Projet 3:
Attaque de réseaux de neurones

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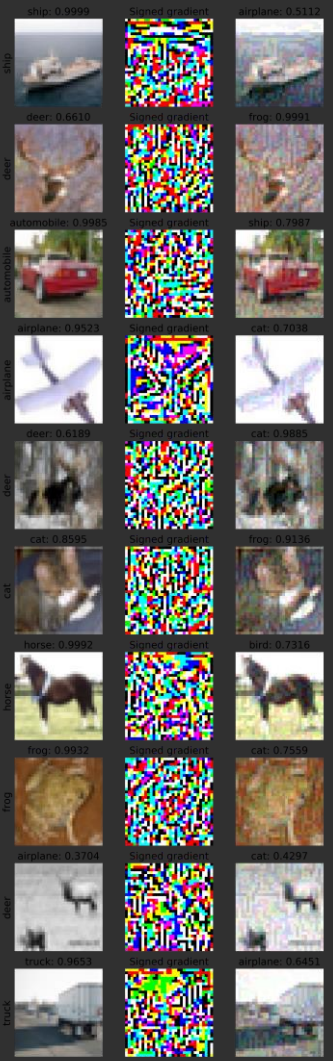
Sommaire

- **Attaque FGSM** - Implémentation et performances
- **Attaque PGD -** Implémentation et performances
- **Défense de réseau**

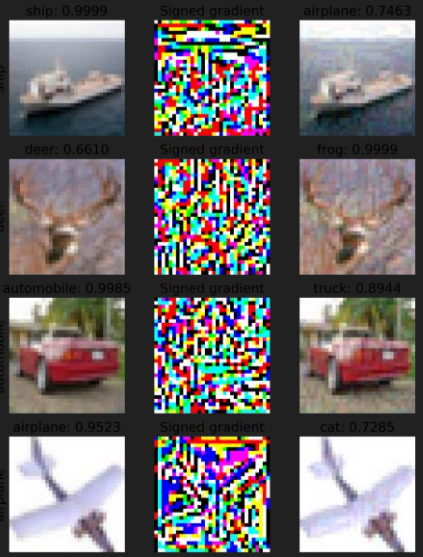
Attaque FGSM

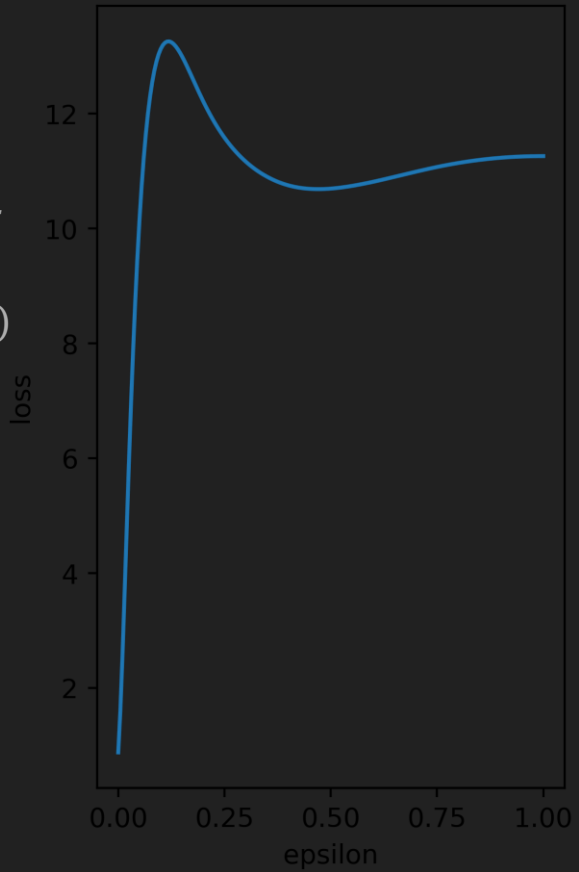


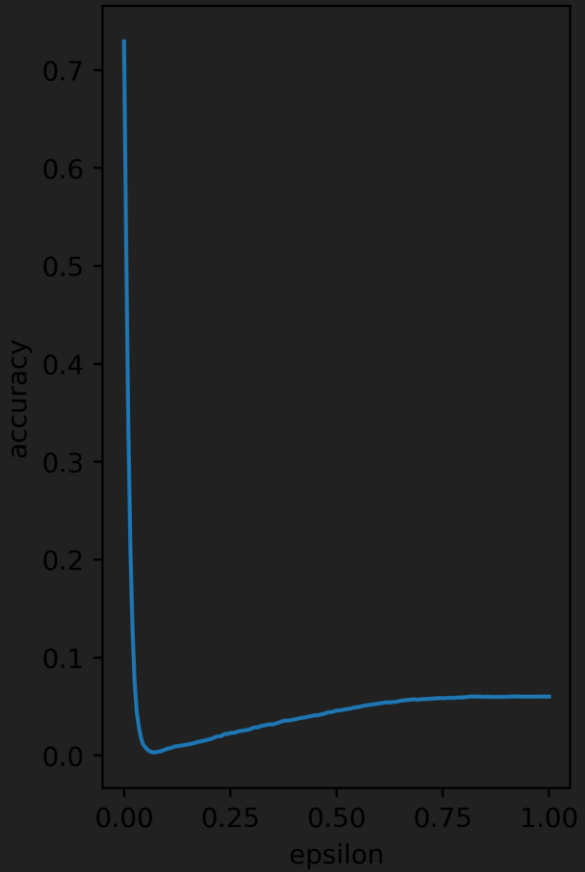
FGSM

Calcul d'une image adversarial:

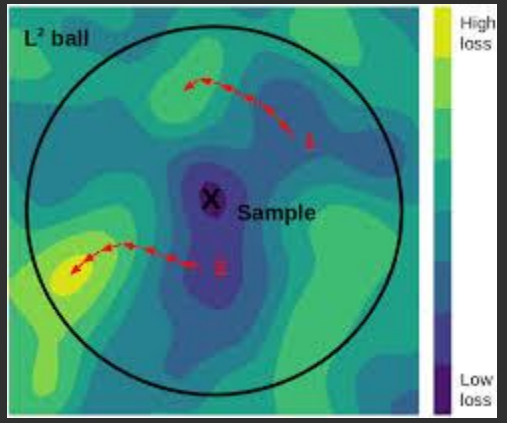
$$adv_x = x + \epsilon * sign(\nabla_x L(x, y))$$







Attaque PGD

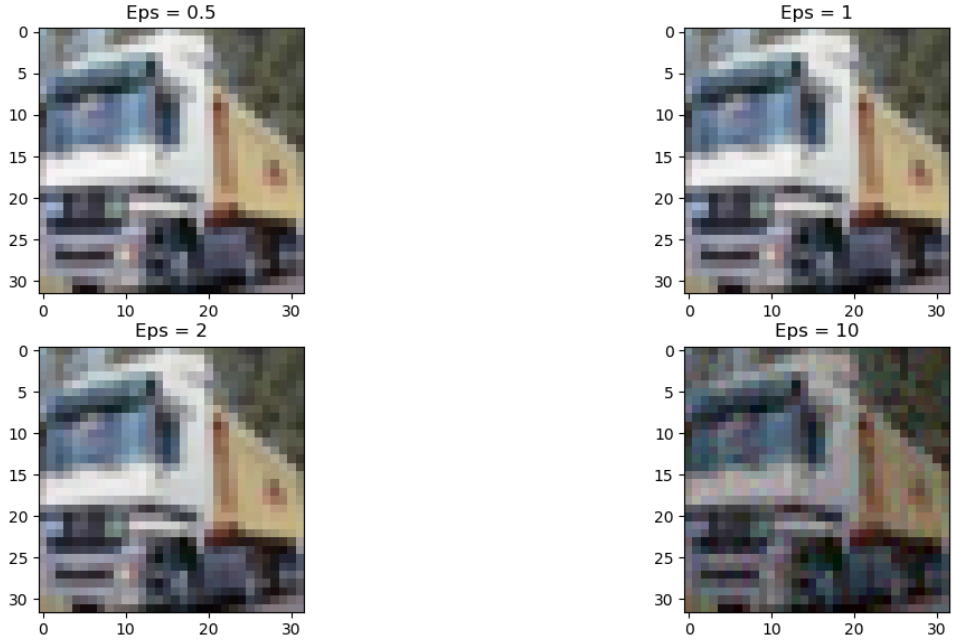


$$x_{t+1} = \Pi_{\mathcal{B}(0,\epsilon)}(x_t + \eta * sign(\nabla_x L_\theta(x, y))$$

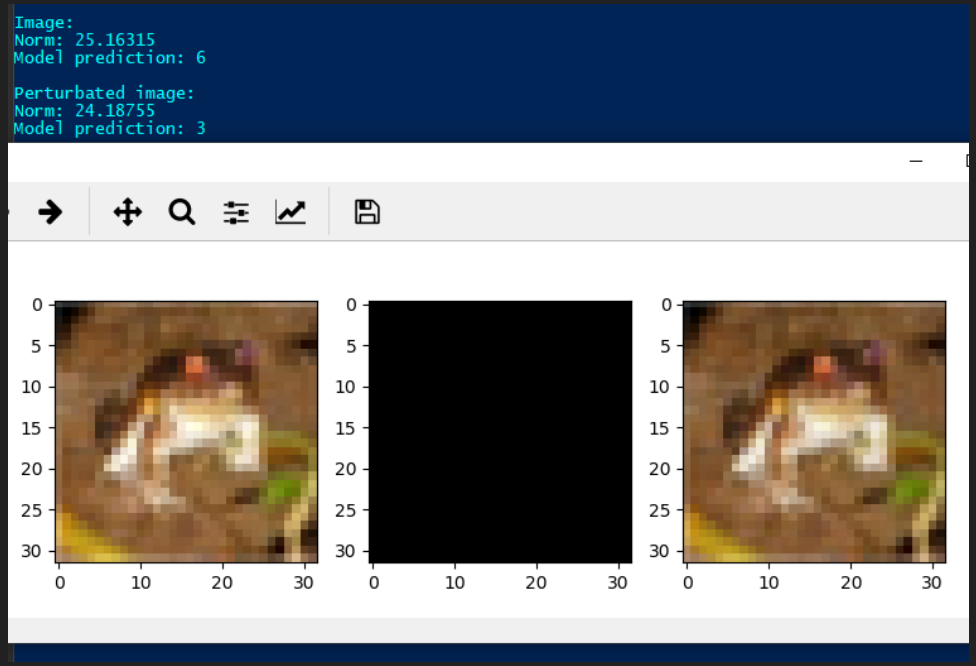
Implémentation

- Calcul du gradient par batch
- Step: η = 0.1
- Eps = 1
- Condition de convergence: $||x_{t+1} - x_t|| < \lambda$
  - λ est en général pris à 0.001
- Les attaques sont générées que sur les images bien prédites par le modèle

```
generate_pgd_attacks(model, loss, x, y, eps, batch_size,
                     step = 0.1, threshold=1e-3, nb_it_max = 20)
```


Eps = 0.5
Eps = 1
Eps = 2
Eps = 10
0
5
10
15
20
25
30

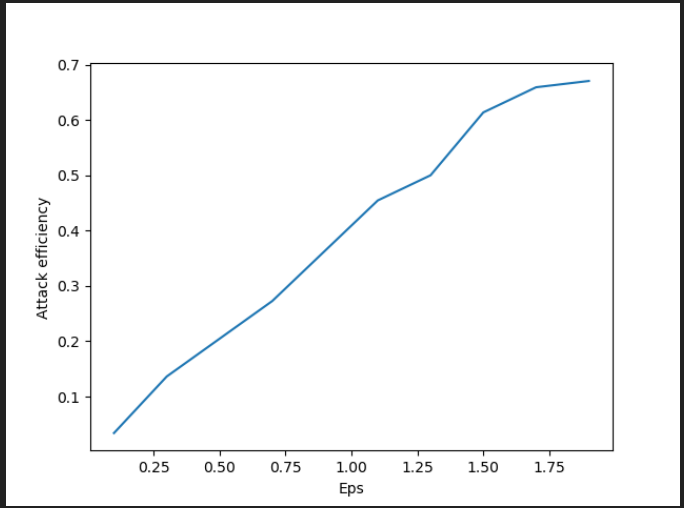
Performances et résultats



Temps de calcul:

~1sec\image sur i5 2.5 GHz

Efficacité des attaques avec ε:



Défense FGSM

Défense FGSM

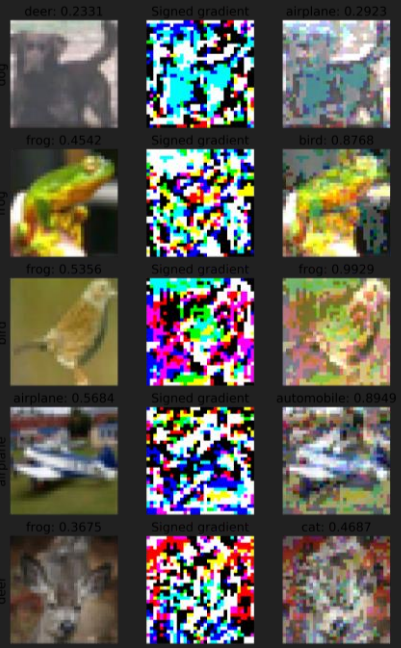
Introduction des images adversariales dans la loss:

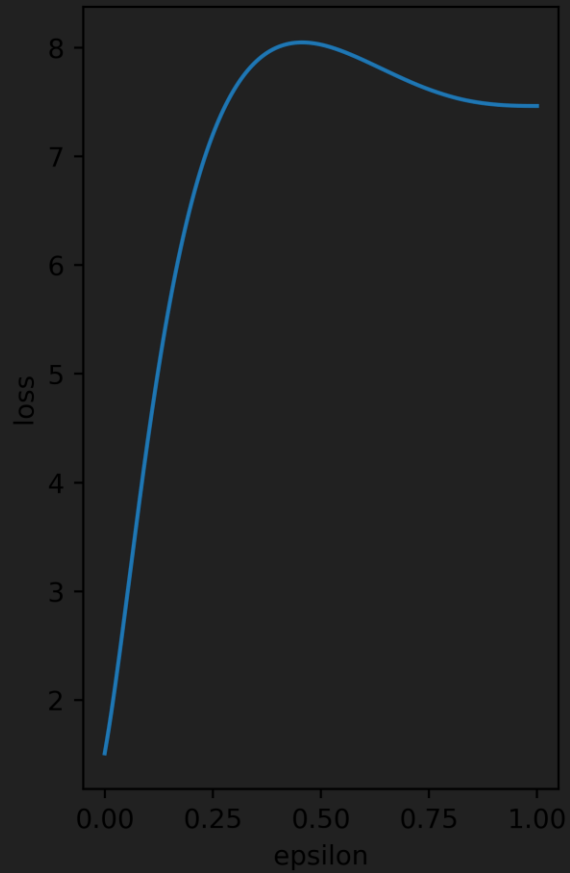
$$L(\theta, x, y) = \alpha \times l(\theta, x, y) + (1 - \alpha) \times l(\theta, x + \epsilon * sign(\nabla_x l(x, y), y))$$

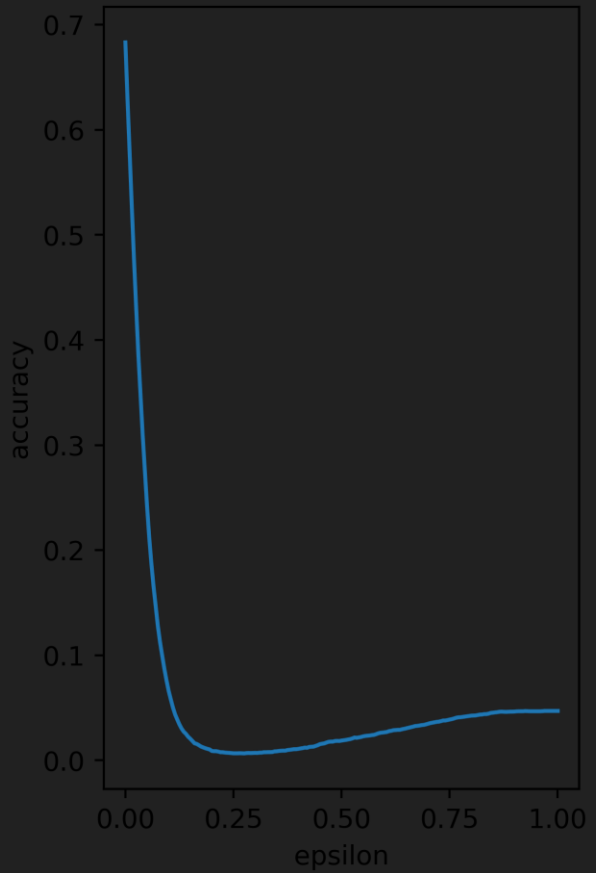
Défense FGSM

$\alpha = 0.7$

$\epsilon = 0.025$



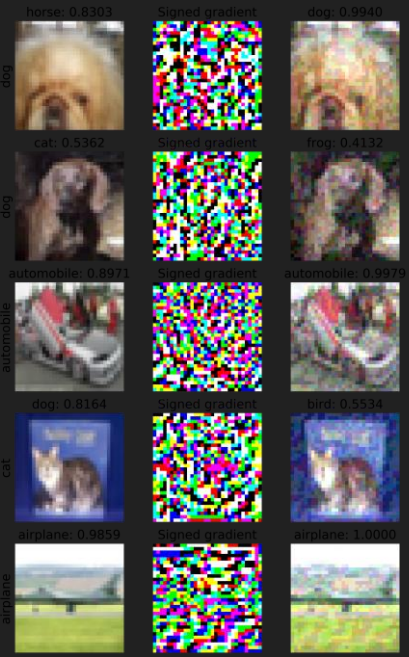


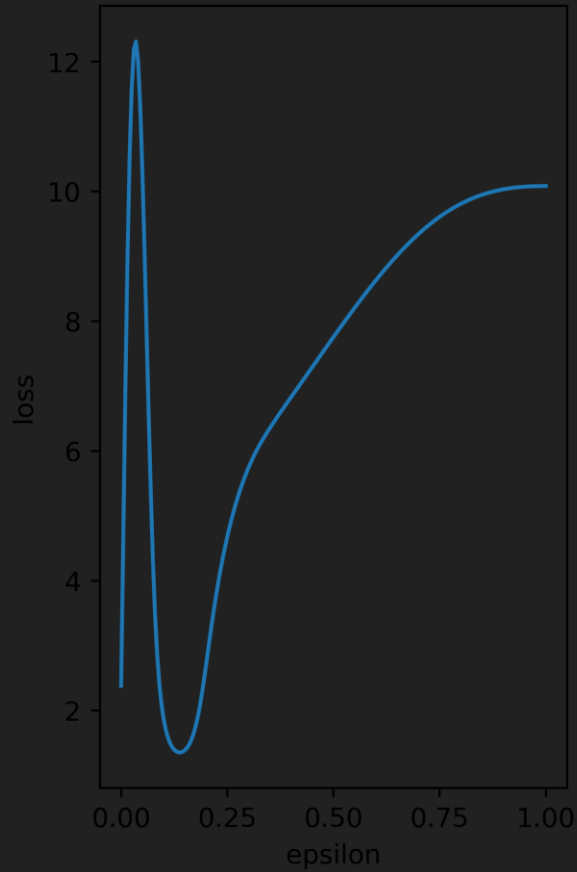


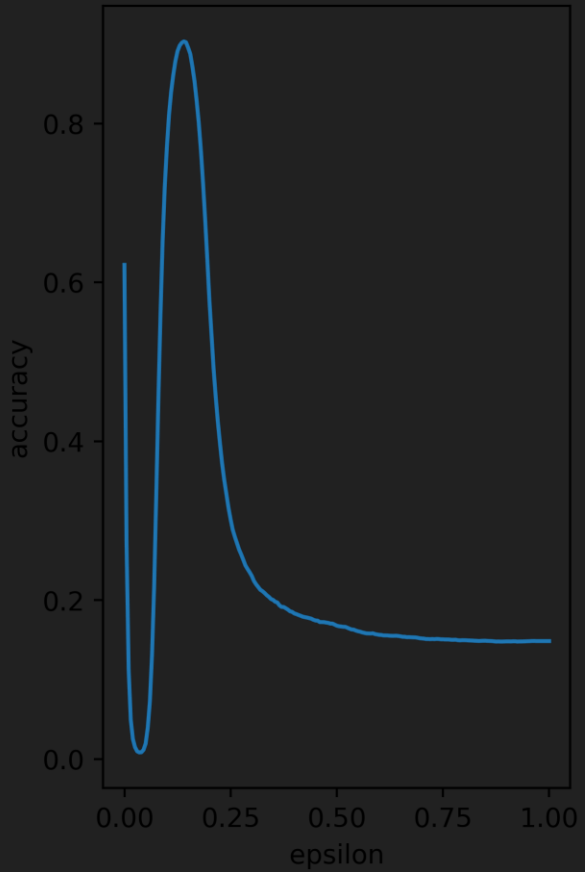
Défense FGSM

$\alpha = 0.5$

$\epsilon = 0.07$







Défense FGSM

$\alpha = 0.1$

$\epsilon = 0.07$