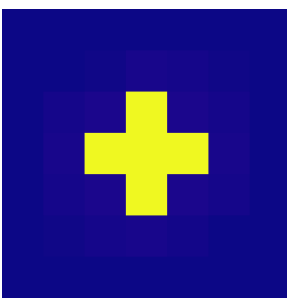
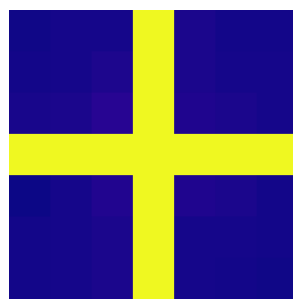


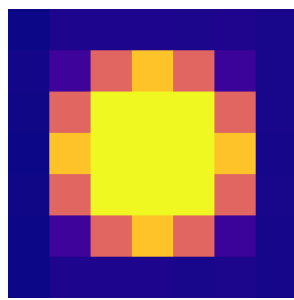
Opération : **fermeture**  
Jeu : **MNIST**



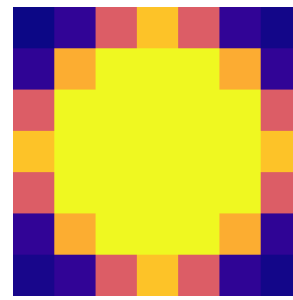
cross3



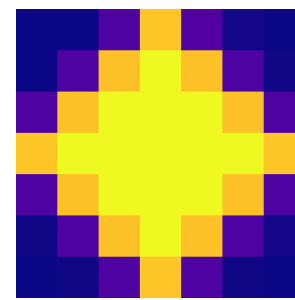
cross7



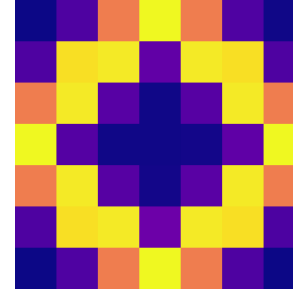
disk2



disk3



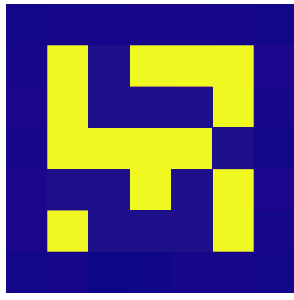
diamond3



complex



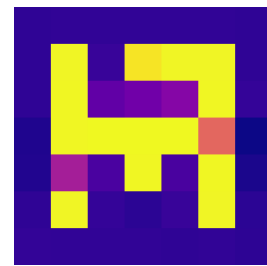
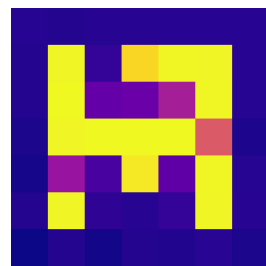
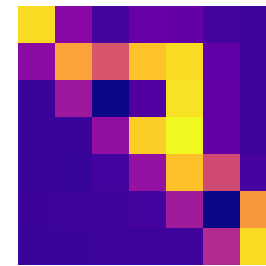
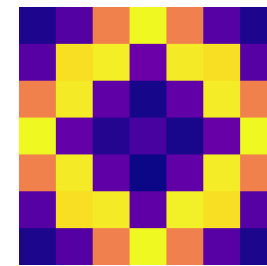
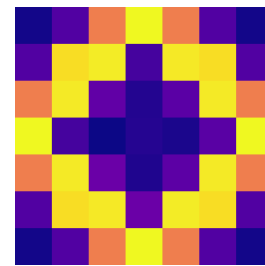
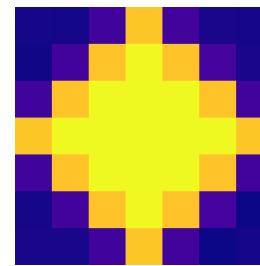
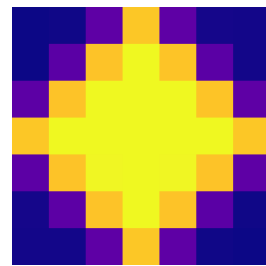
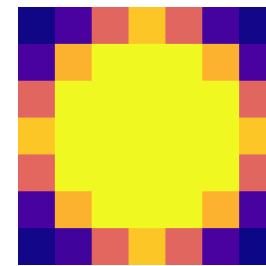
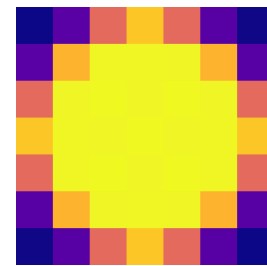
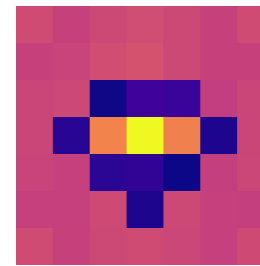
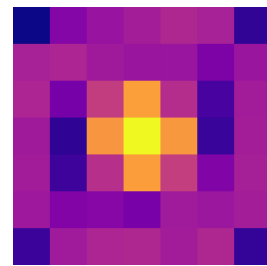
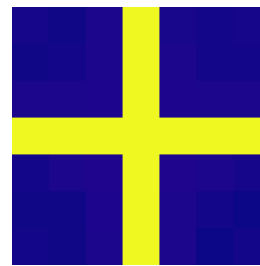
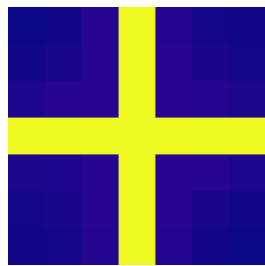
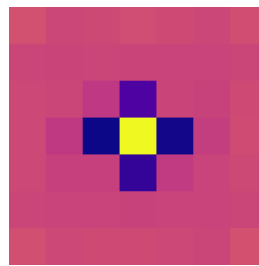
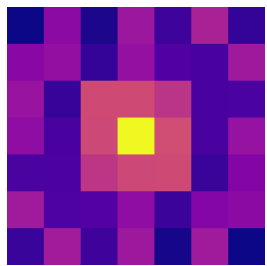
adiag



brand

*SMorph*

$w_1/w_2$



$\alpha_1$

$-0.31 \pm 0.001$

$49.73 \pm 0.30$

$-0.33 \pm 0.001$

$49.26 \pm 0.21$

$50.74 \pm 0.34$

$28.71 \pm 0.06$

$24.21 \pm 8.94$

$37.49 \pm 0.17$

$\alpha_2$

$-4.54 \pm 0.008$

$-49.21 \pm 0.19$

$-8.44 \pm 0.028$

$-47.38 \pm 0.12$

$-50.22 \pm 0.17$

$-40.74 \pm 0.09$

$-15.26 \pm 0.39$

$-25.36 \pm 0.11$

RMSE<sub>1</sub>

$0.28 \pm 2 \times 10^{-4}$

$0.02 \pm 2 \times 10^{-3}$

$0.38 \pm 7 \times 10^{-4}$

$0.021 \pm 3 \times 10^{-4}$

$0.02 \pm 1 \times 10^{-4}$

$0.02 \pm 6 \times 10^{-3}$

$0.14 \pm 2 \times 10^{-2}$

$0.12 \pm 3 \times 10^{-3}$

RMSE<sub>2</sub>

$0.55 \pm 9 \times 10^{-4}$

$0.01 \pm 7 \times 10^{-4}$

$0.54 \pm 1 \times 10^{-3}$

$0.004 \pm 2 \times 10^{-4}$

$0.02 \pm 2 \times 10^{-4}$

$0.02 \pm 4 \times 10^{-3}$

$0.19 \pm 2 \times 10^{-2}$

$0.12 \pm 3 \times 10^{-3}$

LOSS

$1.8 \times 10^{-3} \pm 6 \times 10^{-6}$

$1.4 \times 10^{-5} \pm 3 \times 10^{-6}$

$4.5 \times 10^{-3} \pm 8 \times 10^{-6}$

$1.8 \times 10^{-5} \pm 6 \times 10^{-6}$

$1.1 \times 10^{-5} \pm 3 \times 10^{-6}$

$1.9 \times 10^{-5} \pm 1 \times 10^{-6}$

$6.7 \times 10^{-4} \pm 3 \times 10^{-5}$

$3.2 \times 10^{-4} \pm 1 \times 10^{-5}$

EPOCHS

$17 \pm 2$

$30 \pm 9$

$18 \pm 4$

$32 \pm 5$

$34 \pm 7$

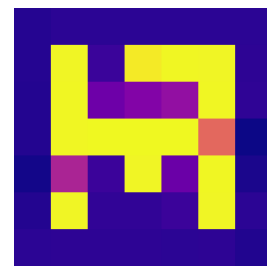
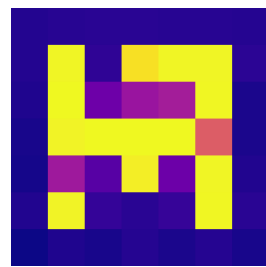
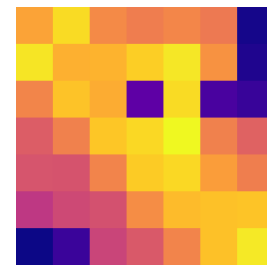
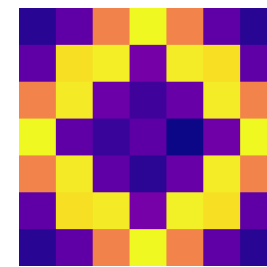
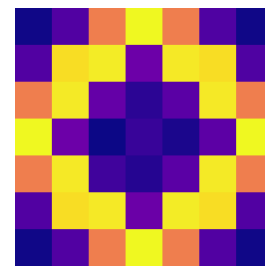
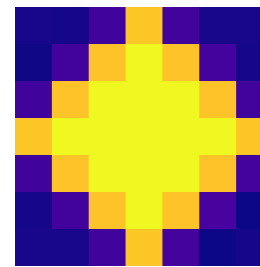
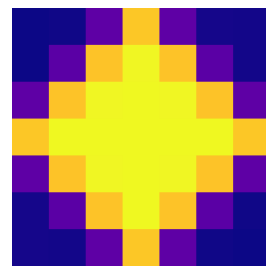
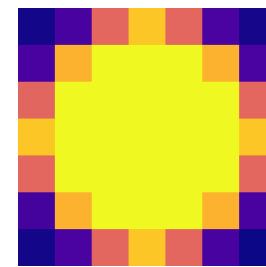
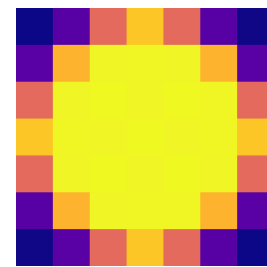
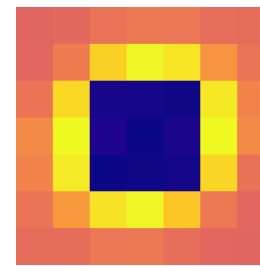
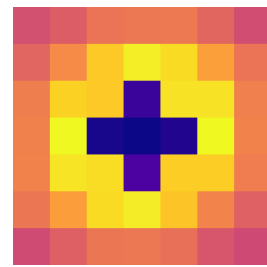
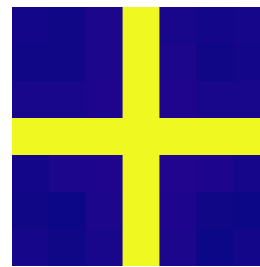
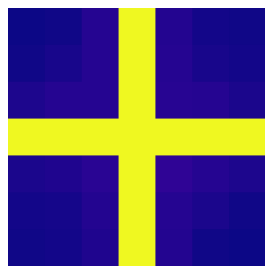
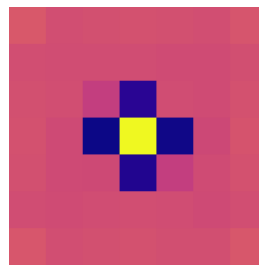
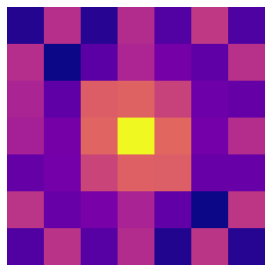
$32 \pm 8$

$33 \pm 7$

$33 \pm 8$

*SMorphTanh*

$w_1/w_2$



$\alpha_1$

$-0.43 \pm 0.001$

$49.82 \pm 0.44$

$1.48 \pm 0.004$

$49.18 \pm 0.22$

$50.50 \pm 0.44$

$28.70 \pm 0.05$

$4.35 \pm 6.16$

$37.26 \pm 0.16$

$\alpha_2$

$-5.11 \pm 0.012$

$-49.20 \pm 0.36$

$-1.78 \pm 0.003$

$-47.29 \pm 0.17$

$-50.03 \pm 0.34$

$-40.72 \pm 0.07$

$-3.87 \pm 5.02$

$-25.29 \pm 0.07$

RMSE<sub>1</sub>

$0.32 \pm 1 \times 10^{-3}$

$0.02 \pm 8 \times 10^{-4}$

$0.57 \pm 7 \times 10^{-4}$

$0.018 \pm 2 \times 10^{-4}$

$0.01 \pm 4 \times 10^{-4}$

$0.02 \pm 3 \times 10^{-3}$

$0.44 \pm 1 \times 10^{-1}$

$0.12 \pm 4 \times 10^{-3}$

RMSE<sub>2</sub>

$0.57 \pm 9 \times 10^{-4}$

$0.01 \pm 3 \times 10^{-4}$

$0.65 \pm 5 \times 10^{-4}$

$0.004 \pm 4 \times 10^{-4}$

$0.01 \pm 3 \times 10^{-4}$

$0.03 \pm 9 \times 10^{-3}$

$0.43 \pm 1 \times 10^{-1}$

$0.13 \pm 3 \times 10^{-3}$

LOSS

$2.0 \times 10^{-3} \pm 4 \times 10^{-5}$

$1.5 \times 10^{-5} \pm 8 \times 10^{-6}$

$1.8 \times 10^{-3} \pm 6 \times 10^{-6}$

$1.4 \times 10^{-5} \pm 4 \times 10^{-6}$

$1.4 \times 10^{-5} \pm 4 \times 10^{-6}$

$2.5 \times 10^{-5} \pm 9 \times 10^{-6}$

$1.8 \times 10^{-3} \pm 5 \times 10^{-4}$

$3.1 \times 10^{-4} \pm 4 \times 10^{-6}$

EPOCHS

$17 \pm 1$

$32 \pm 8$

$23 \pm 4$

$27 \pm 2$

$28 \pm 4$

$31 \pm 4$

$27 \pm 6$

$28 \pm 3$