

Supplementary material for "Gaussian process optimization with failures: classification and convergence proof"

François Bachoc Céline Helbert Victor Picheny

November 7, 2019

D Simulations on 2D Gaussian processes

The performances of both methods (*EFI GPC sign* and *EFI GPC EP*) are compared on simulations of Gaussian processes. It can be seen on Figure D.1 that the regret of *EFI GPC sign* converges more rapidly to 0. The number of successes is more important with *EFI GPC sign* than with *EFI GPC EP* (see Figure D.2). An example of the progression of the algorithms in *case 1* ($\theta_Z = \theta_Y = 0.1$) is plotted on Figure D.3 for *EFI GPC sign* and D.4 for *EFI GPC EP*.

E Industrial case study

Figure E.1 represents the geometry of the turbomachinery rotor blades. It is parameterised by 5 chords lengths, 5 stagger angles and 5 heights of max camber.

The variation range for each geometric parameter is given in Table E.1. The coordinates of the specific points used in Figure 3 in the paper are given in Table E.2.

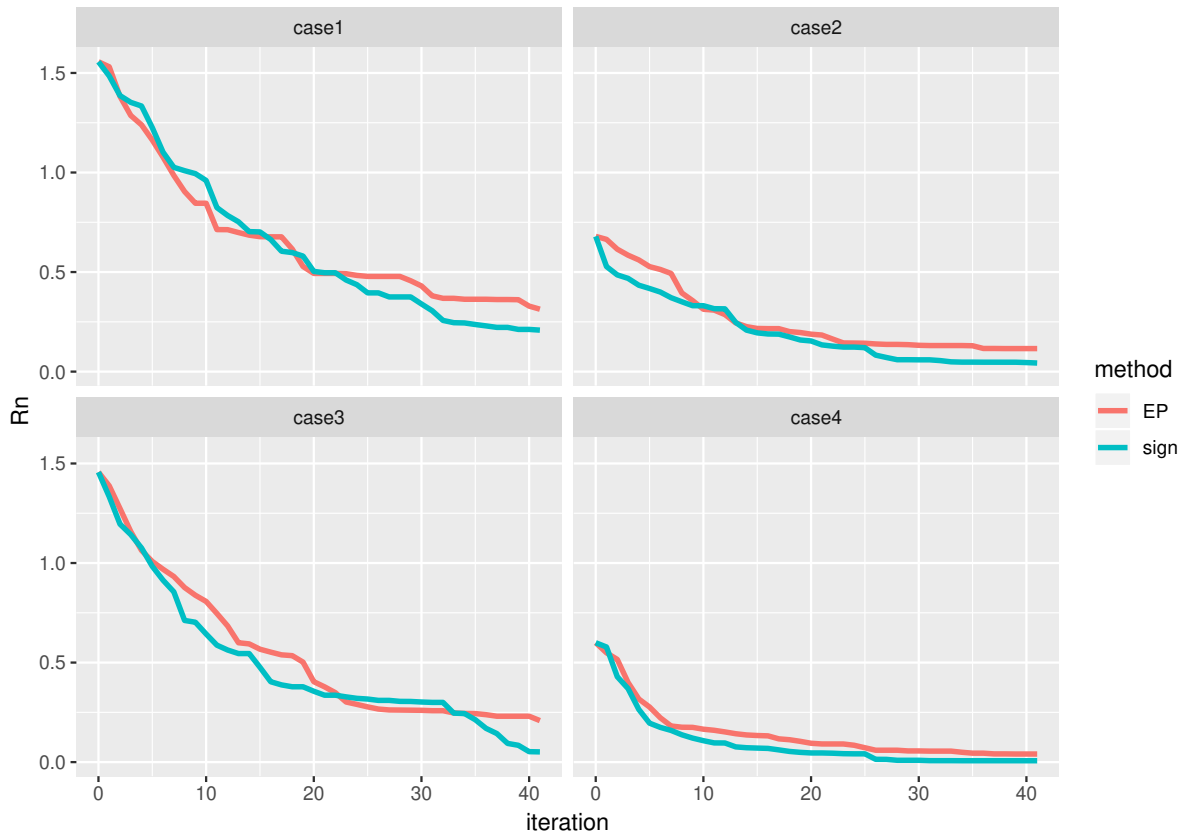


Figure D.1: Evolution of R_n (in mean) along the iteration steps : *EFI GPC sign* in green and *EFI GPC EP* in red. Four cases of range values are considered (see Table 1 in the paper). Parameters are estimated by maximum likelihood.

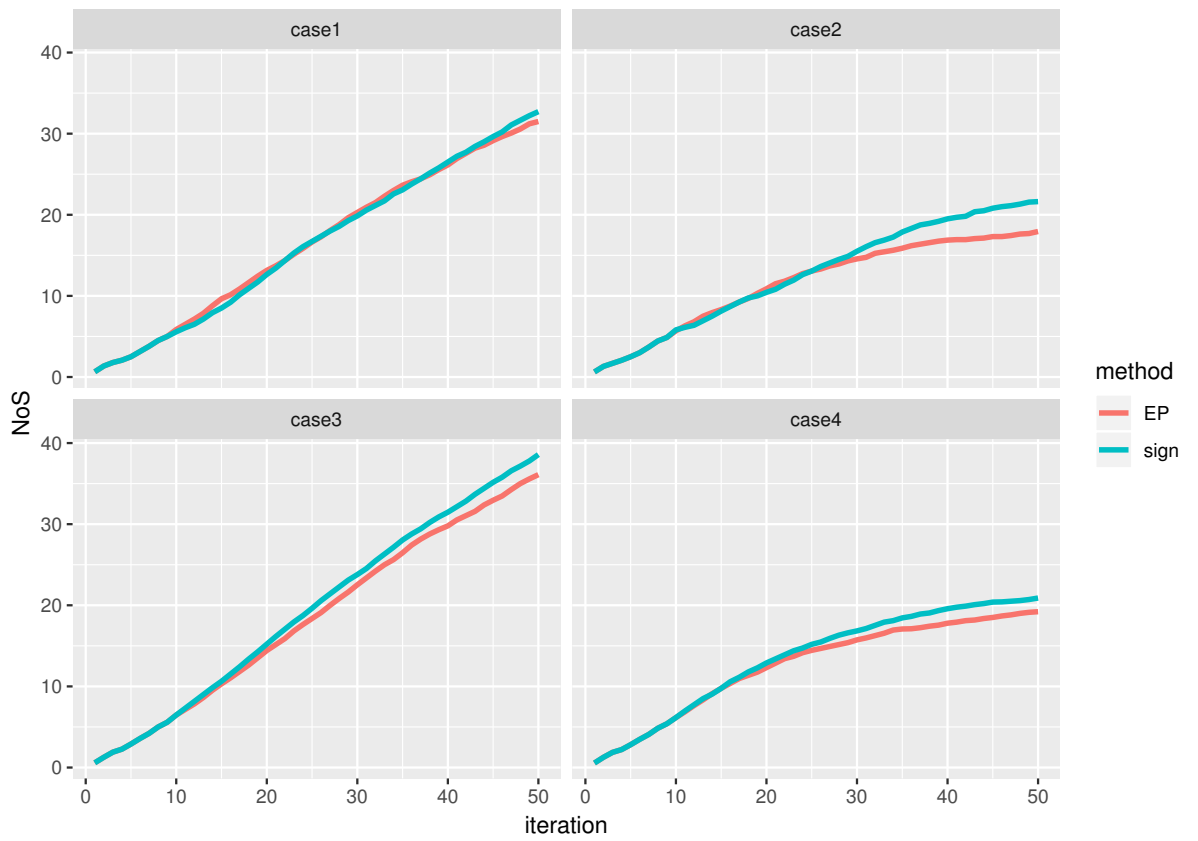


Figure D.2: Evolution of NoS (Number of Successes), in mean, with the number of iterations : $EFI\ GPC\ sign$ in green and $EFI\ GPC\ EP$ in red. Four cases of range values are considered (see Table 1 in the paper).

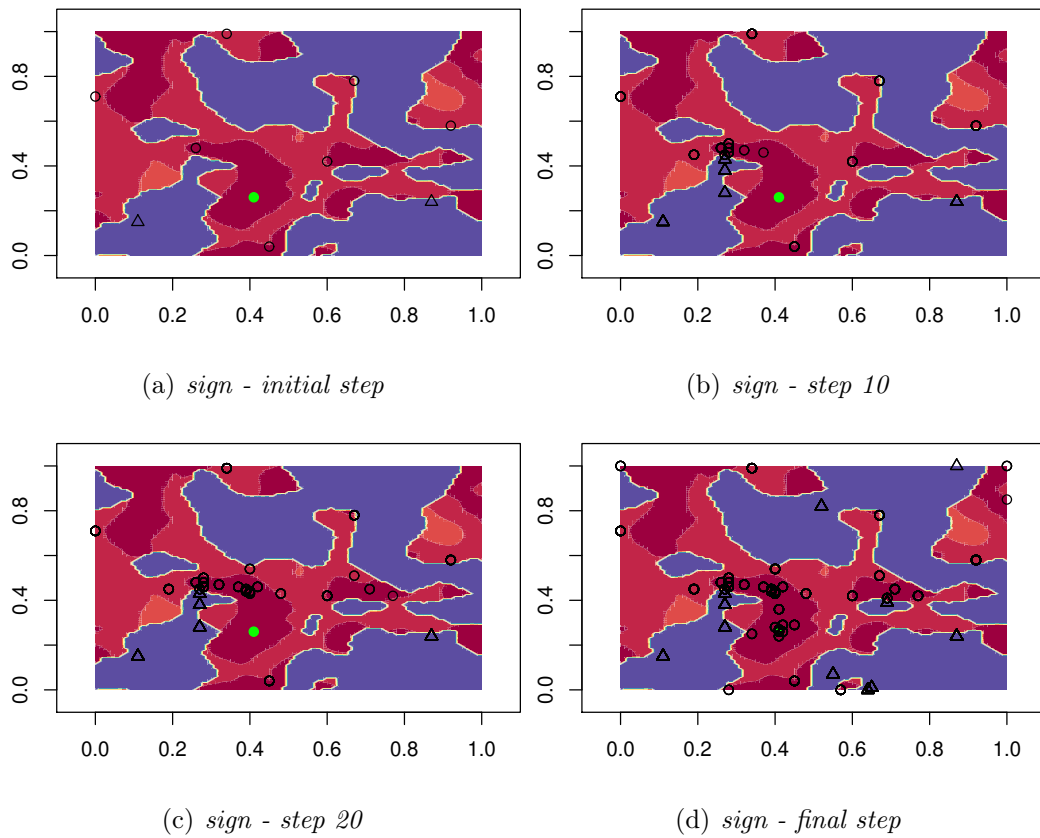


Figure D.3: Evolution of *EFI GPC sign* with iteration. The non admissible area is in blue. The best point is in green. NA points are plotted with triangles. Four situations are plotted : (a) initial step composed of 9 points, (b) after 10 added points, (c) after 20 added points, (d) final situation composed of 50 points.

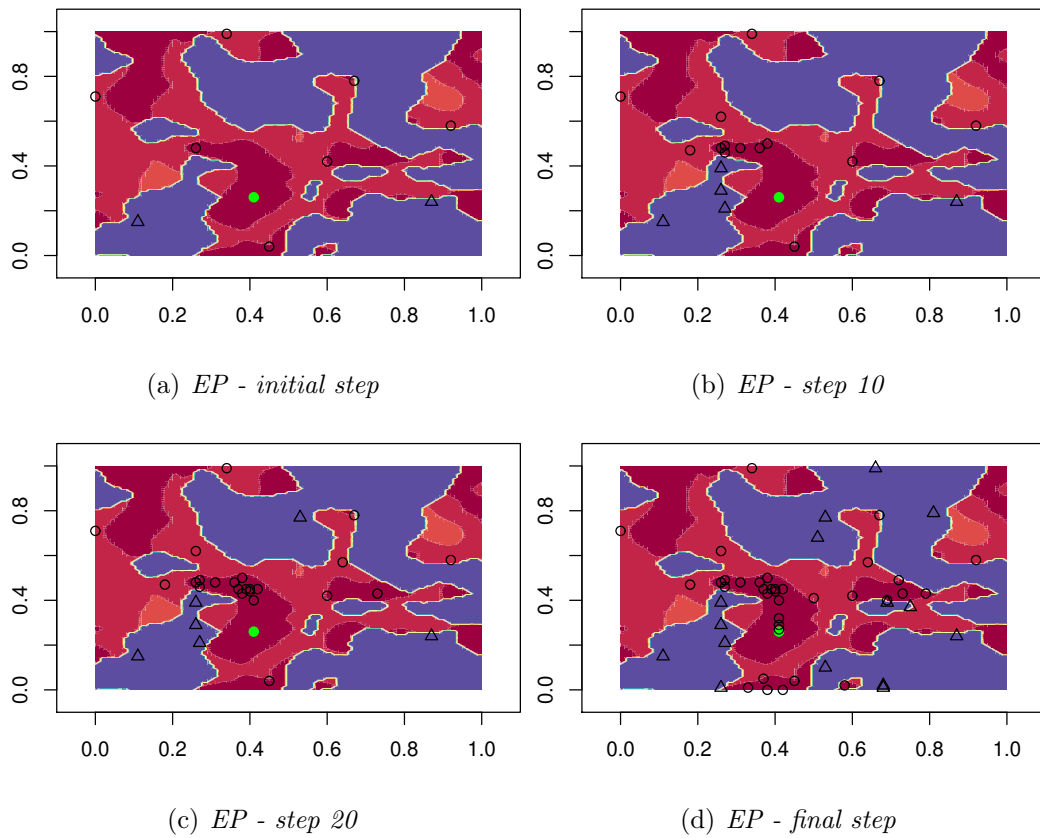


Figure D.4: Evolution of *EFI GPC EP* with iteration. The non admissible area is in blue. The best point is in green. NA points are plotted with triangles. Four situations are plotted : (a) initial step composed of 9 points, (b) after 10 added points, (c) after 20 added points, (d) final situation composed of 50 points.

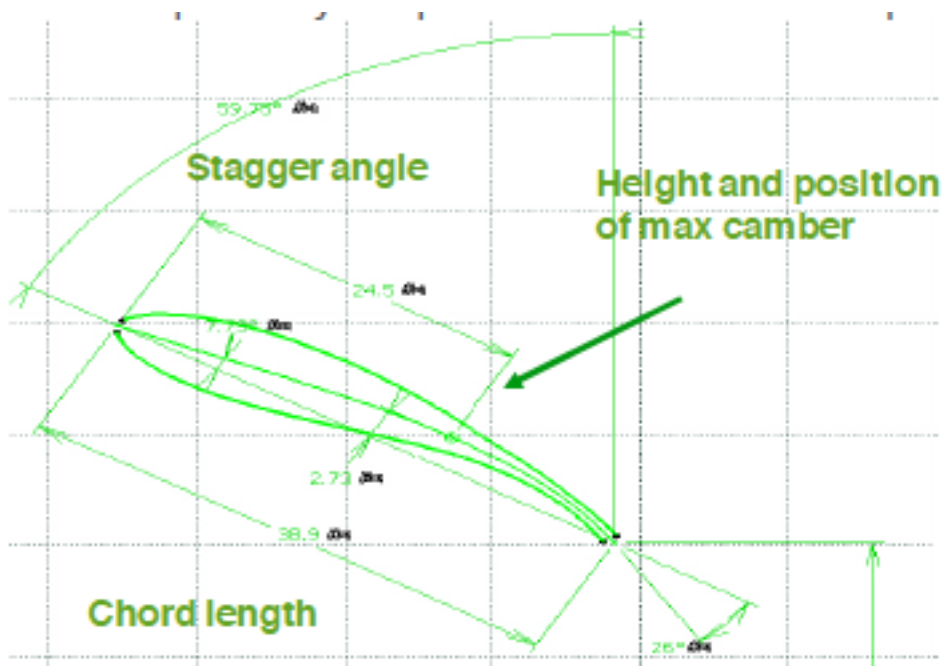


Figure E.1: Section of a rotor blade for the turbomachinery of a fan system.

	min	max
chord (m) 1	0.04138525	0.06752330
chord (m) 2	0.05650678	0.09219527
chord (m) 3	0.07162831	0.11686725
chord (m) 4	0.08674985	0.14153922
chord (m) 5	0.10187138	0.16621120
stagger (deg) 1	-53.35443064	-43.43365215
stagger (deg) 2	-62.79903182	-51.12211434
stagger (deg) 3	-69.27937009	-56.39749175
stagger (deg) 4	-73.91186646	-60.16861691
stagger (deg) 5	-77.35418265	-62.97086524
Hmax (% chord) 1	3.61896038	5.90461956
Hmax (% chord) 2	3.61896038	5.90461956
Hmax (% chord) 3	3.61896038	5.90461956
Hmax (% chord) 4	2.71422028	4.42846467
Hmax (% chord) 5	1.80948019	2.95230978

Table E.1: Ranges for the 15 studied parameters

	Point 1	Point 2	Point 3
chord (m) 1	0.04661286	0.05445427	0.06229569
chord (m) 2	0.06364448	0.07435103	0.08505757
chord (m) 3	0.08067610	0.09424778	0.10781946
chord (m) 4	0.09770772	0.11414453	0.13058135
chord (m) 5	0.11473934	0.13404129	0.15334323
stagger (deg) 1	-51.37027494	-48.39404140	-45.41780785
stagger (deg) 2	-60.46364832	-56.96057308	-53.45749783
stagger (deg) 3	-66.70299442	-62.83843092	-58.97386742
stagger (deg) 4	-71.16321655	-67.04024168	-62.91726682
stagger (deg) 5	-74.47751917	-70.16252394	-65.84752872
Hmax (% chord) 1	4.07609221	4.76178997	5.44748772
Hmax (% chord) 2	4.07609221	4.76178997	5.44748772
Hmax (% chord) 3	4.07609221	4.76178997	5.44748772
Hmax (% chord) 4	3.05706916	3.57134248	4.08561579
Hmax (% chord) 5	2.03804611	2.38089498	2.72374386

Table E.2: Coordinates of three reference points inside the hypercube.