

a9a

$$f(X_k) - f(X^*)$$

 $8 \times 10^{-1}$  $7 \times 10^{-1}$  $6 \times 10^{-1}$ 

0

1

2

3

4

5

6

Number of oracle calls

1e7

- ◆ ZO-AccSGD:  $N = 1000$ ;  $\text{lr} = 0.06361648120413012$ ,  $\rho = 100$ ,  $\text{bs} = 32561$ ,  $B = 10$ ,  $\delta = 0.01$
- ZO-AccSGD:  $N = 1000$ ;  $\text{lr} = 0.06361648120413012$ ,  $\rho = 100$ ,  $\text{bs} = 32561$ ,  $B = 10$ ,  $\delta = 0.001$
- ▲ ZO-AccSGD:  $N = 1000$ ;  $\text{lr} = 0.06361648120413012$ ,  $\rho = 100$ ,  $\text{bs} = 32561$ ,  $B = 10$ ,  $\delta = 0.0001$
- ZO-AccSGD:  $N = 1000$ ;  $\text{lr} = 0.006361648120413011$ ,  $\rho = 100$ ,  $\text{bs} = 32561$ ,  $B = 10$ ,  $\delta = 0.01$
- ★ ZO-AccSGD:  $N = 1000$ ;  $\text{lr} = 0.006361648120413011$ ,  $\rho = 100$ ,  $\text{bs} = 32561$ ,  $B = 10$ ,  $\delta = 0.001$
- ⬢ ZO-AccSGD:  $N = 1000$ ;  $\text{lr} = 0.006361648120413011$ ,  $\rho = 100$ ,  $\text{bs} = 32561$ ,  $B = 10$ ,  $\delta = 0.0001$