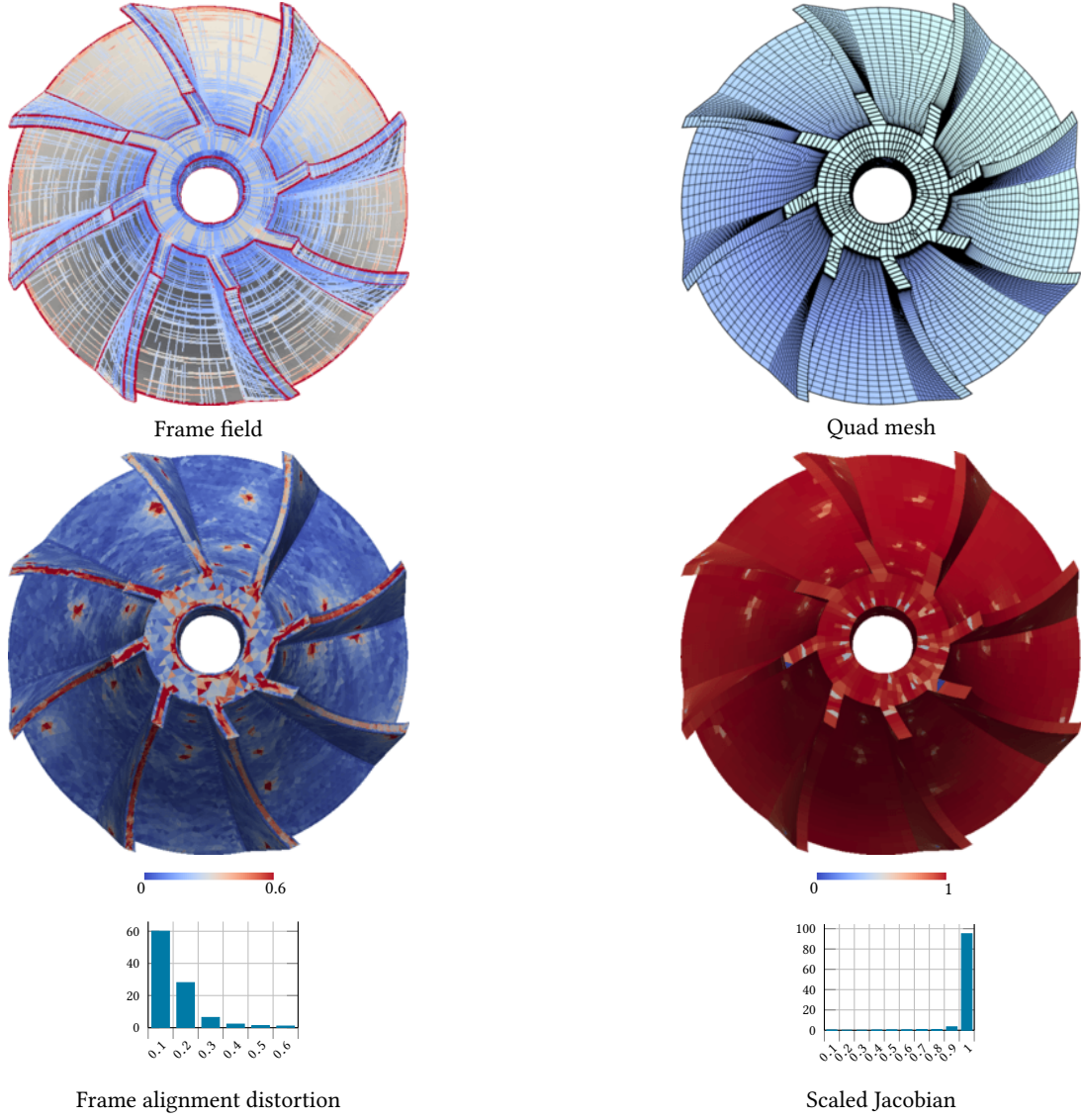
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
impeller	101436	16922(17008)	0.977(0.9687)	64	509(675)	0.1066	0.1177	4.8	36.27	0.05033

Fig. 75. Model: impeller

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
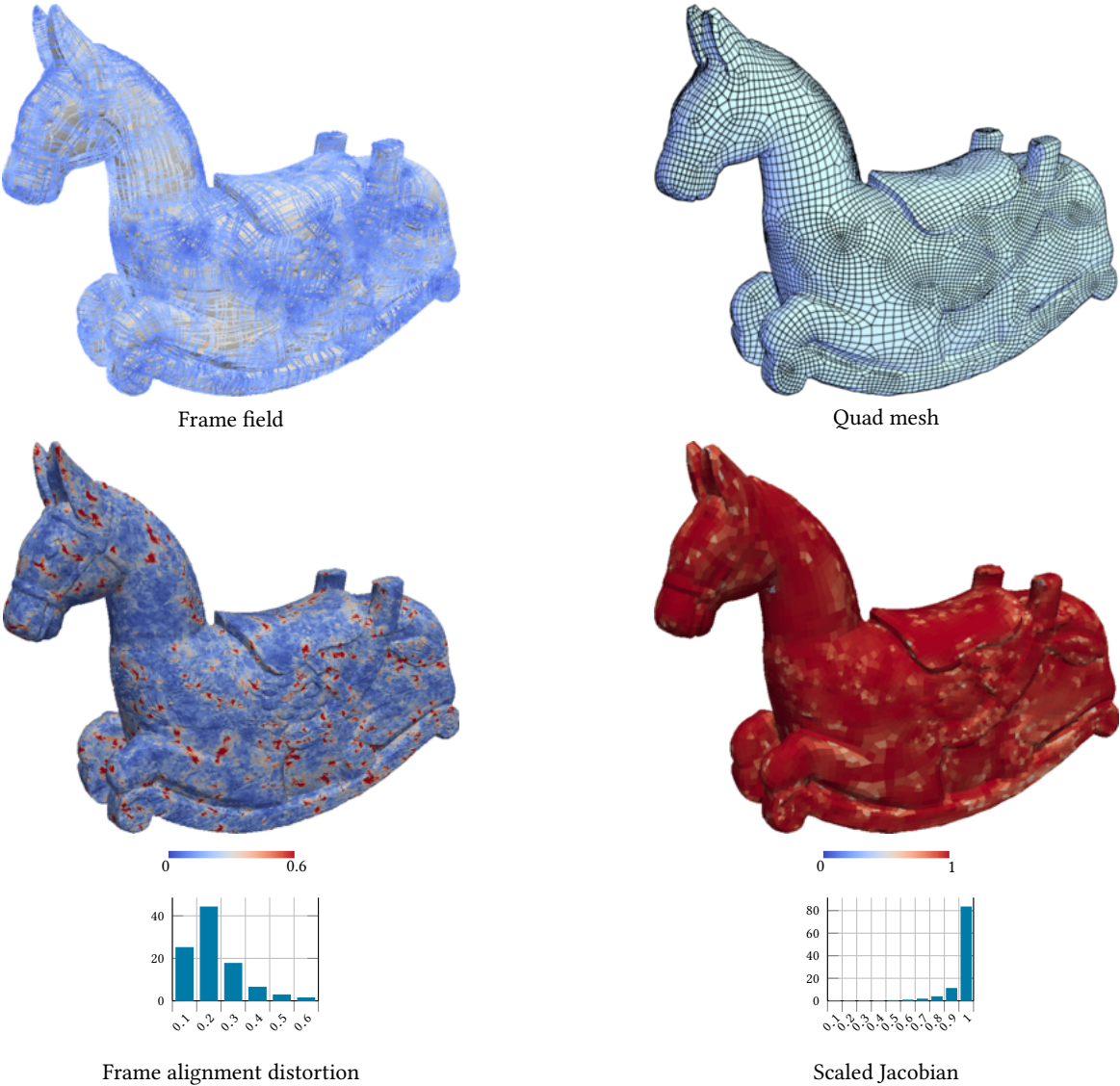
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
isidore-horse	100000	12691(12929)	0.9415(0.9107)	790	1226(1686)	0.1664	0.1942	21.08	44.49	-

Fig. 76. Model: isidore_horse

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
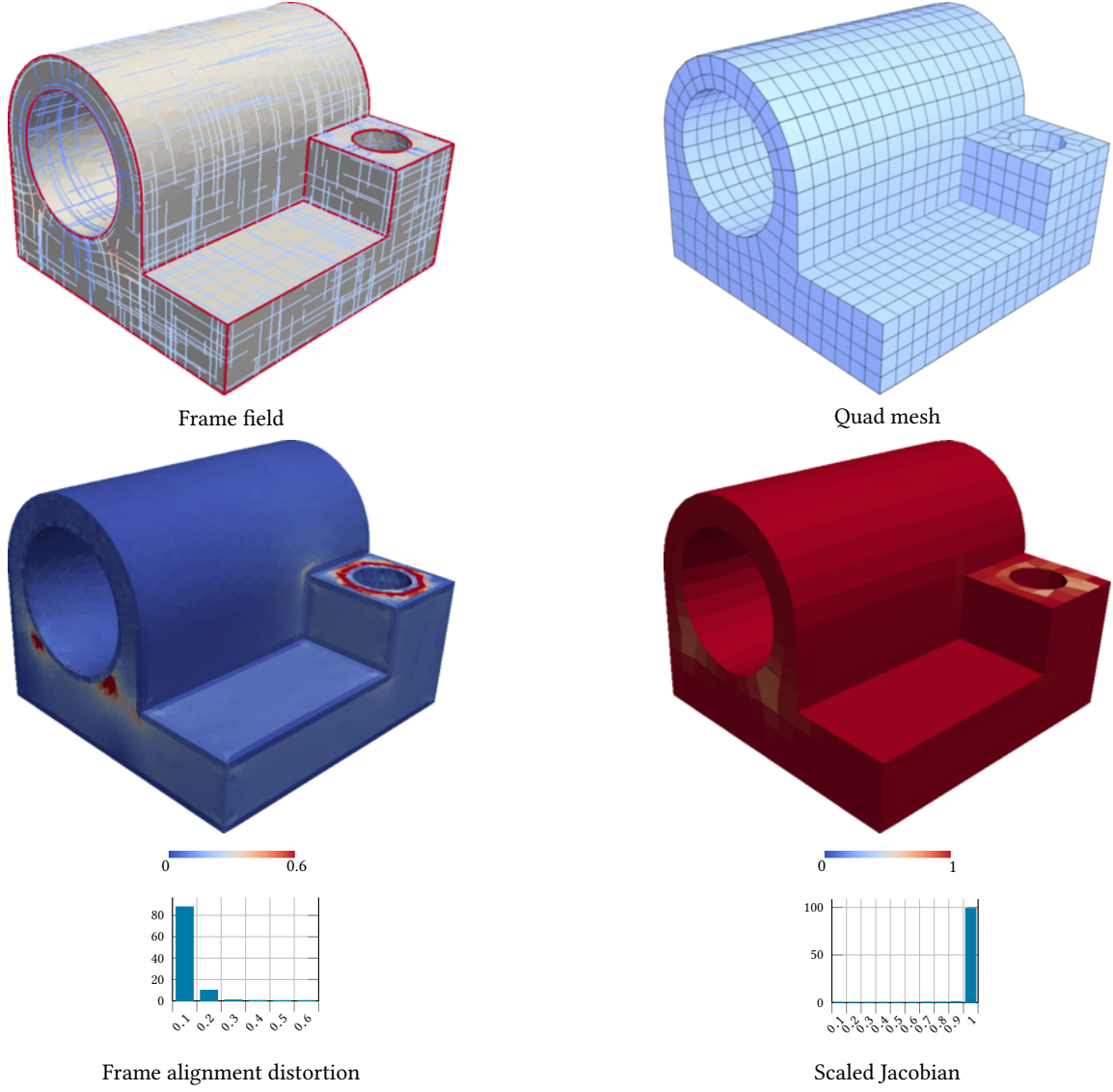
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
joint20k	20968	1764(1764)	0.996(0.996)	24	26(26)	0.04852	0.05196	2.338	6.54	0.3821

Fig. 77. Model: joint20k

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
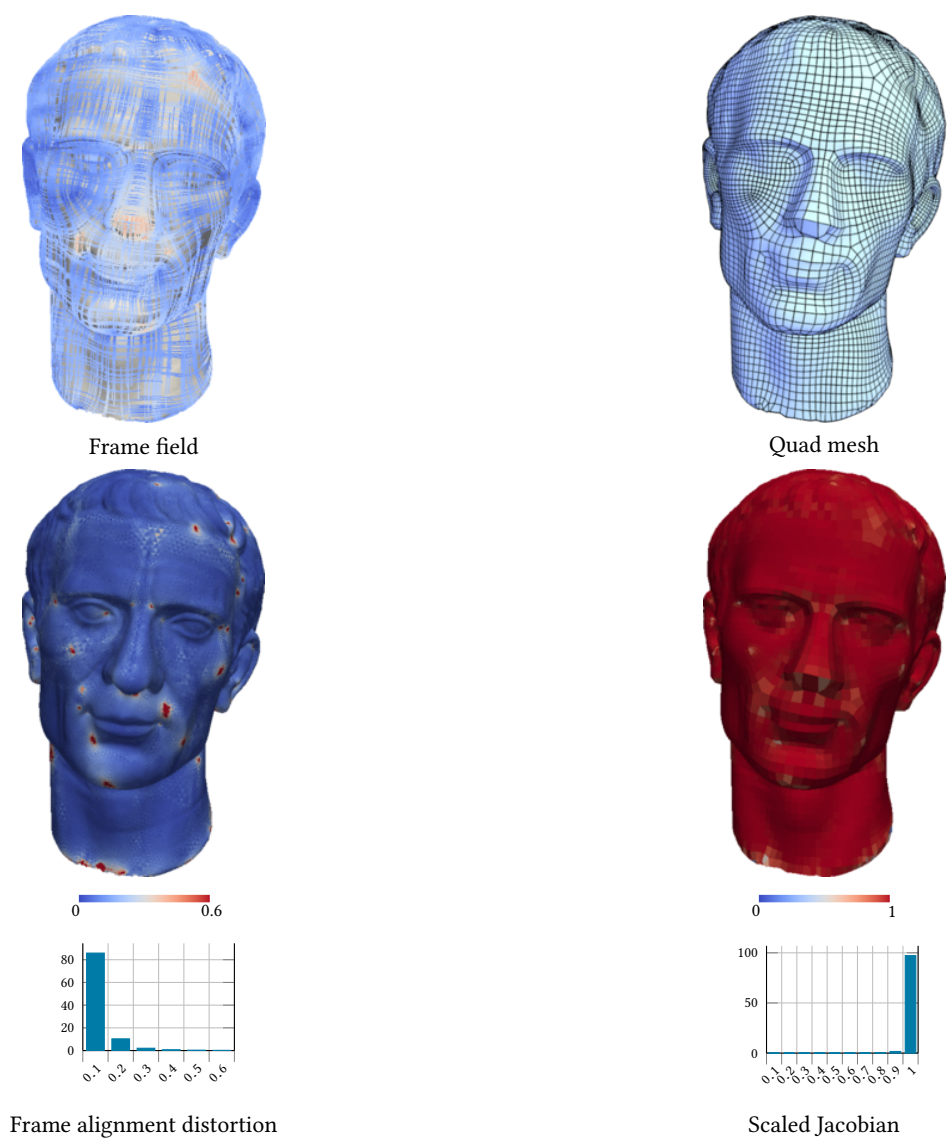
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
julius	85587	8402(8418)	0.9862(0.9817)	96	181(221)	0.05854	0.06886	5.121	27.29	0.3948

Fig. 78. Model: julius

Frame field

Quad mesh

0   0.6

0   1

Frame alignment distortion

Scaled Jacobian
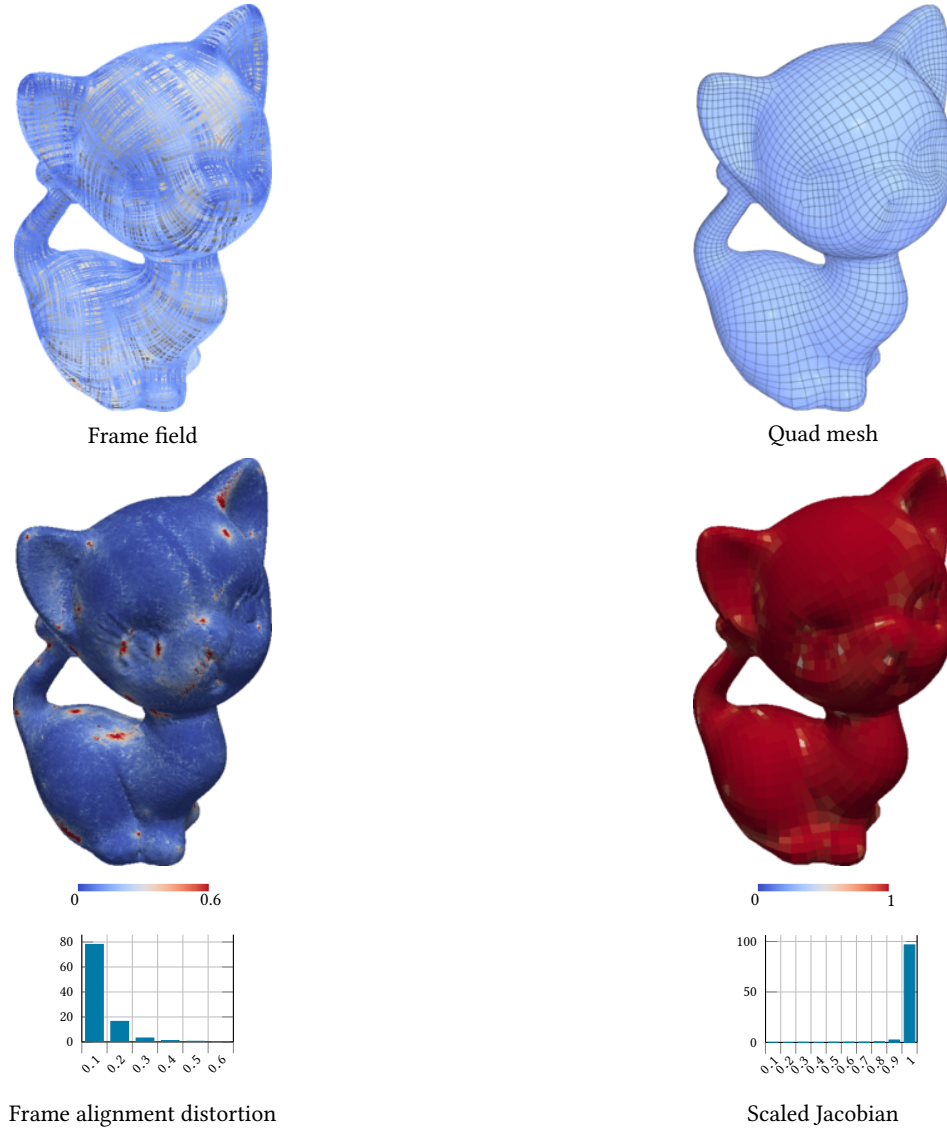
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
kitten100K	100000	4154(4170)	0.9836(0.9764)	77	97(130)	0.07266	0.08658	7.404	29.73	-

Fig. 79. Model: kitten100K

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
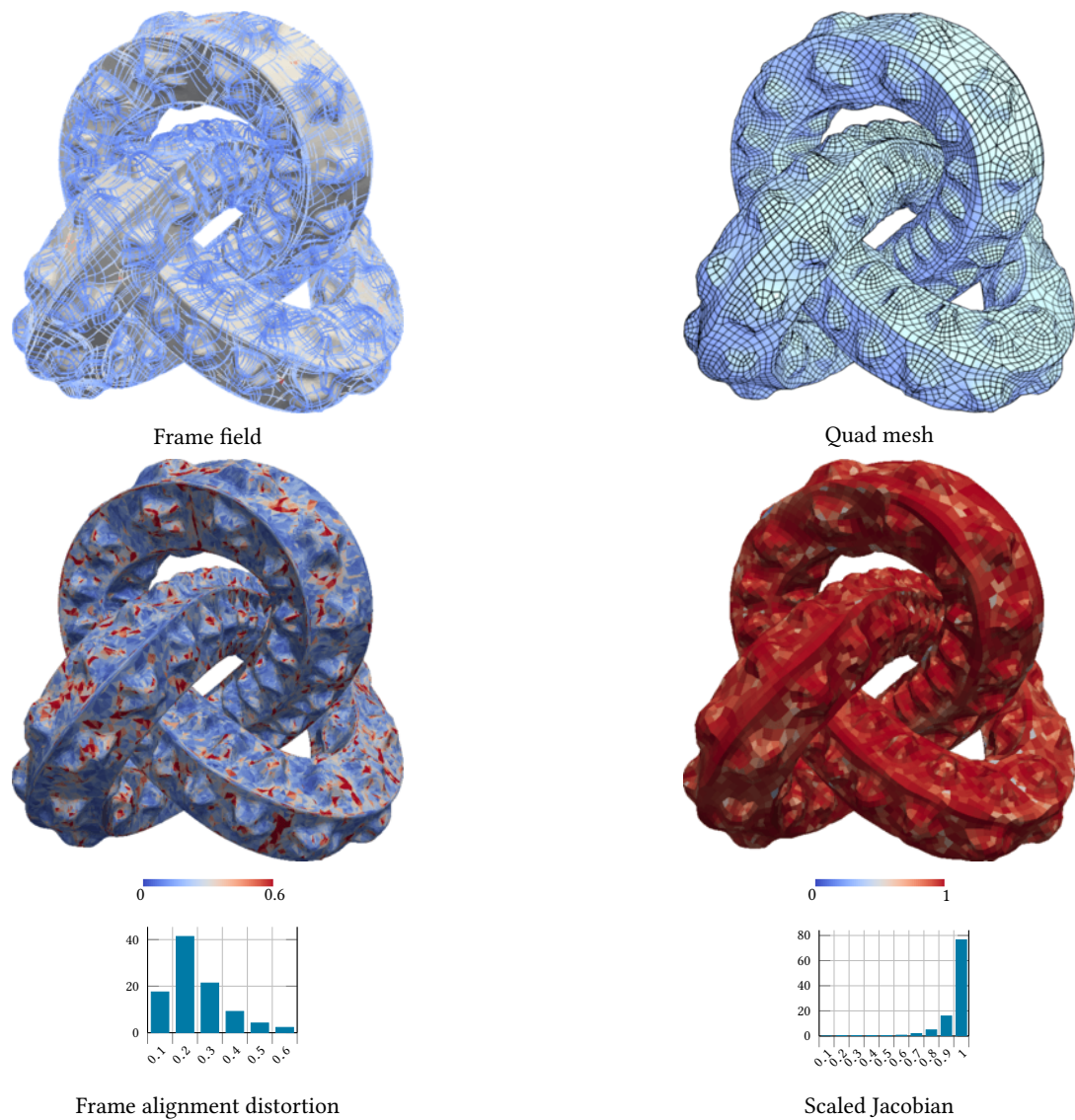
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
knot100K	100000	19110(19679)	0.9279(0.8804)	1680	2693(3856)	0.1996	0.2312	36.98	83.66	-

Fig. 80. Model: knot100K

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
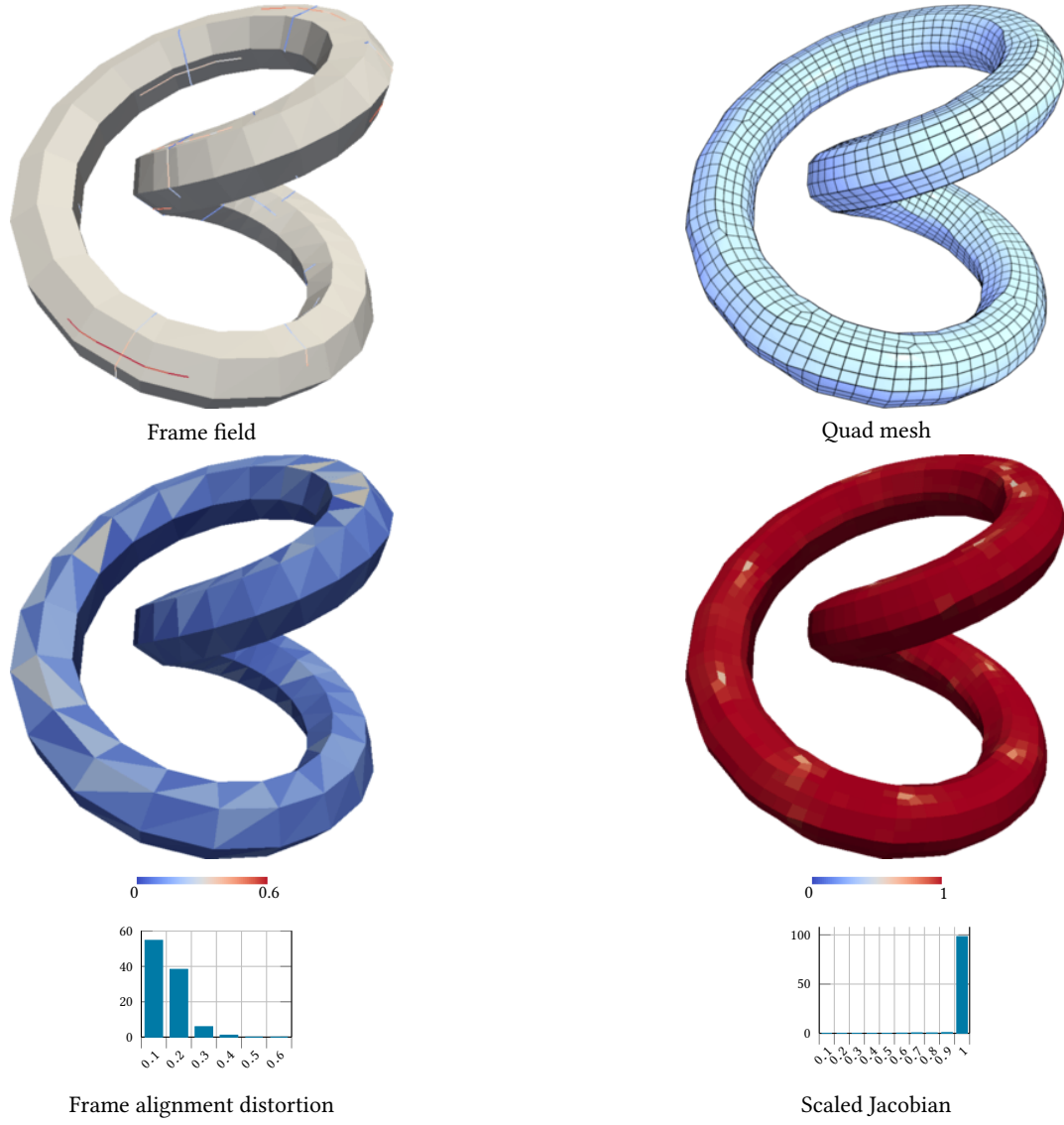
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
knot1	480	2690(2718)	0.9875(0.9687)	0	56(126)	0.1011	0.1089	15.87	3.31	–

Fig. 81. Model: knot1

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
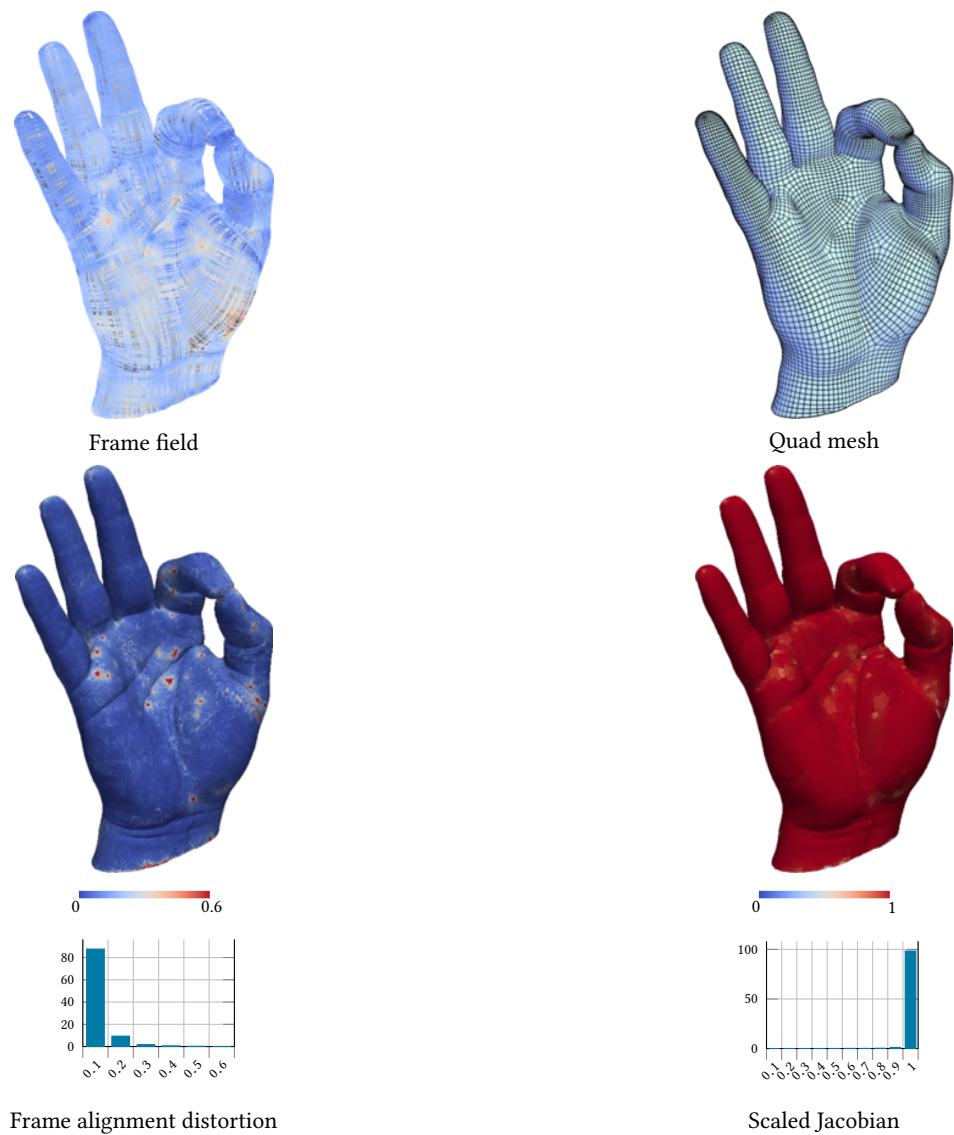
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
laurent-hand	100631	11905(11932)	0.9919(0.9878)	65	150(207)	0.05122	0.06098	2.682	34.94	0.1381

Fig. 82. Model: laurent_hand

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
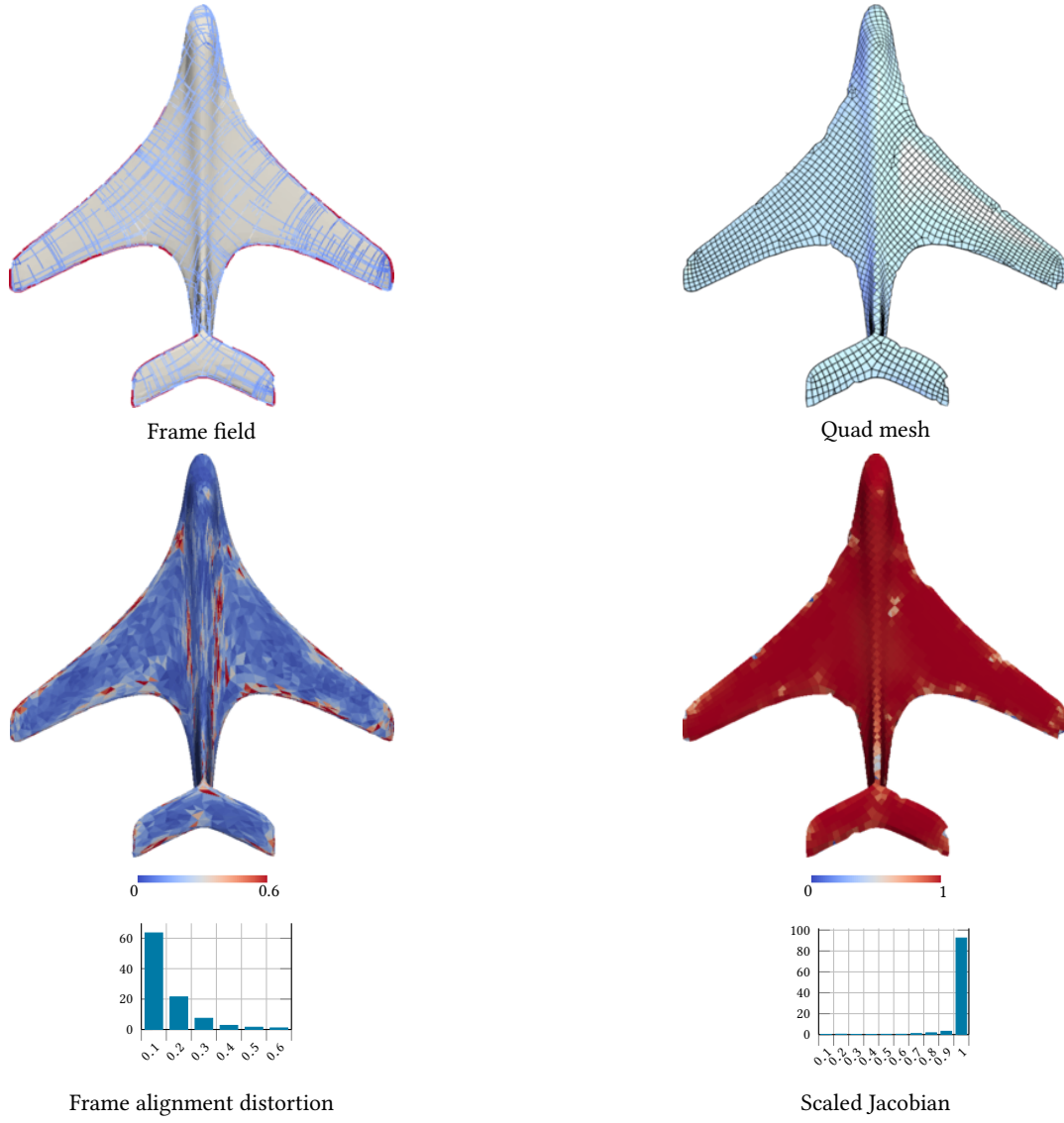
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
lenka-new	11998	3645(3733)	0.9595(0.9293)	38	197(372)	0.1505	0.1654	10.95	6.87	0.1622

Fig. 83. Model: lenka_new

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
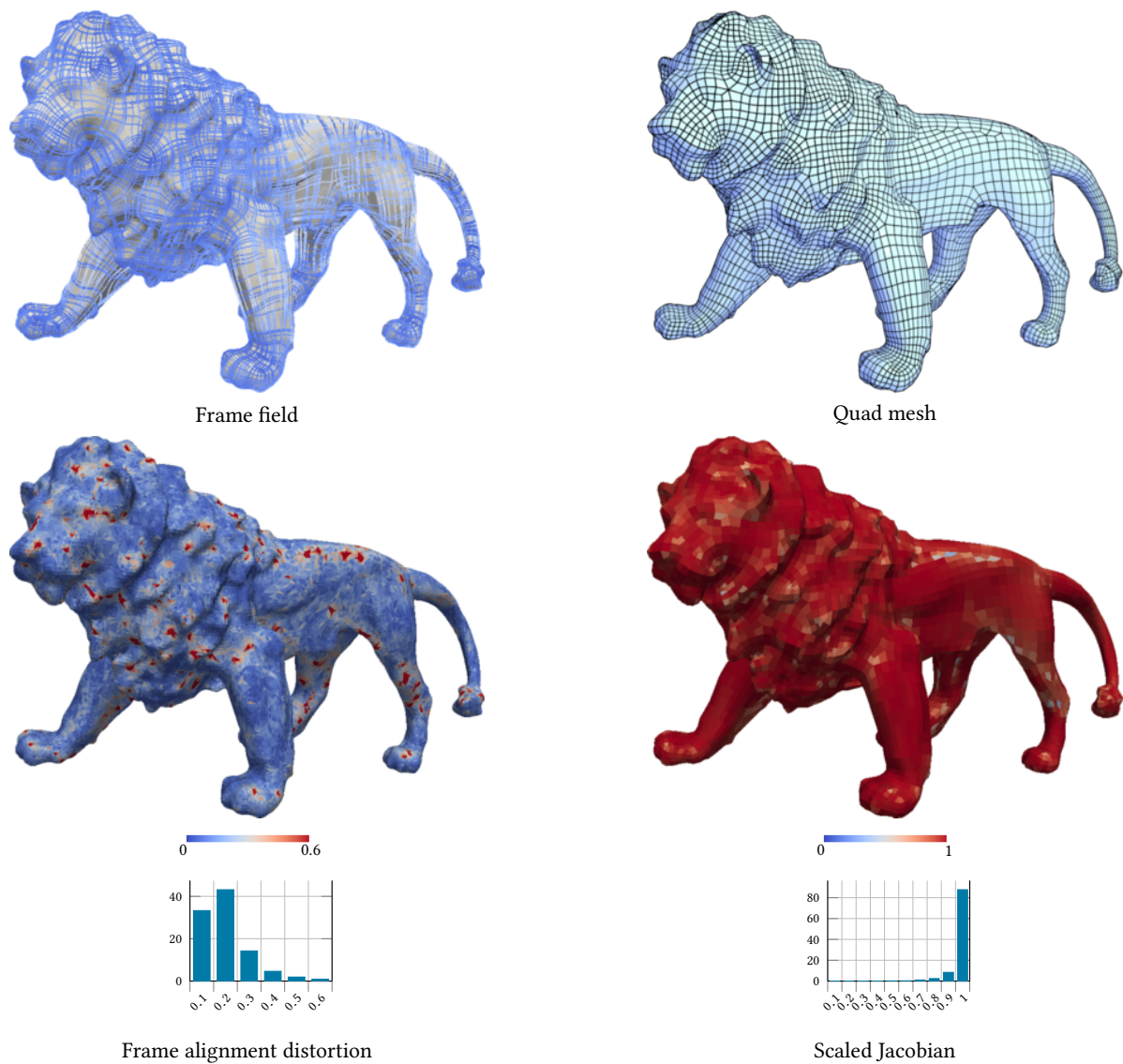
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
lion-recon-50K	55794	7715(7809)	0.9546(0.9358)	334	576(773)	0.1435	0.1683	17.15	21.81	-

Fig. 84. Model: lion_recon_50K

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
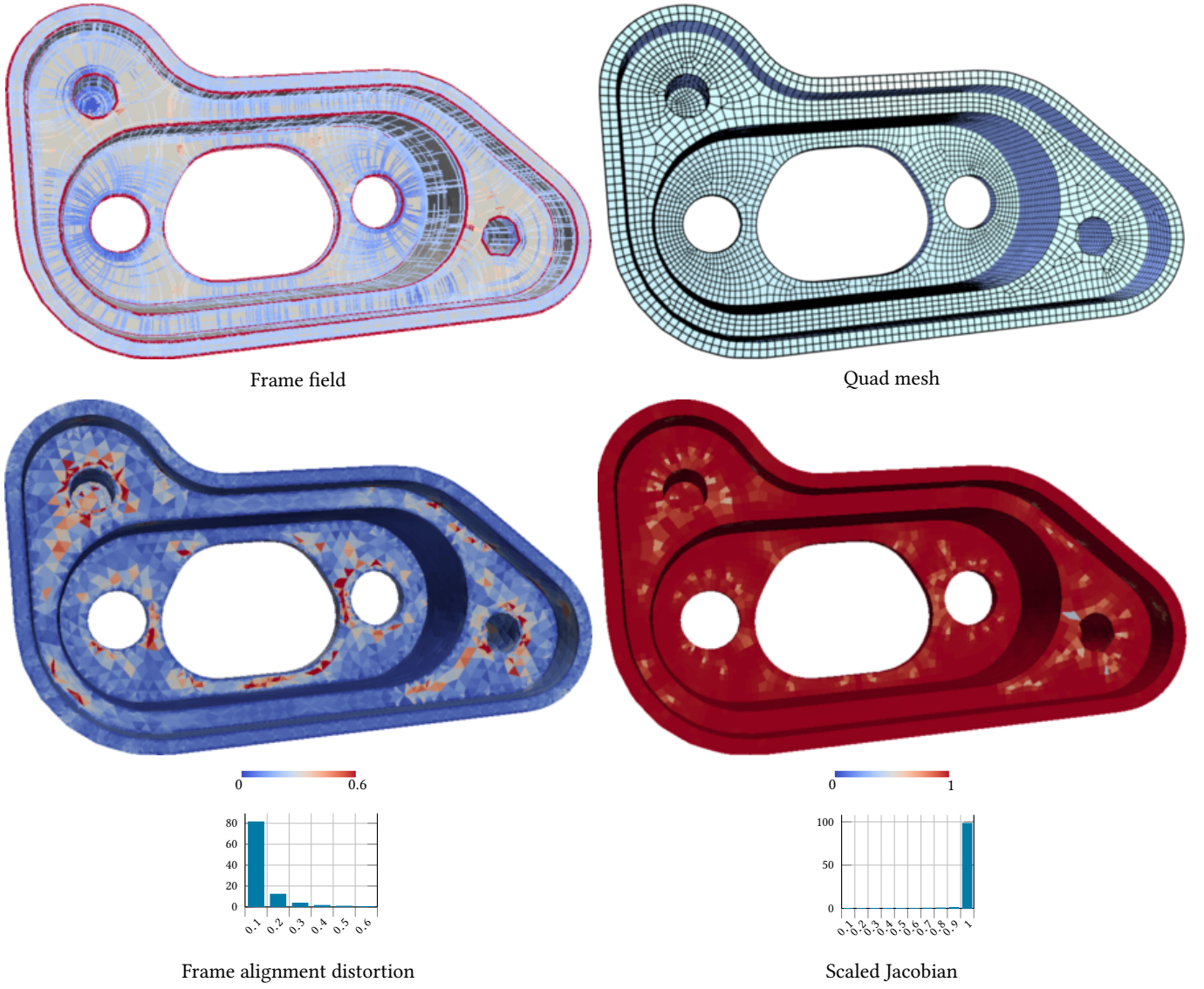
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
lock-Lp	62646	15666(15735)	0.9933(0.9864)	38	258(408)	0.05893	0.06542	4.437	25.67	0.2495

Fig. 85. Model: lock_Lp

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
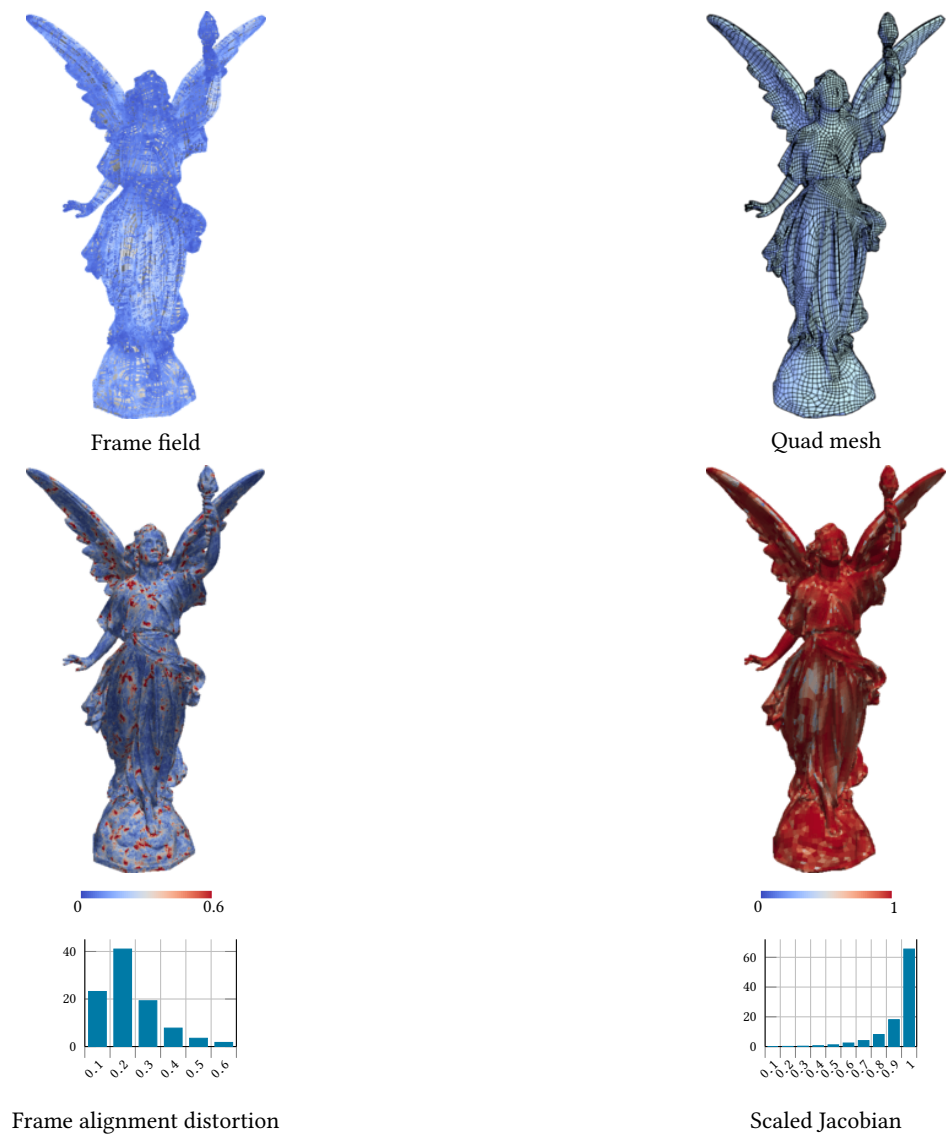
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
lucy100k	100000	13437(13773)	0.8927(0.8558)	1101	1650(2295)	0.181	0.2113	27.83	49.15	-

Fig. 86. Model: lucy100k

Frame field

Quad mesh

0   0.6

Frame alignment distortion

0   1

Scaled Jacobian
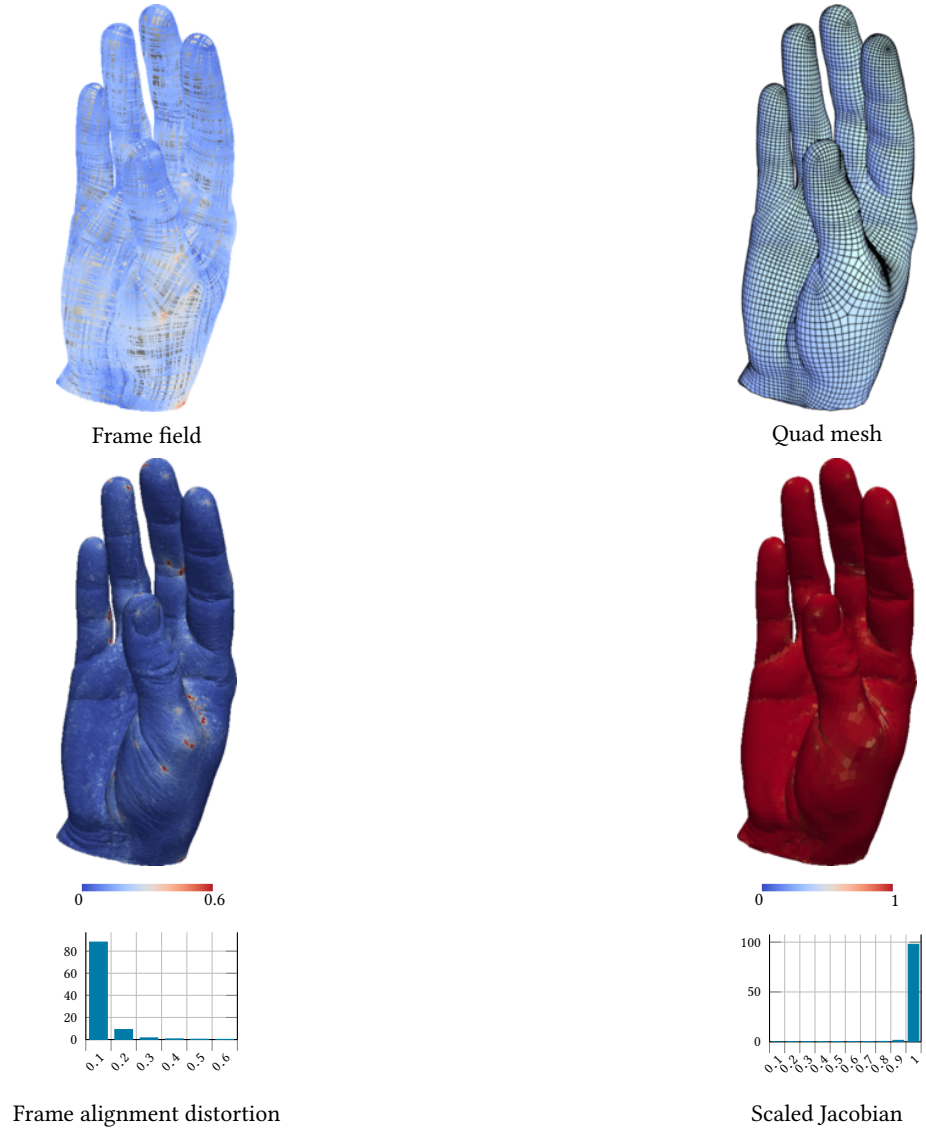
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
magalie-hand100K	100000	11604(11634)	0.9904(0.986)	90	135(202)	0.04925	0.0583	2.688	31.4	-

Fig. 87. Model: magalie_hand100K

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
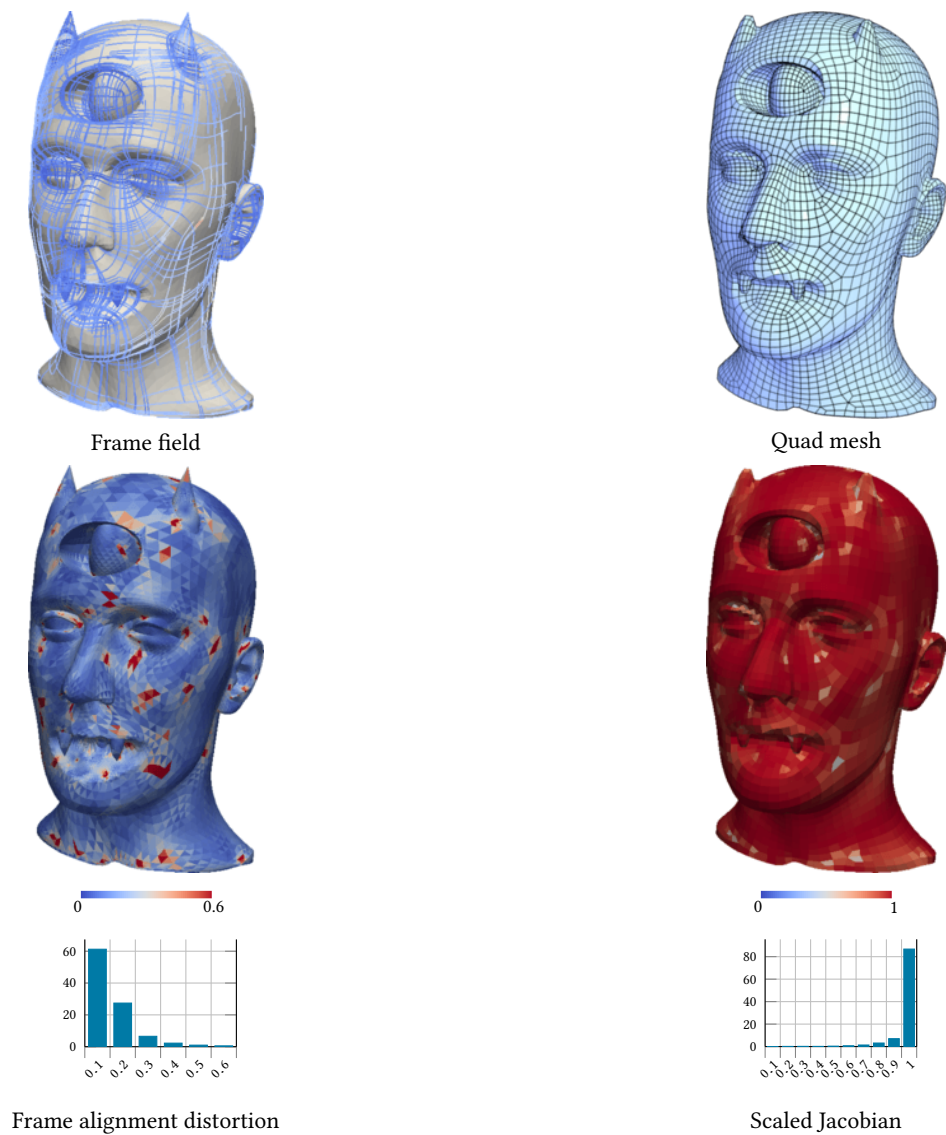
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
mannequin-devil	26568	4908(4970)	0.9502(0.9344)	233	341(458)	0.09903	0.1153	11.1	13.08	0.194

Fig. 88. Model: mannequin-devil

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
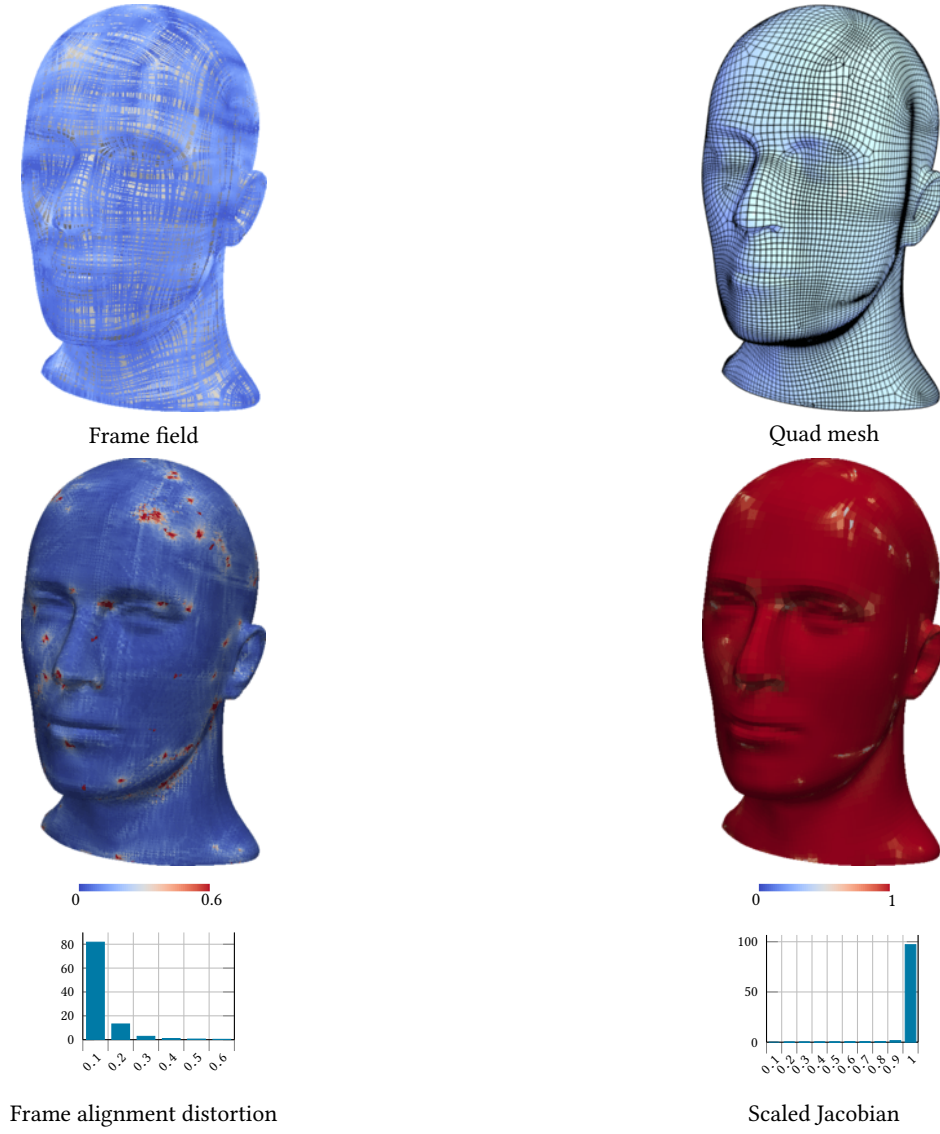
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
mannequin-mc	111538	13209(13302)	0.9868(0.975)	66	245(463)	0.0697	0.08121	5.355	42.57	0.05473

Fig. 89. Model: mannequin_mc

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
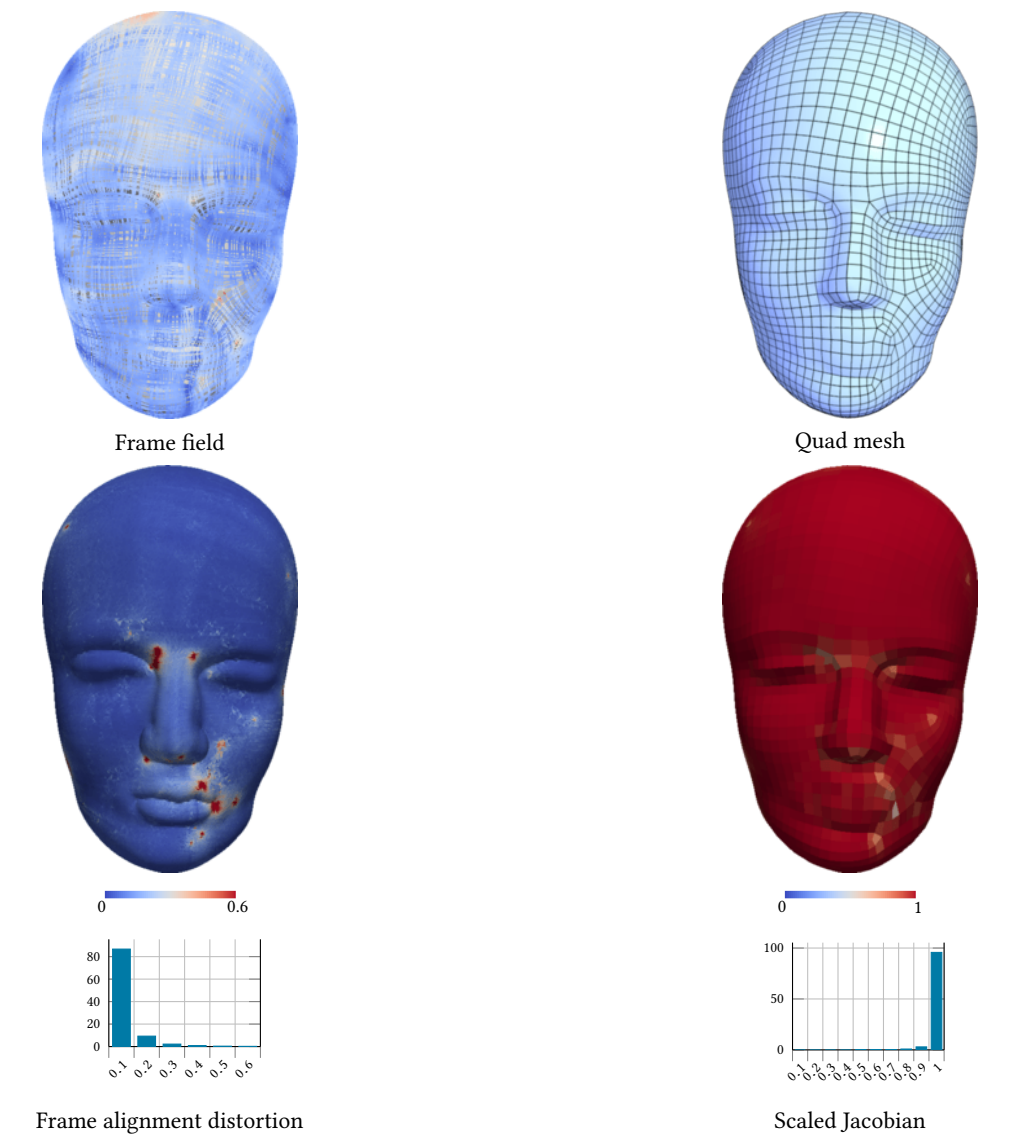
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
mask	62656	1332(1341)	0.9838(0.9729)	20	36(56)	0.05566	0.06591	4.689	20.93	0.1283

Fig. 90. Model: mask

Frame field

Quad mesh

0   0.6

Frame alignment distortion

0   1

Scaled Jacobian
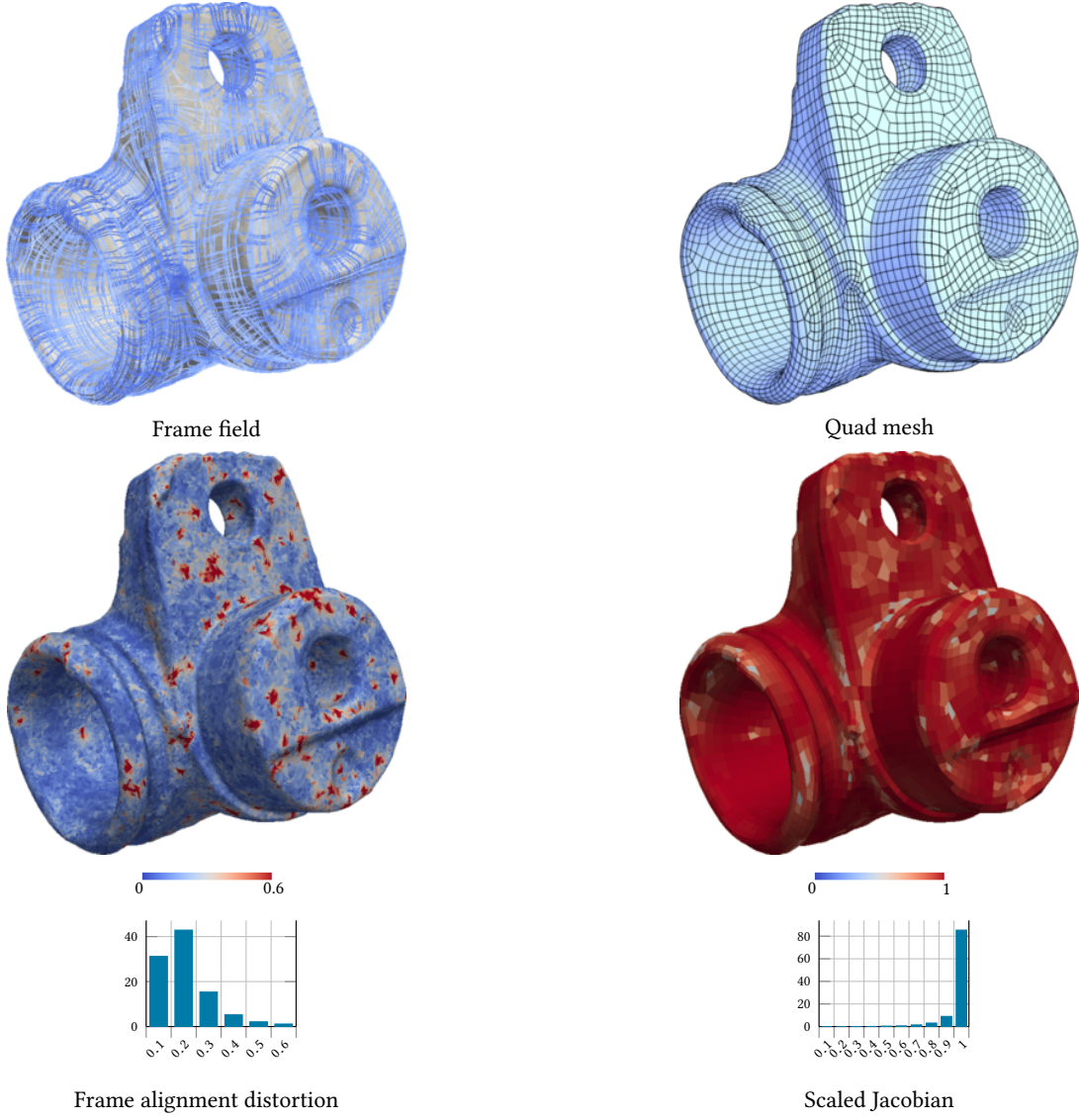
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
master-cylinder100K	100000	9127(9214)	0.9503(0.9344)	418	744(919)	0.1507	0.1772	16.93	42.57	-

Fig. 91. Model: master_cylinder100K

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
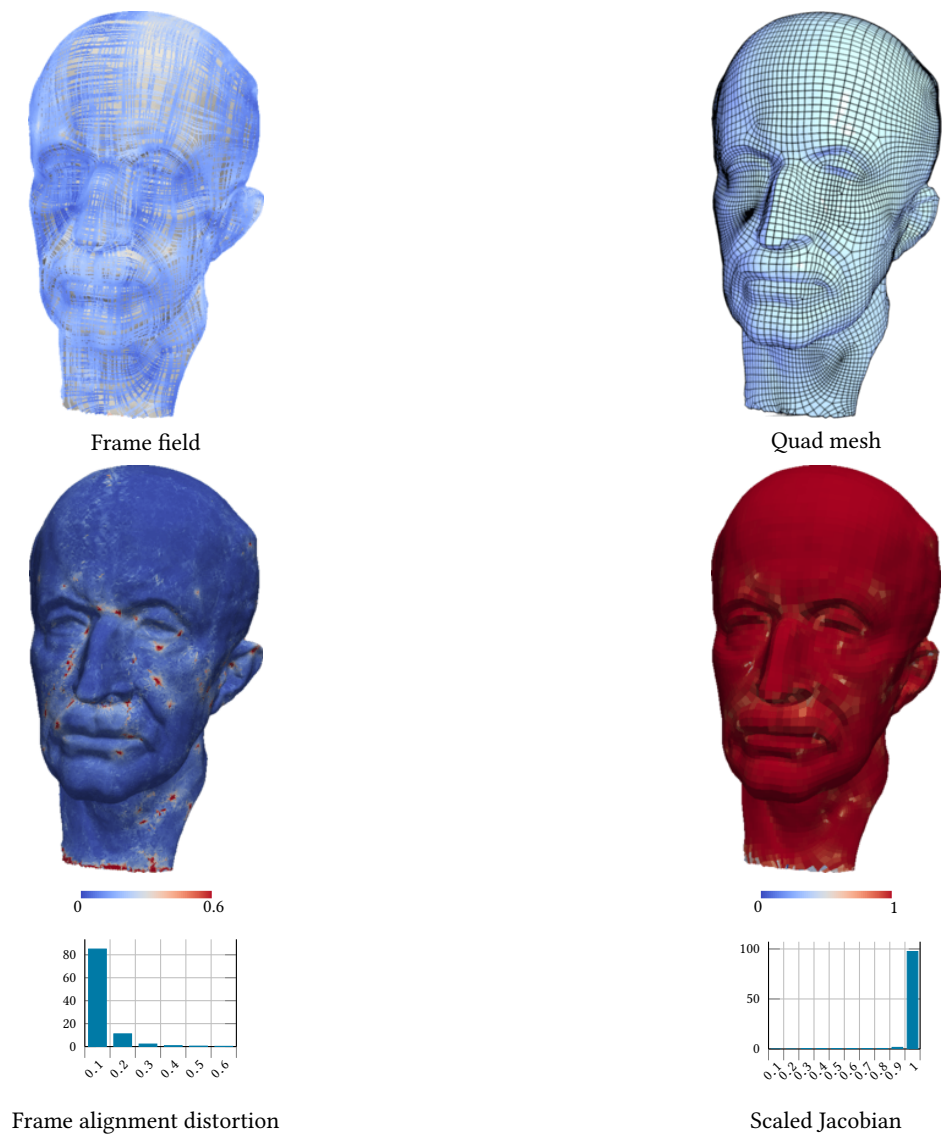
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
max-planck	100625	12913(12955)	0.9881(0.9822)	84	237(324)	0.06049	0.07177	4.054	34.4	0.3564

Fig. 92. Model: max-planck

Frame field

Quad mesh

0   0.6

0   1

Frame alignment distortion

Scaled Jacobian
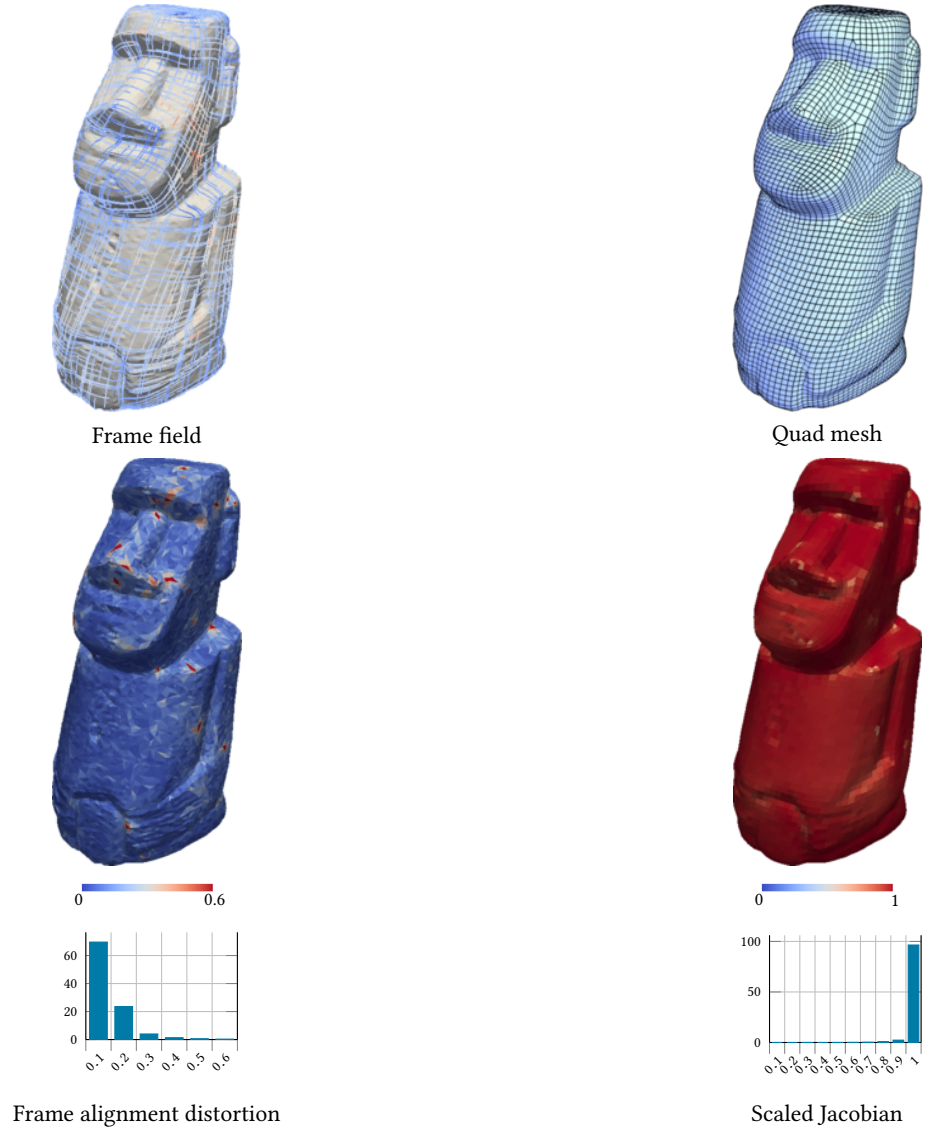
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
moai	20000	7935(7973)	0.9728(0.9652)	68	170(264)	0.08322	0.09552	5.403	8.3	-

Fig. 93. Model: moai

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
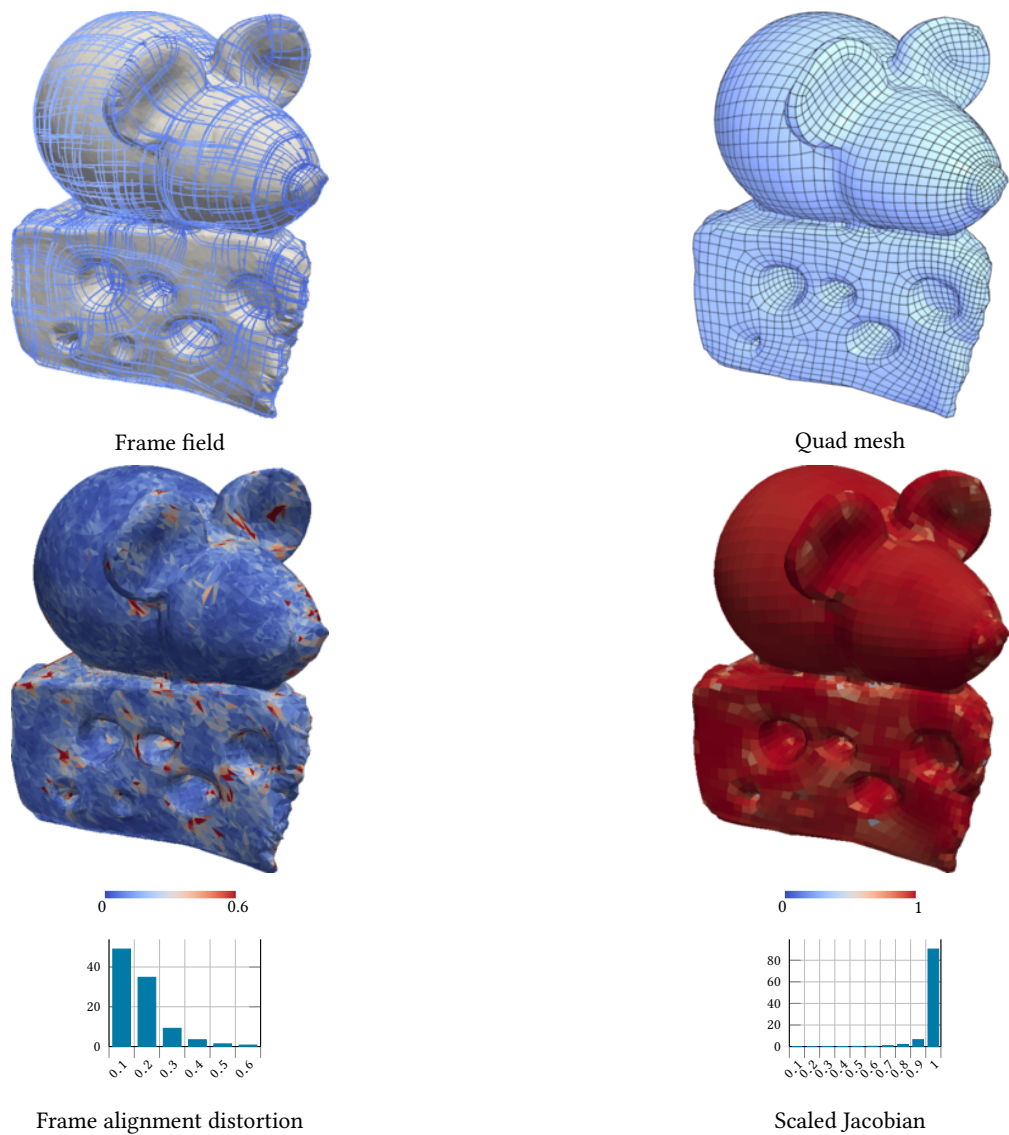
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
mouse	28708	6167(6263)	0.9575(0.9337)	209	323(528)	0.1225	0.1418	13.84	14.7	-

Fig. 94. Model: mouse

Frame field

Quad mesh

0   0.6

0   1

Frame alignment distortion

Scaled Jacobian
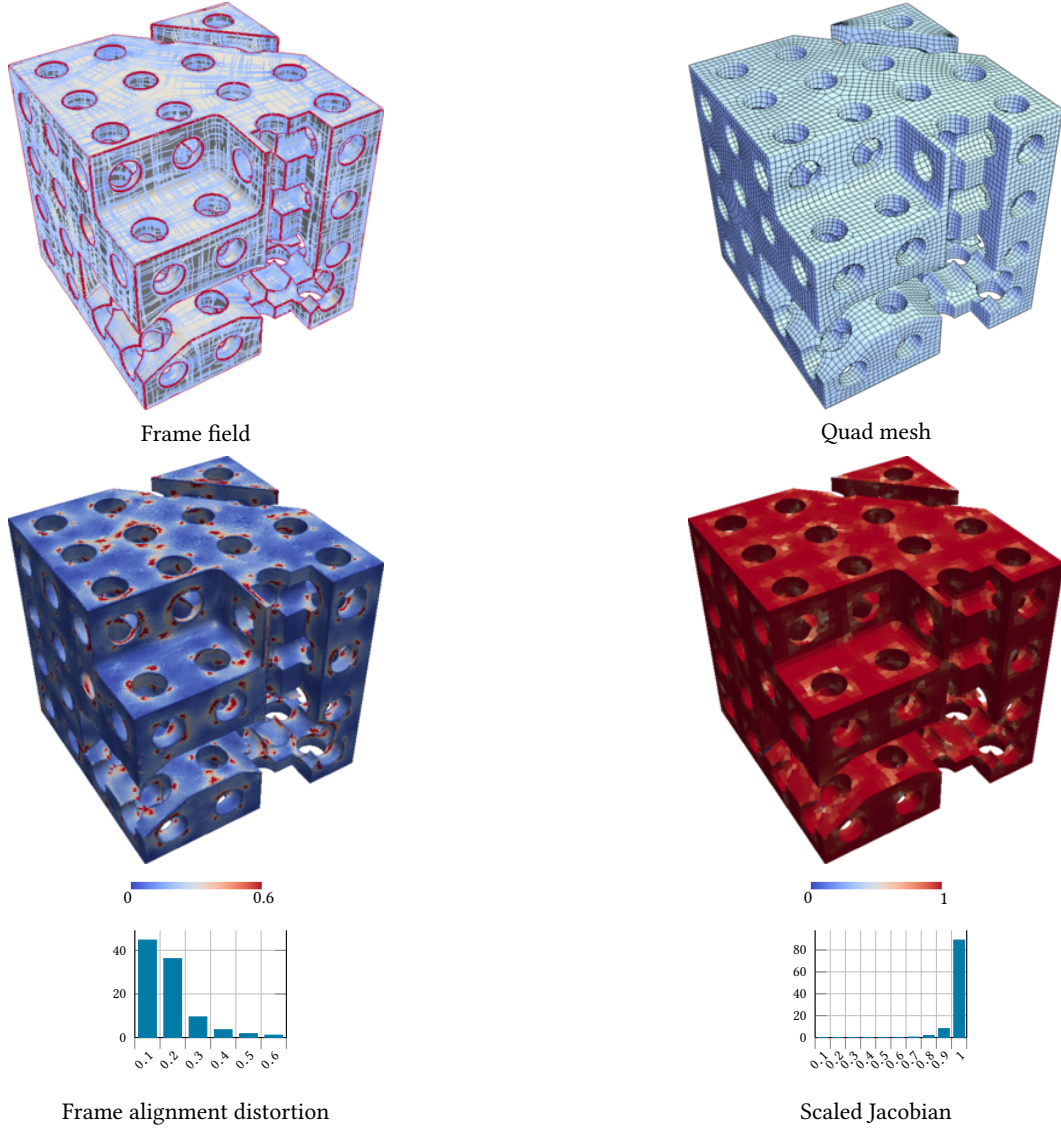
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
nasty-cheese	389972	34291(34456)	0.9644(0.9543)	2270	2472(2833)	0.1516	0.1713	15.89	156.4	0.3195

Fig. 95. Model: nasty_cheese

Frame field

Quad mesh

0   0.6

Frame alignment distortion

0   1

Scaled Jacobian
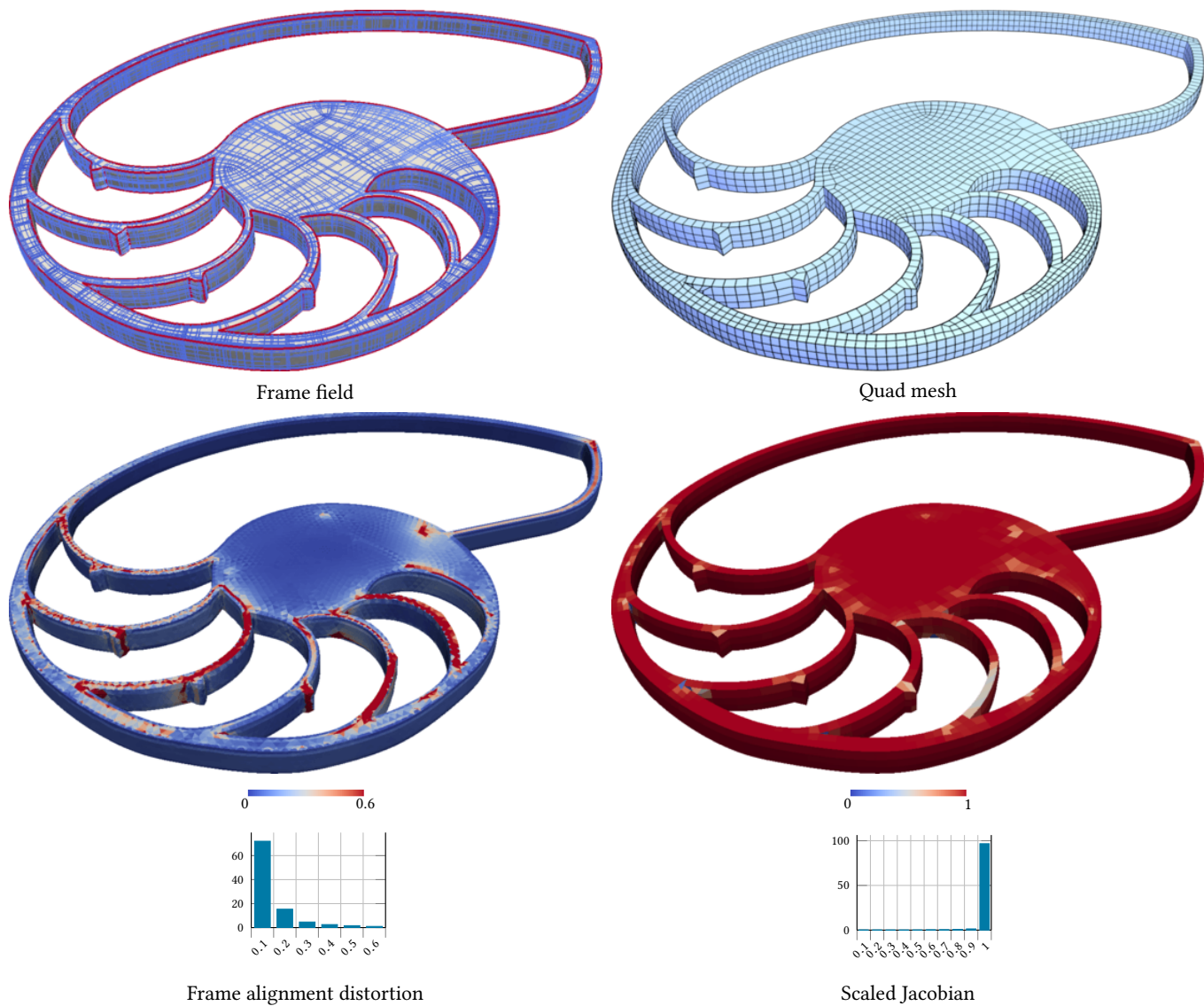
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
nautilus-20k-closed	50438	4952(4972)	0.9829(0.9757)	74	155(196)	0.1181	0.1264	4.554	17.02	0.2545

Fig. 96. Model: nautilus-20k-closed

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
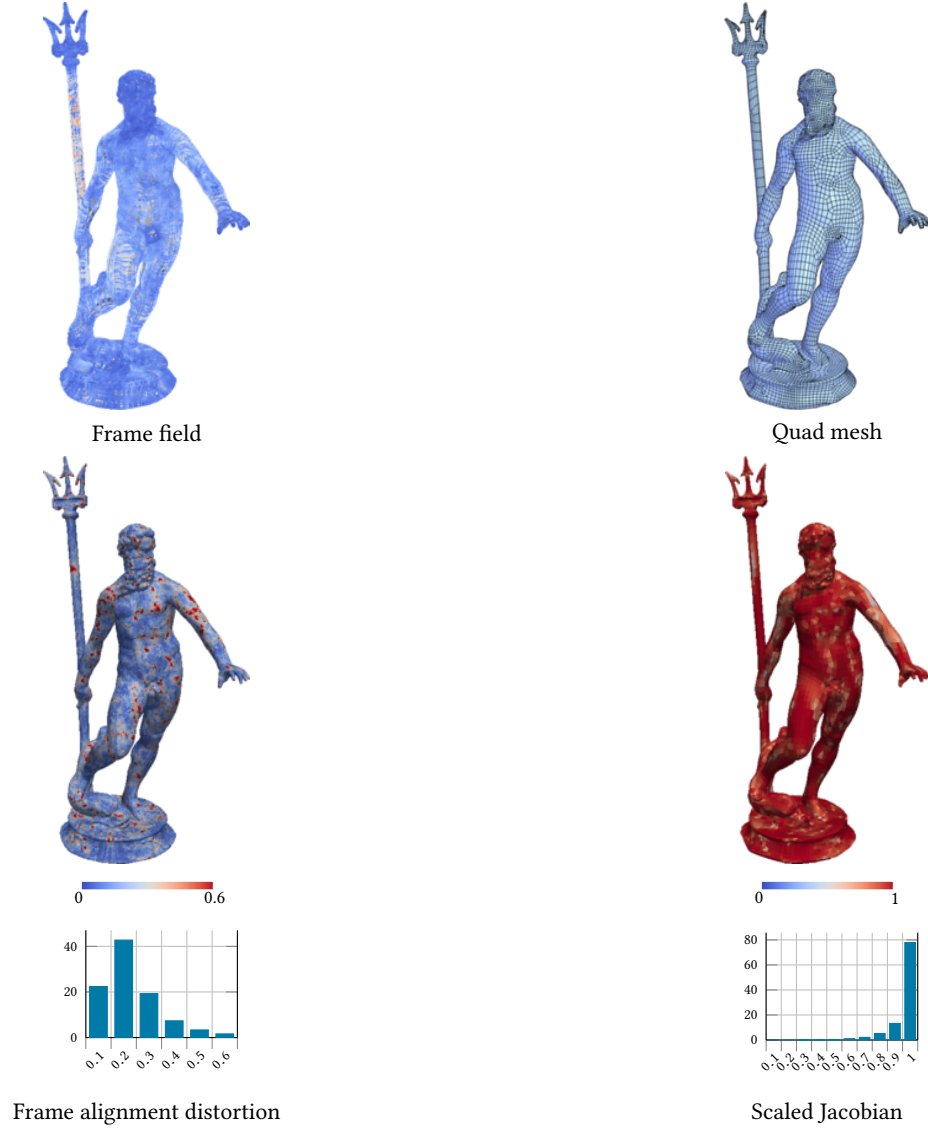
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
neptune0	105030	9532(9660)	0.931(0.9106)	896	1197(1436)	0.1808	0.2103	27.61	48.14	-

Fig. 97. Model: neptune0

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
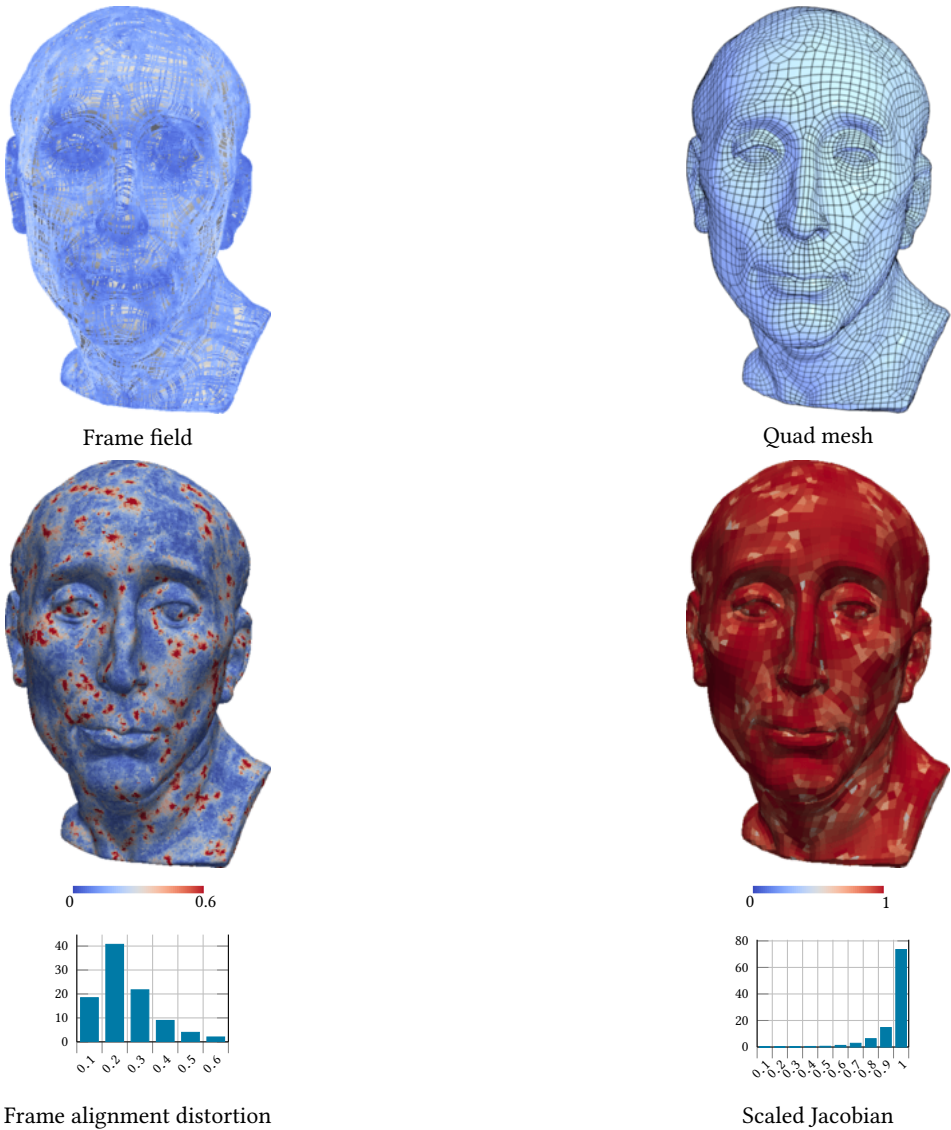
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
nicolo-da-uzzano	100444	5271(5365)	0.9118(0.8821)	614	903(1090)	0.2083	0.243	32.52	40.73	0.3828

Fig. 98. Model: nicolo_da_uzzano

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
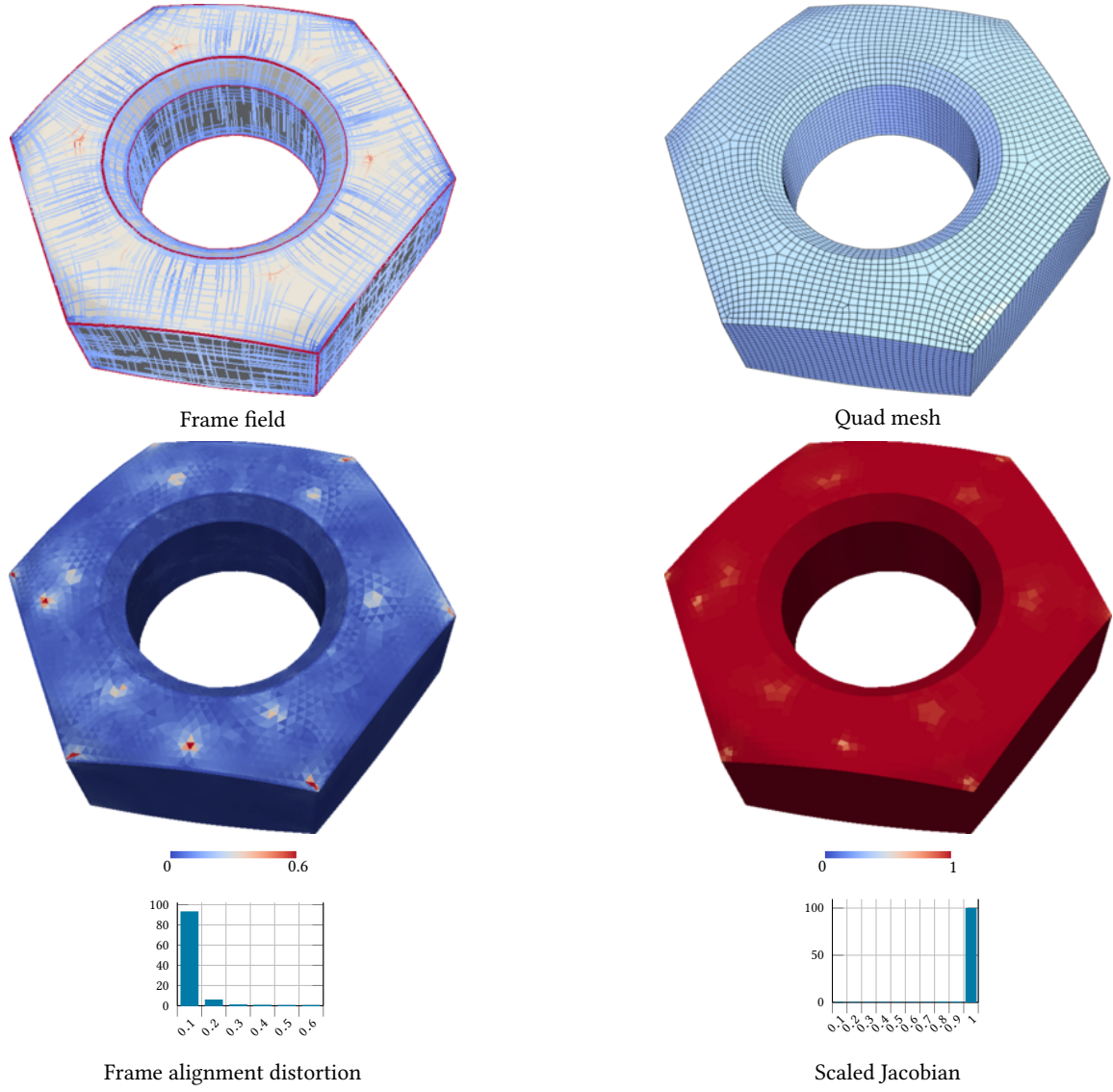
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
nut-refine-tet-surf	48486	11598(11604)	0.9974(0.9965)	24	62(76)	0.04129	0.04528	1.792	16.25	0.04748

Fig. 99. Model: nut_refine_tet_surf

Frame field

Quad mesh

0   0.6

Frame alignment distortion

0   1

Scaled Jacobian
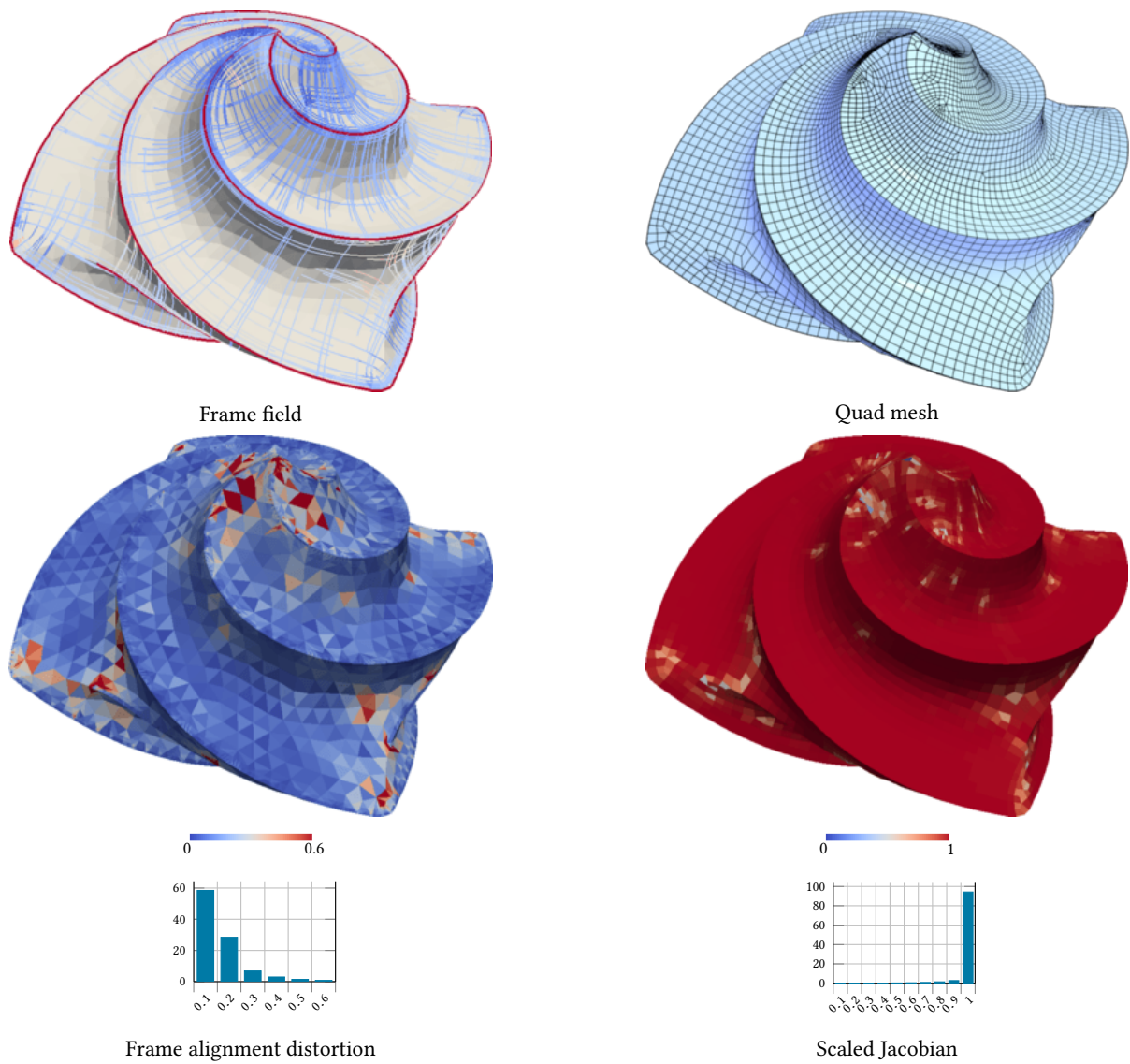
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
octa-flower-Lp	30282	8237(8340)	0.9782(0.9573)	24	392(616)	0.1083	0.1214	10.98	14.98	0.1659

Fig. 100. Model: octa_flower_Lp

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
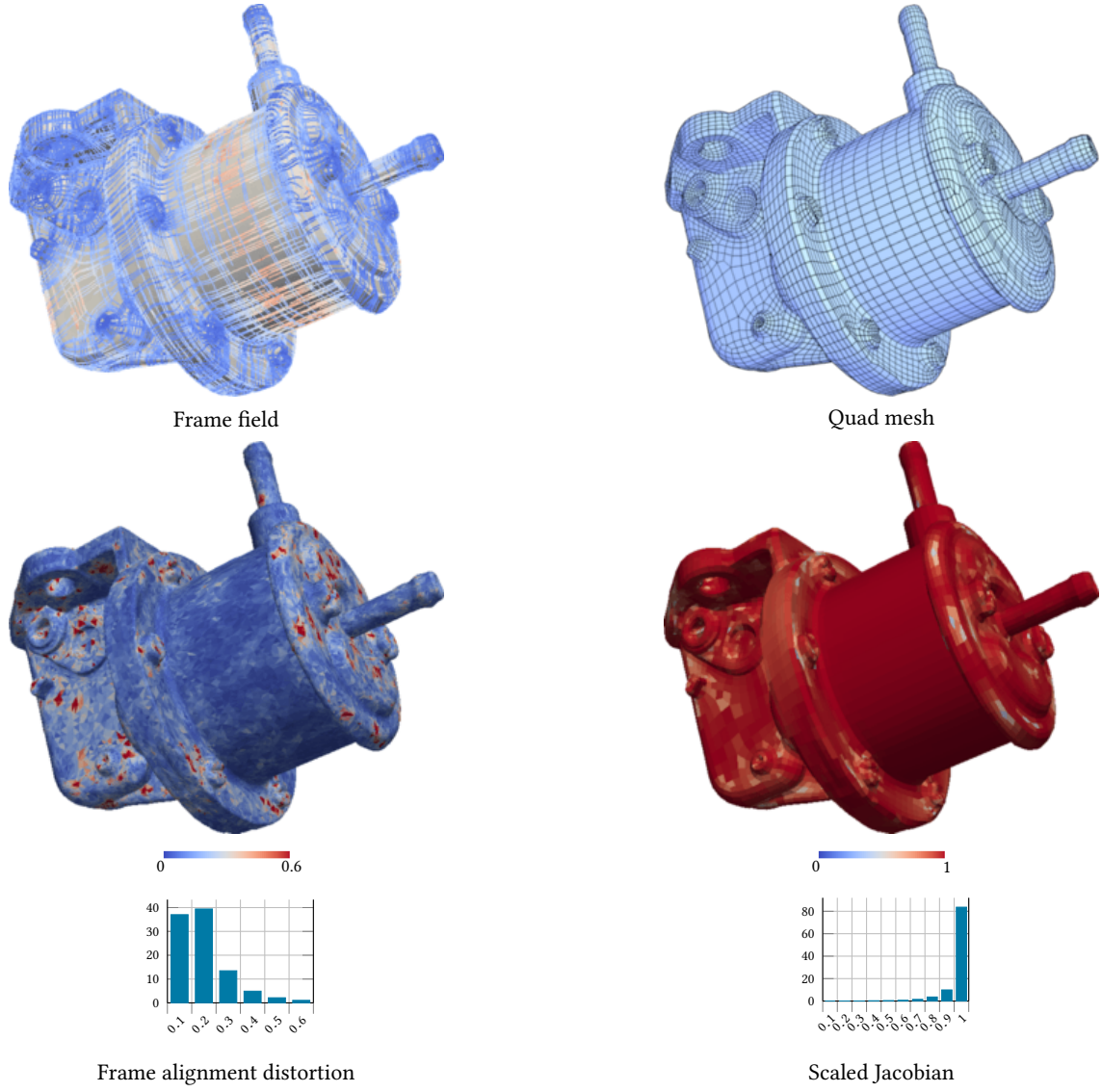
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
oil-pump100K	100000	11923(12112)	0.9442(0.9184)	691	991(1396)	0.1429	0.1666	16.3	50	-

Fig. 101. Model: oil_pump100K

Frame field

Quad mesh

0   0.6

0   1

Frame alignment distortion

Scaled Jacobian
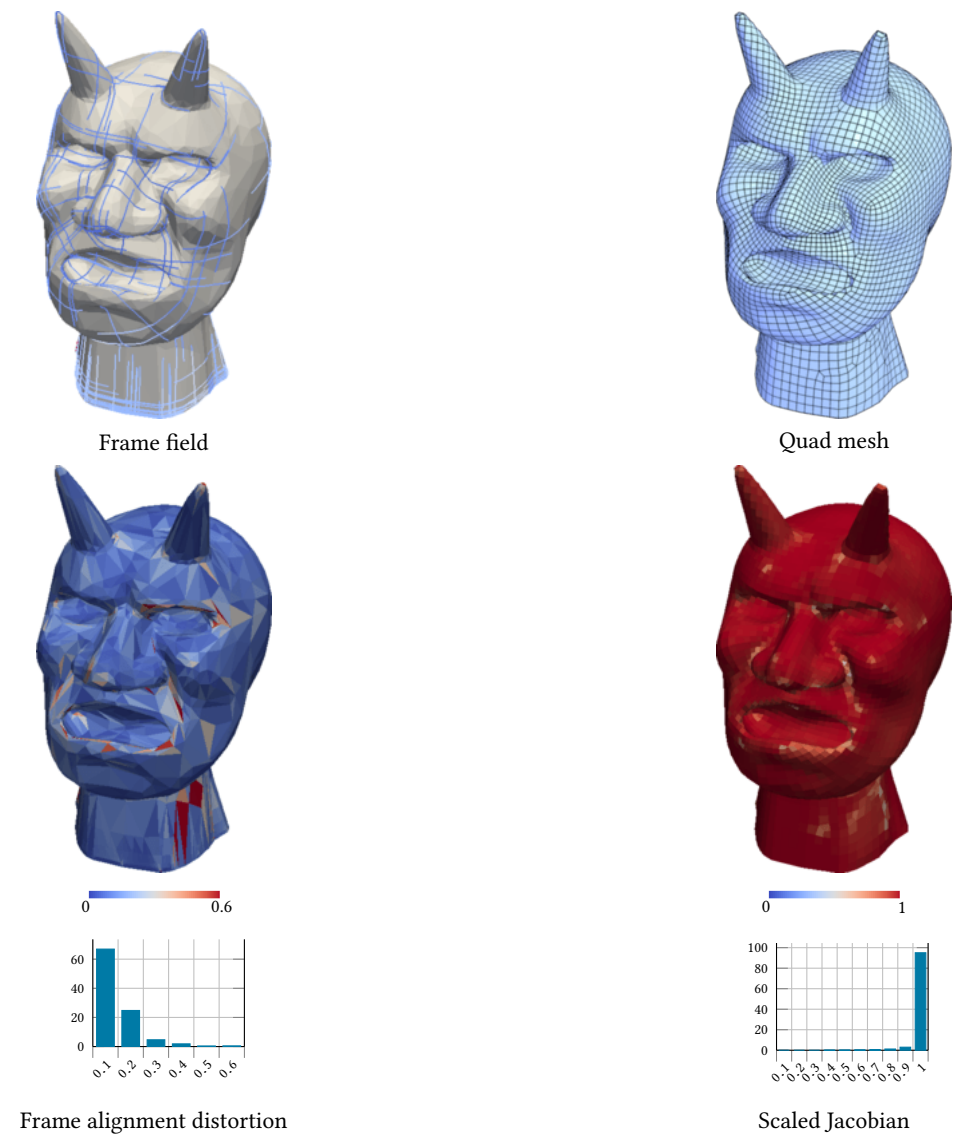
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
oni	4872	4908(4968)	0.9768(0.9573)	44	154(303)	0.09083	0.1008	9.161	5.35	0.198

Fig. 102. Model: oni

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
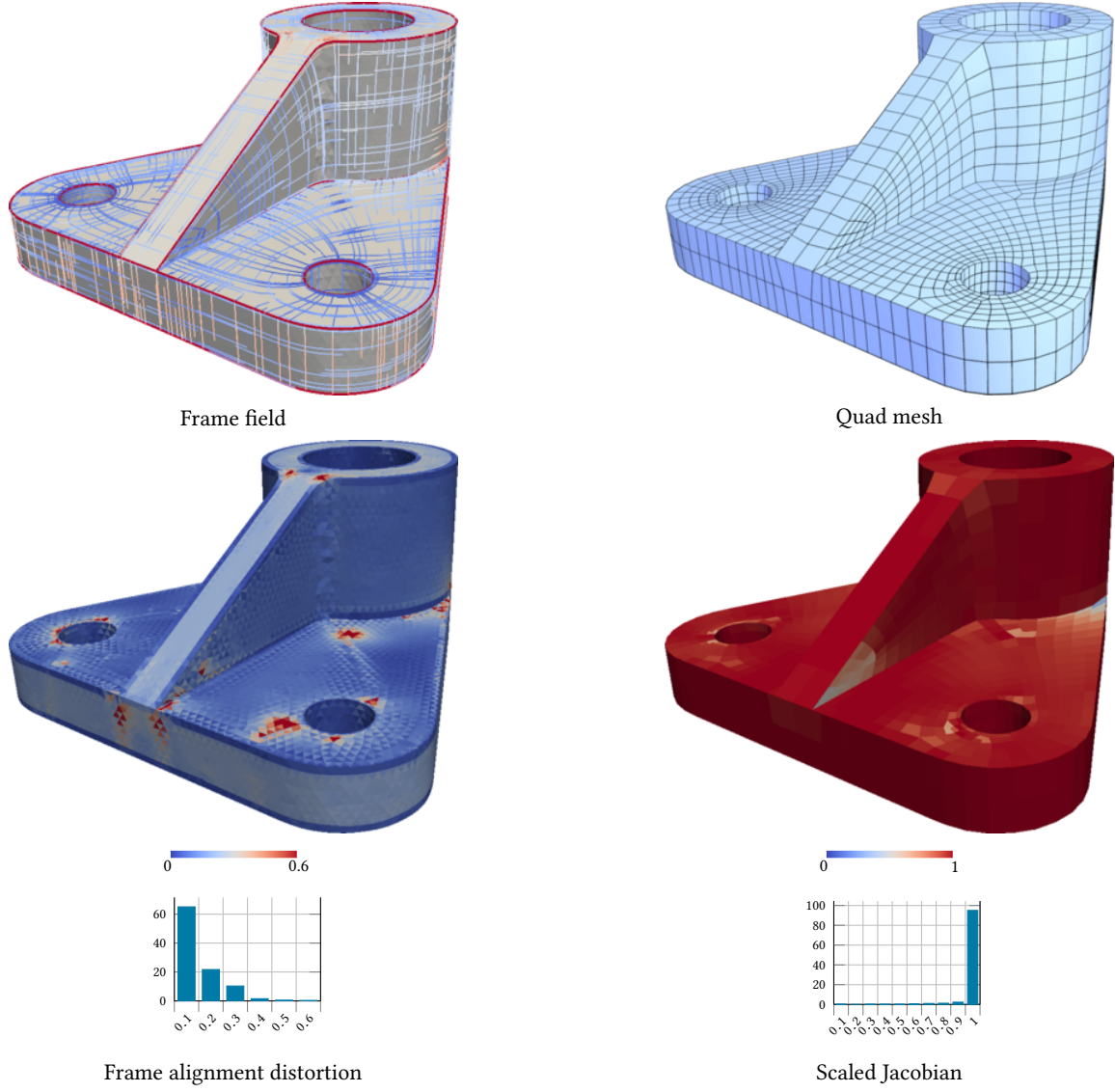
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
part20k	26118	2470(2475)	0.976(0.9726)	20	44(53)	0.09406	0.104	3.904	7.62	0.5526

Fig. 103. Model: part20k

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
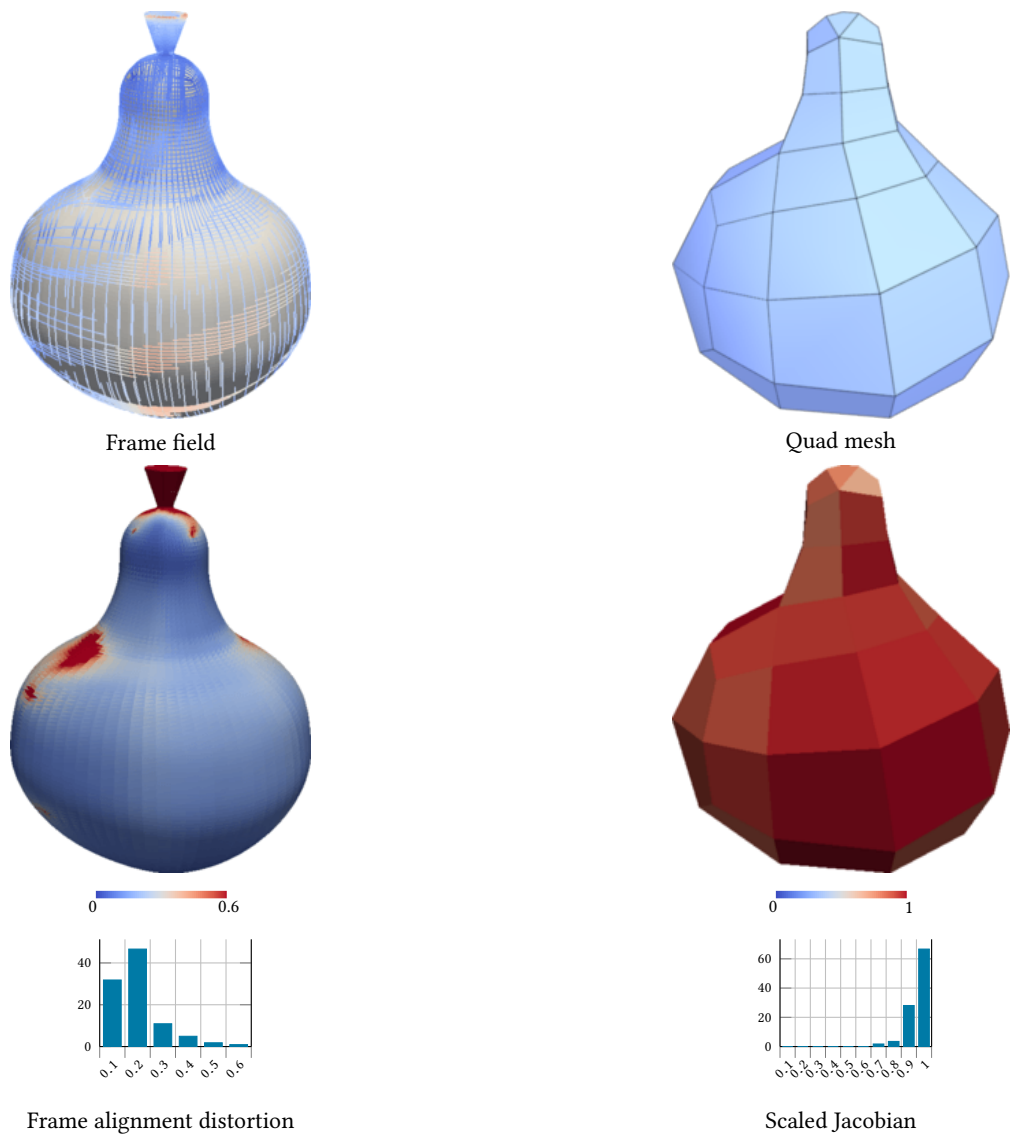
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
pear	21504	57(60)	0.9243(0.8711)	22	16(18)	0.3851	0.4181	43.5	8.03	-

Fig. 104. Model: pear
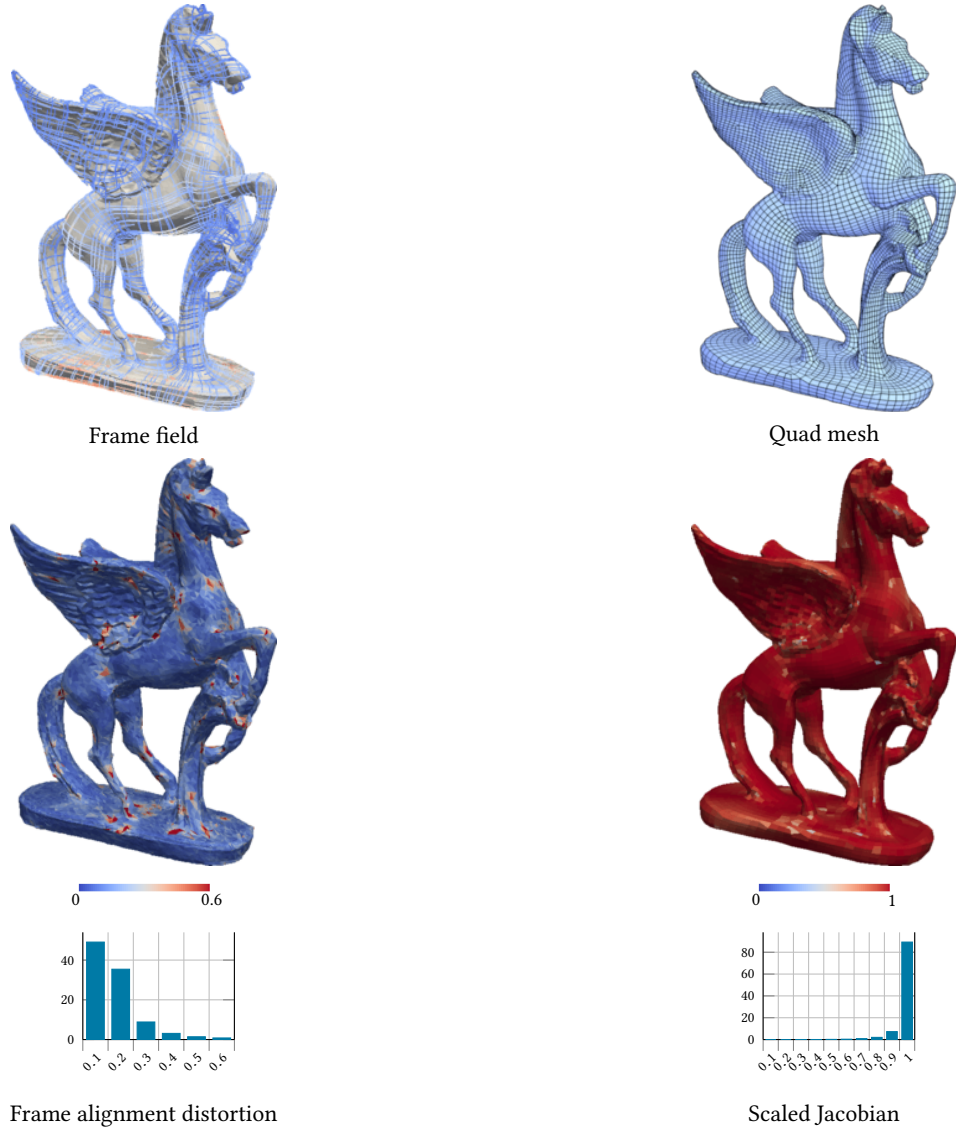
Frame field

Quad mesh

0   0.6

0   1

Frame alignment distortion

Scaled Jacobian

Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
pegaso	30658	10827(10994)	0.9568(0.9327)	359	581(930)	0.1196	0.1373	14.14	20.18	–

Fig. 105. Model: pegaso

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
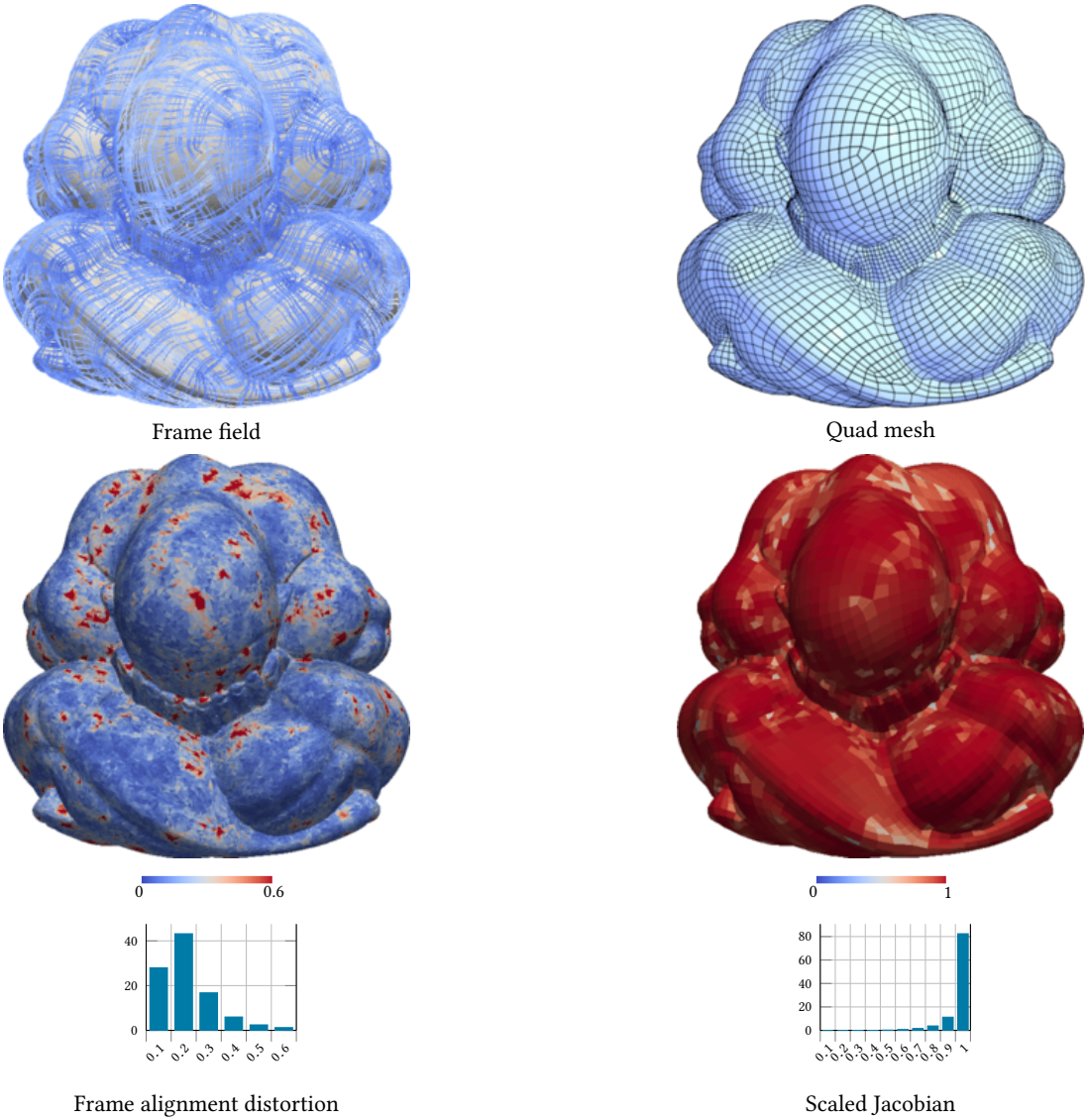
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
pensatore	100000	8353(8474)	0.9406(0.9177)	505	844(1082)	0.1597	0.1875	19.85	39.21	-

Fig. 106. Model: pensatore

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
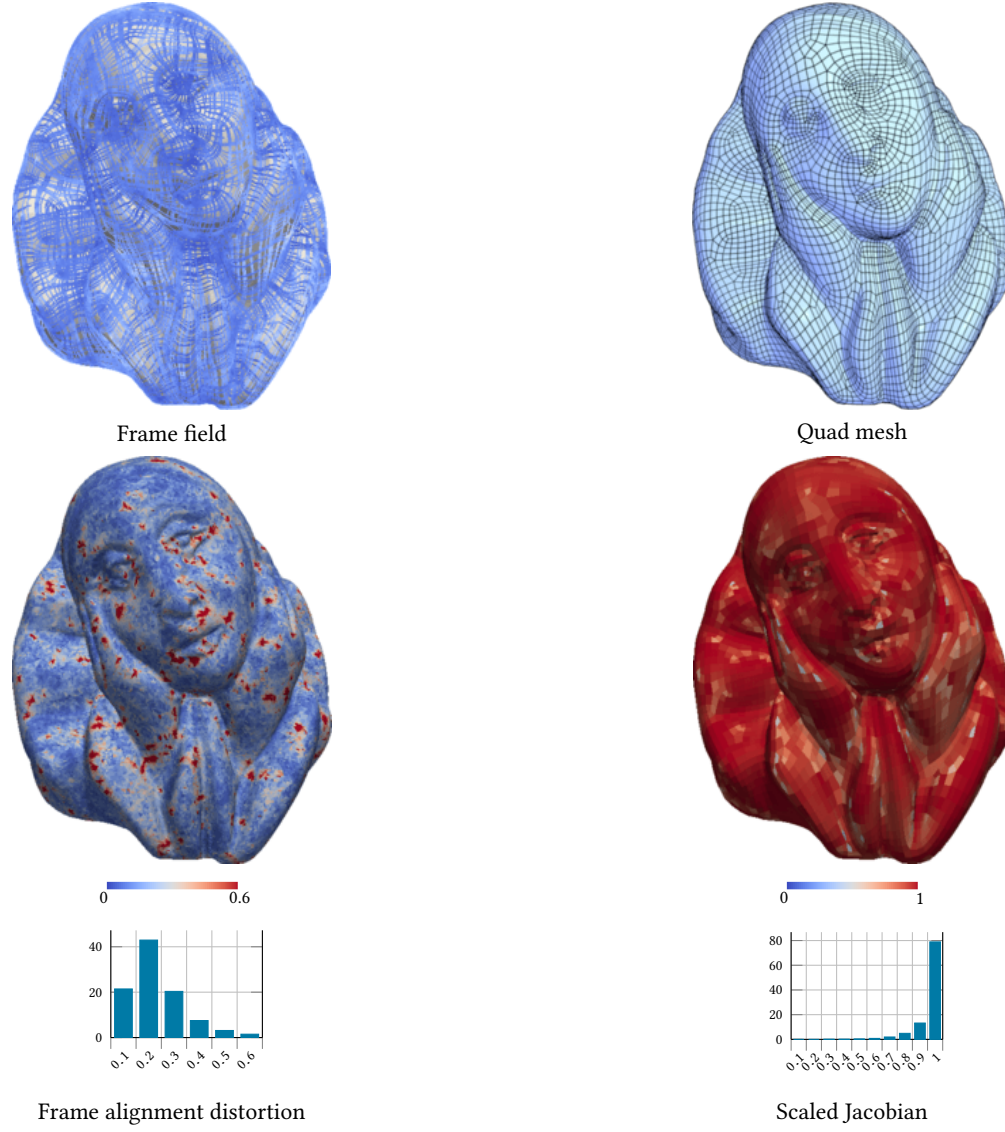
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
pierrot100k	99970	7509(7621)	0.9326(0.9099)	548	885(1079)	0.1834	0.2143	26.07	38.91	-

Fig. 107. Model: pierrot100k

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
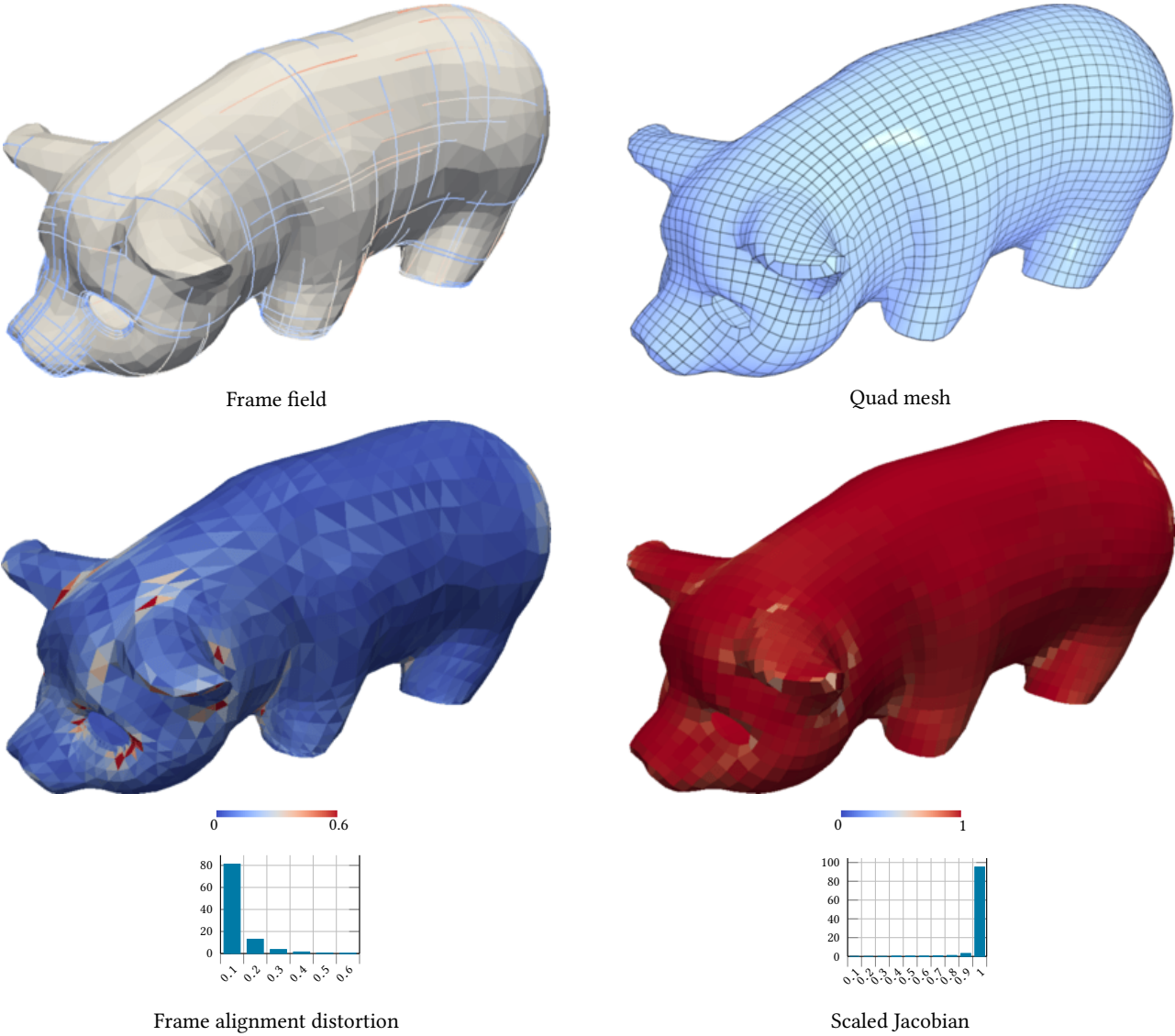
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
pig	4963	3047(3071)	0.9747(0.9632)	40	77(128)	0.06625	0.07449	8.298	3.4	0.2629

Fig. 108. Model: pig

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
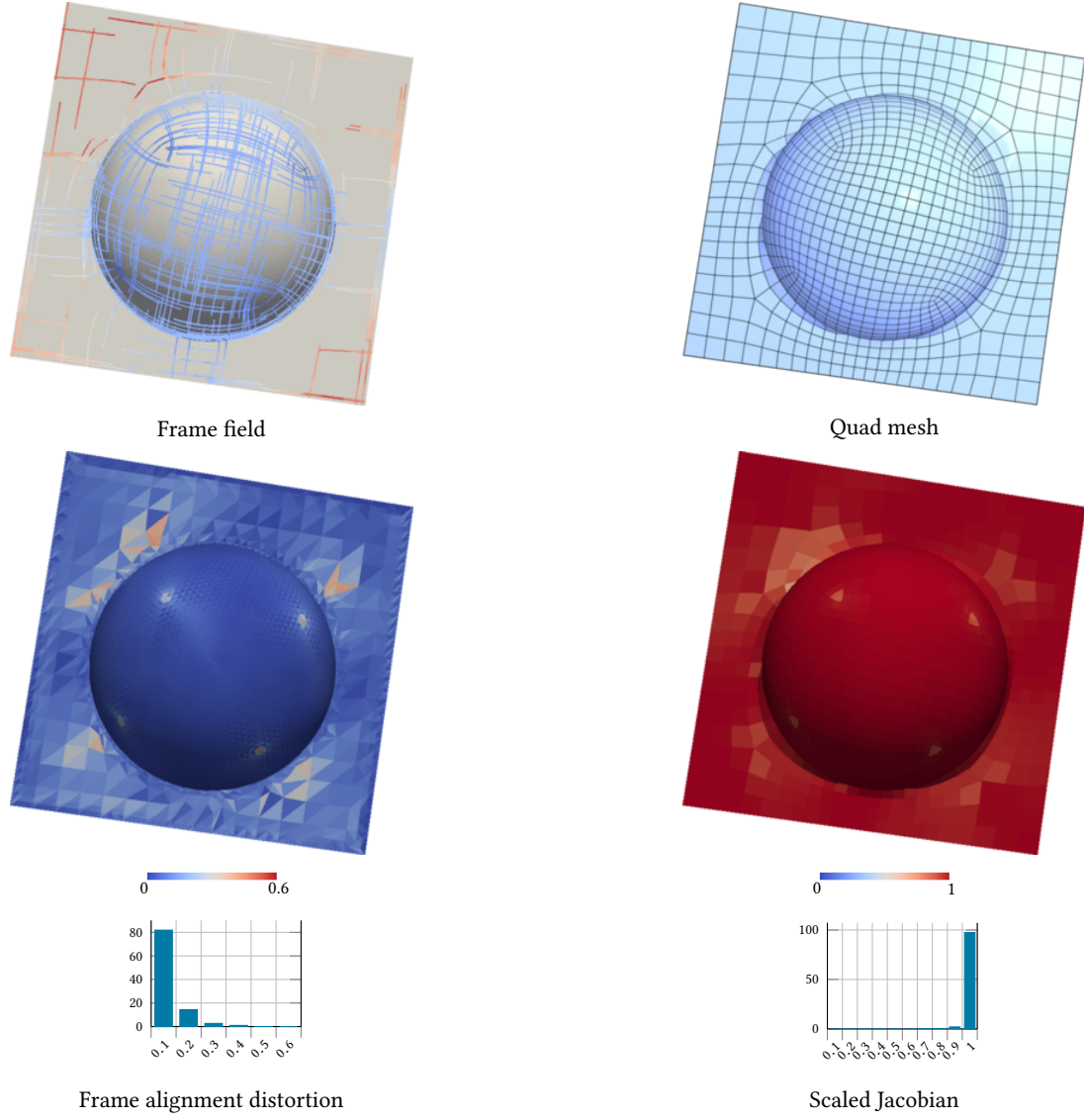
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
plane-sphere	7842	1038(1039)	0.9894(0.9875)	10	14(17)	0.05808	0.06364	6.209	2.39	7.842e-15

Fig. 109. Model: plane-sphere

Frame field

Quad mesh

0   0.6

Frame alignment distortion

0   1

Scaled Jacobian
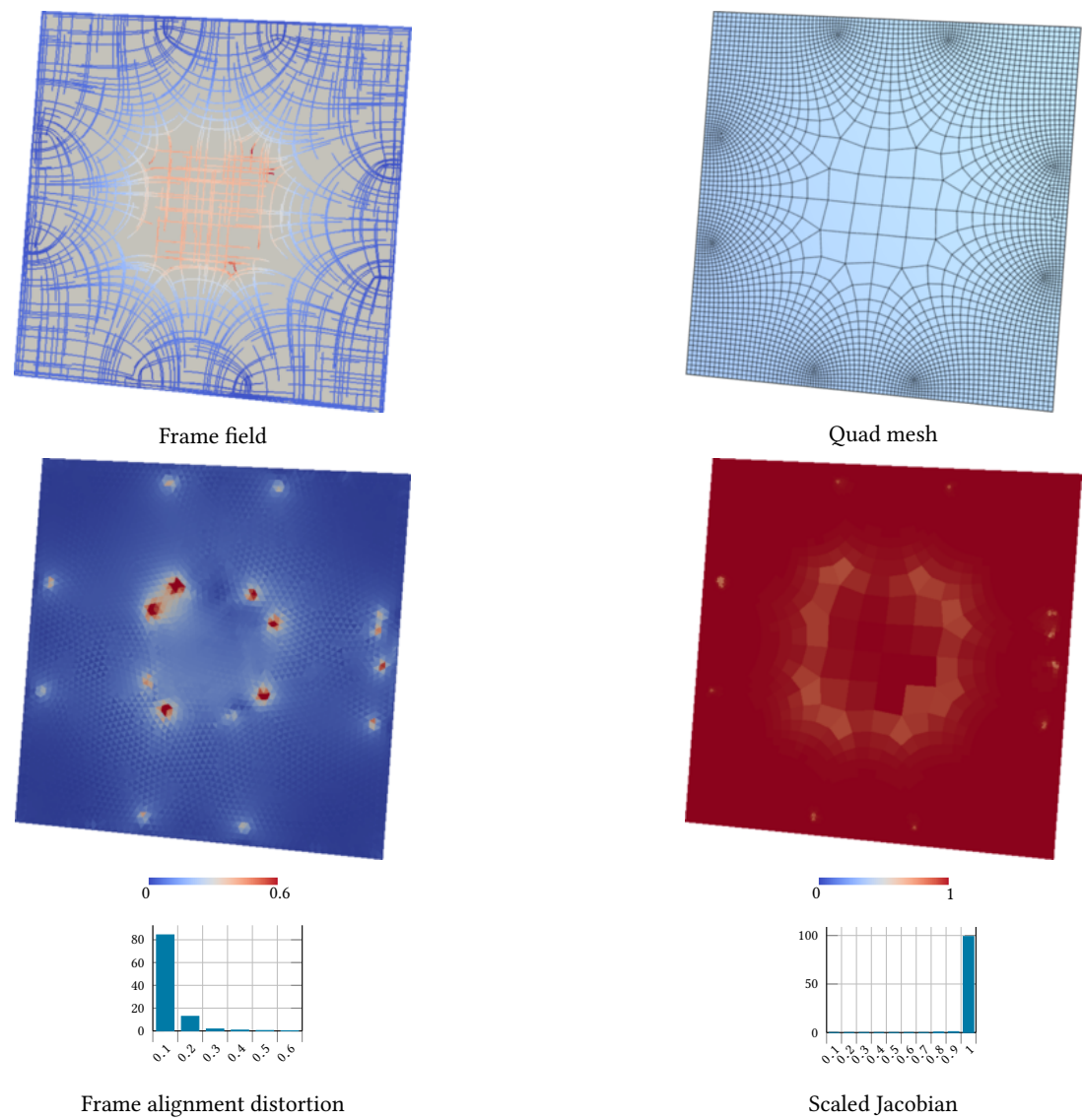
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
plane-re	12359	4158(4162)	0.9956(0.9938)	16	35(41)	0.05406	0.0607	7.047	4.53	2.355e-14

Fig. 110. Model: plane_re

Frame field

Quad mesh

0   0.6

0   1

Frame alignment distortion

Scaled Jacobian
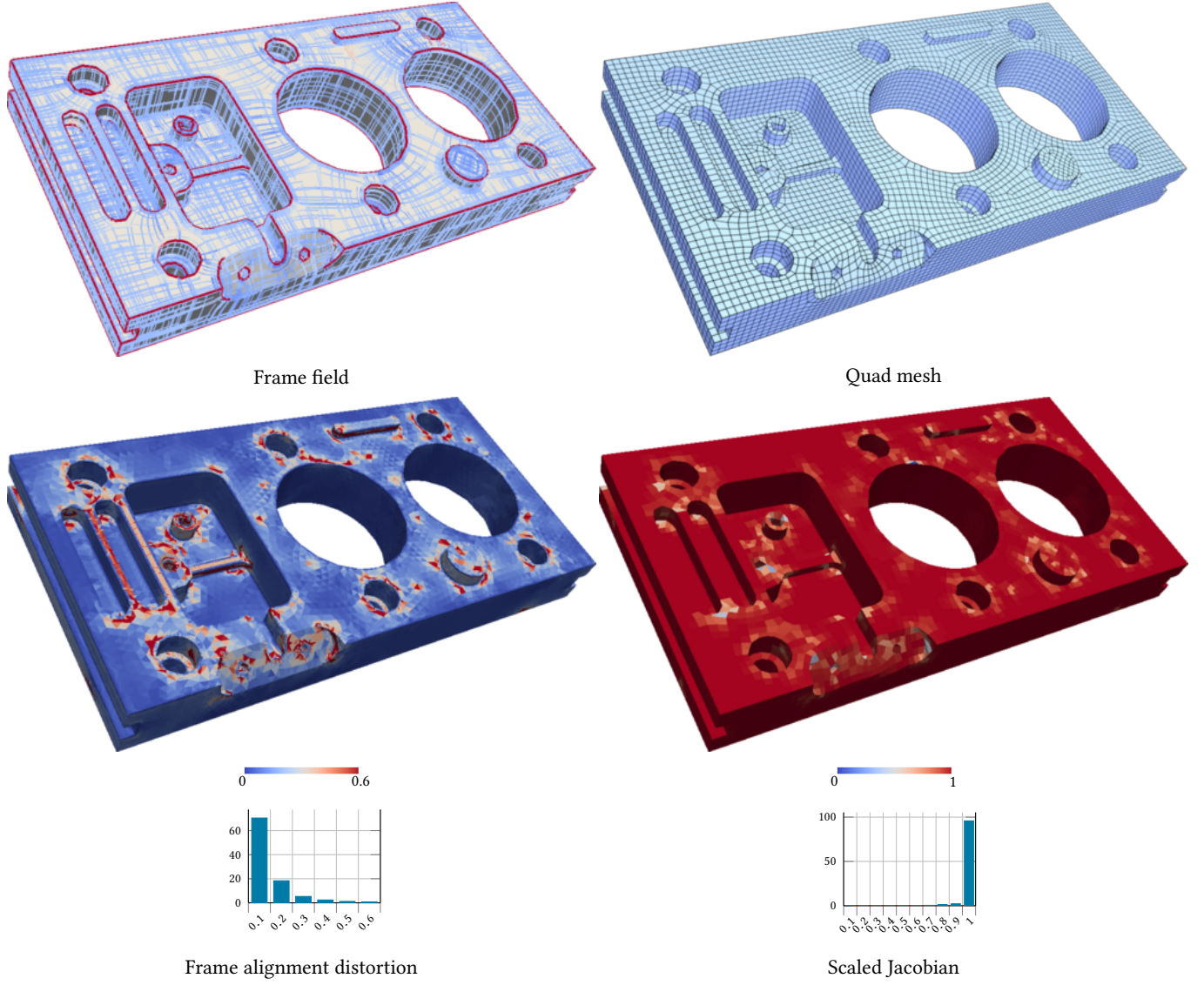
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
plate-Lp	91380	12551(12626)	0.984(0.9738)	207	482(632)	0.09276	0.1038	8.28	32.95	0.7287

Fig. 111.   Model: plate_Lp

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
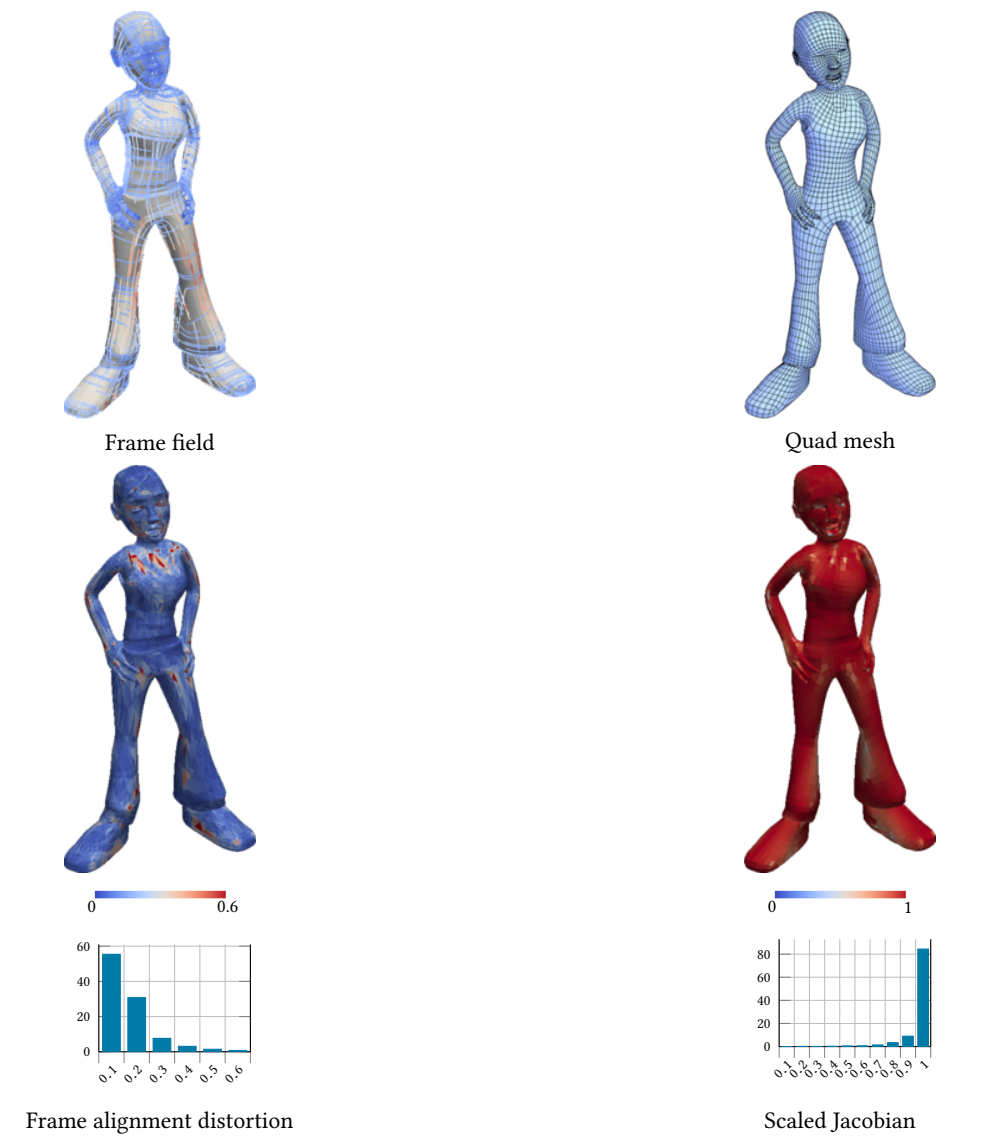
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
polygirl	19902	7365(7472)	0.943(0.9211)	167	341(571)	0.1109	0.1265	11.27	13.13	0.3094

Fig. 112. Model: polygirl

Frame field

Quad mesh

0   0.6

0   1

Frame alignment distortion

Scaled Jacobian
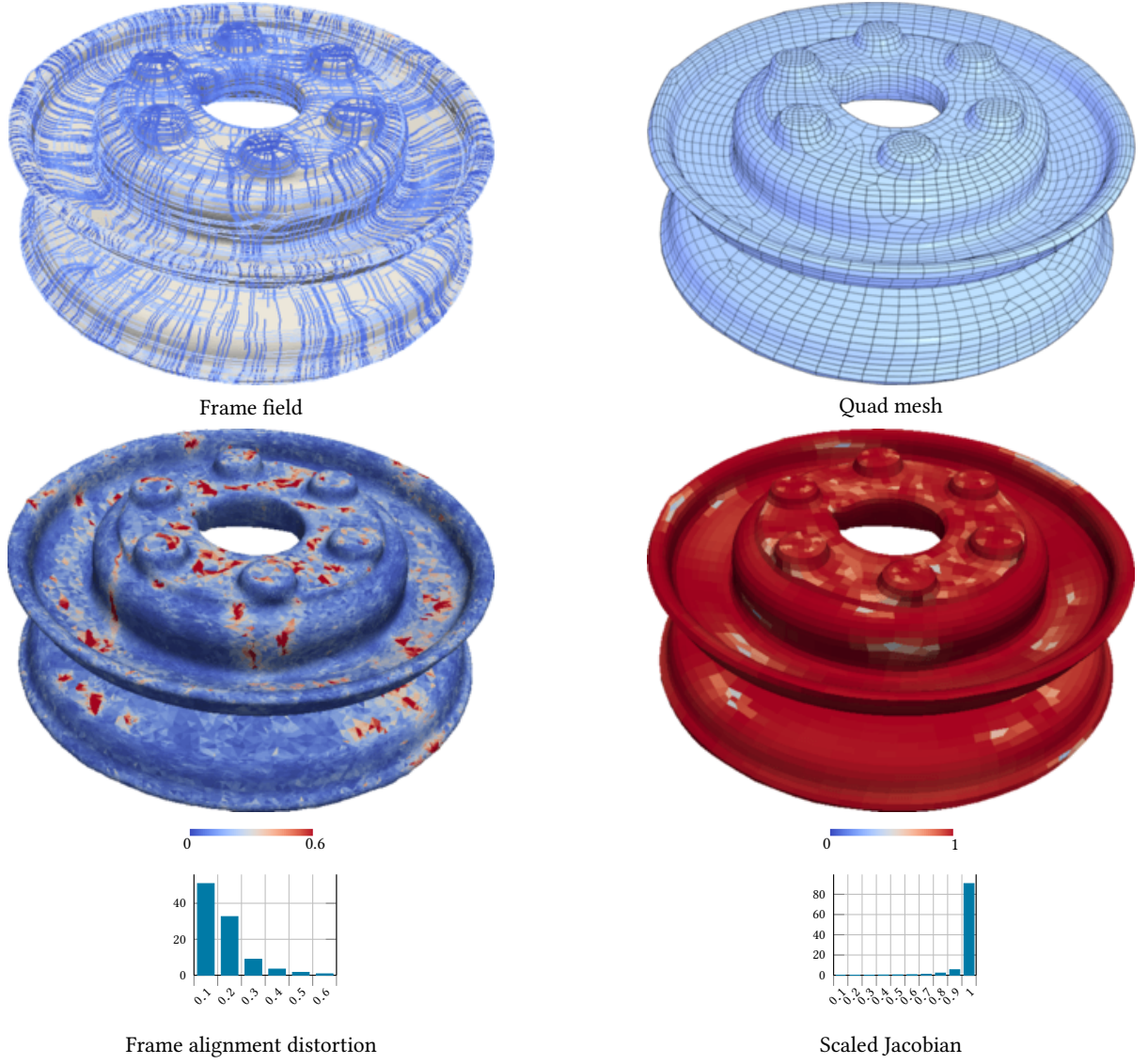
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
pulley100K	100000	8282(8361)	0.9631(0.9478)	228	394(559)	0.1225	0.1427	10.59	33.47	-

Fig. 113. Model: pulley100K

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
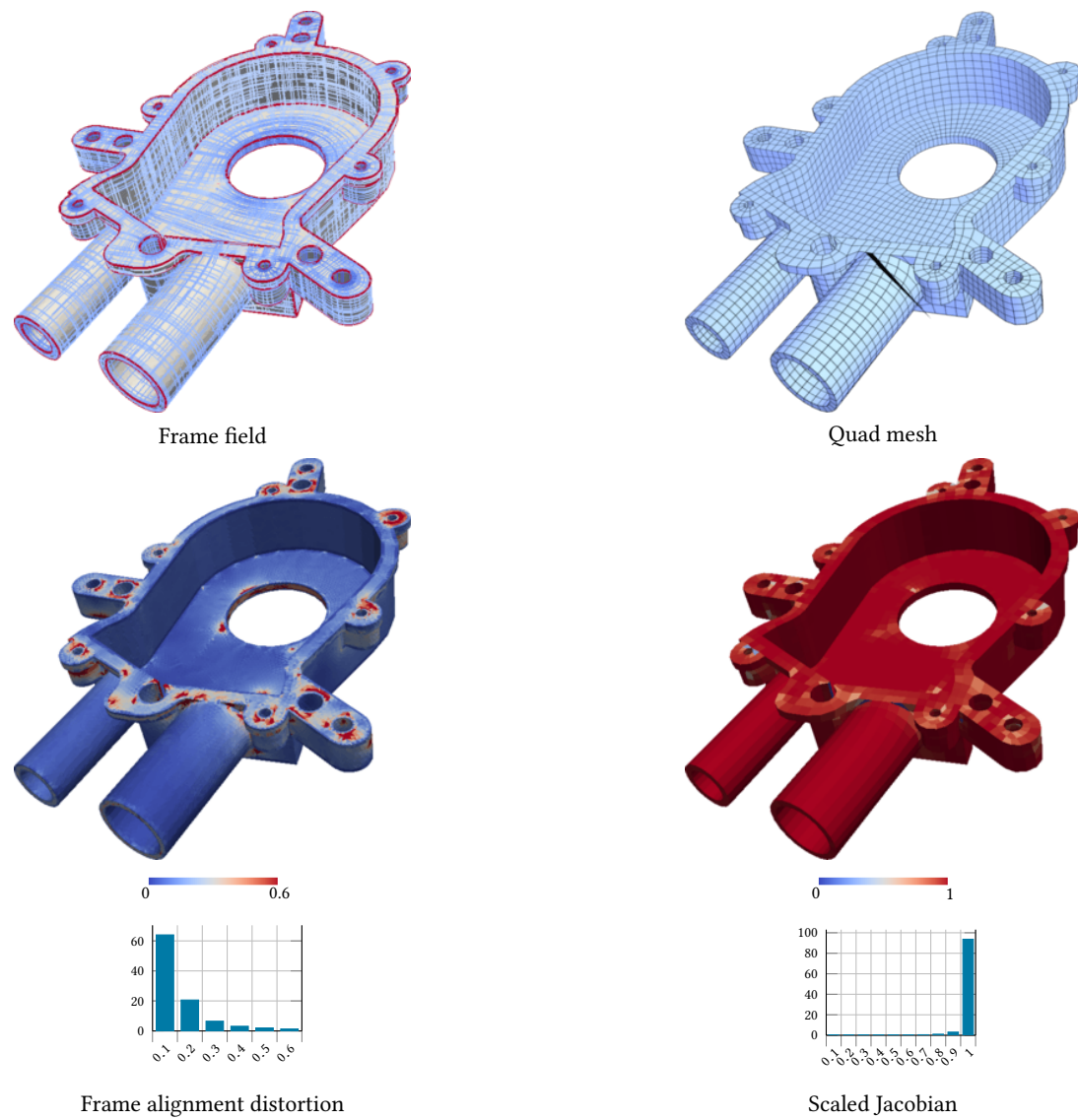
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
pump-2	83796	6956(6994)	0.9673(0.9589)	221	352(417)	0.1356	0.1461	7.749	28.22	0.2461

Fig. 114. Model: pump_2

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
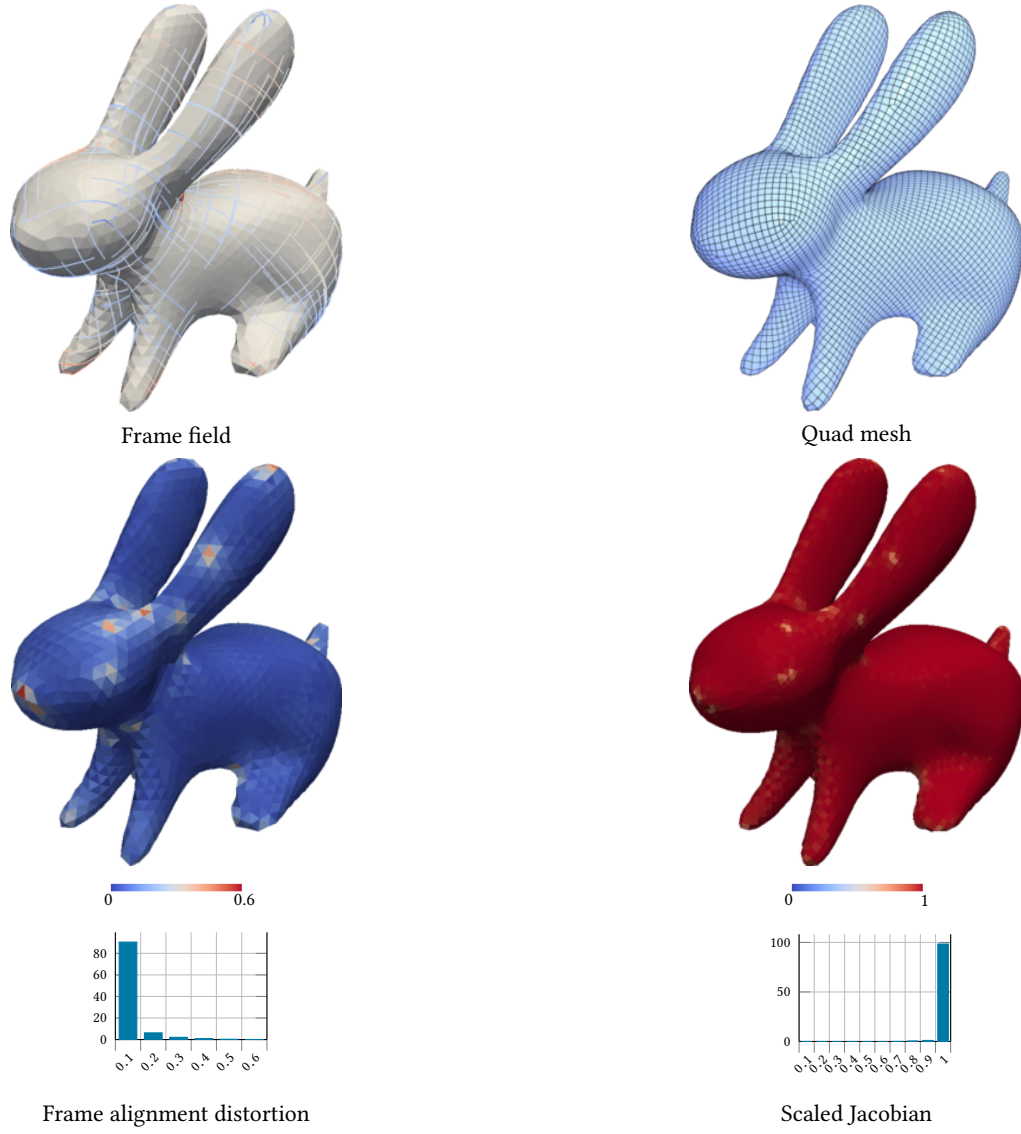
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
rabbit5k	4996	8422(8465)	0.9922(0.9839)	50	107(210)	0.04621	0.05165	6.117	5.05	–

Fig. 115. Model: rabbit5k
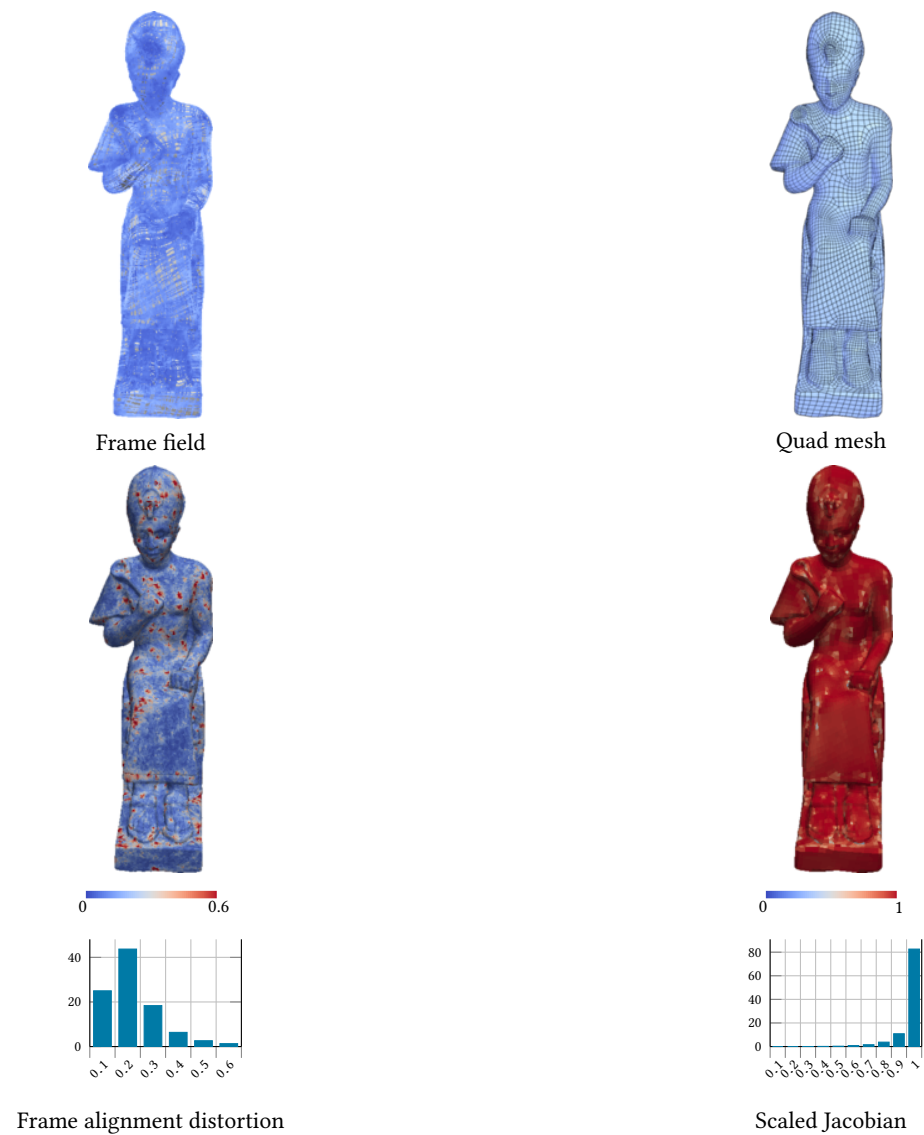
Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian

Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
ramses	100000	7738(7827)	0.9408(0.923)	516	774(939)	0.1675	0.1968	22.54	39.96	–

Fig. 116. Model: ramses

Frame field

Quad mesh

0   0.6

Frame alignment distortion

0   1

Scaled Jacobian
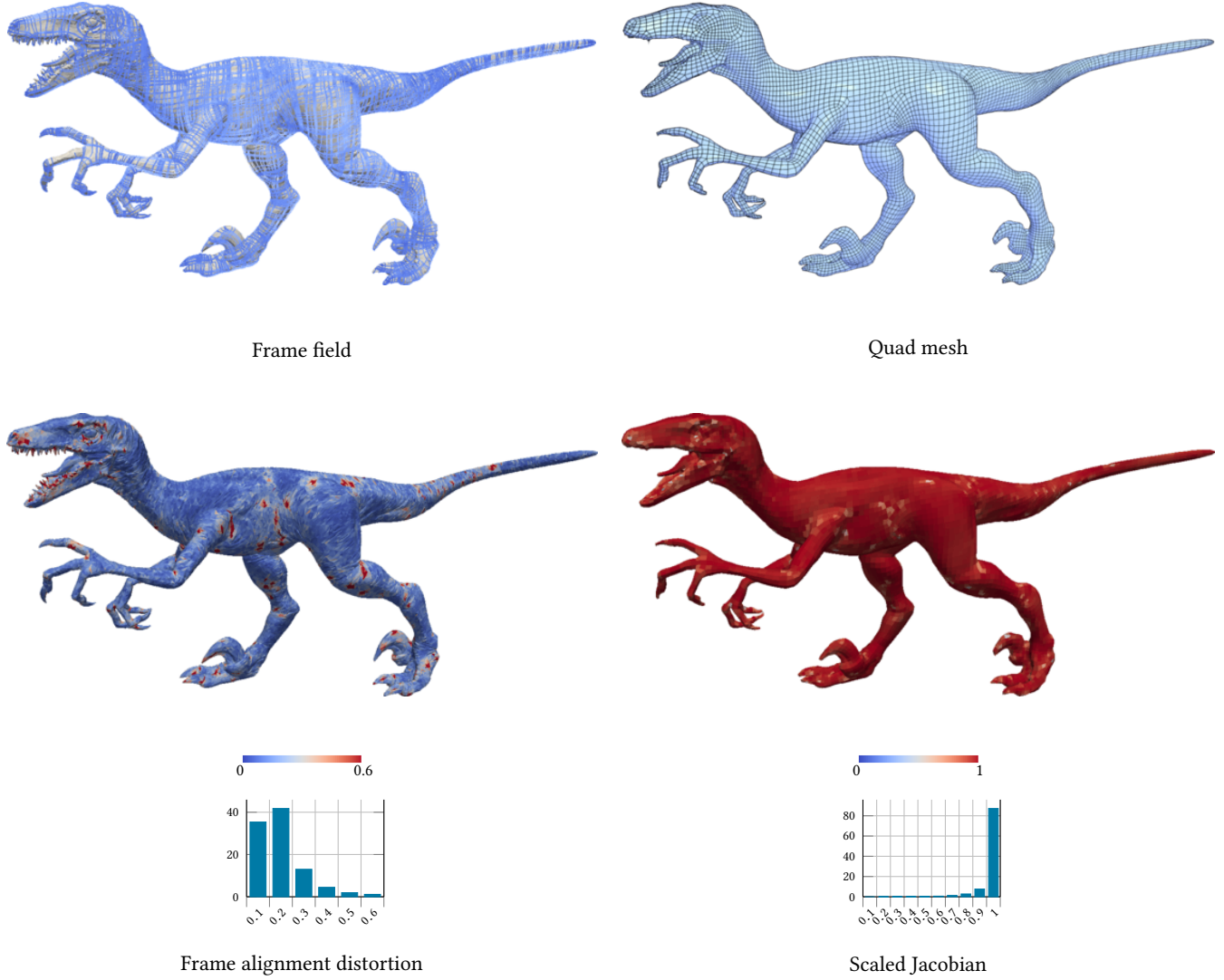
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
raptor50K	46574	9479(9738)	0.9482(0.9145)	726	770(1199)	0.1453	0.1677	16.43	23.39	-

Fig. 117. Model: raptor50K

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
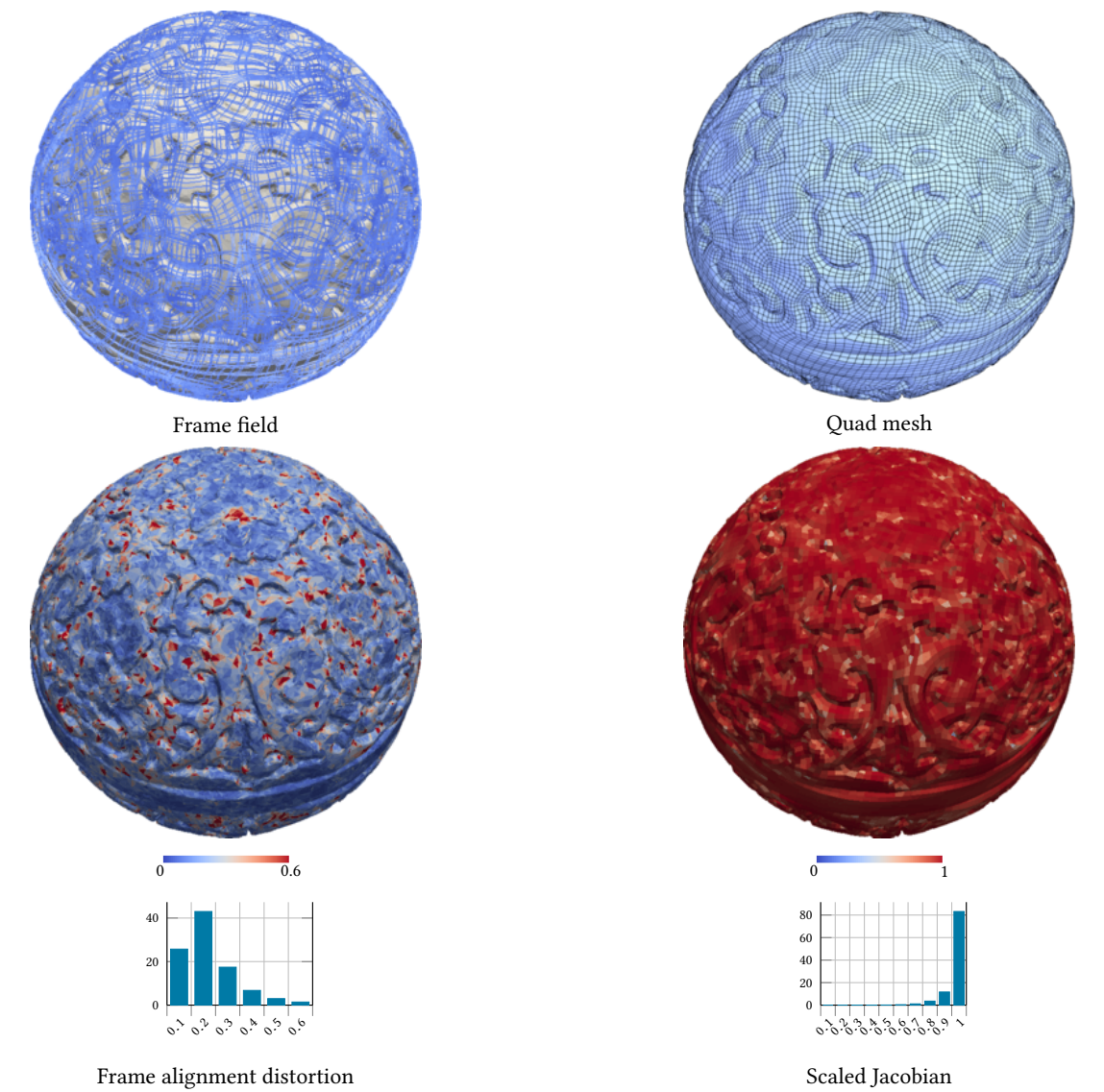
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
red-circular-box100K	100000	24841(25395)	0.9433(0.9072)	1566	2626(3761)	0.1647	0.19	27.1	77.31	-

Fig. 118. Model: red_circular_box100K

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
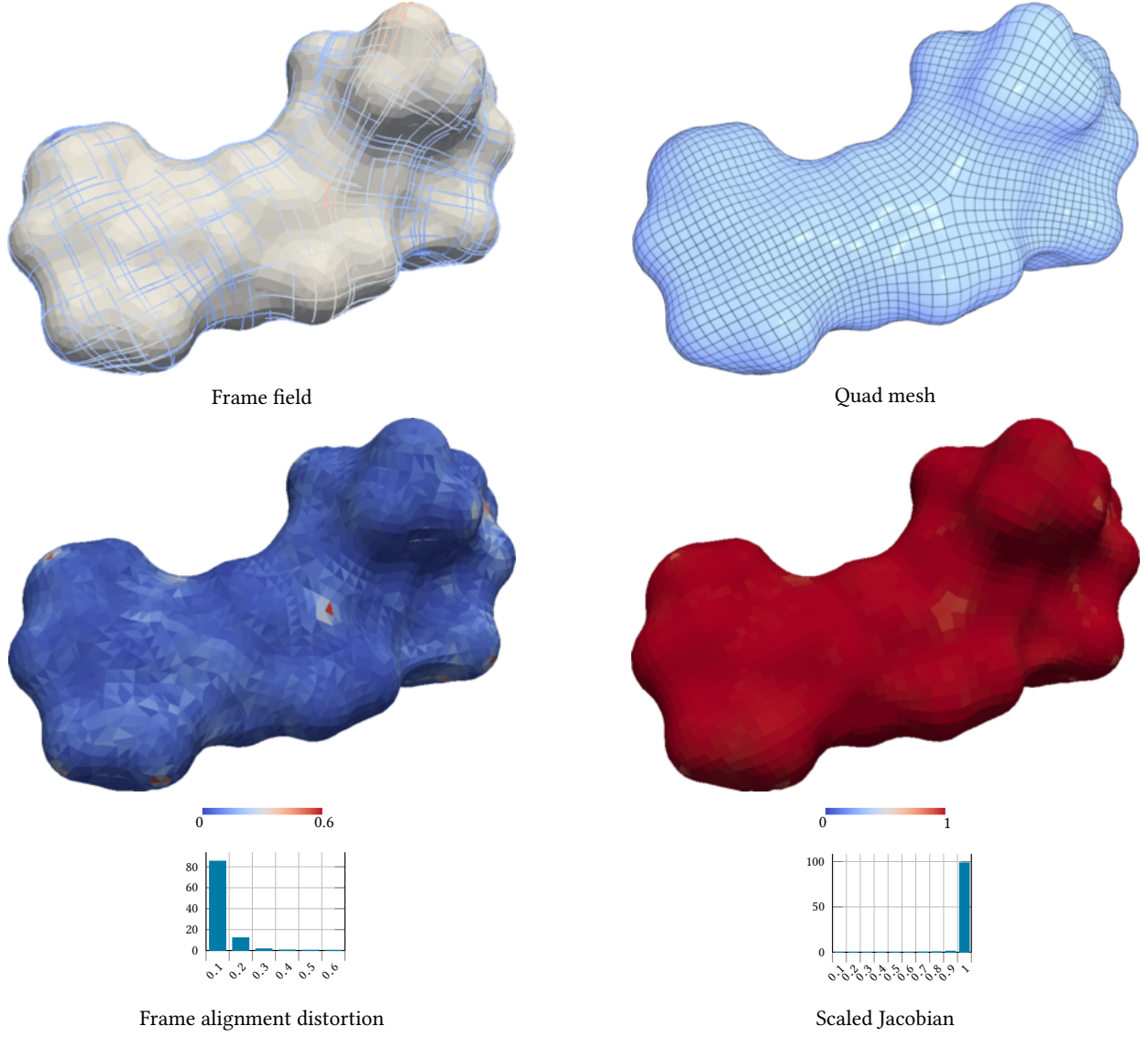
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
retinal	7282	4247(4254)	0.9922(0.989)	18	46(64)	0.06249	0.07086	3.691	3.41	–

Fig. 119. Model: retinal

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
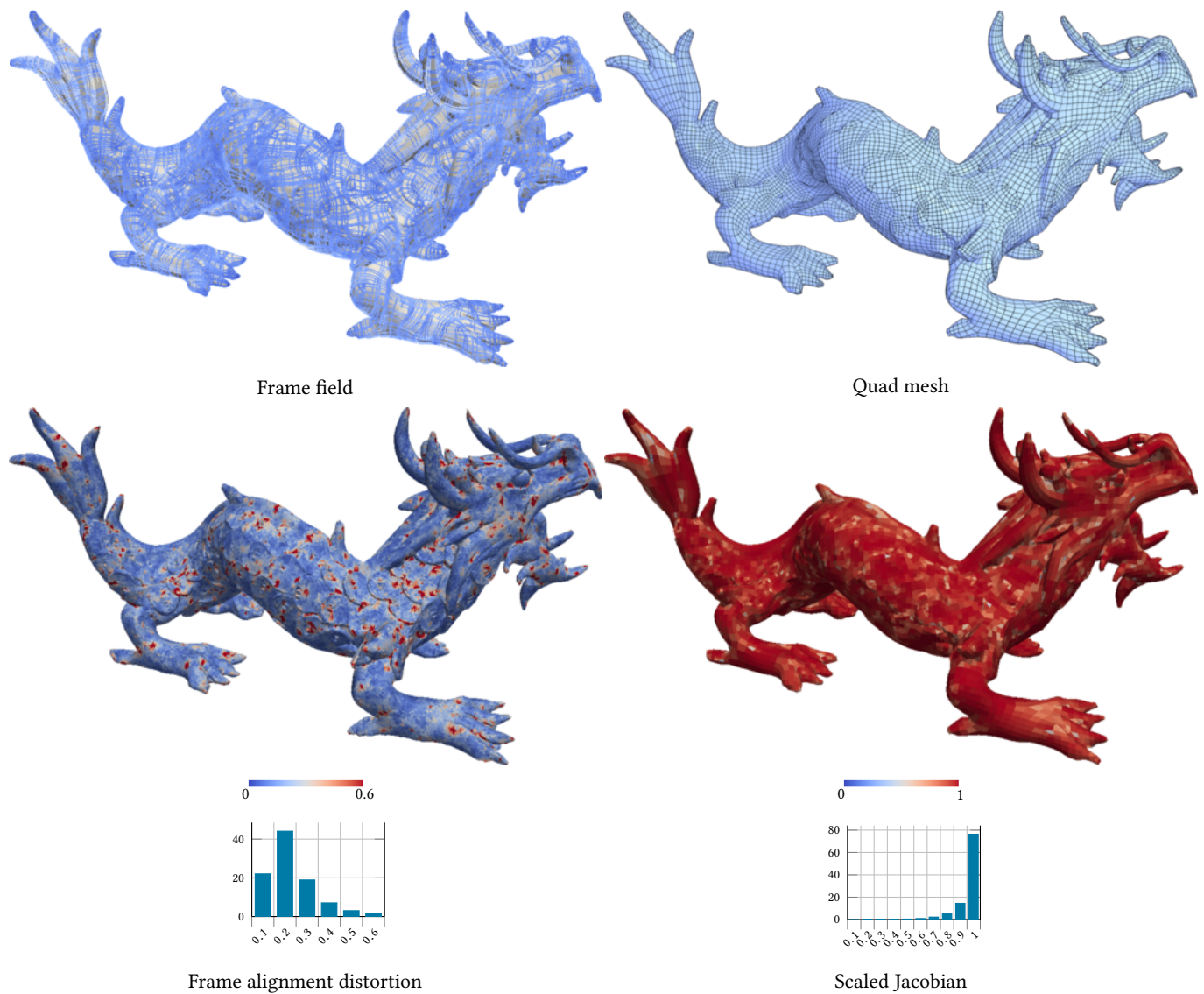
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
rgb-dragon	105022	15624(15984)	0.9262(0.8931)	1996	2180(2876)	0.1771	0.2062	34.06	63.53	-

Fig. 120. Model: rgb_dragon

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
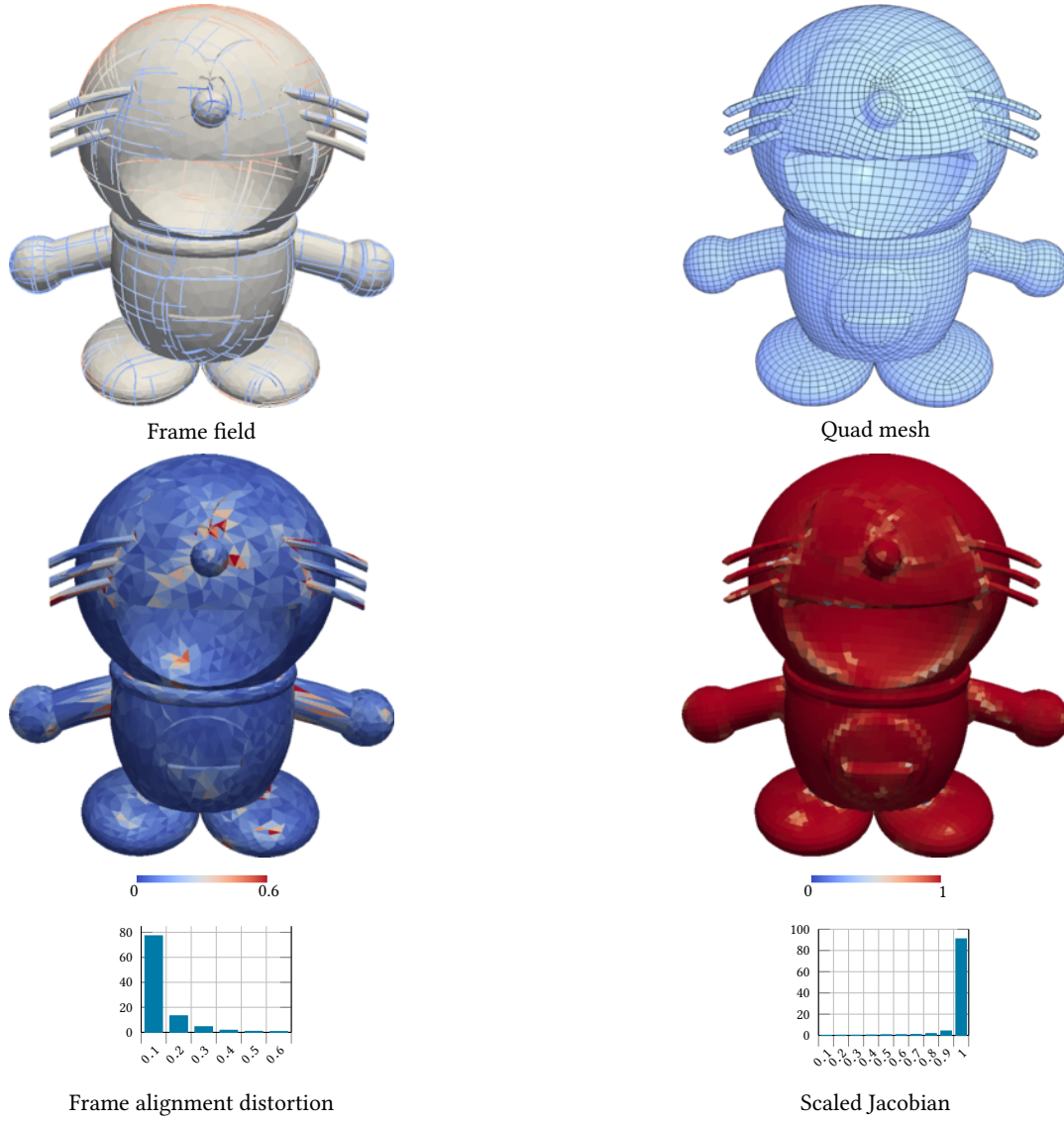
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
robocat-deci	7512	6963(7161)	0.9627(0.9235)	222	379(744)	0.09217	0.1037	12.13	12.91	-

Fig. 121. Model: robocat_deci

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
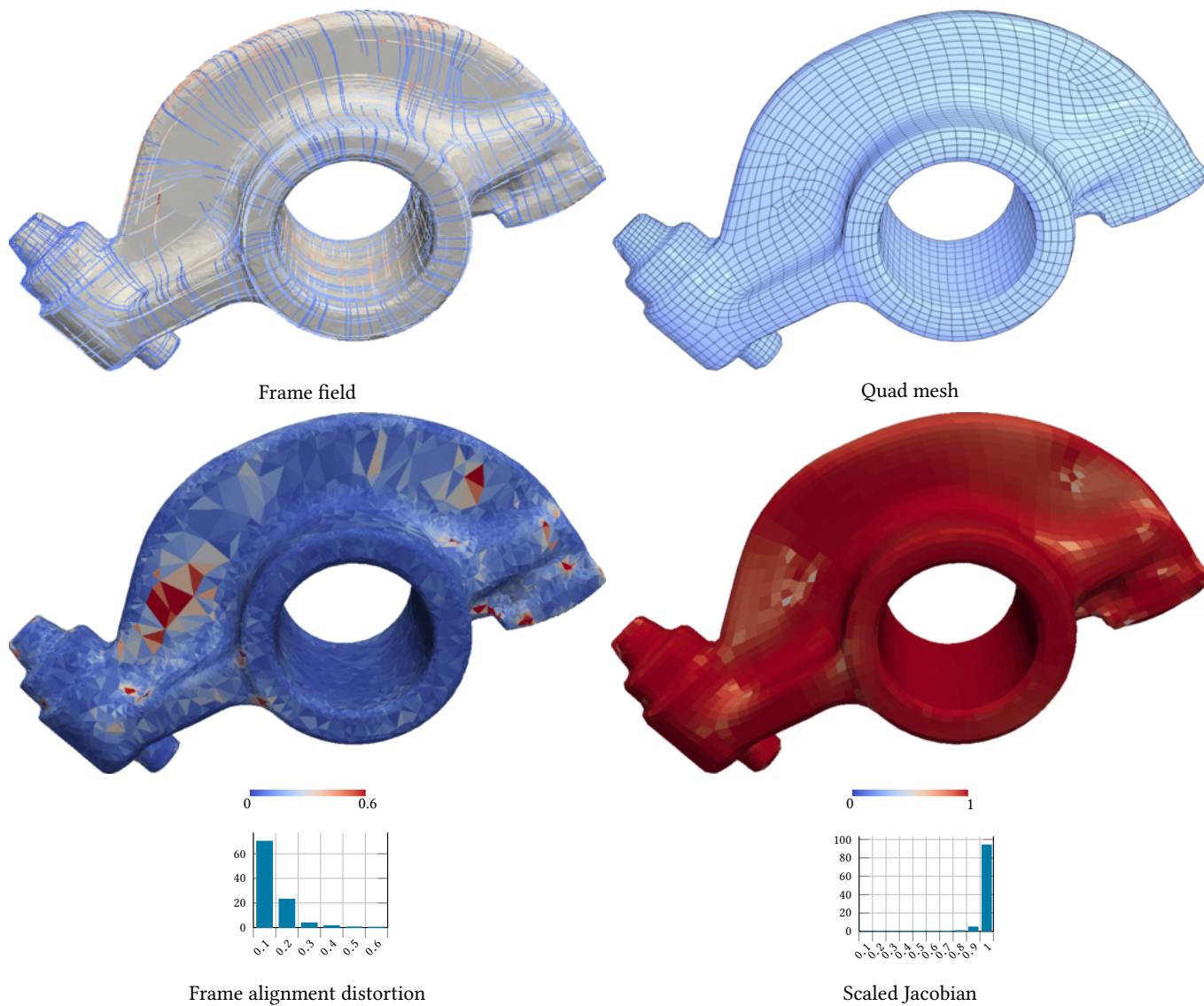
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
rocker-arm	20088	5010(5045)	0.975(0.9639)	50	111(191)	0.08145	0.09442	6.423	8.01	-

Fig. 122. Model: rocker_arm

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
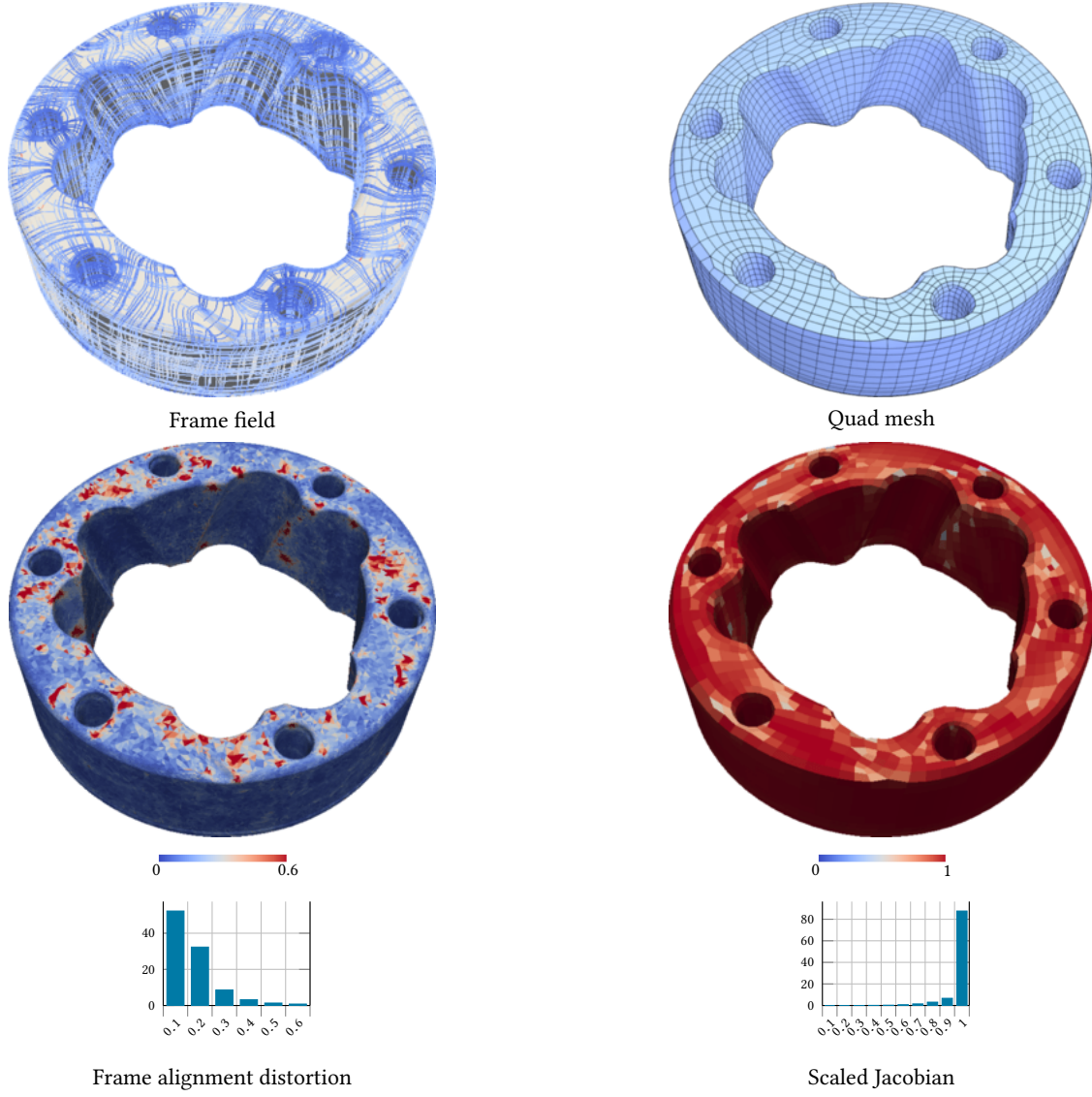
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
rolling-stage100K	100000	5374(5409)	0.9575(0.9462)	150	325(393)	0.1174	0.138	10.2	34.81	-

Fig. 123. Model: rolling_stage100K

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
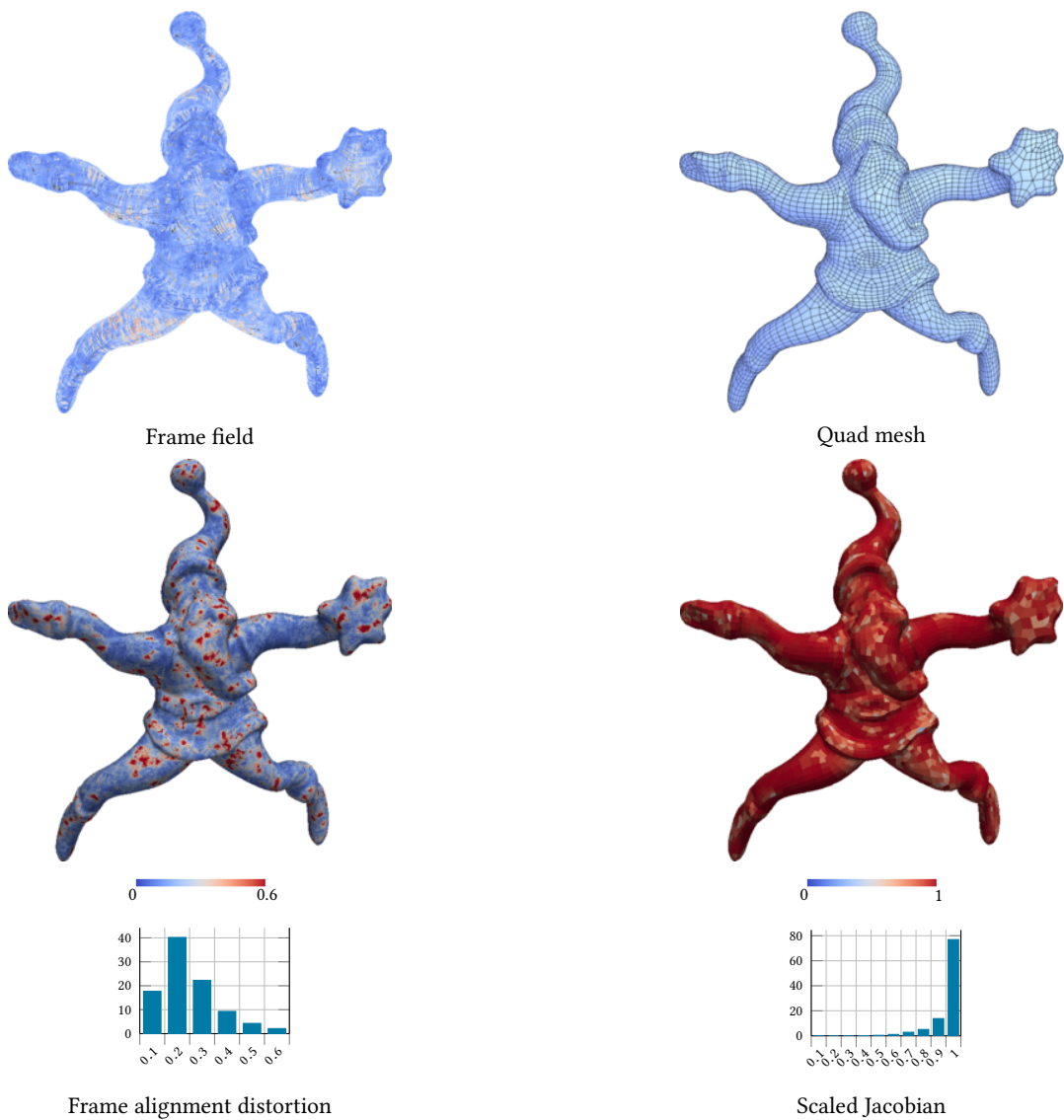
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
santa	151558	5928(6013)	0.9304(0.9089)	934	943(1117)	0.2133	0.2488	33.98	50.51	-

Fig. 124. Model: santa

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
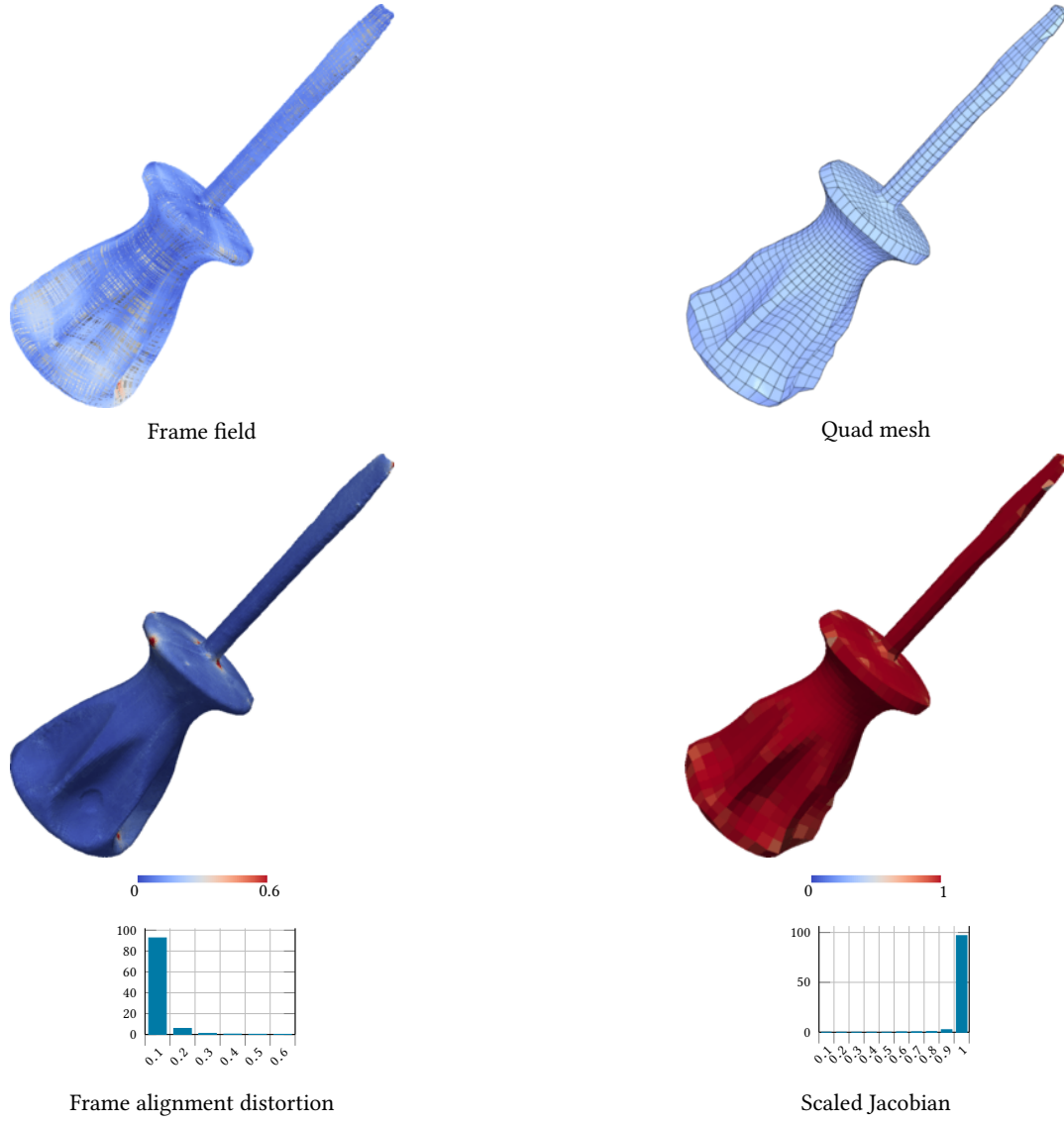
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
screwdriver	54300	1789(1790)	0.9873(0.988)	22	24(23)	0.0461	0.05177	3.002	16.5	-

Fig. 125. Model: screwdriver

Frame field

Quad mesh

0   0.6

Frame alignment distortion

0   1

Scaled Jacobian
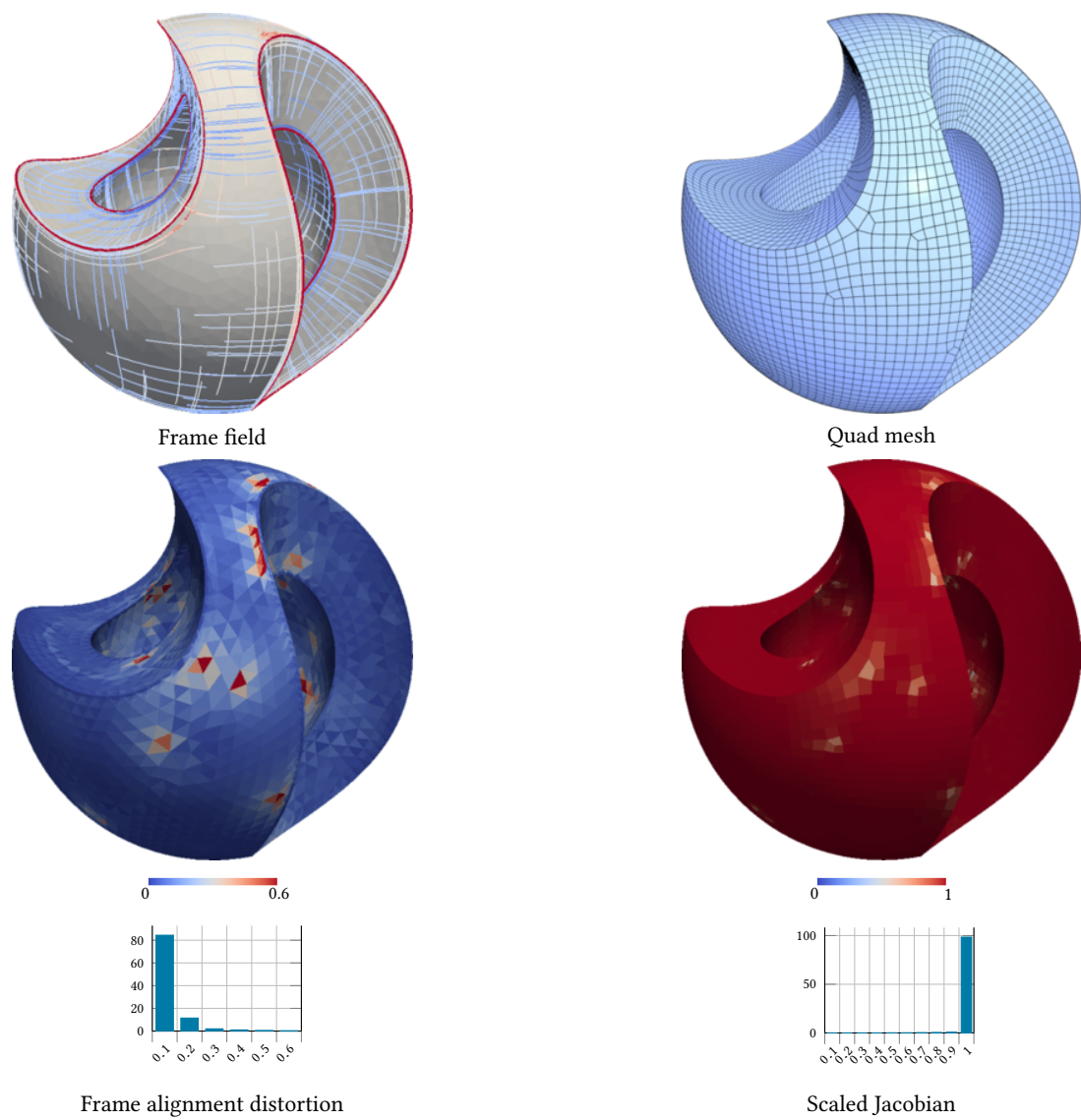
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
sculpt	25520	9314(9355)	0.9934(0.9856)	16	144(238)	0.06041	0.0689	4.475	10.58	0.07208

Fig. 126. Model: sculpt

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
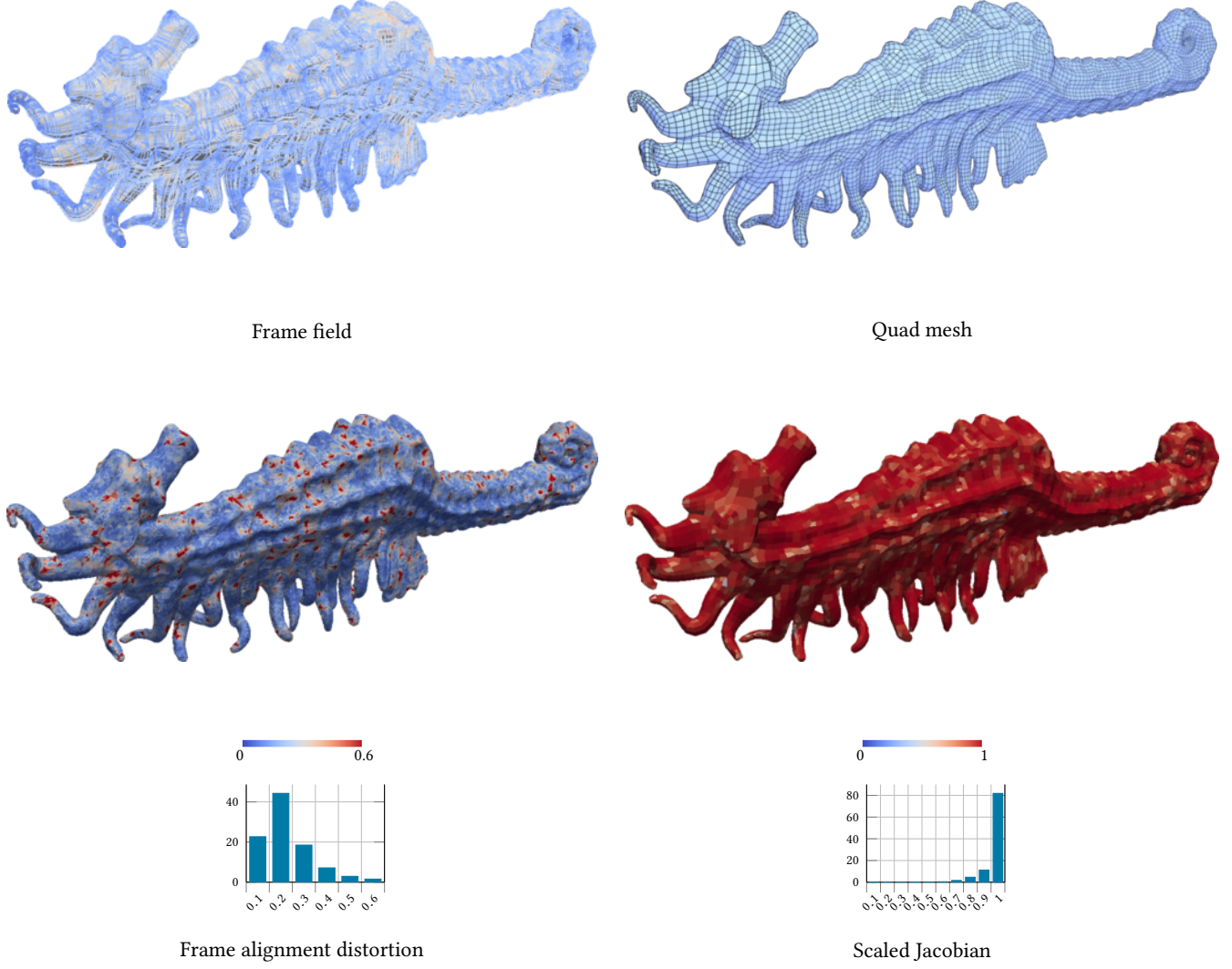
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
seahorse2-100K	100000	10381(10558)	0.9409(0.9132)	1111	1350(1677)	0.1762	0.2062	29.87	43.46	-

Fig. 127. Model: seahorse2_100K

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
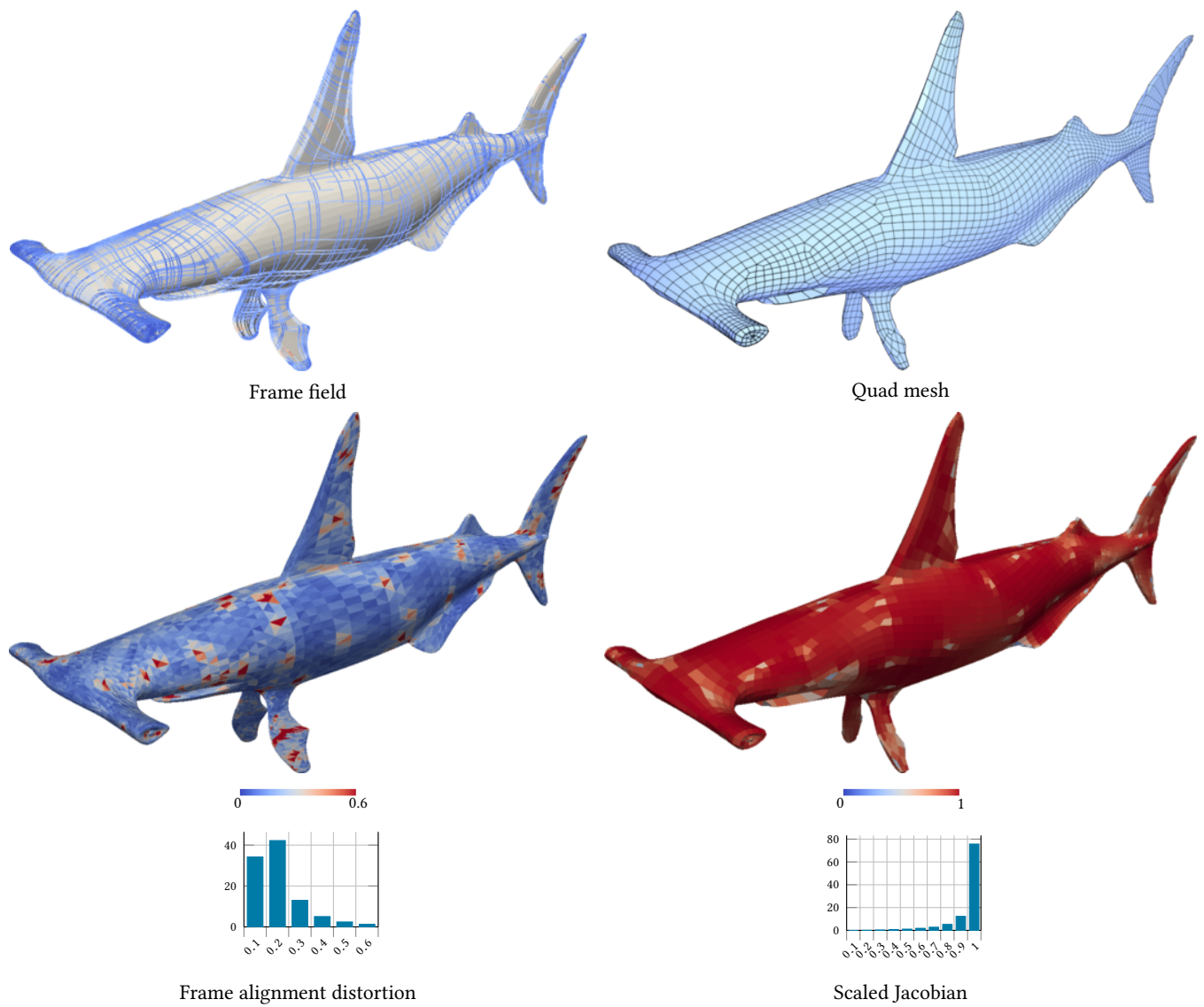
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
shark	20104	4408(4528)	0.919(0.8846)	163	370(595)	0.1521	0.1726	19.49	18.44	-

Fig. 128. Model: shark

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
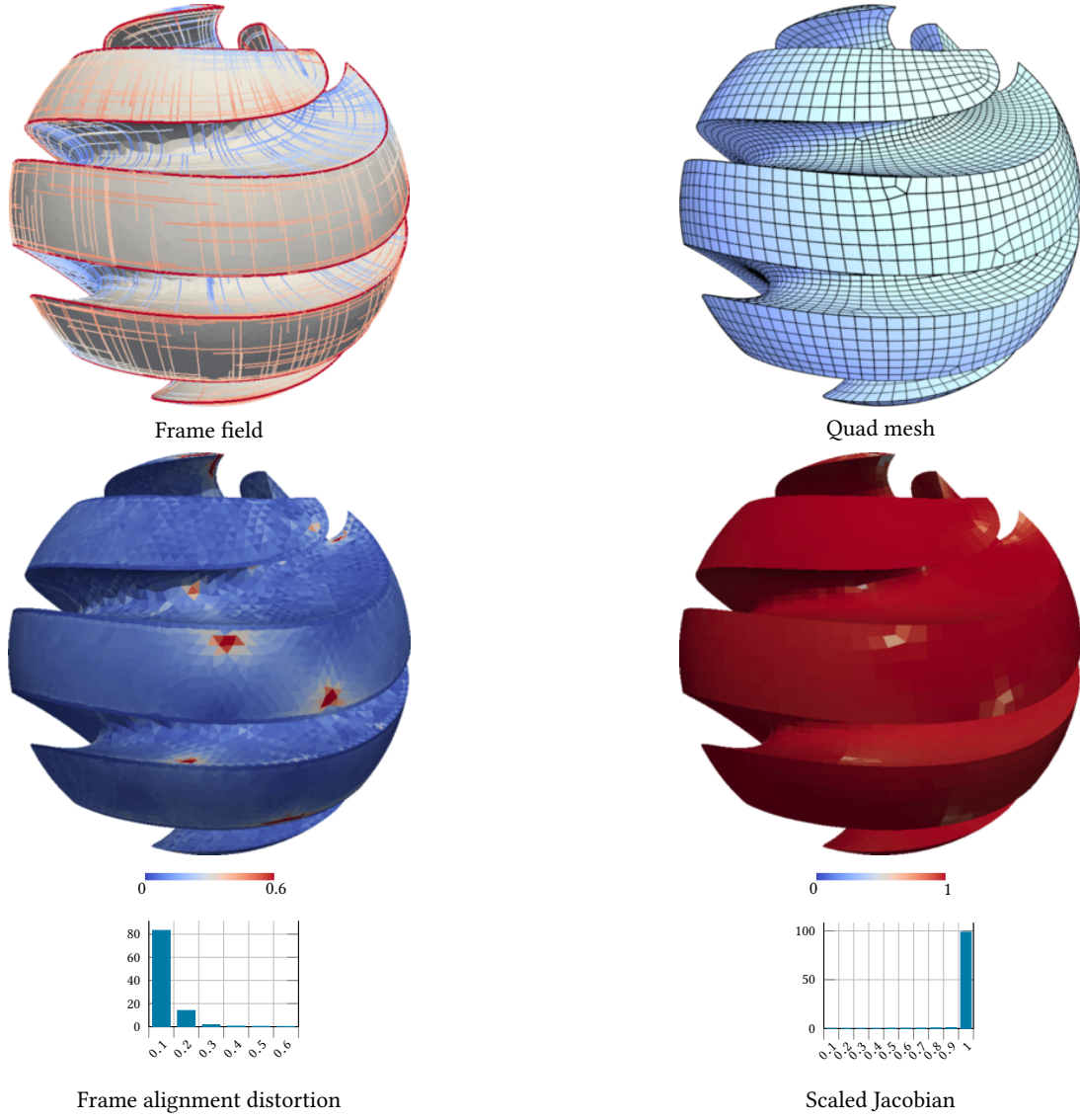
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
sharp-sphere10k	42404	10144(10161)	0.9881(0.9852)	24	100(143)	0.06897	0.07601	2.161	13.76	0.1247

Fig. 129. Model: sharp_sphere10k

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
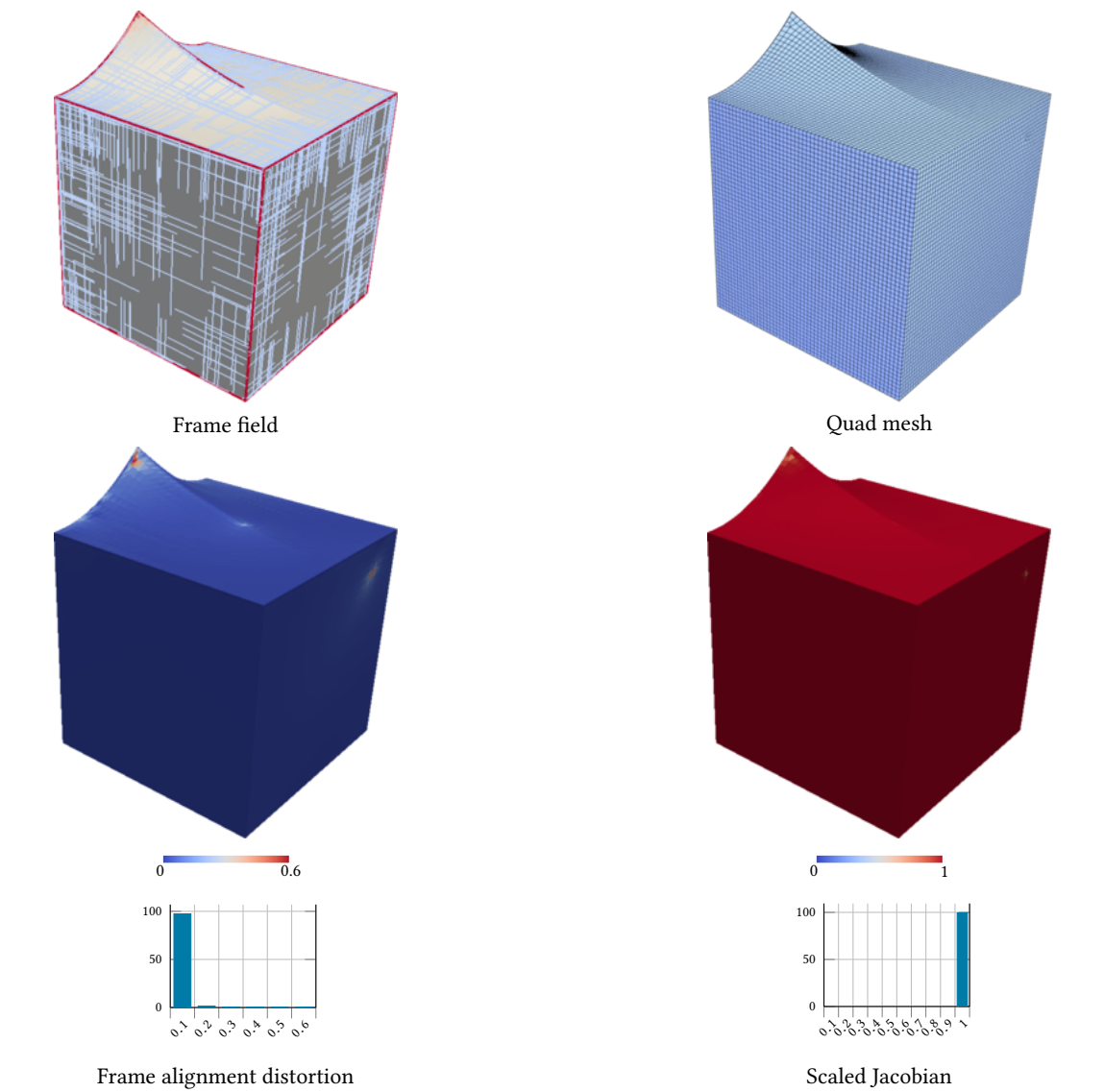
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
smooth-feature	33664	17114(17172)	0.9979(0.9926)	10	93(193)	0.02147	0.02305	1.273	13.73	0.01574

Fig. 130. Model: smooth-feature

Frame field

Quad mesh

0　　　　0.6

Frame alignment distortion

0　　　　1

Scaled Jacobian
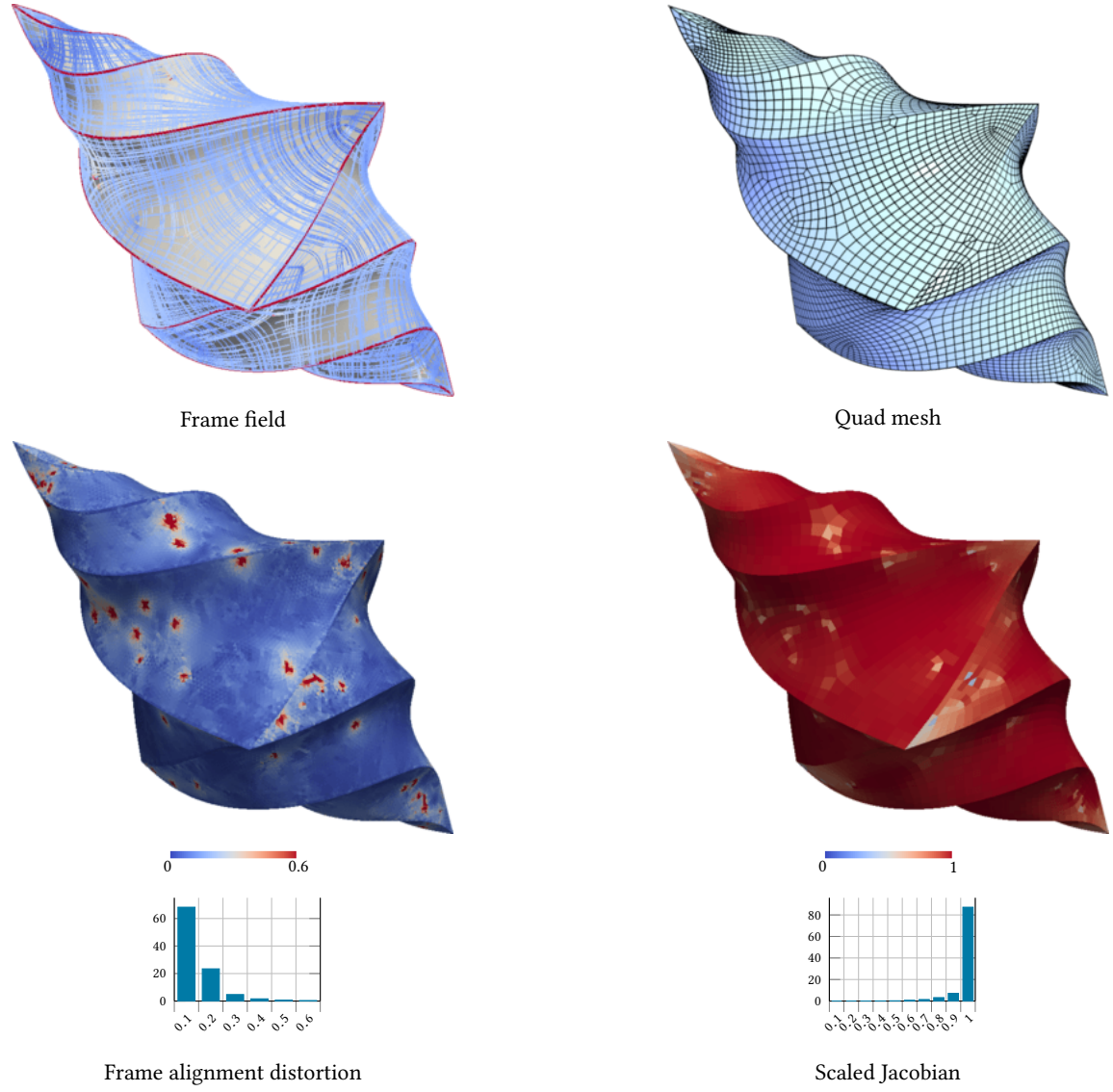
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
spiral	61222	6807(6851)	0.9541(0.9441)	42	236(314)	0.08988	0.1028	5.119	21.46	0.02598

Fig. 131. Model: spiral

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
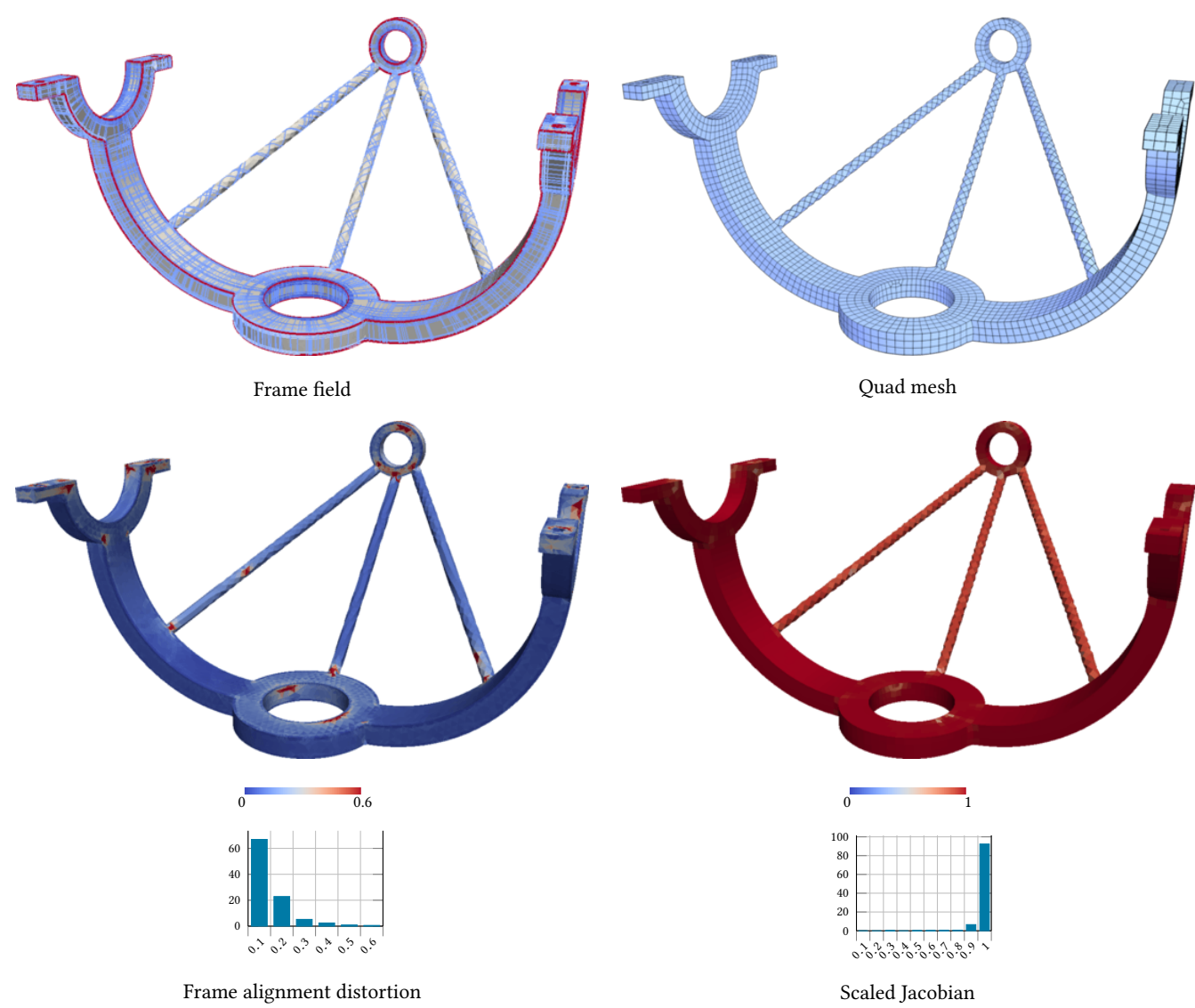
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
switchmec-Lp	34850	4034(4044)	0.9713(0.9672)	108	161(180)	0.09209	0.1041	7.357	13.23	0.563

Fig. 132. Model: switchmec_Lp

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
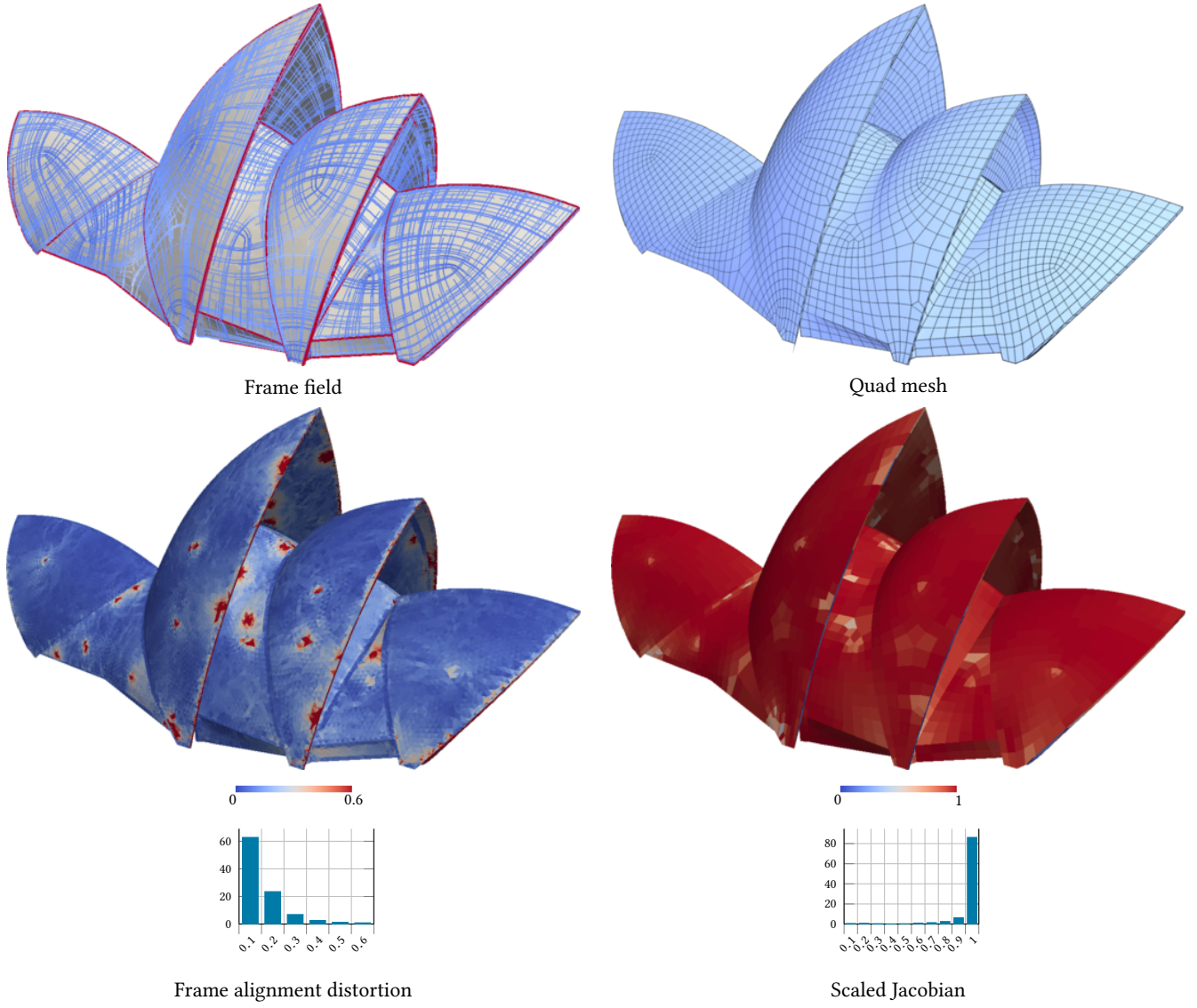
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
sydney	53848	4900(4940)	0.9362(0.9235)	50	305(358)	0.1283	0.1413	7.338	19.54	0.2064

Fig. 133. Model: sydney

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
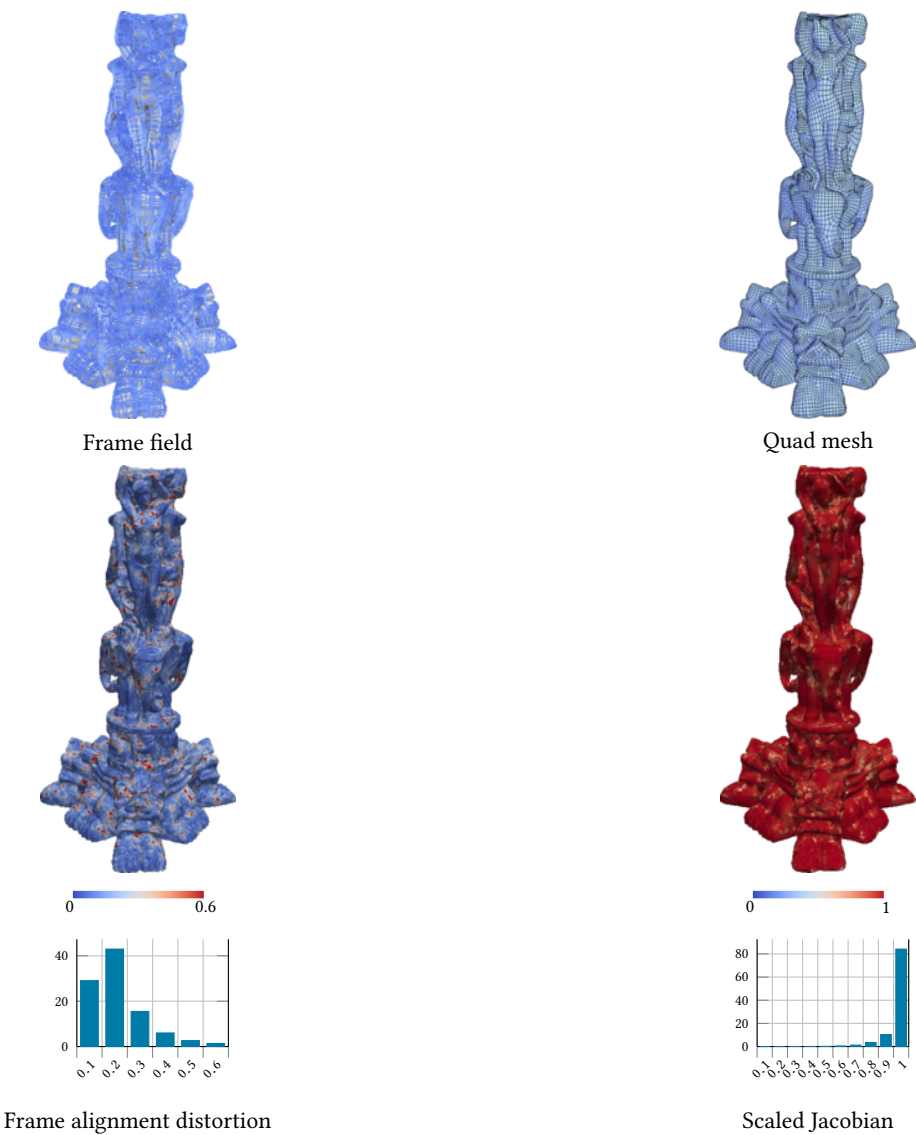
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
thai-statue	79970	19258(19656)	0.9459(0.9137)	1075	1861(2689)	0.1574	0.1814	25.31	55.69	-

Fig. 134. Model: thai_statue

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
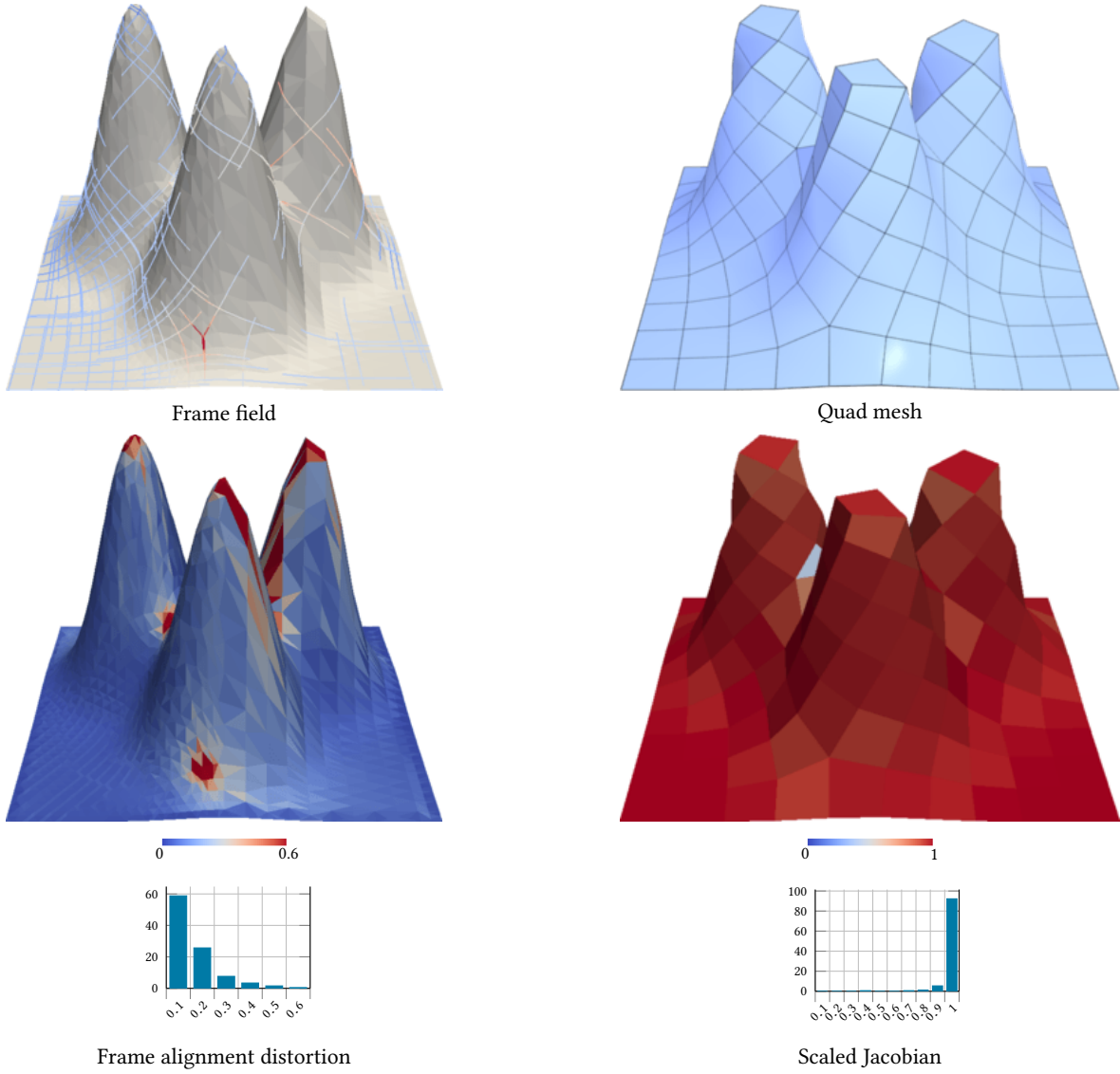
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
three-peaks	3854	167(180)	0.9611(0.9002)	18	21(33)	0.1218	0.1419	27.01	1.33	0.1152

Fig. 135. Model: three_peaks

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
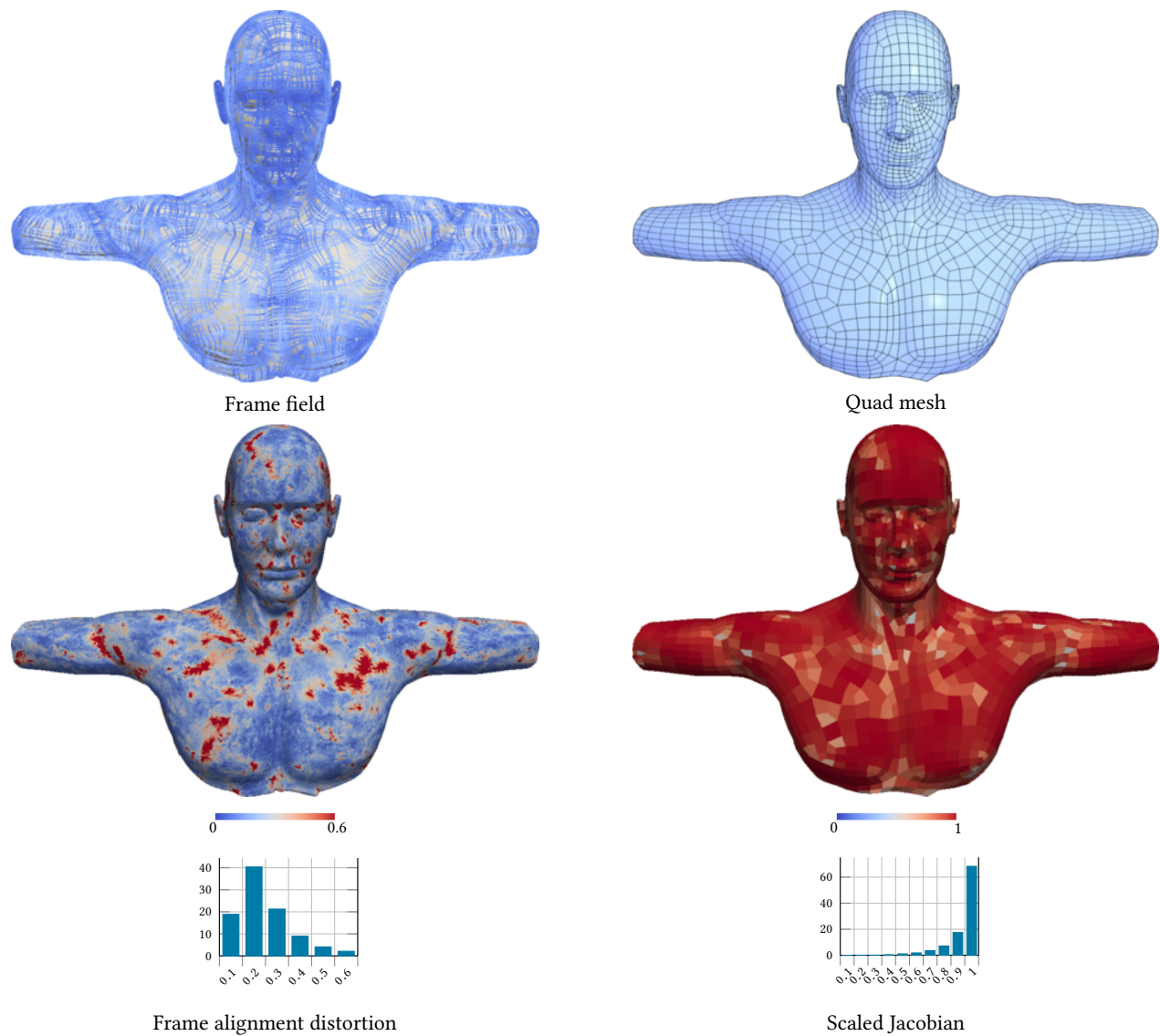
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
torso	100000	3888(3964)	0.9058(0.8778)	446	591(735)	0.2051	0.242	28.82	36.43	–

Fig. 136. Model: torso

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
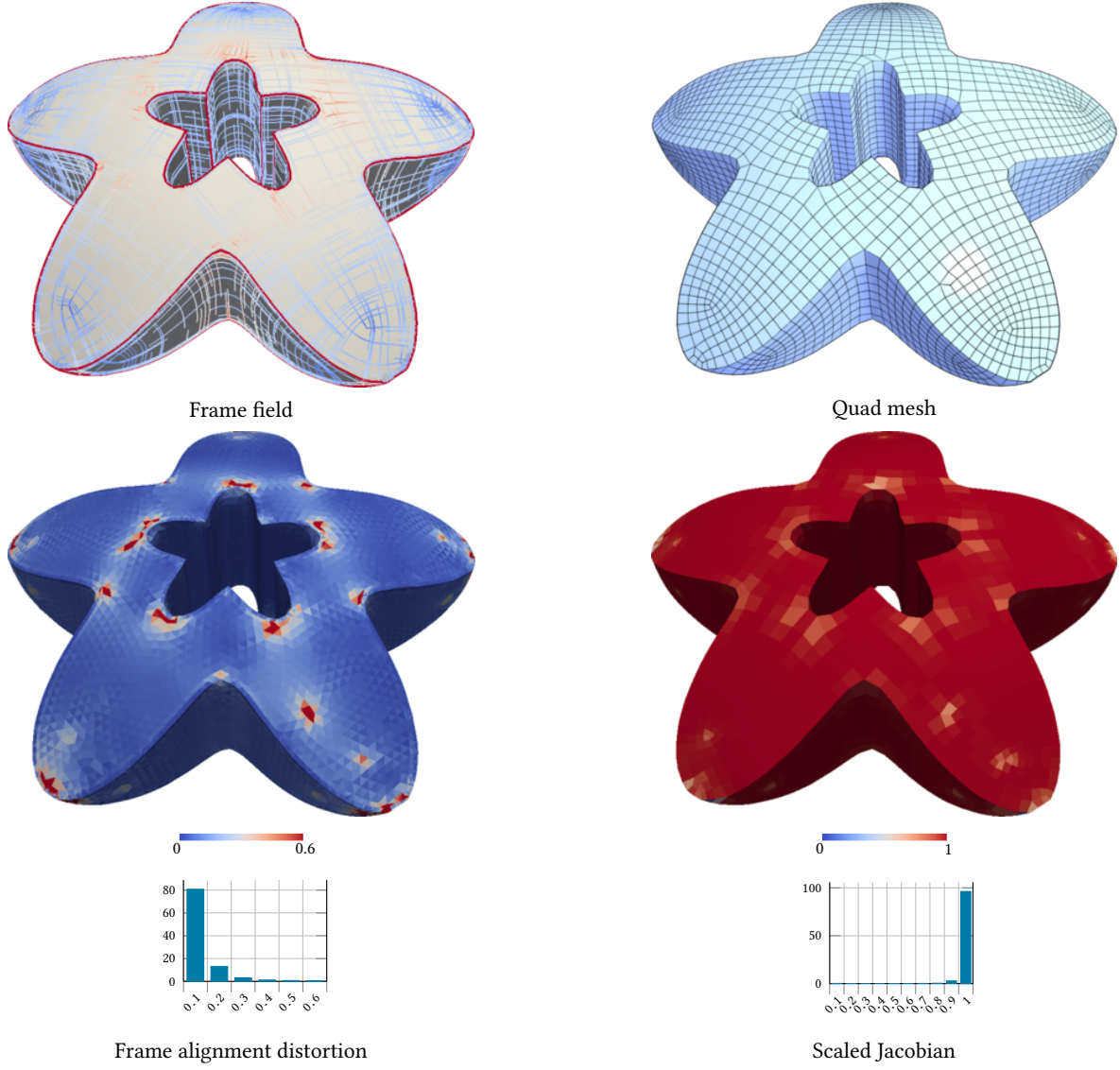
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
trim-star-14k	24754	4146(4162)	0.9848(0.9777)	80	126(157)	0.07575	0.08483	7.605	9.17	0.2644

Fig. 137. Model: trim_star_14k

Frame field

Quad mesh

0   0.6

Frame alignment distortion

0   1

Scaled Jacobian
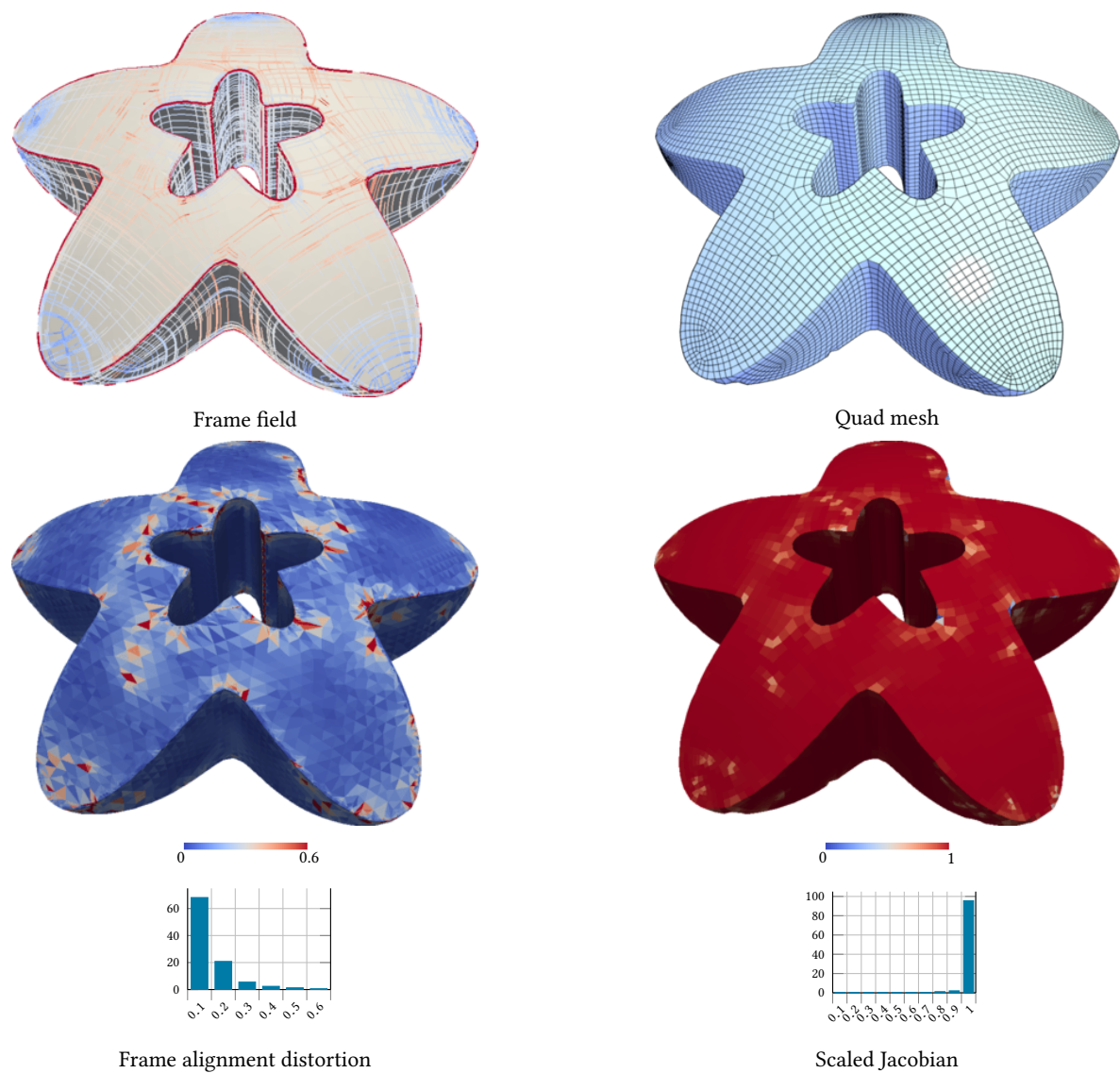
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
trim-star	36234	9650(9751)	0.9787(0.9621)	79	380(591)	0.1064	0.1185	9.491	17.28	0.3233

Fig. 138. Model: trim-star

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
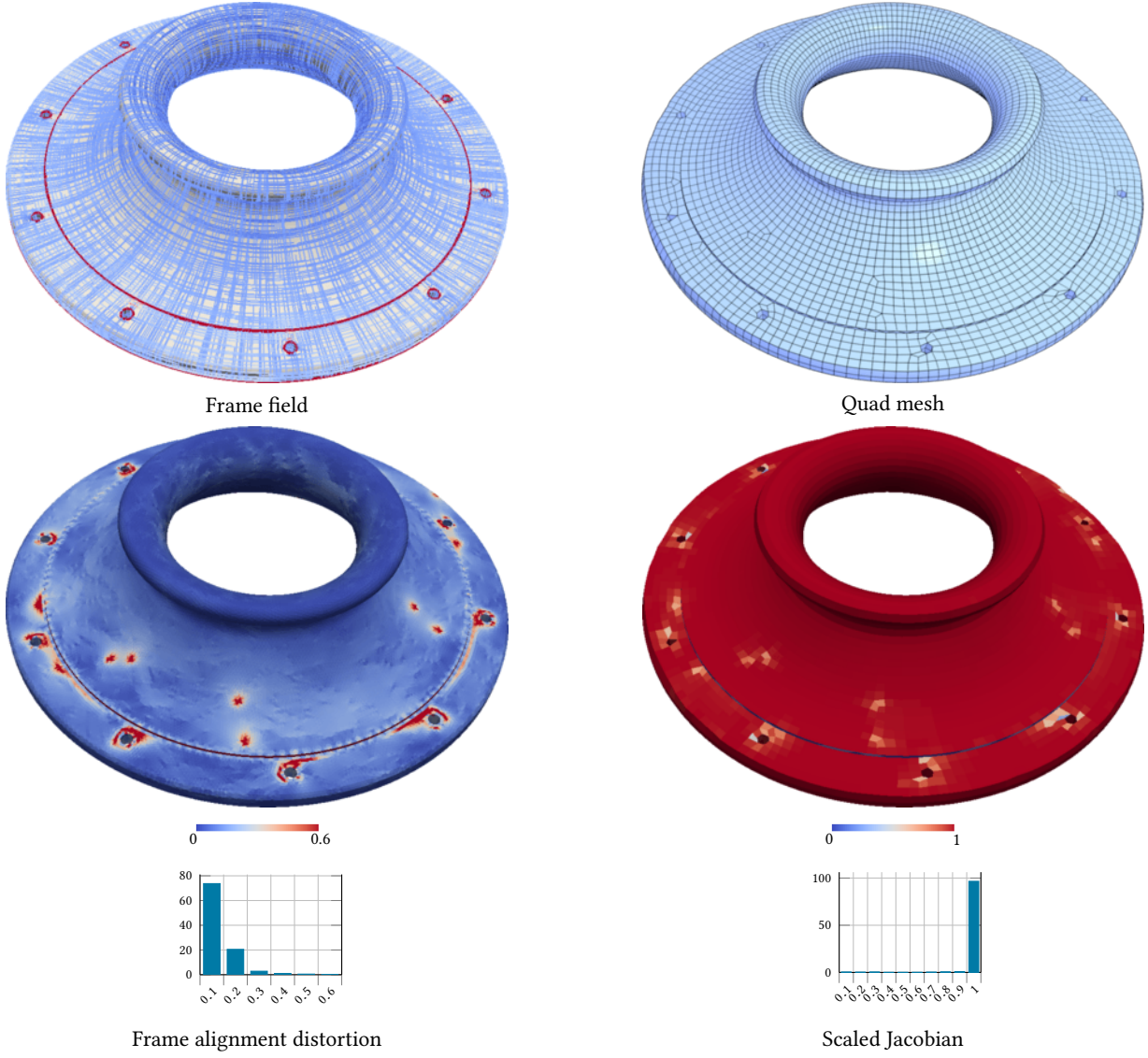
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
turbine-Lp	116834	9468(9475)	0.9786(0.9768)	80	320(332)	0.1121	0.1194	6.351	40.07	0.4714

Fig. 139. Model: turbine_Lp

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian

Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
twirl20k-new	48794	14652(14694)	0.9899(0.9853)	24	209(295)	0.06525	0.07341	3.693	18.88	0.07096
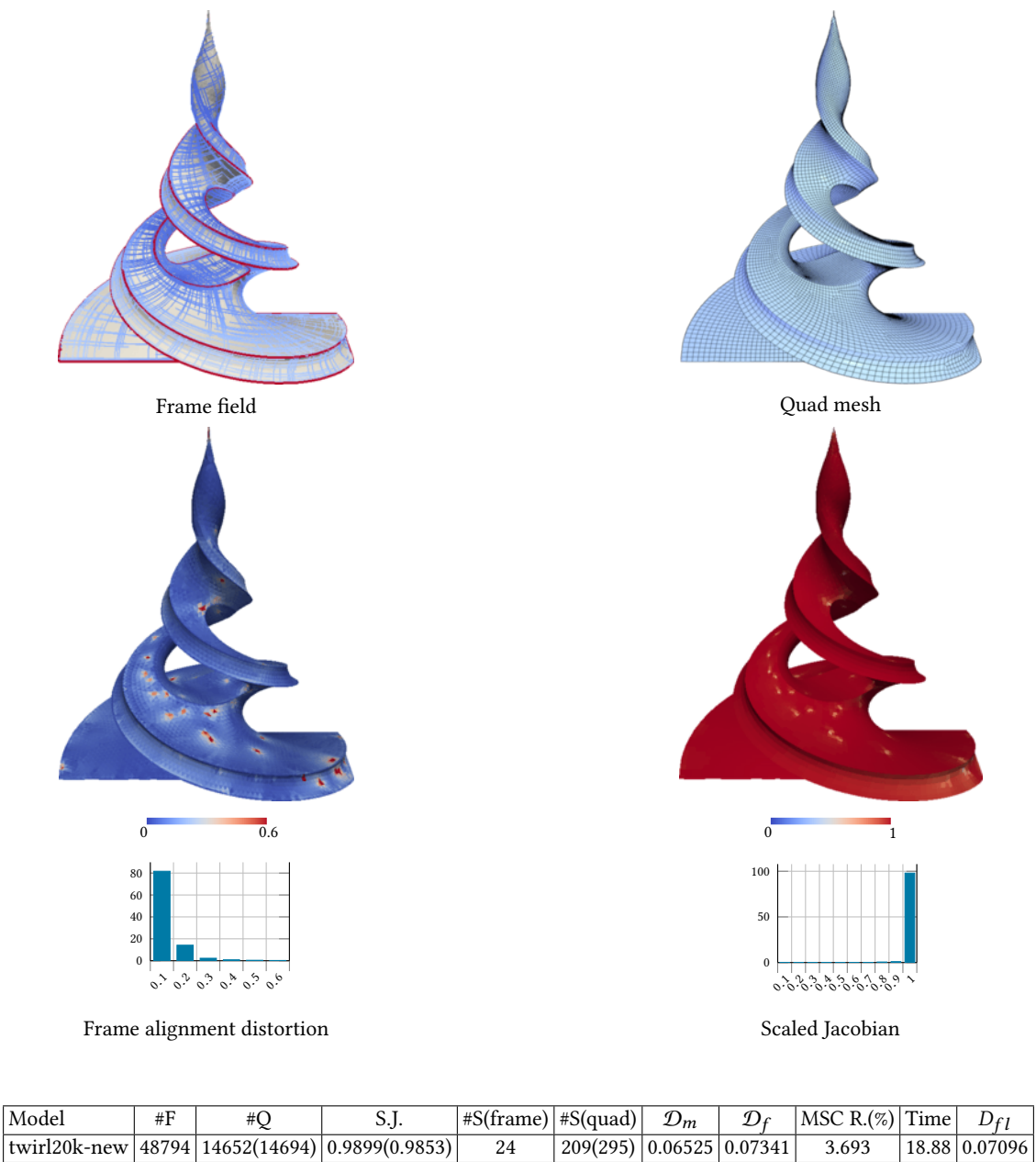
Fig. 140. Model: twirl20k-new

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
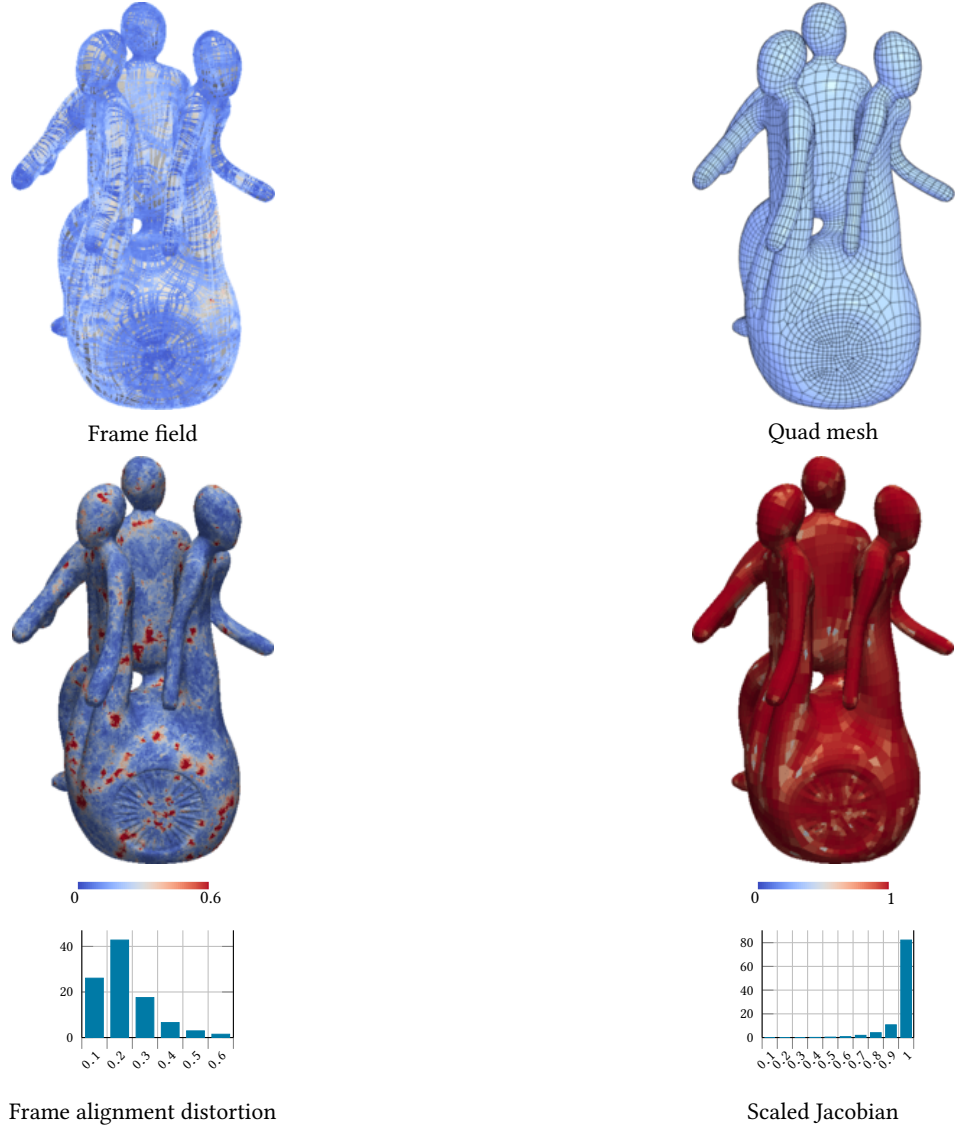
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
uu-memento100k	99932	7379(7486)	0.9394(0.9152)	396	686(895)	0.1677	0.1971	19.25	38.03	-

Fig. 141. Model: uu-memento100k

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
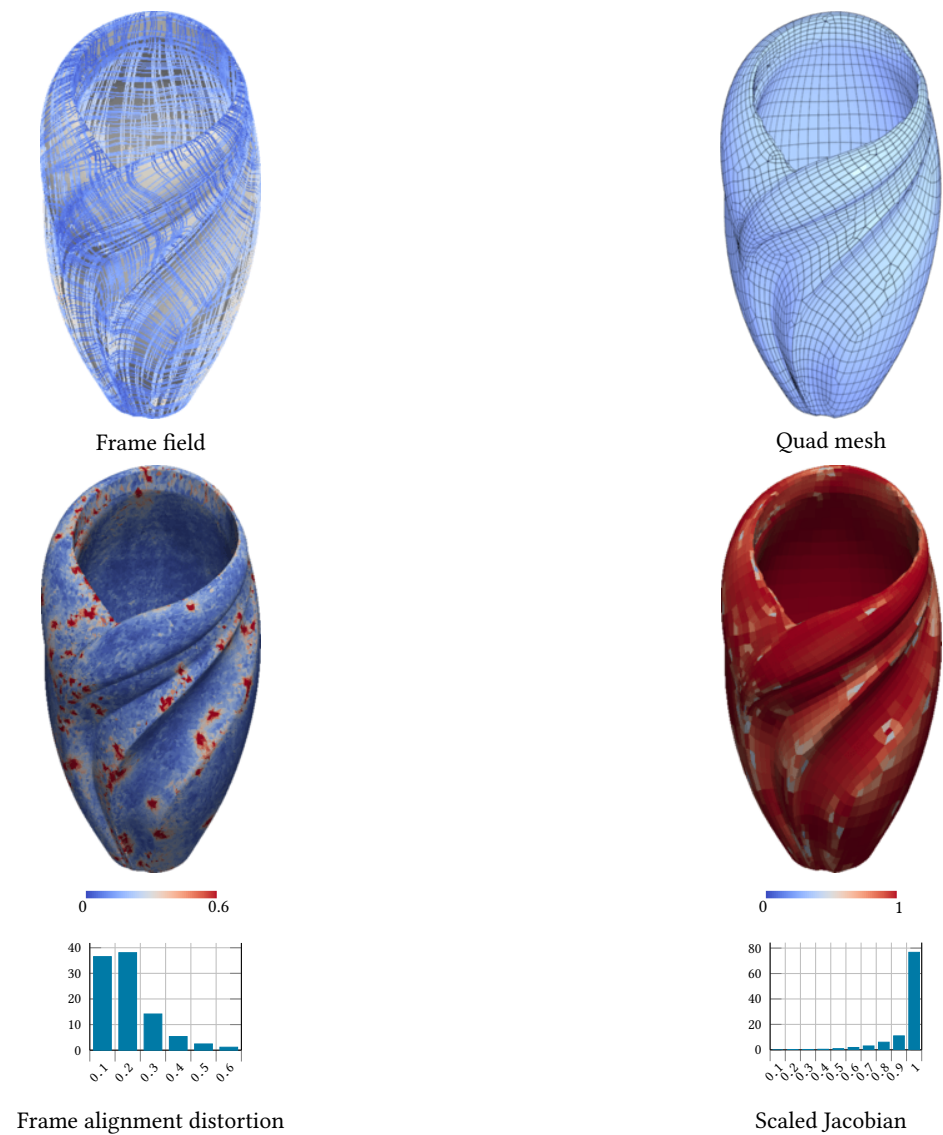
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
vase100K	100000	4944(5014)	0.9238(0.901)	334	439(571)	0.1519	0.1785	11.8	32.55	-

Fig. 142. Model: vase100K

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
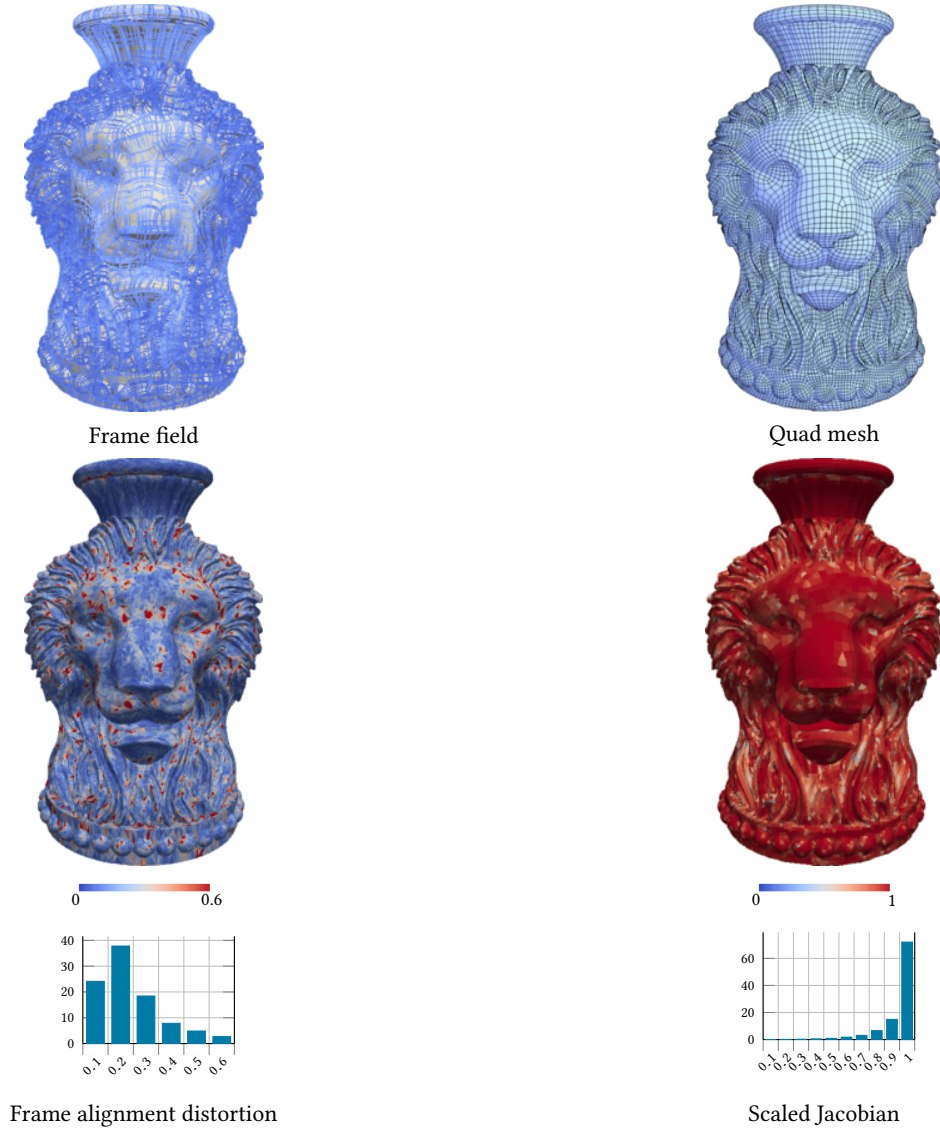
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
vase-lion100K	100000	23358(24180)	0.9113(0.8608)	1296	2534(4150)	0.1923	0.2207	28.72	96.96	-

Fig. 143. Model: vase-lion100K

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
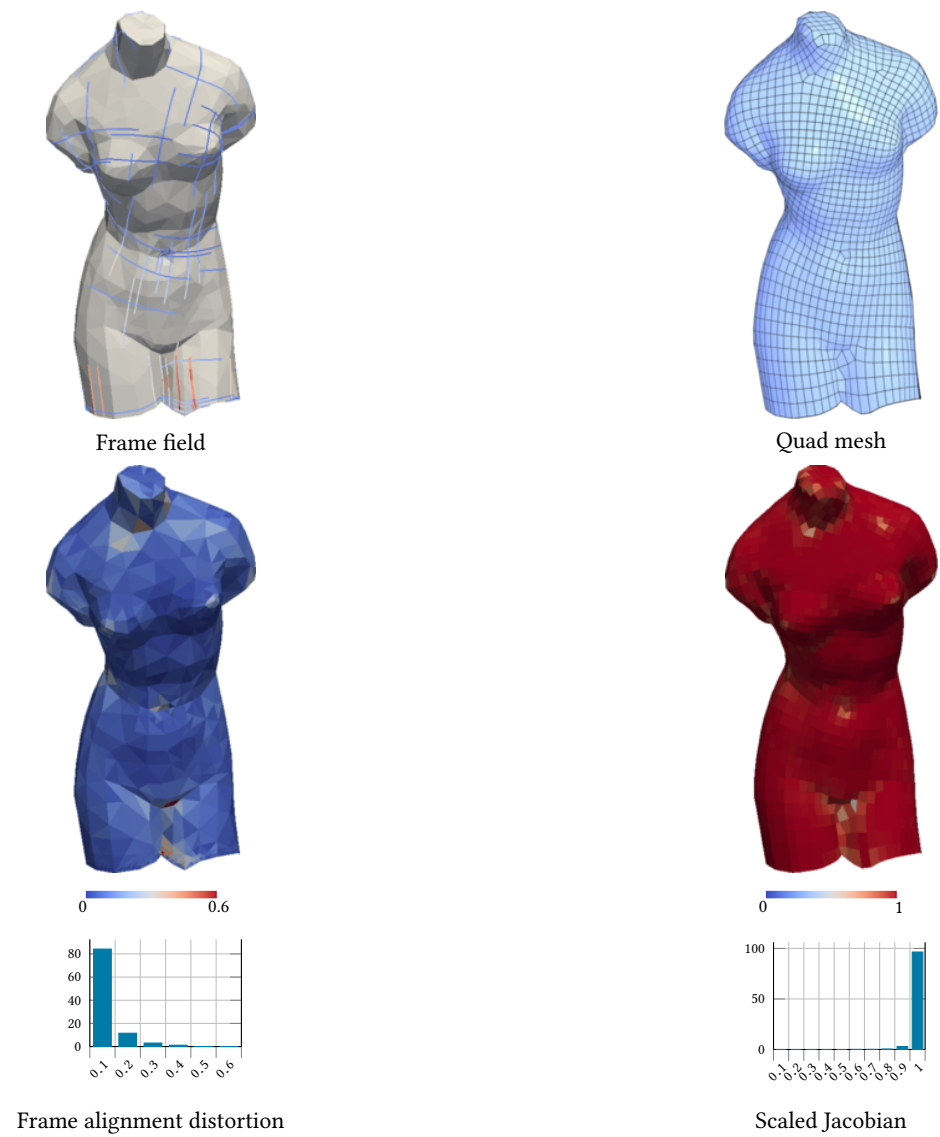
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
venus	2422	2568(2578)	0.9749(0.9683)	18	30(56)	0.06207	0.06831	5.196	1.87	0.461

Fig. 144. Model: venus

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
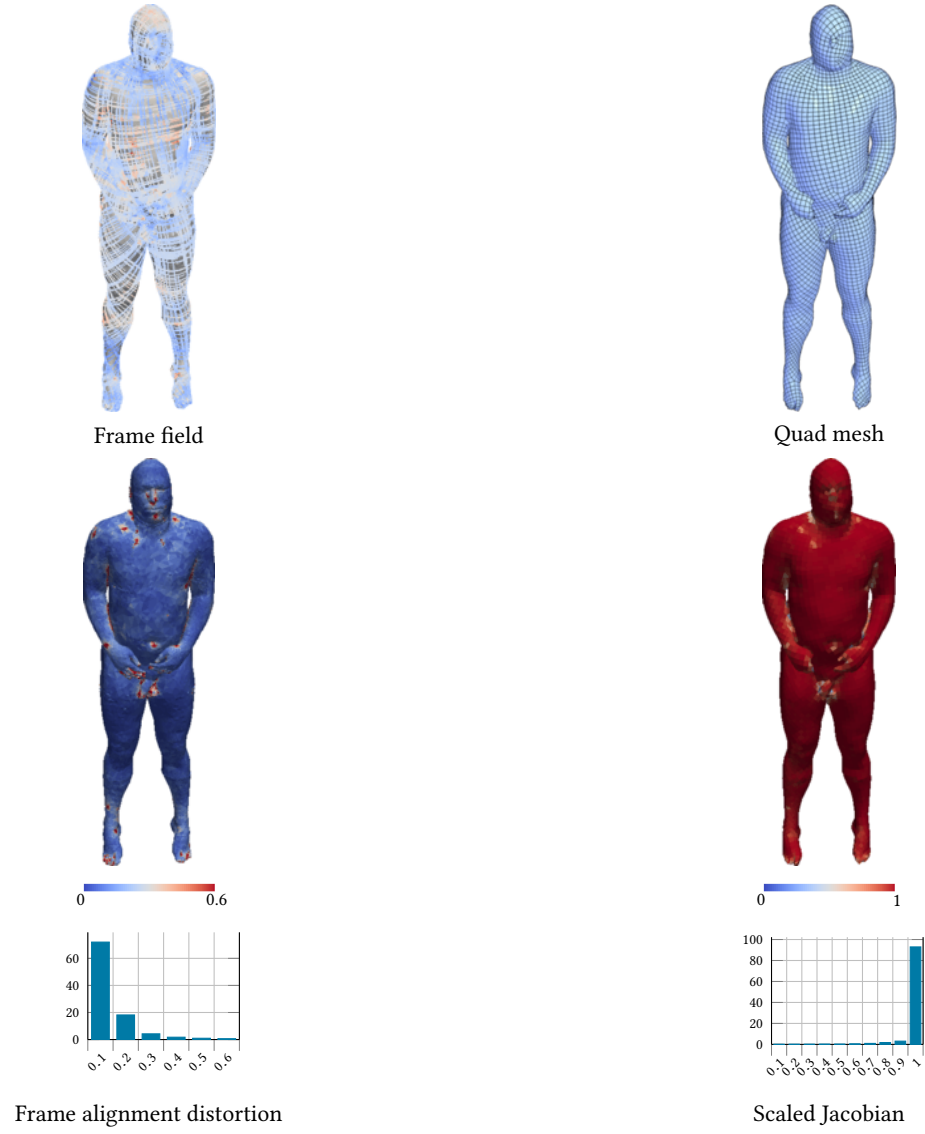
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
vh-skin	58502	5406(5467)	0.9707(0.9583)	2352	241(319)	0.141	0.1542	13.95	23.07	-

Fig. 145. Model: vh_skin

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
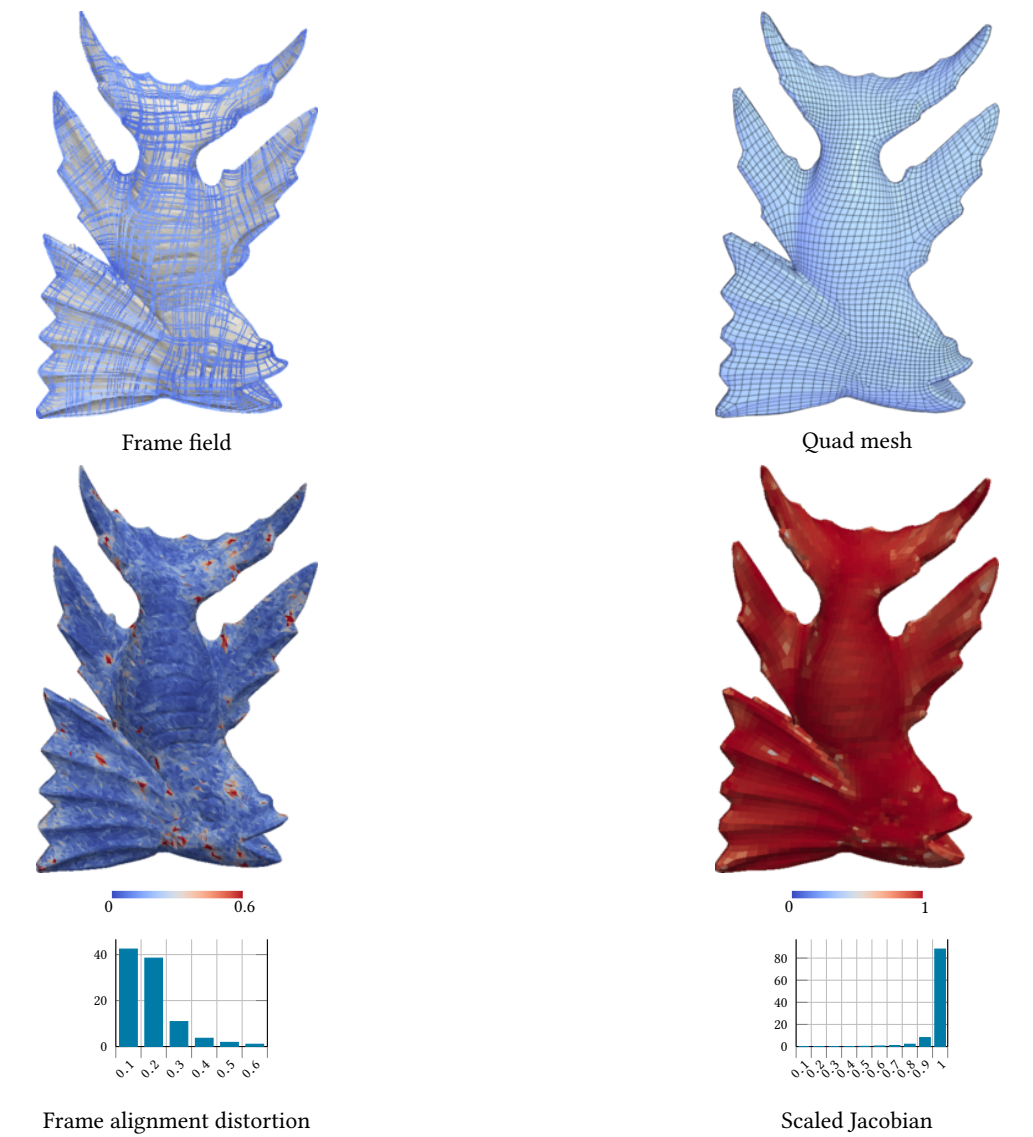
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
woodenfish	34910	7043(7156)	0.9541(0.9274)	156	389(625)	0.1353	0.1554	13.19	17.28	-

Fig. 146. Model: woodenfish

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
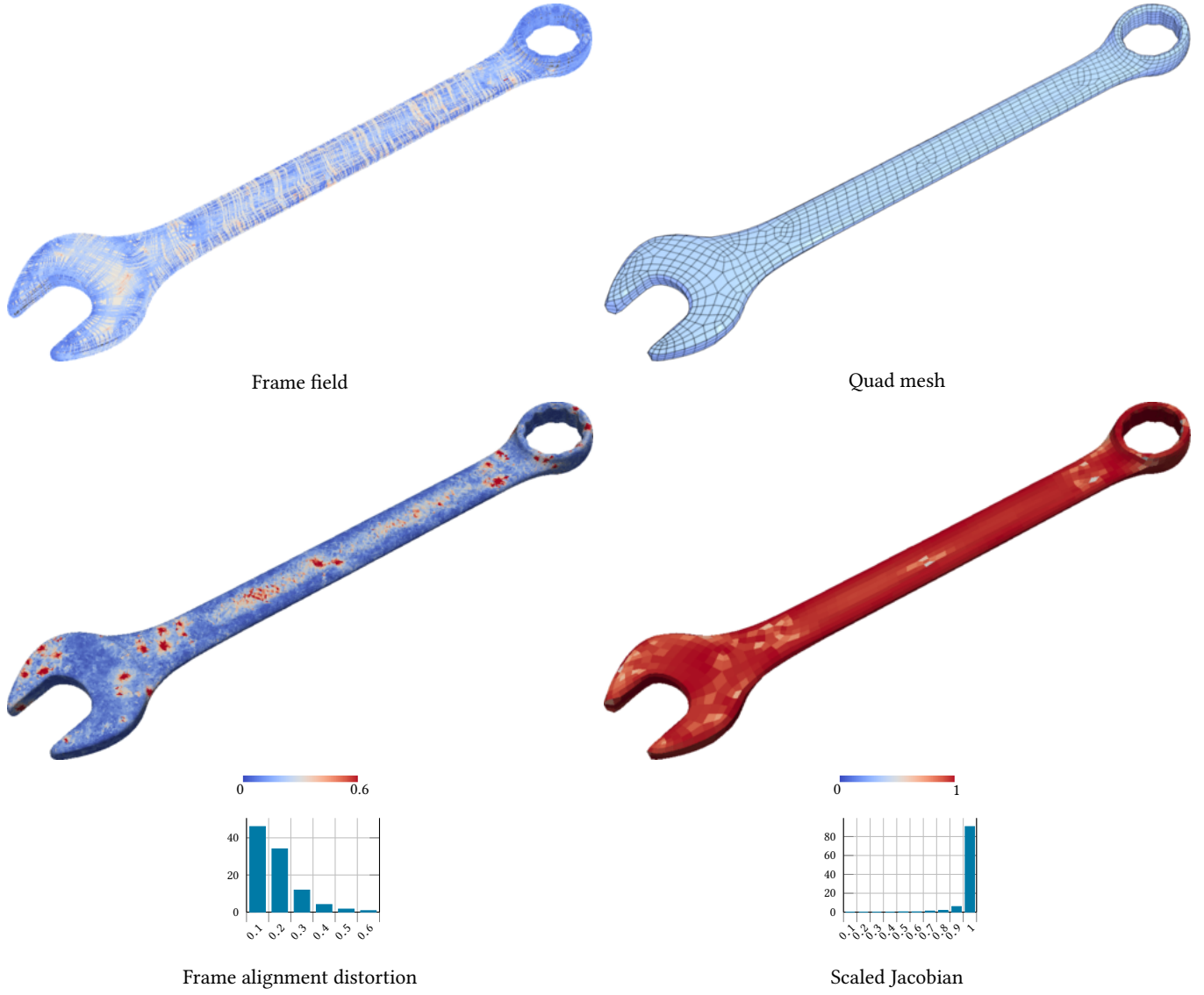
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
wrench50K	50000	2348(2374)	0.9571(0.9391)	68	119(171)	0.1276	0.1522	9.815	15.17	-

Fig. 147. Model: wrench50K

Frame field

Quad mesh

Frame alignment distortion

Scaled Jacobian
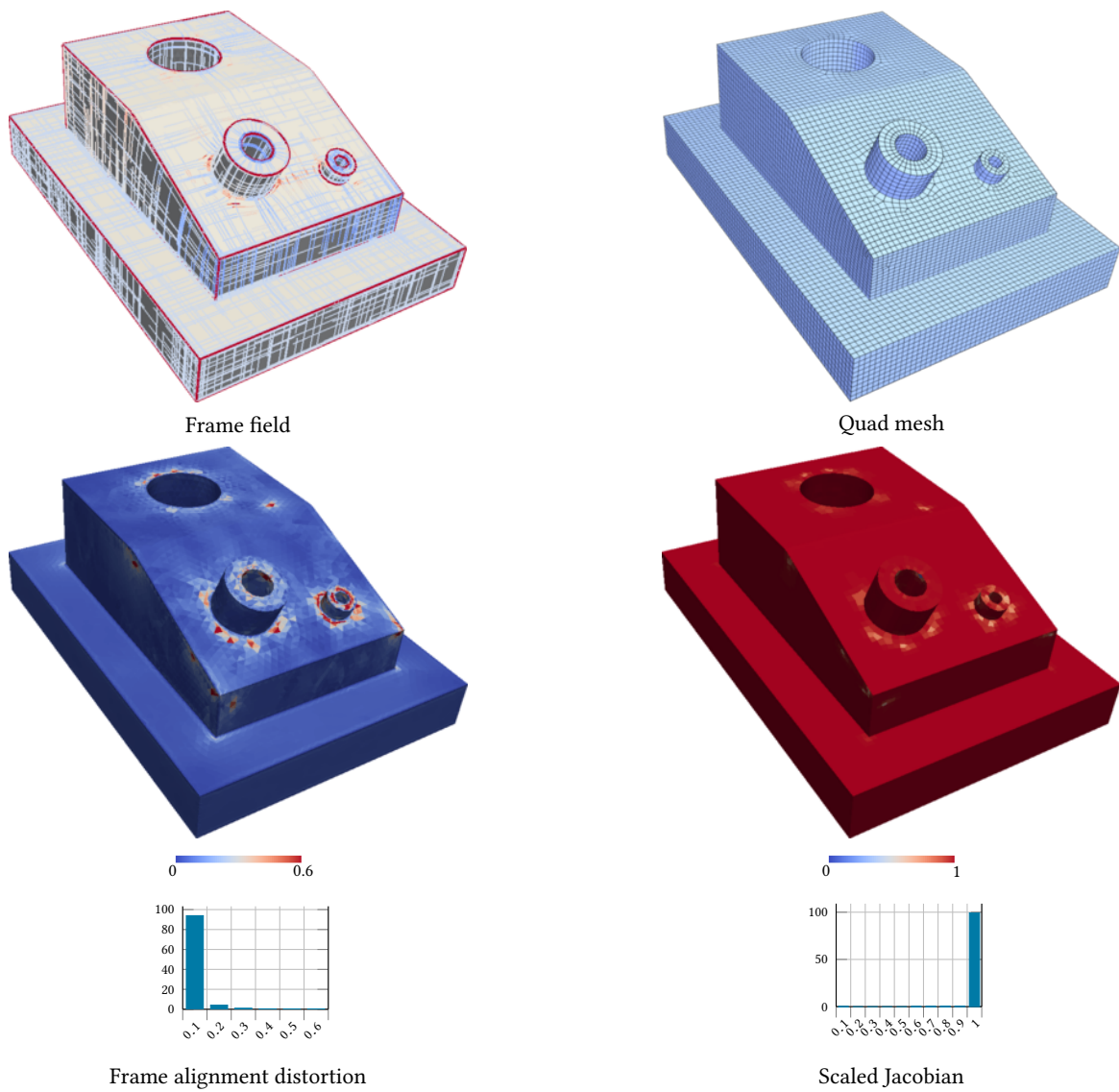
Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
www-re	57424	15548(15572)	0.9967(0.9939)	44	133(180)	0.04103	0.04515	1.708	19.83	0.2127

Fig. 148. Model: www_re

Table 3. Dataset statistics

Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
aircraft-m	24920	3807(3824)	0.9444(0.9378)	54	87(113)	0.07466	0.0862	5.97	9.07	0.2692
amphora	27570	11714(11802)	0.9819(0.9712)	261	255(434)	0.06318	0.07123	6.994	13.93	0.2215
armadillo	43160	10821(10904)	0.9687(0.9565)	267	532(707)	0.113	0.129	11.67	21.85	-
armchair	100000	8845(8862)	0.9913(0.9883)	36	121(158)	0.05498	0.06517	2.395	27.81	-
beetle-refined	46044	6748(6764)	0.9932(0.9888)	53	85(126)	0.0473	0.05321	3.921	18.07	0.2867
beetle-new-re	46925	4024(4036)	0.9767(0.9715)	62	124(153)	0.09364	0.1052	9.326	15.48	0.3916
beetle-re2	42468	2559(2565)	0.9825(0.9782)	60	76(92)	0.08631	0.09667	8.775	12.79	0.4465
bimba100K	100000	9200(9232)	0.9618(0.9561)	145	369(441)	0.1064	0.1223	7.759	34.03	-
blade	58546	3117(3127)	0.986(0.9821)	107	96(118)	0.07257	0.08247	7.995	20.14	-
block-Lp	10904	928(937)	0.966(0.9507)	48	72(92)	0.1649	0.1813	18.38	3.87	0.4483
botijo	82332	6601(6633)	0.9658(0.958)	140	339(408)	0.1186	0.1401	10.21	27.38	-
bozbezbozzel100K	100000	13628(13893)	0.9435(0.914)	892	1407(1898)	0.1657	0.1936	23.5	48.71	-
bozbezbozzel50K	50000	13702(13898)	0.9609(0.9393)	505	863(1263)	0.1254	0.1447	14.87	25.9	-
brain100k	100000	37501(38411)	0.9427(0.9123)	4316	4330(5905)	0.1546	0.1772	31.25	118.6	-
buddha	126524	14962(15245)	0.8945(0.8641)	2374	2748(3285)	0.1995	0.2315	39.21	71.75	-
bumpy-sphere	11444	6835(6865)	0.9912(0.9841)	44	93(161)	0.06589	0.0739	4.437	5.08	-
bumpy-torus	33630	9165(9211)	0.9749(0.9665)	138	280(379)	0.09897	0.1129	9.434	14.05	-
bunnyBotsch	111364	6738(6740)	0.9879(0.9874)	70	88(92)	0.03765	0.04293	3.277	38.38	-
buste	100000	8949(9102)	0.9395(0.9112)	544	900(1195)	0.1595	0.187	21.06	38.89	-
cad5	37336	4919(4928)	0.9866(0.983)	76	134(156)	0.08959	0.09906	5.633	12.36	0.2736
camel	69092	7190(7403)	0.9348(0.8897)	423	672(1119)	0.1943	0.2232	26.08	32.1	-
camille-hand100K	100000	7690(7728)	0.9889(0.9798)	192	116(204)	0.06279	0.07388	6.184	28.23	-
carter30k-mod	79310	8186(8213)	0.9805(0.9752)	252	308(368)	0.0987	0.1083	6.821	31.73	0.355
cast40k	52388	5089(5106)	0.978(0.972)	104	201(237)	0.0973	0.1069	7.914	19.28	0.3554
casting-refined	54174	6260(6284)	0.985(0.9778)	104	224(274)	0.09622	0.1065	6.875	19.4	0.3513
chair	100000	5115(5150)	0.9468(0.9347)	246	341(418)	0.1585	0.1841	16.09	36.8	-
chinese-lion100K	100034	14933(15190)	0.9449(0.918)	933	1622(2194)	0.1624	0.1911	24.38	50.99	3.414e-14
cognit30k	89350	15769(15793)	0.9906(0.988)	138	256(308)	0.05355	0.05969	4.088	28.59	0.2217
coverrear-Lp	50990	7997(8020)	0.993(0.988)	64	130(179)	0.07701	0.08309	4.704	19.62	0.3751
cover-small	140914	21278(21356)	0.9806(0.9746)	189	669(816)	0.09825	0.1095	5.03	49.12	0.1923
cow2	8626	5382(5420)	0.9722(0.9621)	70	159(246)	0.08913	0.1003	9.123	6.12	-
cup	11340	2261(2266)	0.9905(0.9866)	12	27(39)	0.05572	0.06824	2.847	3.57	-
dancer-25k	49996	3225(3273)	0.9324(0.9076)	115	239(331)	0.1454	0.1705	12.41	17.09	-
dancer2	18292	2587(2625)	0.9219(0.8974)	117	168(254)	0.1394	0.1597	13.75	7.34	-
dancing-children100K	100000	14317(14577)	0.9416(0.9125)	754	1366(1847)	0.1629	0.1902	22.32	54.44	-
datatech-2	130956	15107(15183)	0.979(0.9703)	212	527(718)	0.1185	0.1305	7.622	52.36	0.2873
david	50864	13316(13572)	0.9541(0.924)	622	1066(1612)	0.1392	0.1604	19.84	32.22	-
deckel40k	42962	2950(2958)	0.9855(0.9809)	62	86(103)	0.08635	0.09491	6.324	14.22	0.7567
deformed-armadillo	100000	13998(14191)	0.9523(0.9306)	731	1208(1569)	0.1486	0.1736	18.38	44.82	-
dente	18670	4419(4465)	0.9741(0.957)	41	160(257)	0.1064	0.1236	7.806	8.08	-
dilo	54344	4154(4218)	0.9165(0.8914)	254	435(555)	0.1654	0.1913	24	23.29	-
dragonstand-recon100K	104358	10349(10521)	0.9365(0.9108)	875	1279(1620)	0.1668	0.1958	24.71	47.35	-
duck	19276	5200(5211)	0.9939(0.99)	33	32(59)	0.03682	0.0428	2.326	6.54	-
eight	1536	2856(2862)	0.99(0.9862)	8	38(55)	0.07125	0.07552	6.01	1.95	-
elephant	49918	6789(6869)	0.9503(0.9302)	240	452(611)	0.1401	0.1633	15.37	22	-
elk	10388	7421(7559)	0.9676(0.9363)	84	279(607)	0.1051	0.1179	15.19	13.12	-
eros100K	100000	19155(19193)	0.9905(0.987)	132	224(303)	0.04693	0.05554	2.957	42.8	-
face-YO	32489	9258(9276)	0.993(0.9899)	25	189(230)	0.03168	0.03586	3.14	11.91	0.3207
fandisk30k	30078	816(819)	0.9731(0.9672)	32	66(72)	0.1274	0.1433	6.884	8.57	0.4456
femur	7798	6568(6764)	0.9573(0.9201)	570	413(771)	0.09864	0.1115	15.07	11.38	-

Table 4. Dataset statistics

Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
fertility-tri	27954	2248(2254)	0.9585(0.9534)	54	92(103)	0.09782	0.1144	9.431	10.53	-
filigree100k	100000	12242(12617)	0.9281(0.8853)	1211	1628(2344)	0.1779	0.2053	28.24	54.34	-
fish	15145	3948(3998)	0.9438(0.925)	69	168(263)	0.1122	0.1258	8.924	7.02	0.4911
focal-octa	20156	17622(17800)	0.9828(0.9694)	164	241(588)	0.1042	0.1148	6.308	16.42	-
foot	20423	2402(2404)	0.9952(0.9937)	12	16(20)	0.03506	0.04046	1.746	6.69	0.2449
fusee-Lp	102692	9048(9091)	0.9673(0.959)	263	486(585)	0.1472	0.1605	8.912	37.63	0.2856
fusee	107050	9050(9104)	0.9648(0.9545)	258	451(564)	0.1269	0.1398	7.689	40.35	0.1953
gargoyle100K	100000	21418(21765)	0.9499(0.9228)	1269	1985(2715)	0.1564	0.1813	23.75	67	-
gearbox	128606	26244(26694)	0.9357(0.9104)	2567	3064(4014)	0.1464	0.1698	26.21	89.92	-
genus3	13312	2463(2466)	0.9588(0.9577)	22	63(68)	0.07812	0.09302	6.687	4.38	-
grayloc	68580	23666(24004)	0.9638(0.9422)	298	1048(1711)	0.1143	0.132	10.02	43.42	-
greek-sculpture	50000	12709(13346)	0.9157(0.852)	571	1275(2406)	0.1918	0.2157	22.11	55.3	-
hand	3426	2368(2389)	0.9672(0.9516)	36	62(115)	0.07542	0.08435	8.535	2.48	0.4104
hand-olivier	7175	3313(3344)	0.9769(0.9629)	38	82(143)	0.07542	0.08527	6.821	3.76	0.3649
helmet	1000	2855(2959)	0.9719(0.9153)	31	104(323)	0.09014	0.09775	15.81	3.63	-
heptoroid100k	100000	11106(11245)	0.9147(0.8934)	219	657(934)	0.144	0.169	13.69	33.37	-
holes3	11776	3018(3032)	0.9533(0.947)	26	112(137)	0.1372	0.1555	11.12	4.61	-
homer	10202	5376(5453)	0.9739(0.9521)	124	226(371)	0.09271	0.1027	10.93	7.21	-
horse	39698	4509(4534)	0.9562(0.9463)	144	278(337)	0.1267	0.1484	14.96	14.69	-
igea100k	100000	3012(3027)	0.9768(0.9689)	74	95(127)	0.07385	0.08676	6.183	31.95	-
impeller	101436	16922(17008)	0.977(0.9687)	64	509(675)	0.1066	0.1177	4.8	36.27	0.05033
isidore-horse	100000	12691(12929)	0.9415(0.9107)	790	1226(1686)	0.1664	0.1942	21.08	44.49	-
joint20k	20968	1764(1764)	0.996(0.996)	24	26(26)	0.04852	0.05196	2.338	6.54	0.3821
julius	85587	8402(8418)	0.9862(0.9817)	96	181(221)	0.05854	0.06886	5.121	27.29	0.3948
kitten100K	100000	4154(4170)	0.9836(0.9764)	77	97(130)	0.07266	0.08658	7.404	29.73	-
knot100K	100000	19110(19679)	0.9279(0.8804)	1680	2693(3856)	0.1996	0.2312	36.98	83.66	-
knot1	480	2690(2718)	0.9875(0.9687)	0	56(126)	0.1011	0.1089	15.87	3.31	-
laurent-hand	100631	11905(11932)	0.9919(0.9878)	65	150(207)	0.05122	0.06098	2.682	34.94	0.1381
lenka-new	11998	3645(3733)	0.9595(0.9293)	38	197(372)	0.1505	0.1654	10.95	6.87	0.1622
lion-recon-50K	55794	7715(7809)	0.9546(0.9358)	334	576(773)	0.1435	0.1683	17.15	21.81	-
lock-Lp	62646	15666(15735)	0.9933(0.9864)	38	258(408)	0.05893	0.06542	4.437	25.67	0.2495
lucy100k	100000	13437(13773)	0.8927(0.8558)	1101	1650(2295)	0.181	0.2113	27.83	49.15	-
magalie-hand100K	100000	11604(11634)	0.9904(0.986)	90	135(202)	0.04925	0.0583	2.688	31.4	-
mannequin-devil	26568	4908(4970)	0.9502(0.9344)	233	341(458)	0.09903	0.1153	11.1	13.08	0.194
mannequin-mc	111538	13209(13302)	0.9868(0.975)	66	245(463)	0.0697	0.08121	5.355	42.57	0.05473
mask	62656	1332(1341)	0.9838(0.9729)	20	36(56)	0.05566	0.06591	4.689	20.93	0.1283
master-cylinder100K	100000	9127(9214)	0.9503(0.9344)	418	744(919)	0.1507	0.1772	16.93	42.57	-
max-planck	100625	12913(12955)	0.9881(0.9822)	84	237(324)	0.06049	0.07177	4.054	34.4	0.3564
moai	20000	7935(7973)	0.9728(0.9652)	68	170(264)	0.08322	0.09552	5.403	8.3	-
mouse	28708	6167(6263)	0.9575(0.9337)	209	323(528)	0.1225	0.1418	13.84	14.7	-
nasty-cheese	389972	34291(34456)	0.9644(0.9543)	2270	2472(2833)	0.1516	0.1713	15.89	156.4	0.3195
nautilus-20k-closed	50438	4952(4972)	0.9829(0.9757)	74	155(196)	0.1181	0.1264	4.554	17.02	0.2545
neptune0	105030	9532(9660)	0.931(0.9106)	896	1197(1436)	0.1808	0.2103	27.61	48.14	-
nicolo-da-uzzano	100444	5271(5365)	0.9118(0.8821)	614	903(1090)	0.2083	0.243	32.52	40.73	0.3828
nut-refine-tet-surf	48486	11598(11604)	0.9974(0.9965)	24	62(76)	0.04129	0.04528	1.792	16.25	0.04748
octa-flower-Lp	30282	8237(8340)	0.9782(0.9573)	24	392(616)	0.1083	0.1214	10.98	14.98	0.1659
oil-pump100K	100000	11923(12112)	0.9442(0.9184)	691	991(1396)	0.1429	0.1666	16.3	50	-
oni	4872	4908(4968)	0.9768(0.9573)	44	154(303)	0.09083	0.1008	9.161	5.35	0.198
part20k	26118	2470(2475)	0.976(0.9726)	20	44(53)	0.09406	0.104	3.904	7.62	0.5526
pear	21504	57(60)	0.9243(0.8711)	22	16(18)	0.3851	0.4181	43.5	8.03	-

Table 5. Dataset statistics

Model	#F	#Q	S.J.	#S(frame)	#S(quad)	$\mathcal{D}_m$	$\mathcal{D}_f$	MSC R.(%)	Time	D_{fl}
pegaso	30658	10827(10994)	0.9568(0.9327)	359	581(930)	0.1196	0.1373	14.14	20.18	-
pensatore	100000	8353(8474)	0.9406(0.9177)	505	844(1082)	0.1597	0.1875	19.85	39.21	-
pierrot100k	99970	7509(7621)	0.9326(0.9099)	548	885(1079)	0.1834	0.2143	26.07	38.91	-
pig	4963	3047(3071)	0.9747(0.9632)	40	77(128)	0.06625	0.07449	8.298	3.4	0.2629
plane-sphere	7842	1038(1039)	0.9894(0.9875)	10	14(17)	0.05808	0.06364	6.209	2.39	7.842e-15
plane-re	12359	4158(4162)	0.9956(0.9938)	16	35(41)	0.05406	0.0607	7.047	4.53	2.355e-14
plate-Lp	91380	12551(12626)	0.984(0.9738)	207	482(632)	0.09276	0.1038	8.28	32.95	0.7287
polygirl	19902	7365(7472)	0.943(0.9211)	167	341(571)	0.1109	0.1265	11.27	13.13	0.3094
pulley100K	100000	8282(8361)	0.9631(0.9478)	228	394(559)	0.1225	0.1427	10.59	33.47	-
pump-2	83796	6956(6994)	0.9673(0.9589)	221	352(417)	0.1356	0.1461	7.749	28.22	0.2461
rabbit5k	4996	8422(8465)	0.9922(0.9839)	50	107(210)	0.04621	0.05165	6.117	5.05	-
ramses	100000	7738(7827)	0.9408(0.923)	516	774(939)	0.1675	0.1968	22.54	39.96	-
raptor50K	46574	9479(9738)	0.9482(0.9145)	726	770(1199)	0.1453	0.1677	16.43	23.39	-
red-circular-box100K	100000	24841(25395)	0.9433(0.9072)	1566	2626(3761)	0.1647	0.19	27.1	77.31	-
retinal	7282	4247(4254)	0.9922(0.989)	18	46(64)	0.06249	0.07086	3.691	3.41	-
rgb-dragon	105022	15624(15984)	0.9262(0.8931)	1996	2180(2876)	0.1771	0.2062	34.06	63.53	-
robocat-deci	7512	6963(7161)	0.9627(0.9235)	222	379(744)	0.09217	0.1037	12.13	12.91	-
rocker-arm	20088	5010(5045)	0.975(0.9639)	50	111(191)	0.08145	0.09442	6.423	8.01	-
rolling-stage100K	100000	5374(5409)	0.9575(0.9462)	150	325(393)	0.1174	0.138	10.2	34.81	-
santa	151558	5928(6013)	0.9304(0.9089)	934	943(1117)	0.2133	0.2488	33.98	50.51	-
screwdriver	54300	1789(1790)	0.9873(0.988)	22	24(23)	0.0461	0.05177	3.002	16.5	-
sculpt	25520	9314(9355)	0.9934(0.9856)	16	144(238)	0.06041	0.0689	4.475	10.58	0.07208
seahorse2-100K	100000	10381(10558)	0.9409(0.9132)	1111	1350(1677)	0.1762	0.2062	29.87	43.46	-
shark	20104	4408(4528)	0.919(0.8846)	163	370(595)	0.1521	0.1726	19.49	18.44	-
sharp-sphere10k	42404	10144(10161)	0.9881(0.9852)	24	100(143)	0.06897	0.07601	2.161	13.76	0.1247
smooth-feature	33664	17114(17172)	0.9979(0.9926)	10	93(193)	0.02147	0.02305	1.273	13.73	0.01574
spiral	61222	6807(6851)	0.9541(0.9441)	42	236(314)	0.08988	0.1028	5.119	21.46	0.02598
switchmec-Lp	34850	4034(4044)	0.9713(0.9672)	108	161(180)	0.09209	0.1041	7.357	13.23	0.563
sydney	53848	4900(4940)	0.9362(0.9235)	50	305(358)	0.1283	0.1413	7.338	19.54	0.2064
thai-statue	79970	19258(19656)	0.9459(0.9137)	1075	1861(2689)	0.1574	0.1814	25.31	55.69	-
three-peaks	3854	167(180)	0.9611(0.9002)	18	21(33)	0.1218	0.1419	27.01	1.33	0.1152
torso	100000	3888(3964)	0.9058(0.8778)	446	591(735)	0.2051	0.242	28.82	36.43	-
trim-star-14k	24754	4146(4162)	0.9848(0.9777)	80	126(157)	0.07575	0.08483	7.605	9.17	0.2644
trim-star	36234	9650(9751)	0.9787(0.9621)	79	380(591)	0.1064	0.1185	9.491	17.28	0.3233
turbine-Lp	116834	9468(9475)	0.9786(0.9768)	80	320(332)	0.1121	0.1194	6.351	40.07	0.4714
twirl20k-new	48794	14652(14694)	0.9899(0.9853)	24	209(295)	0.06525	0.07341	3.693	18.88	0.07096
uu-memento100k	99932	7379(7486)	0.9394(0.9152)	396	686(895)	0.1677	0.1971	19.25	38.03	-
vase100K	100000	4944(5014)	0.9238(0.901)	334	439(571)	0.1519	0.1785	11.8	32.55	-
vase-lion100K	100000	23358(24180)	0.9113(0.8608)	1296	2534(4150)	0.1923	0.2207	28.72	96.96	-
venus	2422	2568(2578)	0.9749(0.9683)	18	30(56)	0.06207	0.06831	5.196	1.87	0.461
vh-skin	58502	5406(5467)	0.9707(0.9583)	2352	241(319)	0.141	0.1542	13.95	23.07	-
woodenfish	34910	7043(7156)	0.9541(0.9274)	156	389(625)	0.1353	0.1554	13.19	17.28	-
wrench50K	50000	2348(2374)	0.9571(0.9391)	68	119(171)	0.1276	0.1522	9.815	15.17	-
www-re	57424	15548(15572)	0.9967(0.9939)	44	133(180)	0.04103	0.04515	1.708	19.83	0.2127