Fits d'une gaussienne par réseaux de neurones

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0.0.1 fit d'une gaussienne, variations du nombre d'outputs

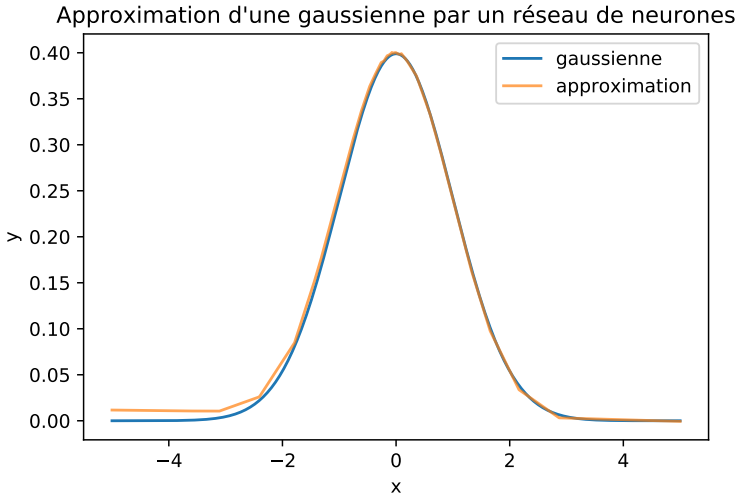

FIGURE 1 – Fit d'une gaussienne. 10001 points. outputs : 20, 20, 1. Total params : 481 Trainable params : 481. Epochs = 30, batch = 20

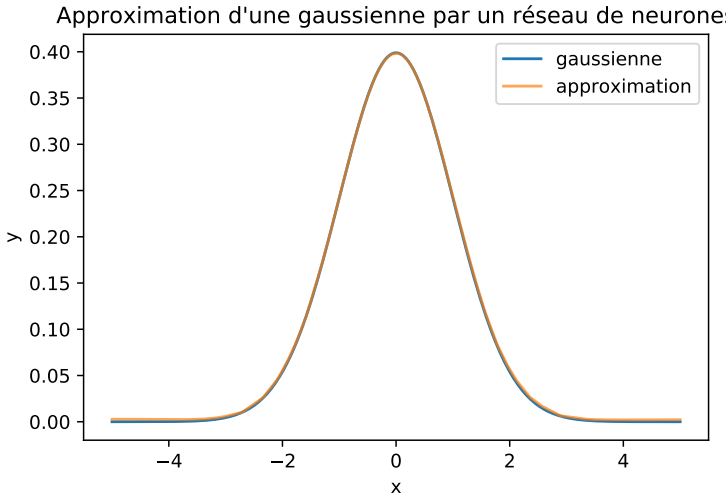

FIGURE 2 – Fit d'une gaussienne. 10001 points. outputs : 200, 200, 1. Total params : 40,801 Trainable params : 40,801. Epochs = 30, batch = 20

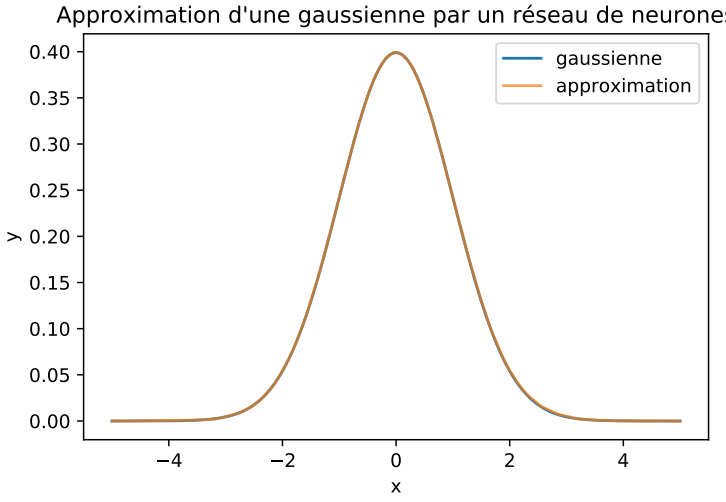

FIGURE 3 – Fit d'une gaussienne. 10001 points. outputs : 400, 400, 1. Total params : 161,601 Trainable params : 161,601. Epochs = 30, batch = 20

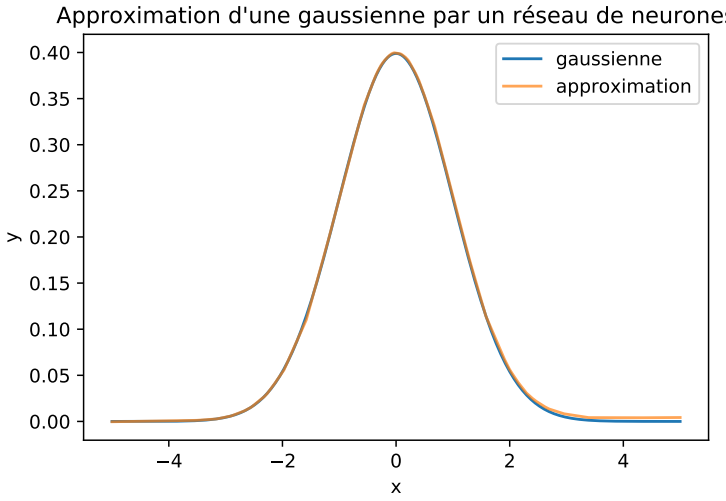

FIGURE 4 – Fit d'une gaussienne. 10001 points. outputs : 200, 20, 1. Total params : 4,441 Trainable params : 4,441. Epochs = 30, batch = 20

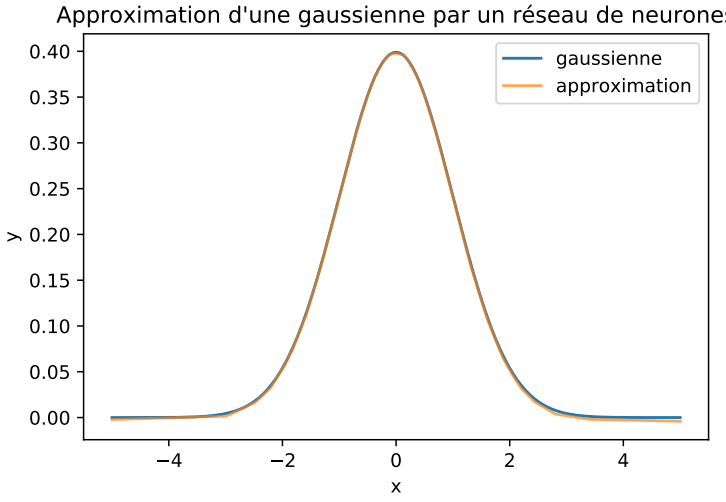

FIGURE 5 – Fit d'une gaussienne. 10001 points. outputs : 20, 200, 1. Total params : 4,441 Trainable params : 4,441. Epochs = 30, batch = 20

0.0.2 fit d'une gaussienne, variation du batch

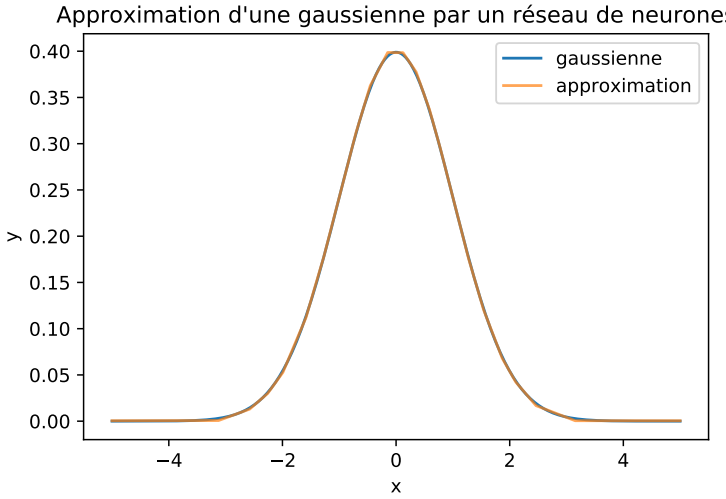

FIGURE 6 – Fit d'une gaussienne. 10001 points. outputs : 200, 200, 1. Total params : 40,801 Trainable params : 40,801. Epochs = 30, batch = 2

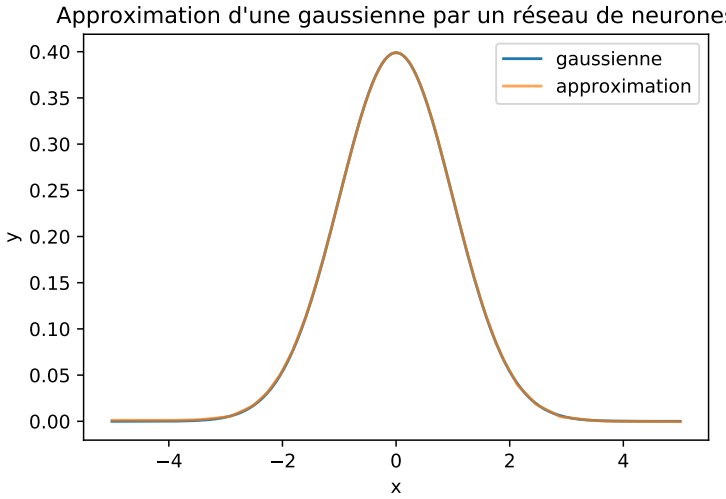

FIGURE 7 – Fit d'une gaussienne. 10001 points. outputs : 200, 200, 1. Total params : 40,801 Trainable params : 40,801. Epochs = 30, batch = 20

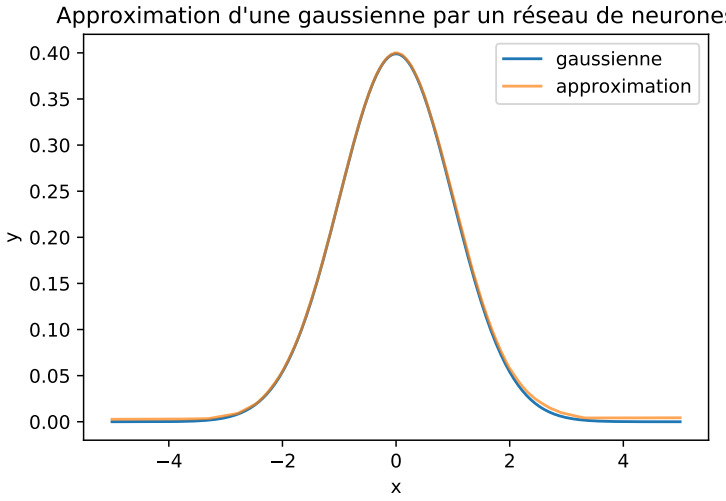

FIGURE 8 – Fit d'une gaussienne. 10001 points. outputs : 200, 200, 1. Total params : 40,801 Trainable params : 40,801. Epochs = 30, batch = 200

0.0.3 fit d'une gaussienne, variation des epochs

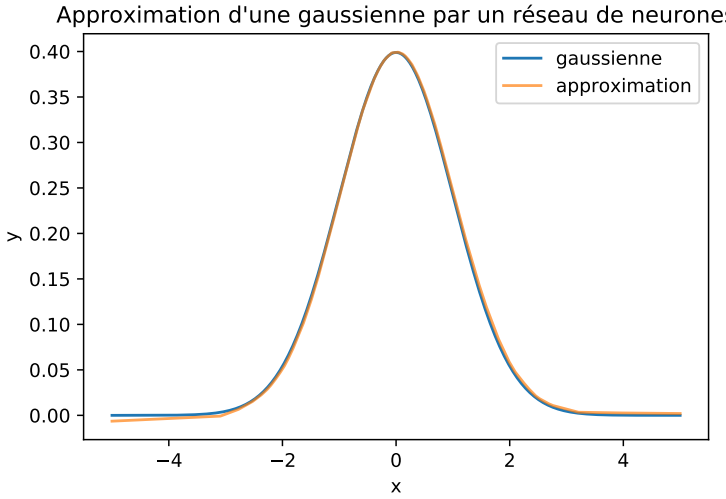

FIGURE 9 – Fit d'une gaussienne. 10001 points. outputs : 200, 200, 1. Total params : 40,801 Trainable params : 40,801. Epochs = 3, batch = 20

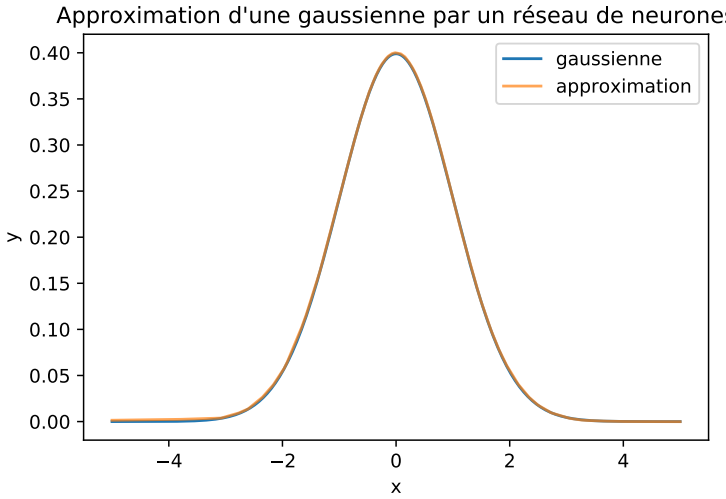

FIGURE 10 – Fit d'une gaussienne. 10001 points. outputs : 200, 200, 1. Total params : 40,801 Trainable params : 40,801. Epochs = 30, batch = 20

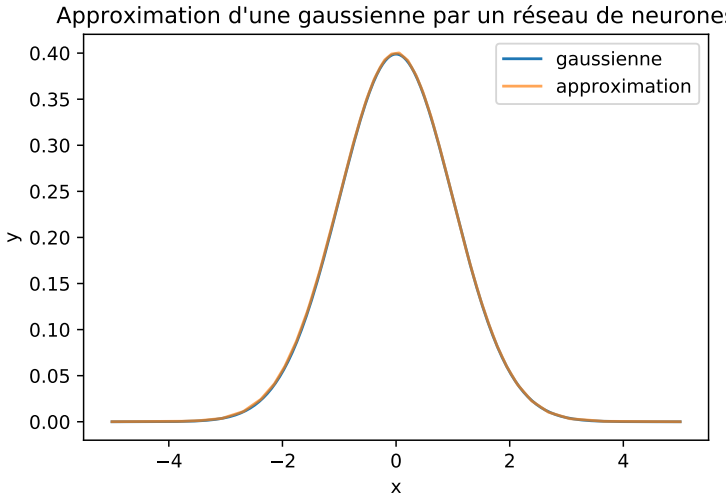

FIGURE 11 – Fit d'une gaussienne. 10001 points. outputs : 200, 200, 1. Total params : 40,801 Trainable params : 40,801. Epochs = 300, batch = 20

0.0.4 fit d'une gaussienne, variation batch vs epochs

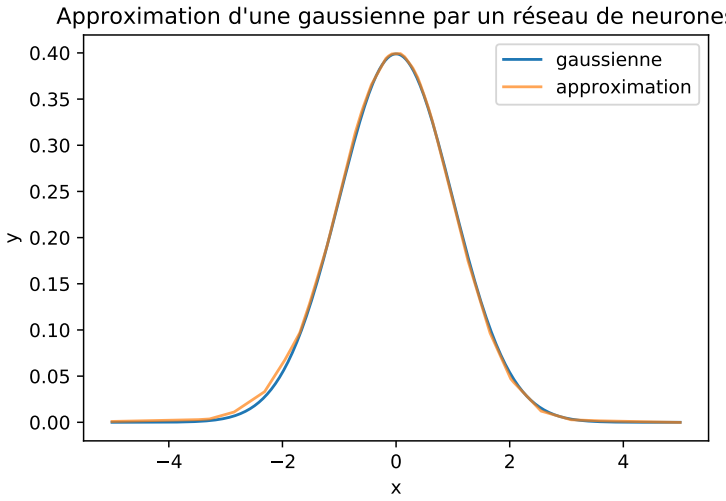

FIGURE 12 – Fit d'une gaussienne. 10001 points. outputs : 200, 200, 1. Total params : 40,801 Trainable params : 40,801. Epochs = 3, batch = 2. 77 secondes de calcul.

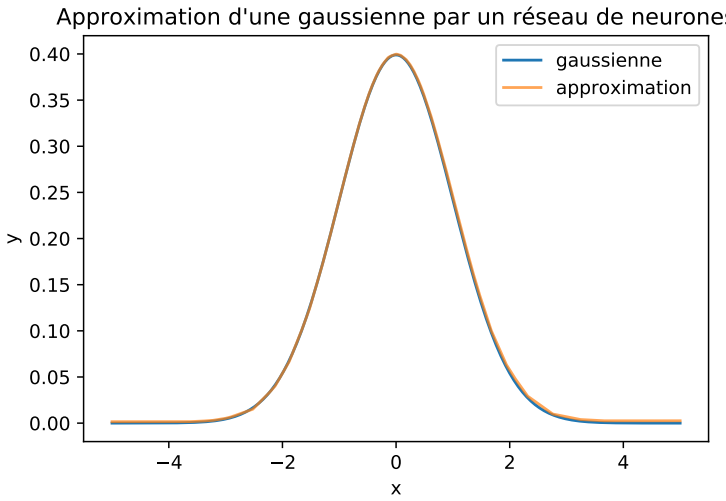

FIGURE 13 – Fit d'une gaussienne. 10001 points. outputs : 200, 200, 1. Total params : 40,801 Trainable params : 40,801. Epochs = 30, batch = 20. 83 secondes de calcul.

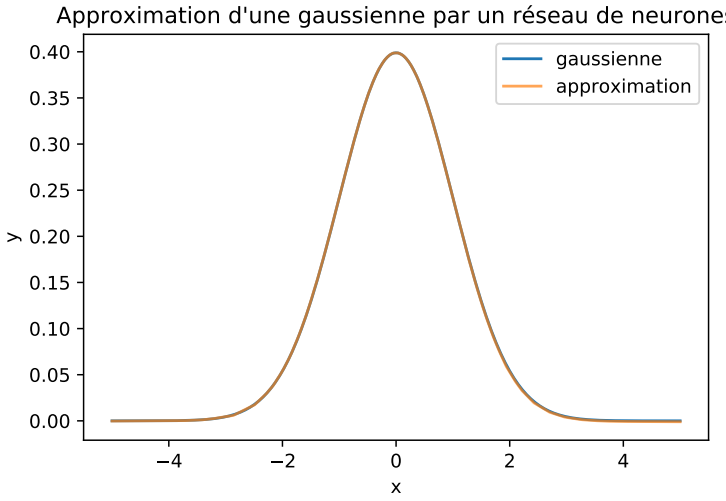

FIGURE 14 – Fit d'une gaussienne. 10001 points. outputs : 200, 200, 1. Total params : 40,801 Trainable params : 40,801. Epochs = 300, batch = 200. 96 secondes de calcul.

0.0.5 Fit des polynômes d'hermite - variation du nombre de points et d'outputs (annexes)

On voit en annexes A et B que, pour un même réseau et un échantillon de 500 points, l'approximation d'une fonction d'onde semble plus précise que l'approximation du module carré. Cette différence, si elle existe, est plus difficile à détecter visuellement pour un échantillon à 10001 points (annexes C et D).

Mémo : [2] [8] [6] [3] [5] [4] [1] [7]

Bibliographie

[1] Colin Bernet. *Handwritten Digit Recognition with scikit-learn.* URL : https://thedatafrog.com/en/articles/handwritten-digit-recognition-scikit-learn/.

[2] Colin Bernet. *Le réseau à un neurone : régression logistique.* URL : https://thedatafrog.com/fr/articles/logistic-regression/.

[3] Colin Bernet. *Le surentraînement.* URL : https://thedatafrog.com/fr/articles/overfitting-illustrated/.

[4] Colin Bernet. *Matplotlib for Machine Learning.* URL : https://thedatafrog.com/en/articles/matplotlib-machine-learning/.

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[6] Colin Bernet. *Premier réseau de neurones avec keras.* URL : https://thedatafrog.com/fr/articles/first-neural-network-keras/.

[7] Colin Bernet. *Python Crash Course for Machine Learning.* URL : https://thedatafrog.com/en/articles/python-crash-course-machine-learning/.

[8] Colin Bernet. *Régression Logistique vs Réseau de Neurones : Non Linéarités.* URL : https://thedatafrog.com/fr/articles/logistic-regression-neural-network/.

A Approximation des pol. d'Hermite par réseau de neurones (500 points)

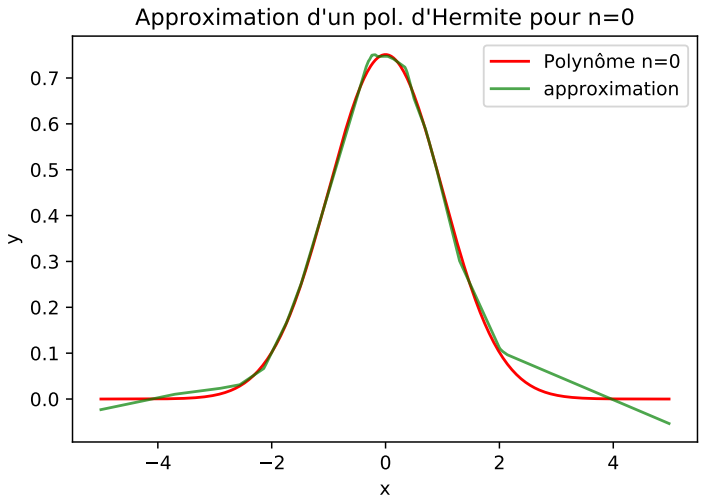

FIGURE 15 – n=0, 500 points. outputs : 20 20 1. Params : 481. Trainable : 481.

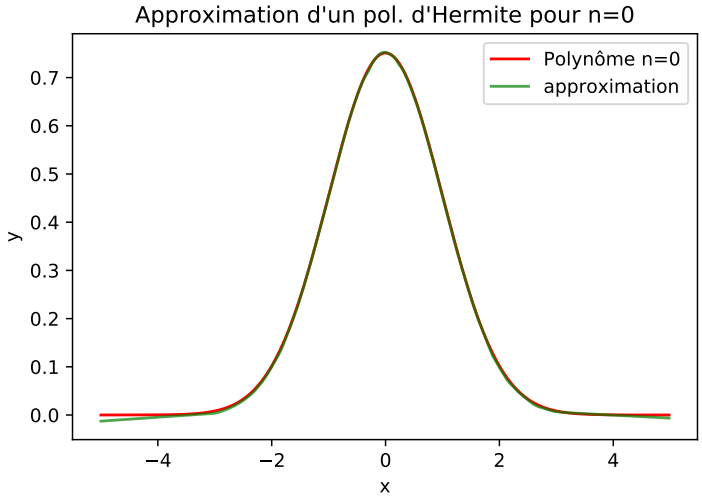

FIGURE 16 – n=0, 500 points. Réseau 200 200 1. Params : 40801. Trainable : 40801.

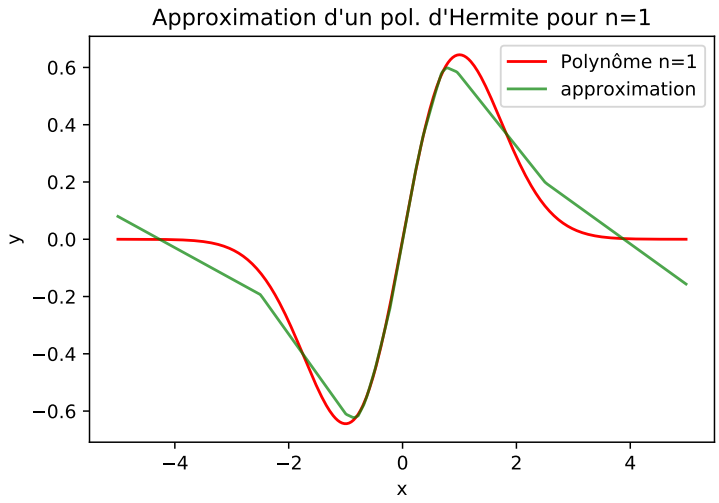

FIGURE 17 – n=1, 500 points. outputs : 20 20 1. Params : 481. Trainable : 481.

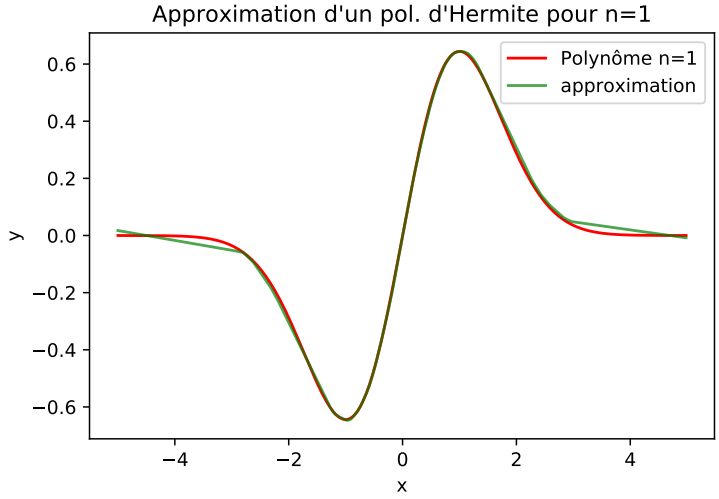

FIGURE 18 – n=1, 500 points. outputs : 200 200 1. Params : 40801. Trainable : 40801.

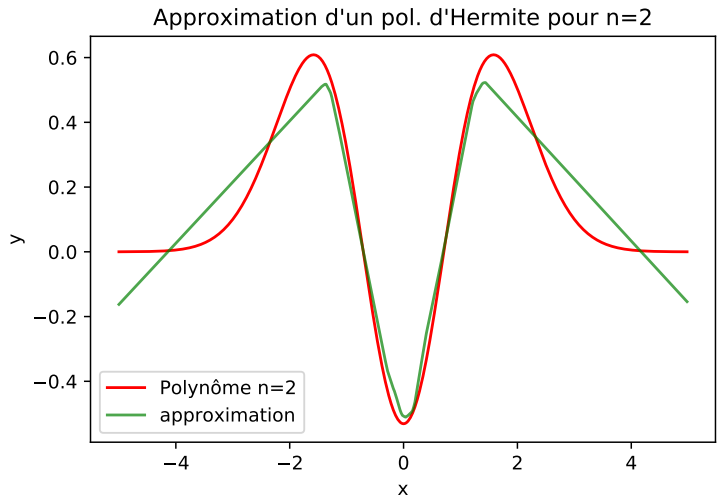

FIGURE 19 – n=2, 500 points. outputs : 20 20 1. Params : 481. Trainable : 481.

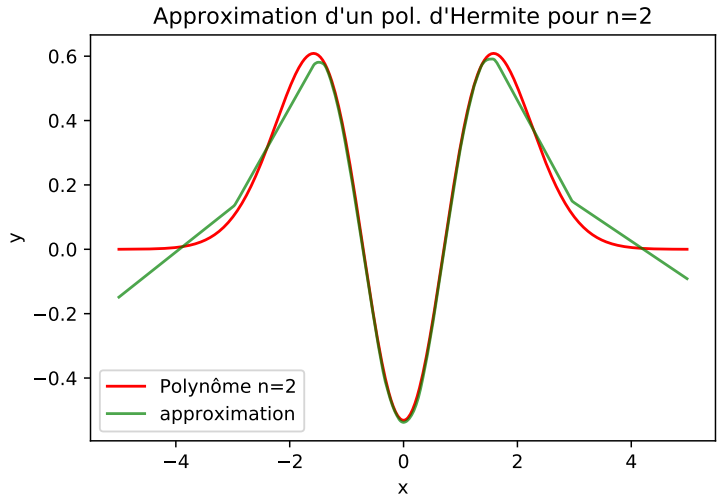

FIGURE 20 – n=2, 500 points. outputs : 200 200 1. Params : 40801. Trainable : 40801.

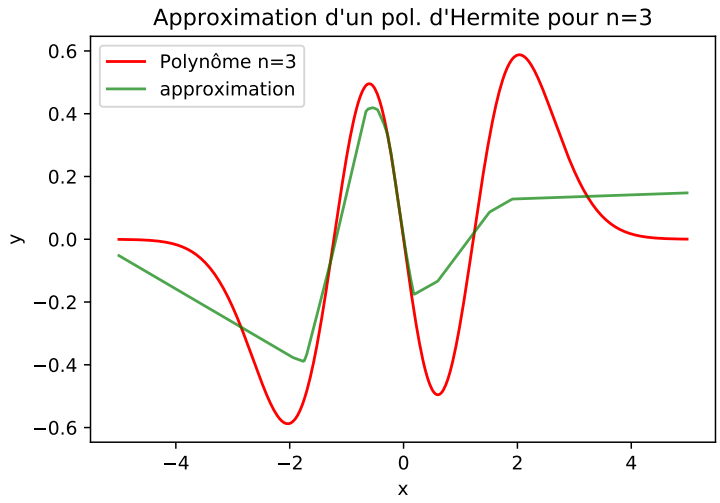

FIGURE 21 – n=3, 500 points. outputs : 20 20 1. Params : 481. Trainable : 481.

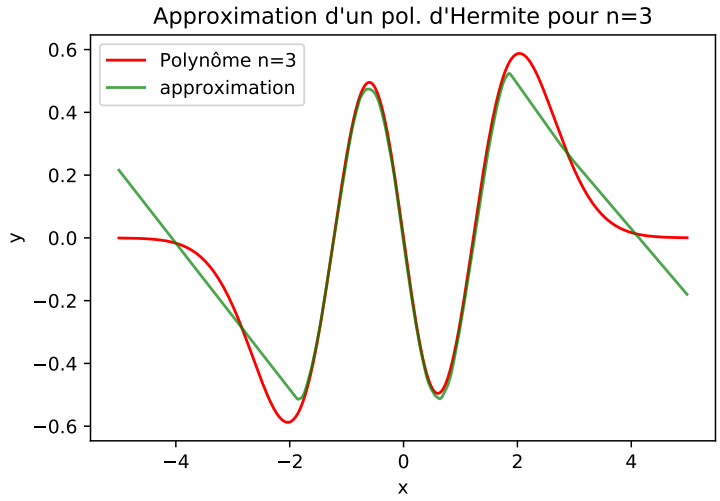

FIGURE 22 – n=3, 500 points. outputs : 200 200 1. Params : 40801. Trainable : 40801.

B Approximation des modules carrés des pol. d'Hermite par réseau de neurones (500 points)

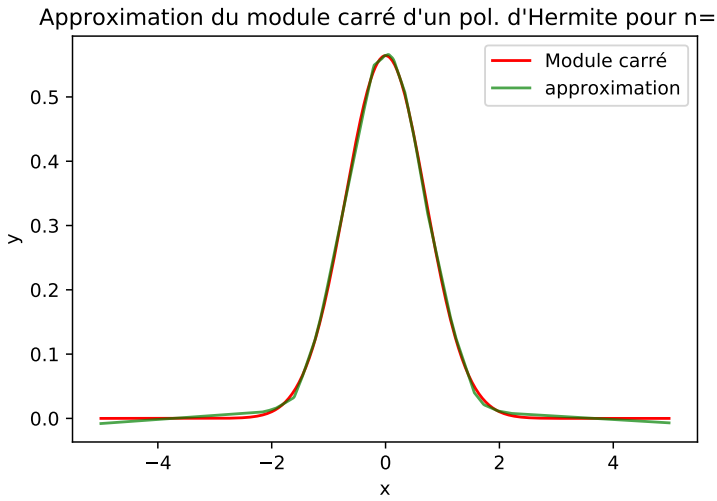

FIGURE 23 – n=0, 500 points. outputs : 20 20 1. Params : 481. Trainable : 481.

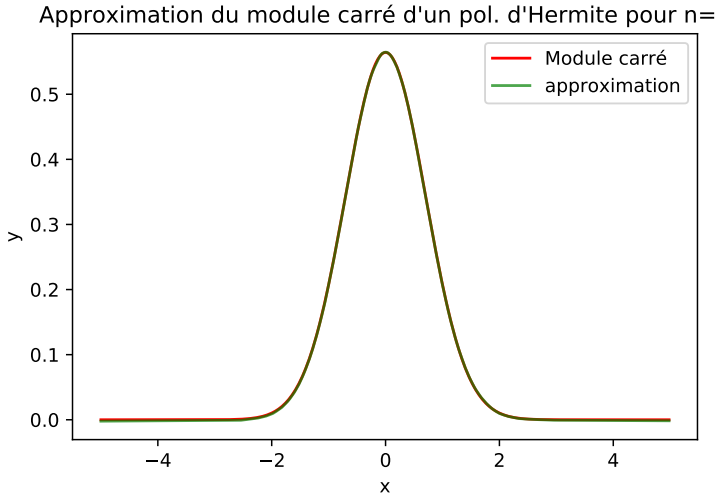

FIGURE 24 – n=0, 500 points. outputs : 200 200 1. Params : 40801. Trainable : 40801.

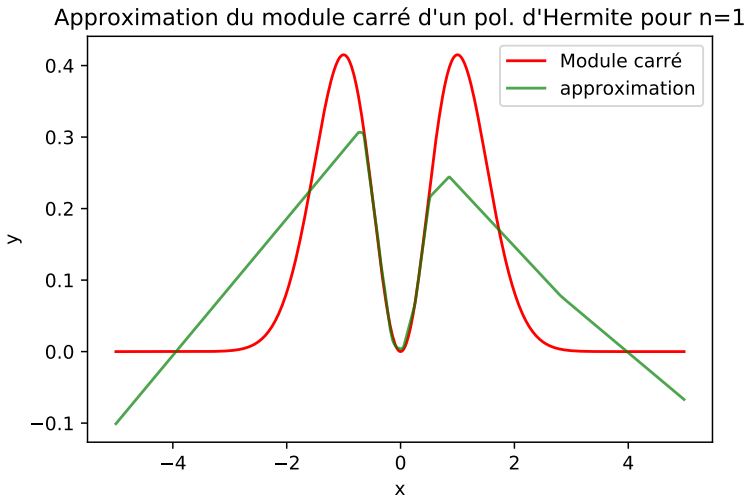

FIGURE 25 – n=1, 500 points. outputs : 20 20 1. Params : 481. Trainable : 481.

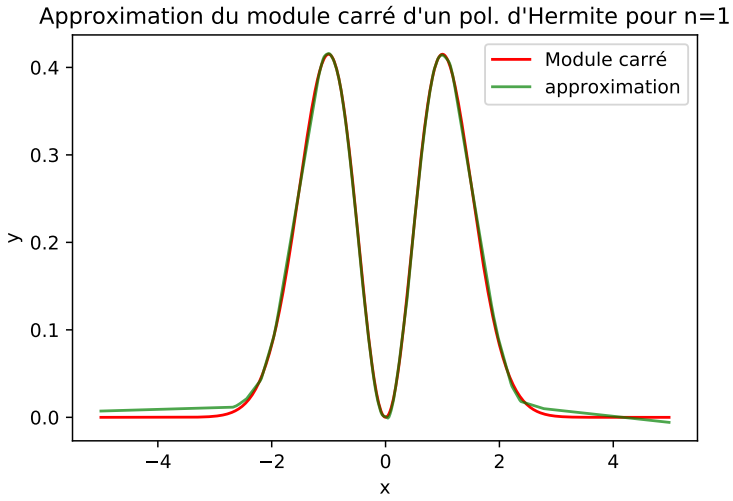

FIGURE 26 – n=1, 500 points. outputs : 200 200 1. Params : 40801. Trainable : 40801.

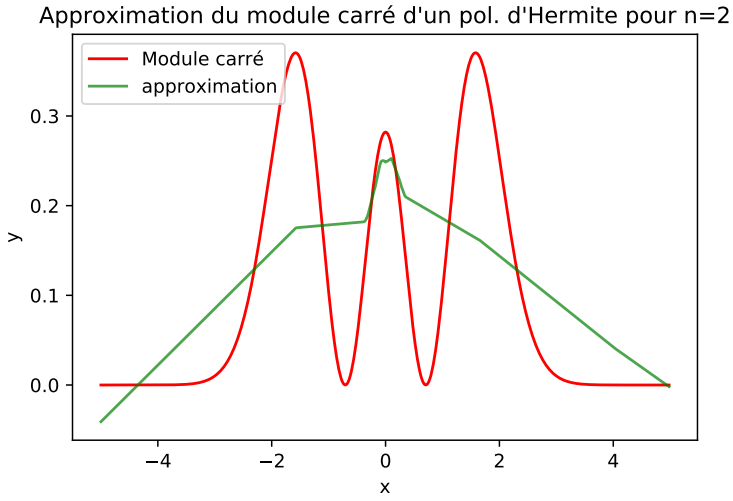

FIGURE 27 – n=2, 500 points. outputs : 20 20 1. Params : 481. Trainable : 481.

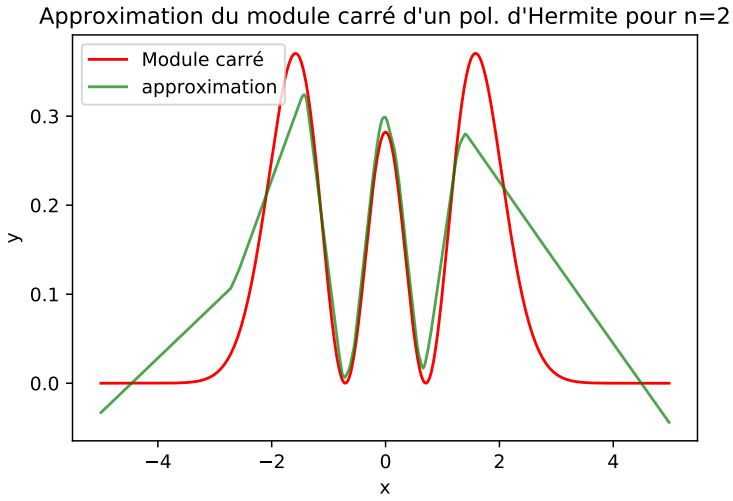

FIGURE 28 – n=2, 500 points. outputs : 200 200 1. Params : 40801. Trainable : 40801.

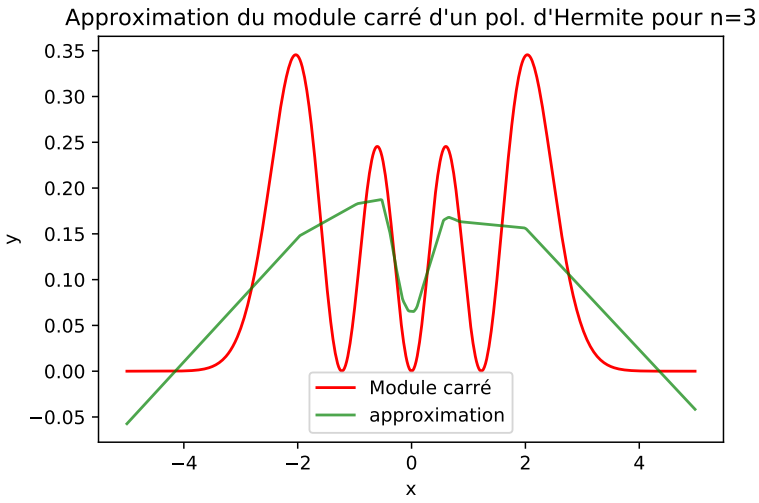

FIGURE 29 – n=3, 500 points. outputs : 20 20 1. Params : 481. Trainable : 481.

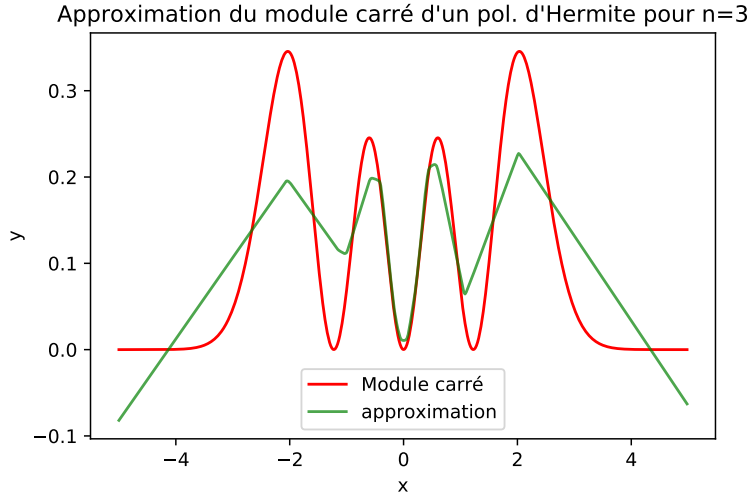

FIGURE 30 – n=3, 500 points. outputs : 200 200 1. Params : 40801. Trainable : 40801.

C Approximation des pol. d'Hermite par réseau de neurones (10001 pts)

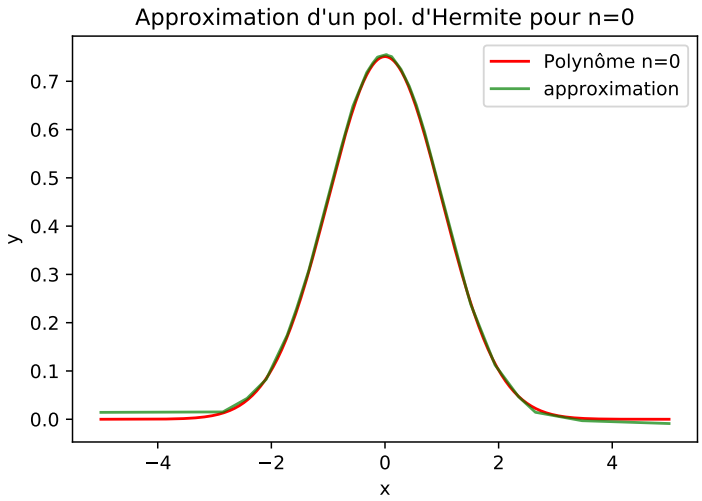

FIGURE 31 – n=0, 10001 pts. outputs : 20 20 1. Params : 481. Trainable : 481.

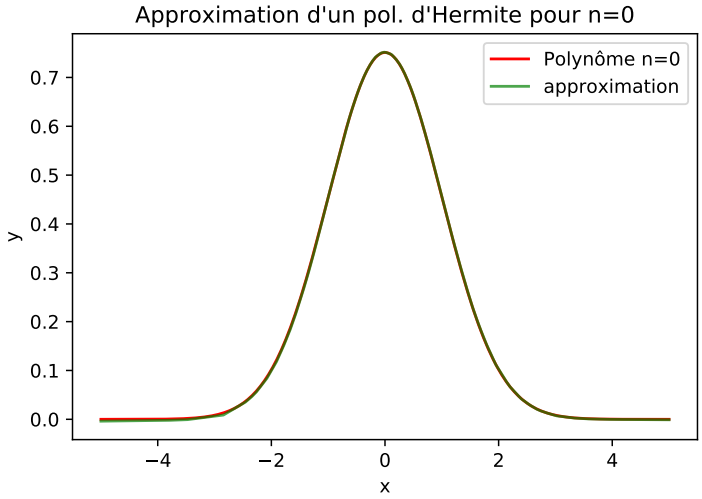

FIGURE 32 – n=0, 10001 pts. outputs : 200 200 1. Params : 40801. Trainable : 40801.

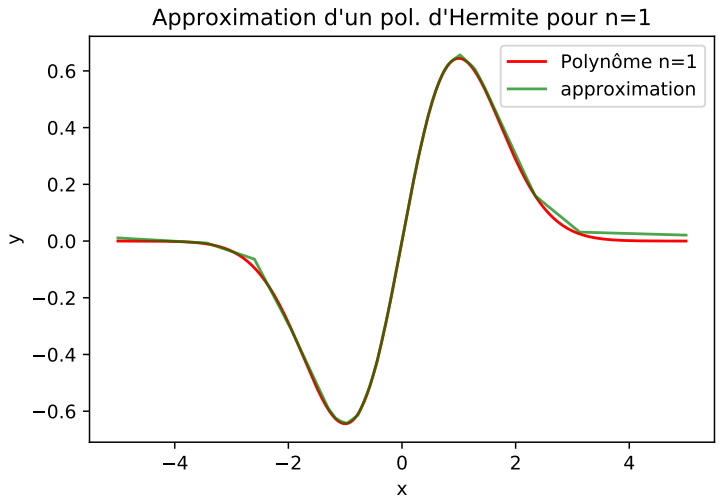

FIGURE 33 – n=1, 10001 pts. outputs : 20 20 1. Params : 481. Trainable : 481.

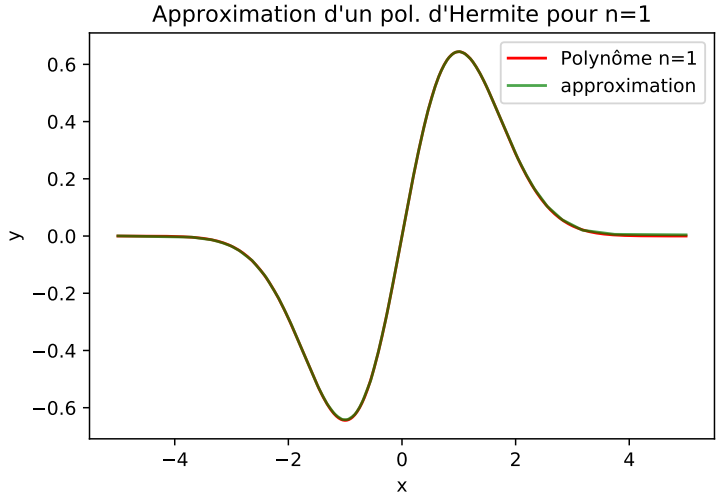

FIGURE 34 – n=1, 10001 pts. outputs : 200 200 1. Params : 40801. Trainable : 40801.

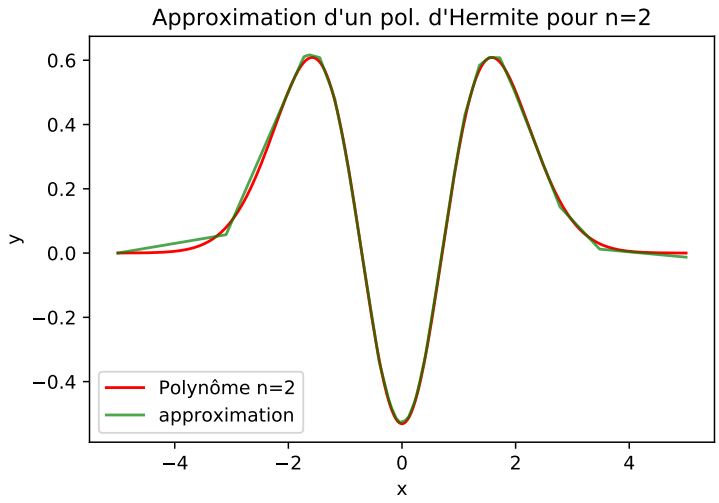

FIGURE 35 – n=2, 10001 pts. outputs : 20 20 1. Params : 481. Trainable : 481.

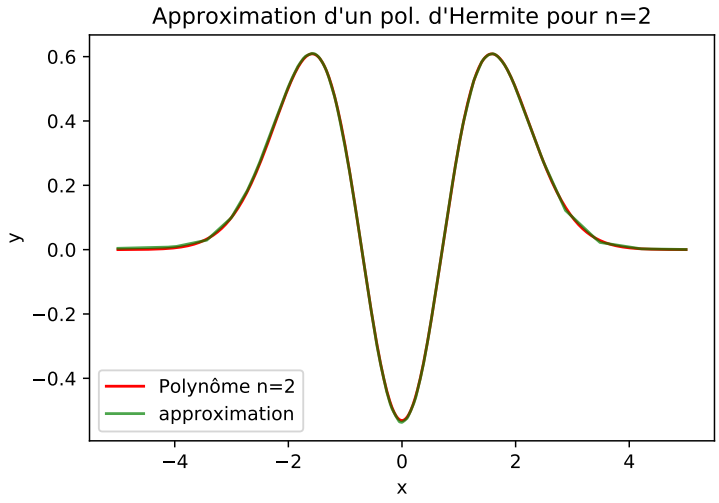

FIGURE 36 – n=2, 10001 pts. outputs : 200 200 1. Params : 40801. Trainable : 40801.

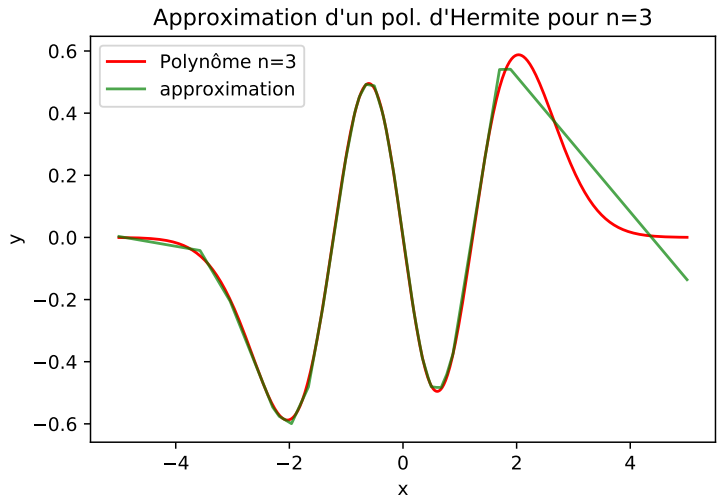

FIGURE 37 – n=3, 10001 pts. outputs : 20 20 1. Params : 481. Trainable : 481.

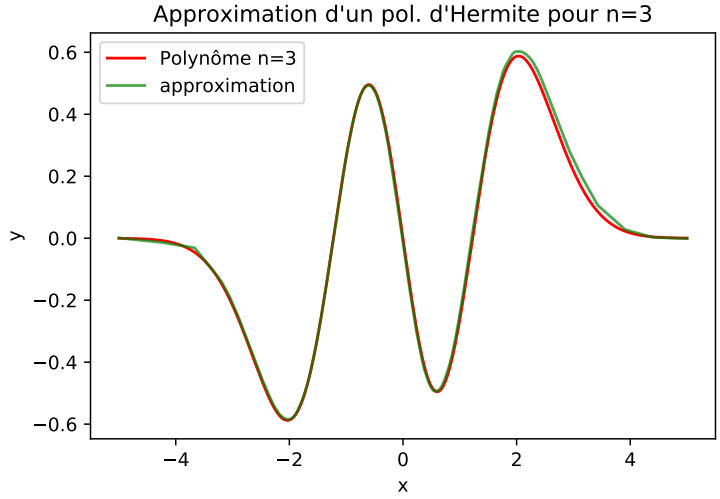

FIGURE 38 – n=3, 10001 pts. outputs : 200 200 1. Params : 40801. Trainable : 40801.

D Approximation des modules carrés des pol. d'Hermite par réseau de neurones (10001 pts)

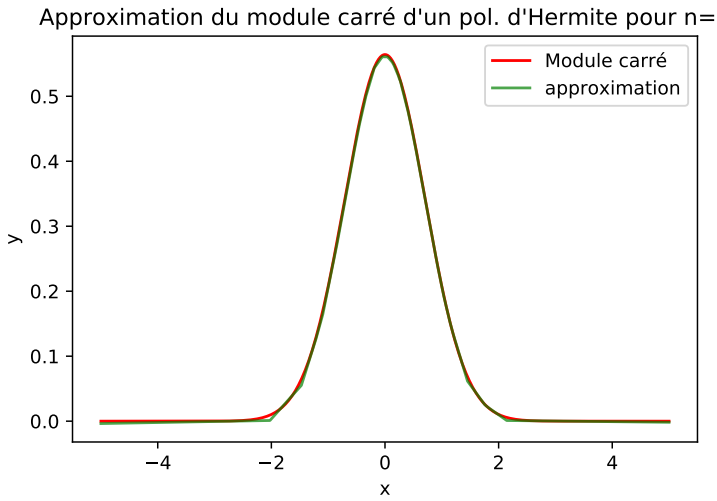

FIGURE 39 – n=0, 10001 pts. outputs : 20 20 1. Params : 481. Trainable : 481.

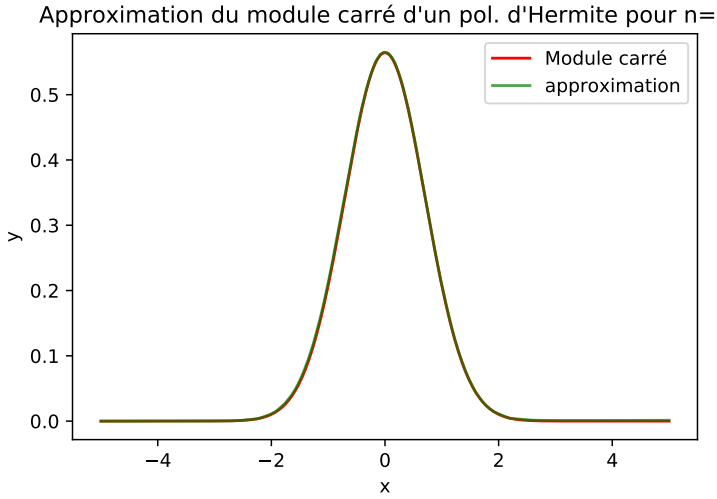

FIGURE 40 – n=0, 10001 pts. outputs : 200 200 1. Params : 40801. Trainable : 40801.

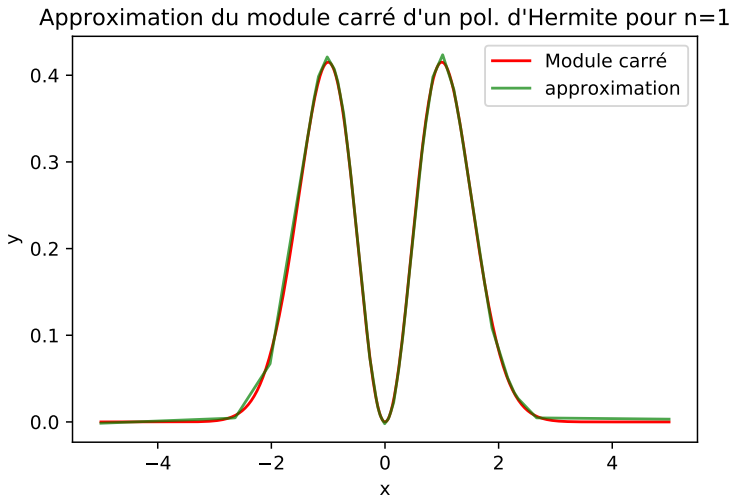

FIGURE 41 – n=1, 10001 pts. outputs : 20 20 1. Params : 481. Trainable : 481.

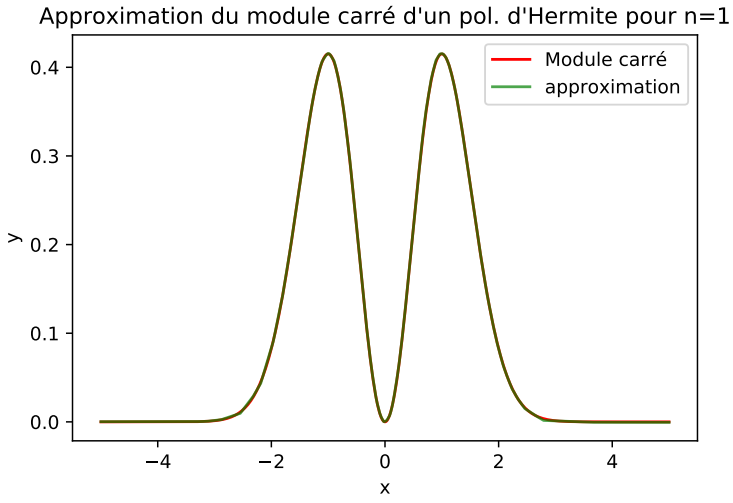

FIGURE 42 – n=1, 10001 pts. outputs : 200 200 1. Params : 40801. Trainable : 40801.

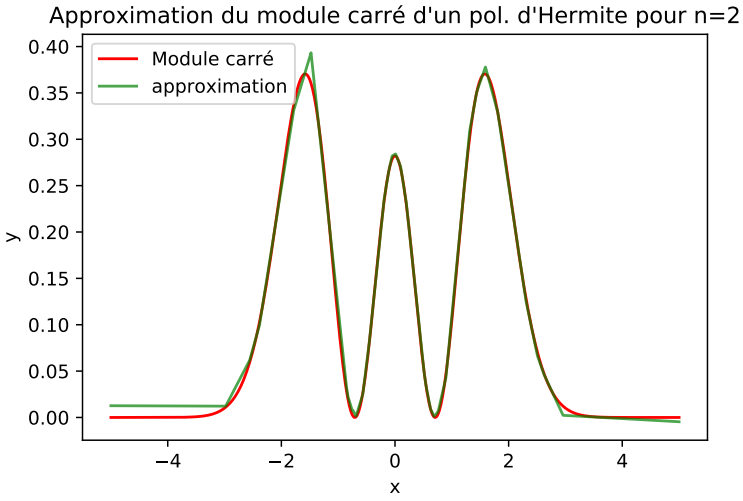

FIGURE 43 – n=2, 10001 pts. outputs : 20 20 1. Params : 481. Trainable : 481.

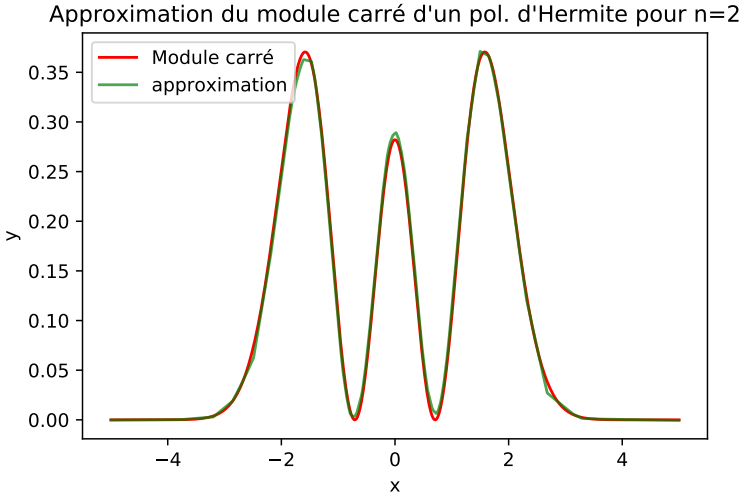

FIGURE 44 – n=2, 10001 pts. outputs : 200 200 1. Params : 40801. Trainable : 40801.

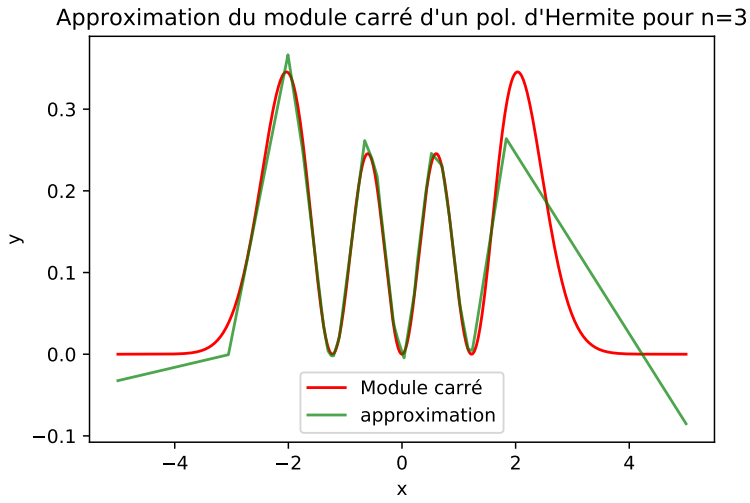

FIGURE 45 – n=3, 10001 pts. outputs : 20 20 1. Params : 481. Trainable : 481.

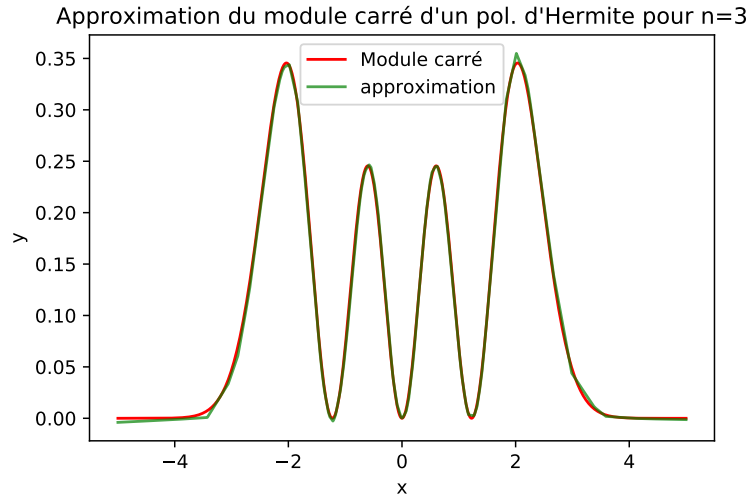

FIGURE 46 – n=3, 10001 pts. outputs : 200 200 1. Params : 40801. Trainable : 40801.