

Equation	ArgMin	Minimum
$Q_1(\boldsymbol{\theta}) = \sum_{i=1}^D \theta_i^2$	$\boldsymbol{\theta}^* = \mathbf{0}$	$Q_1(\boldsymbol{\theta}^*) = 0$
$Q_2(\boldsymbol{\theta}) = \sum_{i=1}^D \left(\sum_{j=1}^i \theta_j \right)^2$	$\boldsymbol{\theta}^* = \mathbf{0}$	$Q_2(\boldsymbol{\theta}^*) = 0$
$Q_3(\boldsymbol{\theta}) = \sum_{i=1}^{D-1} [100\{\theta_{i+1} + 1 - (\theta_i + 1)^2\} + \theta_i^2]$	$\boldsymbol{\theta}^* = \mathbf{0}$	$Q_3(\boldsymbol{\theta}^*) = 0$
$Q_4(\boldsymbol{\theta}) = \sum_{i=1}^D \{\theta_i^2 - \cos(2\pi\theta_i) + 10\} - 9D$	$\boldsymbol{\theta}^* = \mathbf{0}$	$Q_4(\boldsymbol{\theta}^*) = 0$
$Q_5(\boldsymbol{\theta}) = \frac{1}{4000} \ \boldsymbol{\theta}\ ^2 - \prod_{i=1}^D \cos\left(\frac{\theta_i}{\sqrt{i}}\right) + 1$	$\boldsymbol{\theta}^* = \mathbf{0}$	$Q_5(\boldsymbol{\theta}^*) = 0$
$Q_6(\boldsymbol{\theta}) = -20 \exp\left(-0.2\sqrt{\frac{1}{D}\ \boldsymbol{\theta}\ }\right)$ $- \exp\left\{\frac{1}{D} \sum_{i=1}^D \cos(2\pi\theta_i)\right\} + 20 + \exp(1)$	$\boldsymbol{\theta}^* = \mathbf{0}$	$Q_6(\boldsymbol{\theta}^*) = 0$

Table 1. Simpson et al; Up ↑

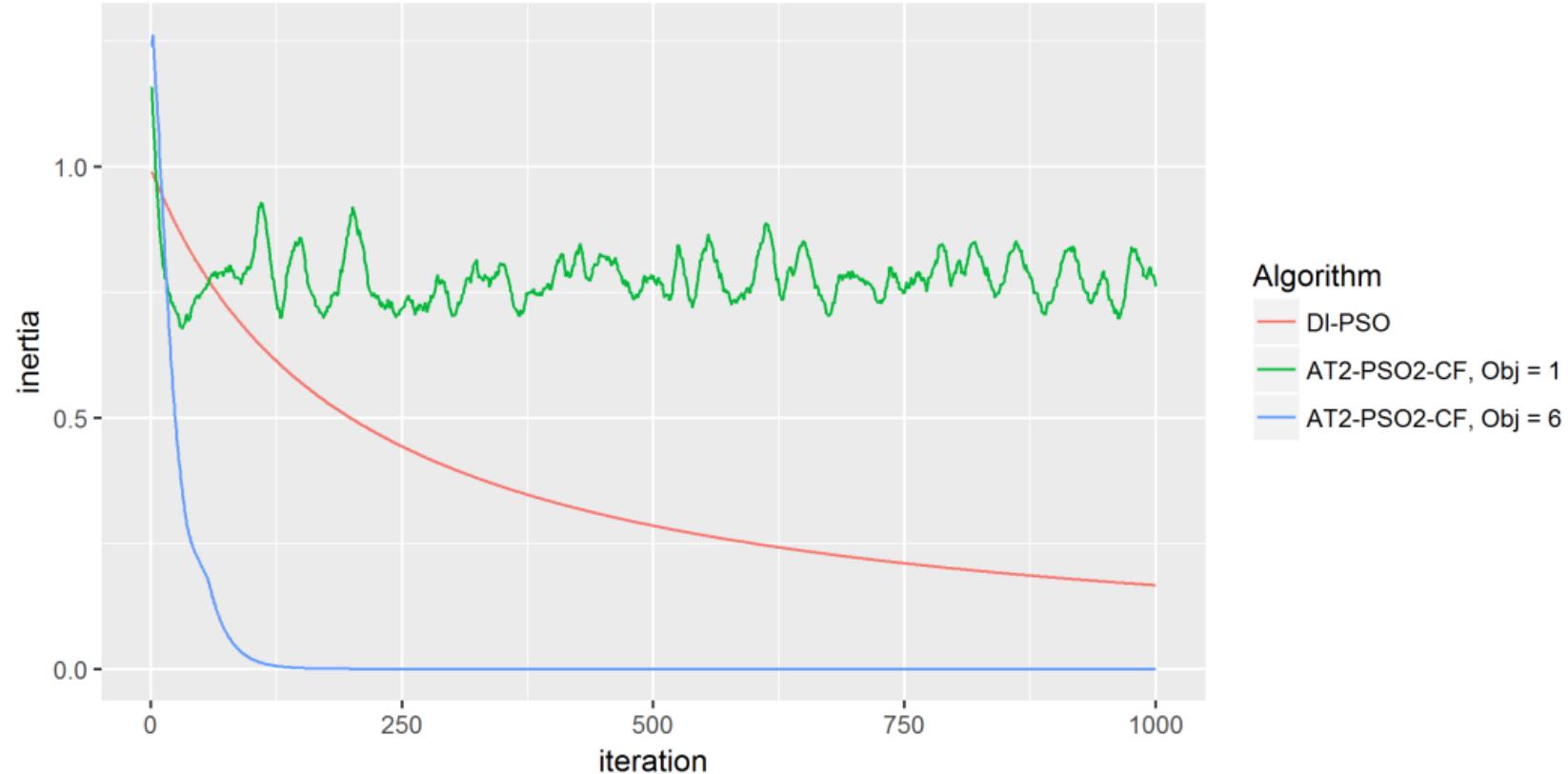


Figure 1. Simpson et al; Up ↑

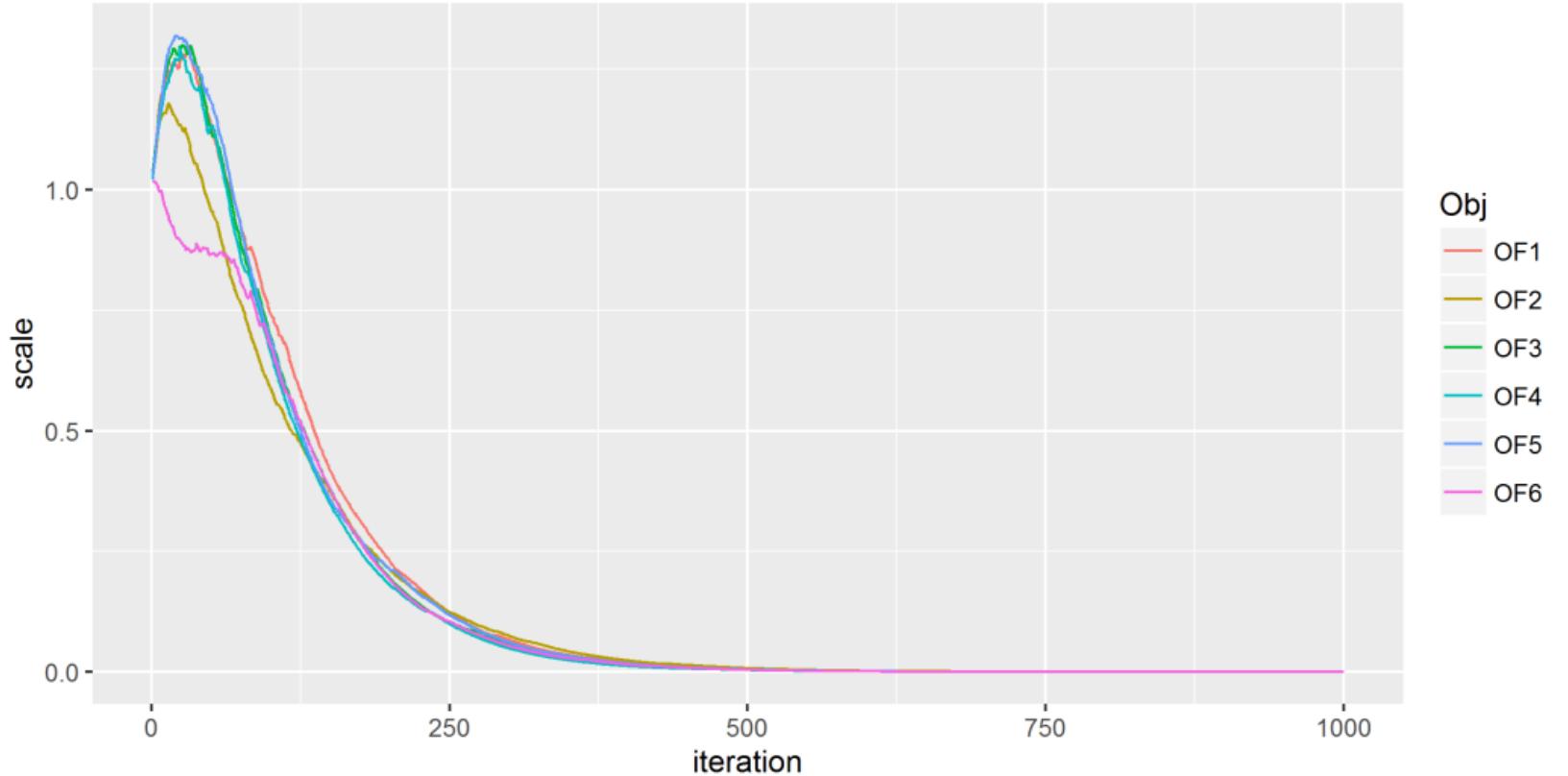


Figure 2. Simpson et al; Up ↑

Algorithm	\overline{Q}_{puk}	Q_{puk}^*
Uniform	16.40	26.80
PSO1	14.40	20.63
PSO2	14.45	21.03
PSO1-CF	15.53	23.54
PSO2-CF	15.77	23.16
AT1-PSO1	14.38	20.57
AT1-PSO2	14.56	23.18
AT1-PSO1-CF	15.96	23.33
AT1-PSO2-CF	15.60	24.02
AT2-PSO1	14.42	21.13
AT2-PSO2	14.32	22.11
AT2-PSO1-CF	15.85	24.00
AT2-PSO2-CF	15.95	23.63
AT1-BBPSO	14.53	22.28
AT1-BBPSOxp	15.87	22.19
AT1-BBPSO-CF	14.65	21.33
AT1-BBPSOxp-CF	14.84	22.34
AT2-BBPSO	14.65	23.49
AT2-BBPSOxp	15.21	23.25
AT2-BBPSO-CF	14.63	21.92
AT2-BBPSOxp-CF	14.52	22.76
GA-11	14.40	21.19
GA-21	15.20	23.21
GA-12	14.45	20.84
GA-22	15.26	22.61

Table 2. Simpson et al; Up ↑

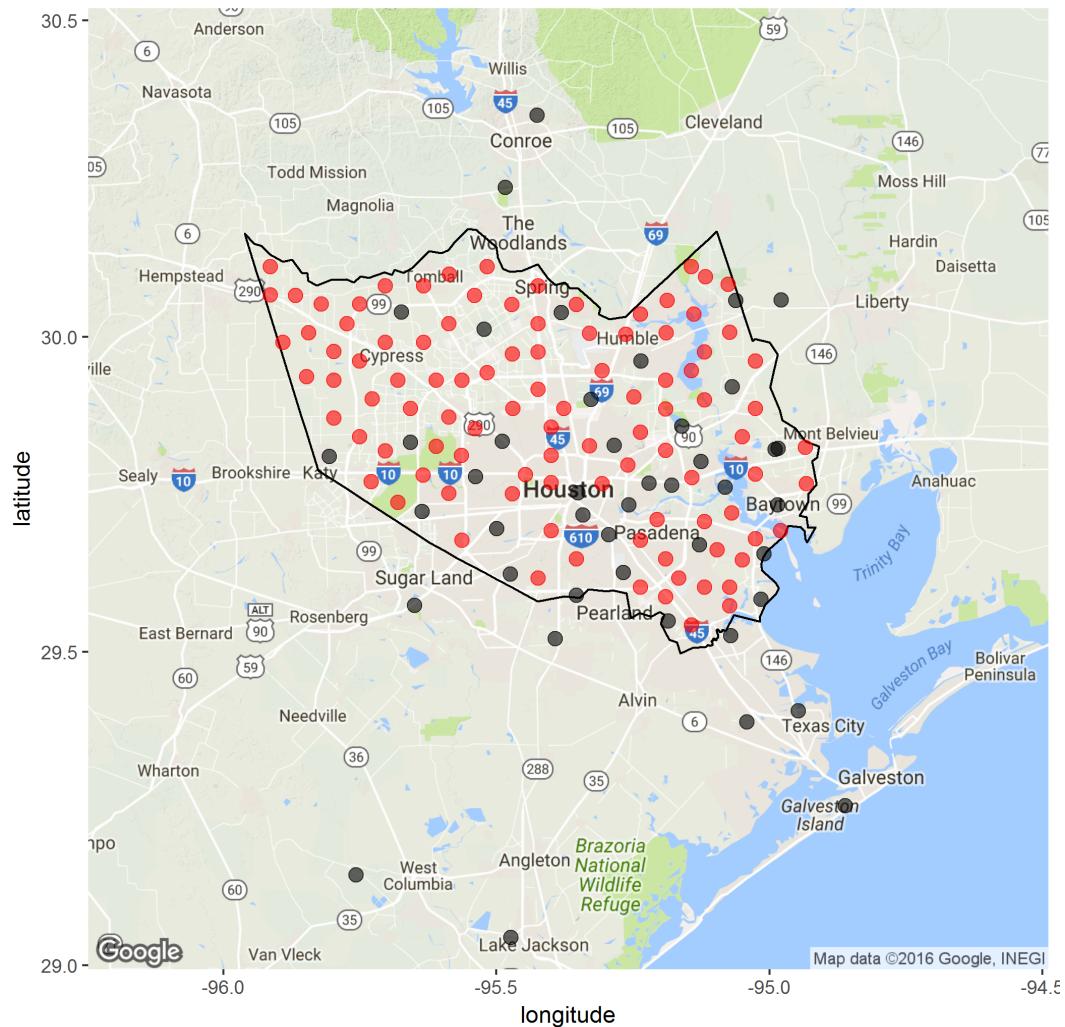


Figure 3. Simpson et al; Up ↑

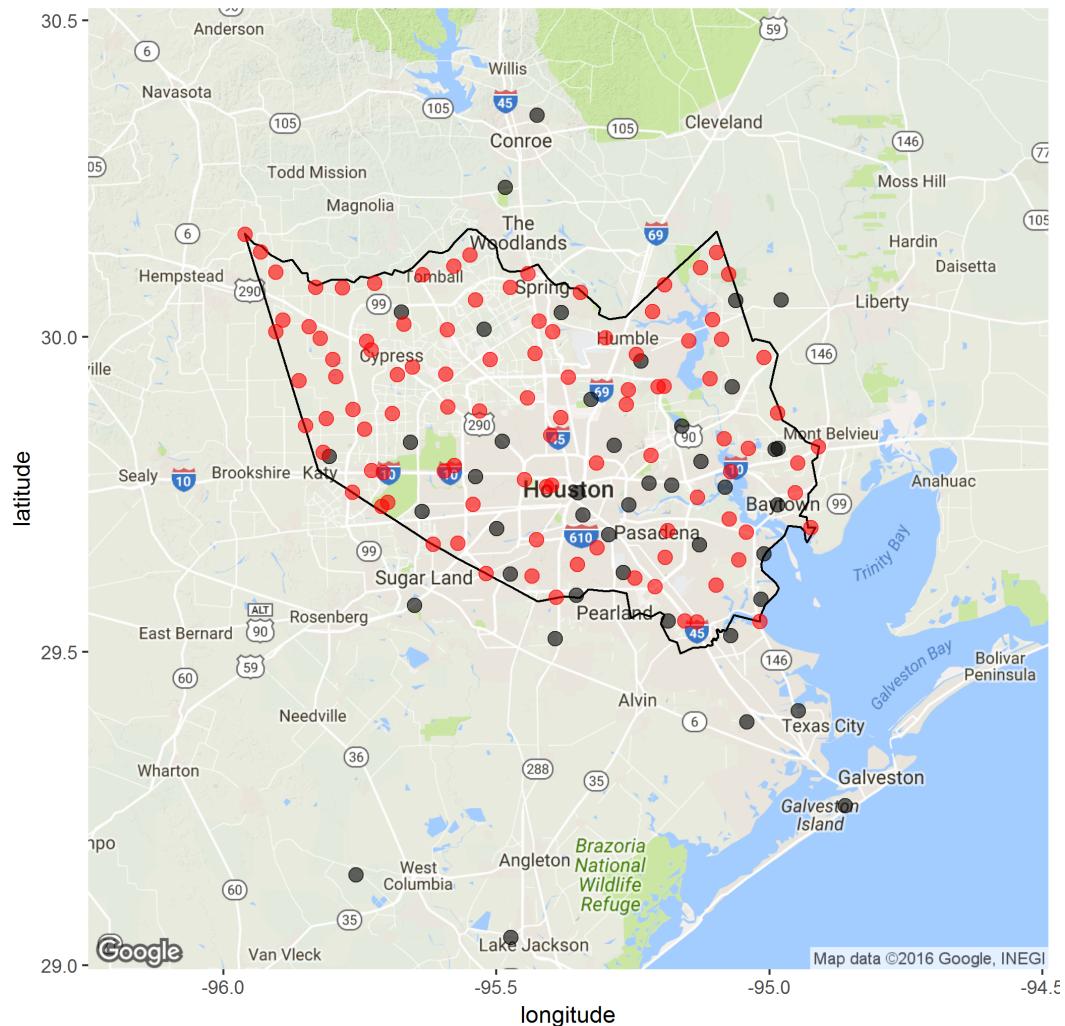


Figure 4. Simpson et al; Up ↑