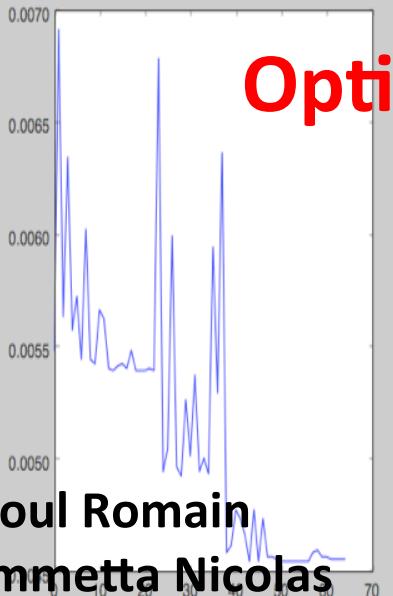




- plot is a boolean, it allow plotting of results """

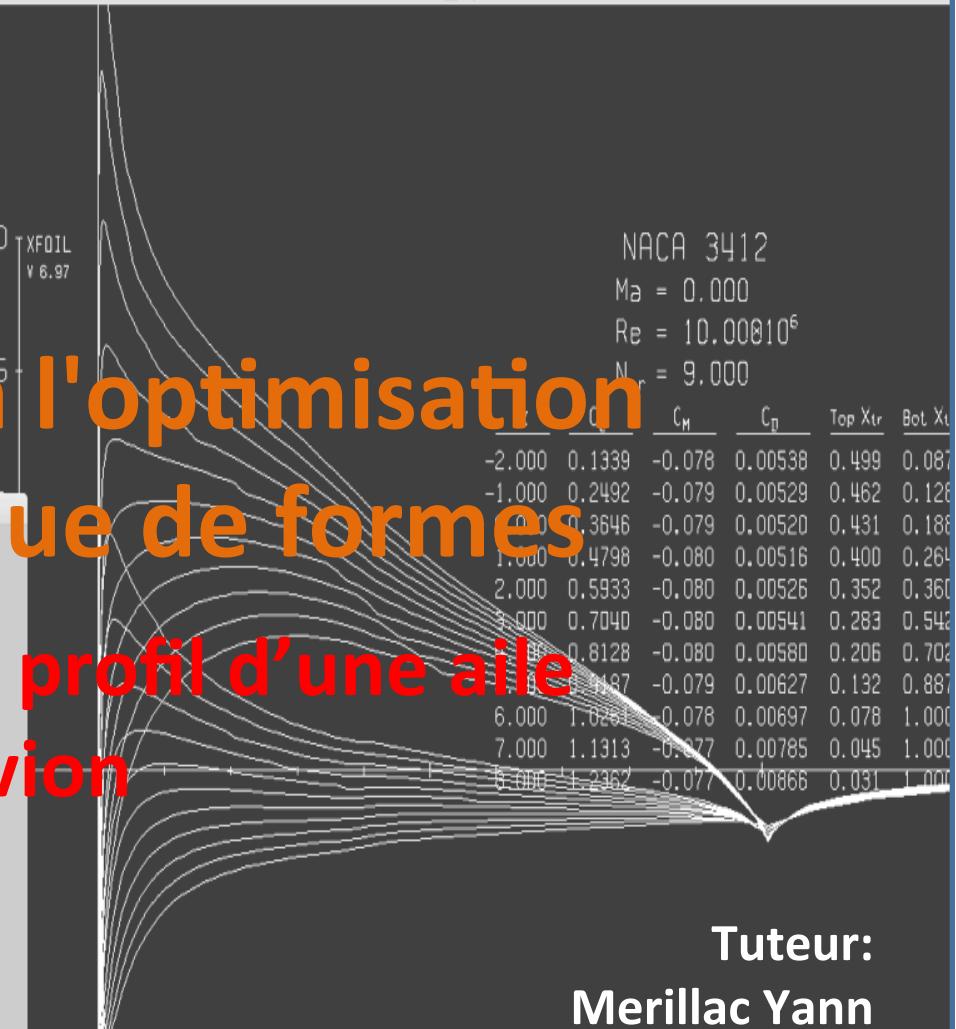
```
try:  
    if not ( 0<nit and -25<=alpha0 and -25<=alpha1 and alpha0<=alpha1 and alpha0<=25 and alpha1<=25 ):  
        raise ValueError  
except ValueError:  
    sys.exit("In DataTreatment, nit must be positive, and -25 <= alpha0 < alpha1 <= 25.")  
  
print(naca_cordonates)  
  
average=False  
  
if option!=None:  
    if option[0:2]=="CL":  
        print("under constraint:"+option)  
        np=1  
    elif option[0:5]=="alpha":
```



Introduction à l'optimisation aérodynamique de formes

Optimisation du profil d'une aile d'avion

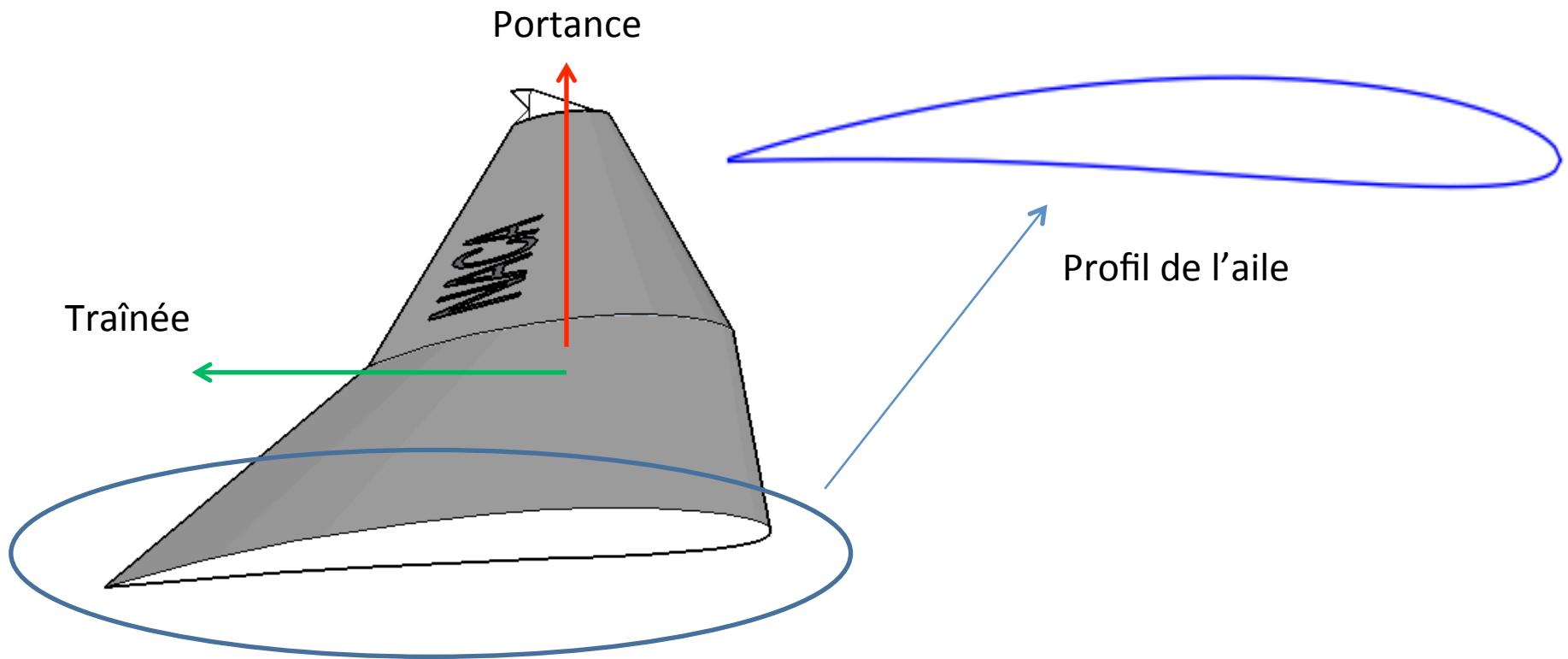
XFOIL
V 6.97



Tuteur:
Merillac Yann

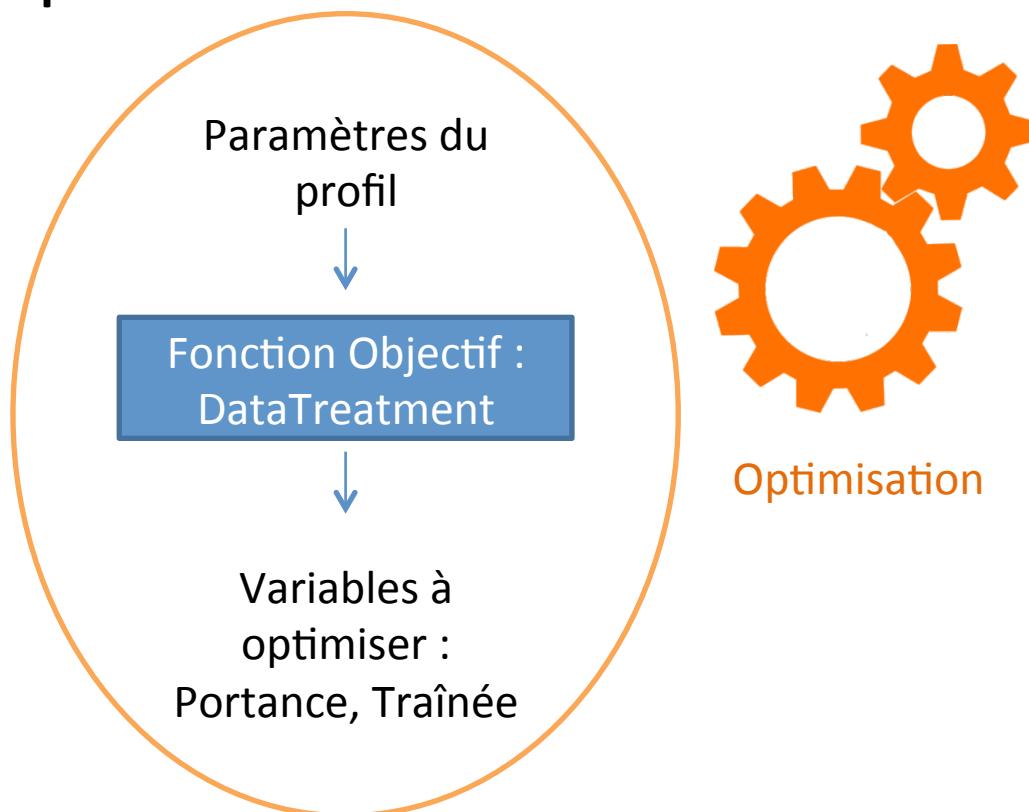
Degoul Romain
Giammetta Nicolas

Introduction



Introduction

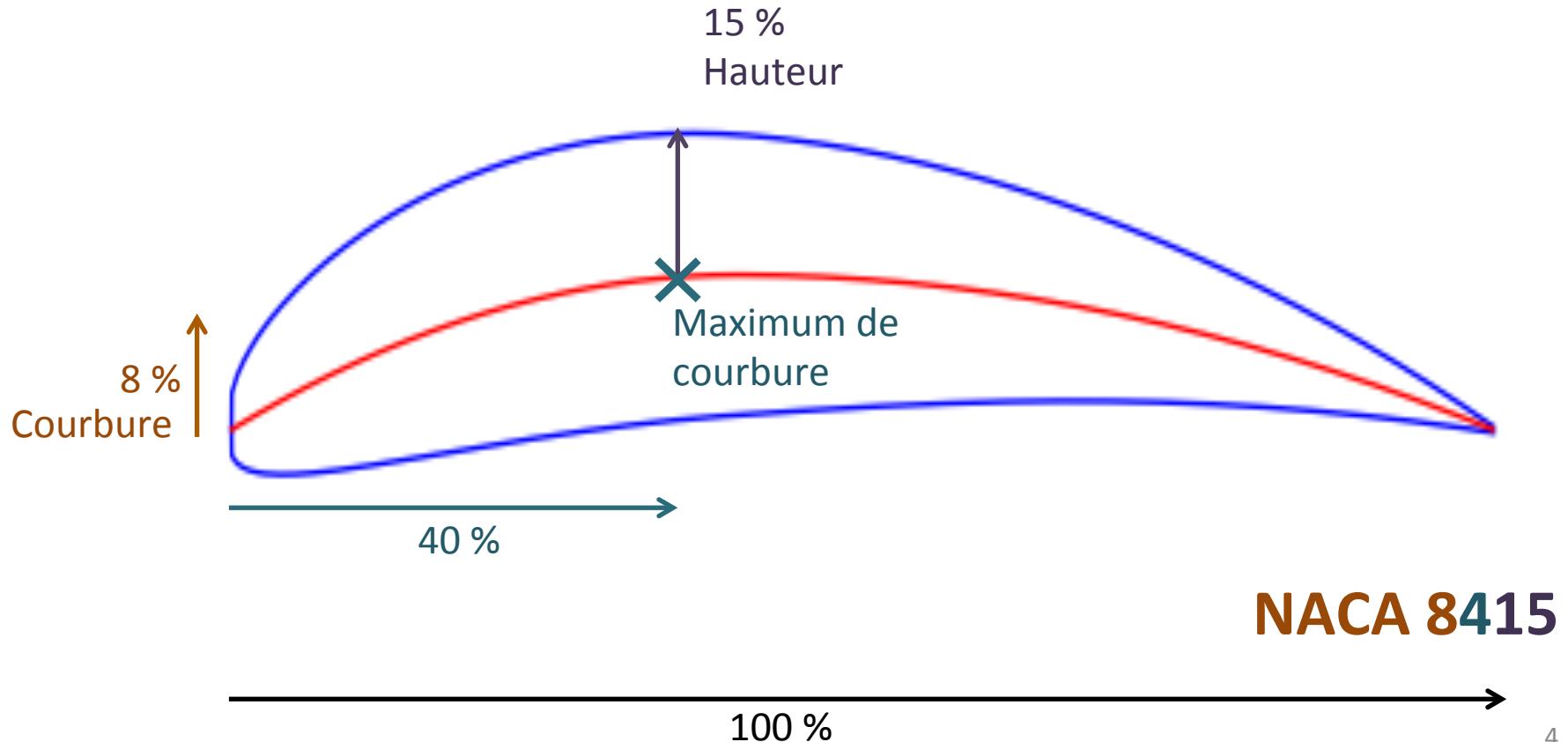
- But : création d'une fonction objectif et son optimisation



Fonction objectif : DataTreatment

- 1) Profil NACA

3 paramètres :
MPXX



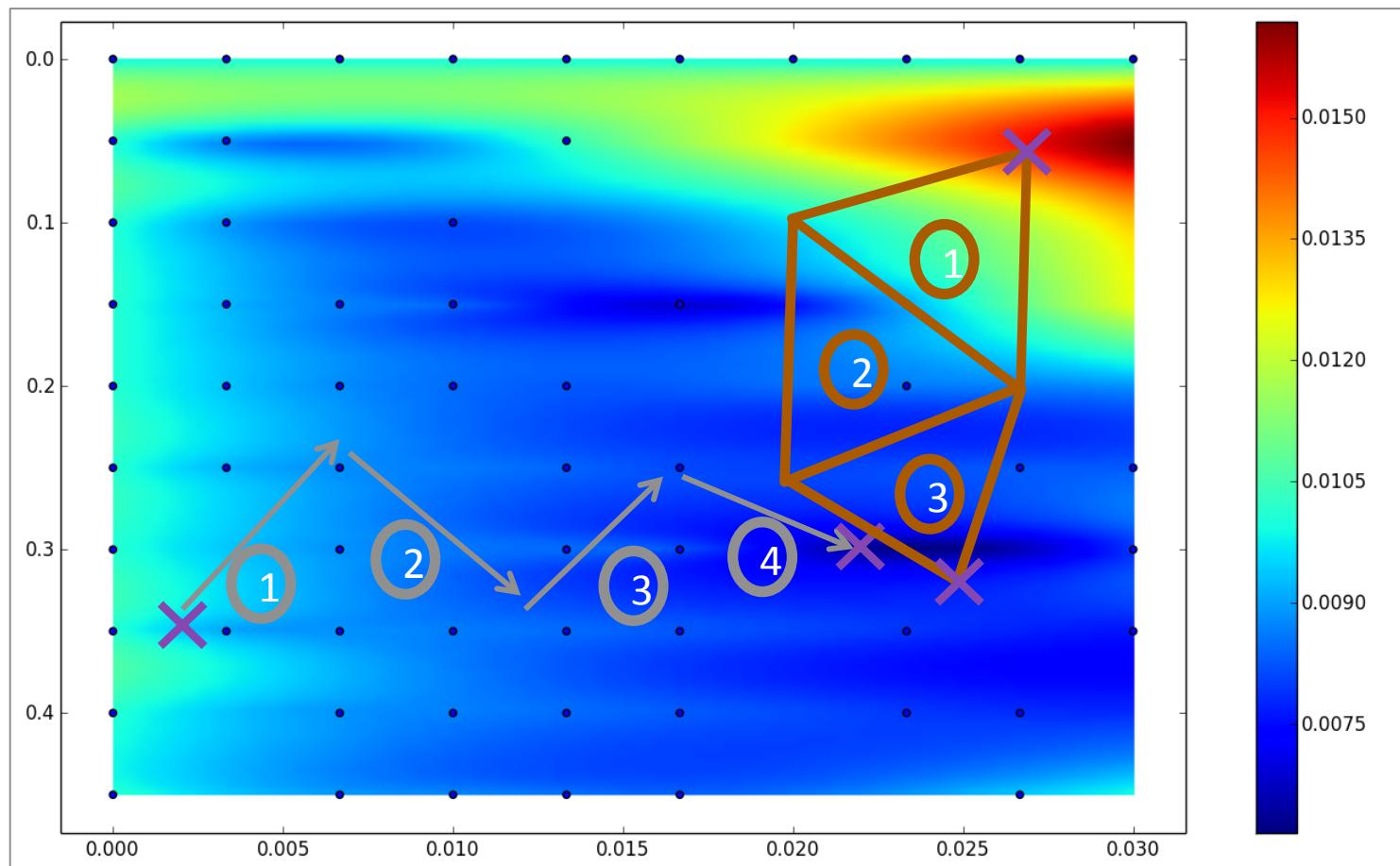
Fonction objectif : DataTreatment

- 2) Obtention des variables à optimiser



Optimisation

- 1) Algorithmes utilisés



Optimisation du profil

- Minimiser la traînée mais pour quelles conditions?

Alpha ou C_L constant?

Film de l'optimisation

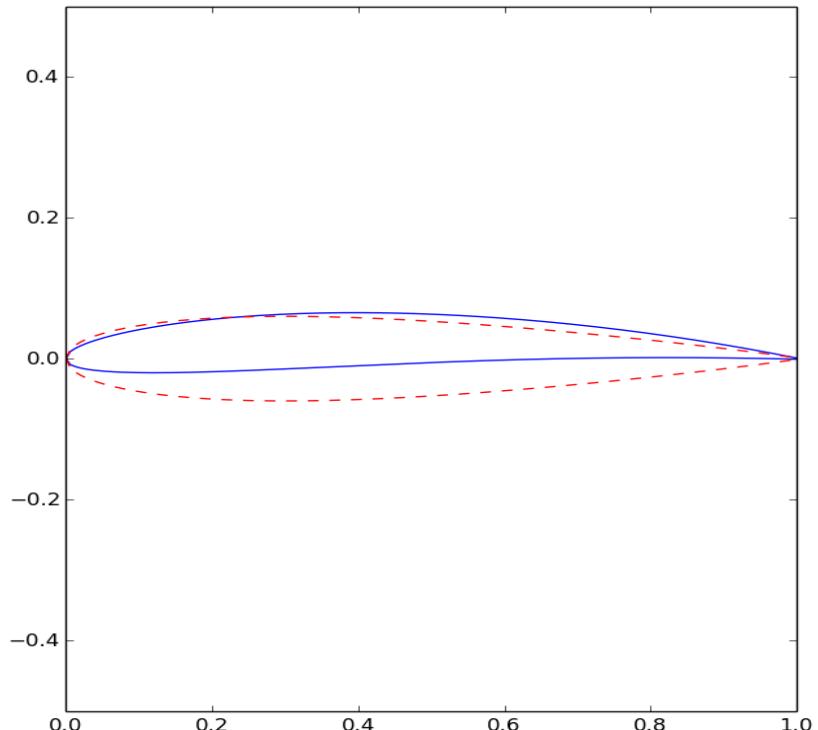
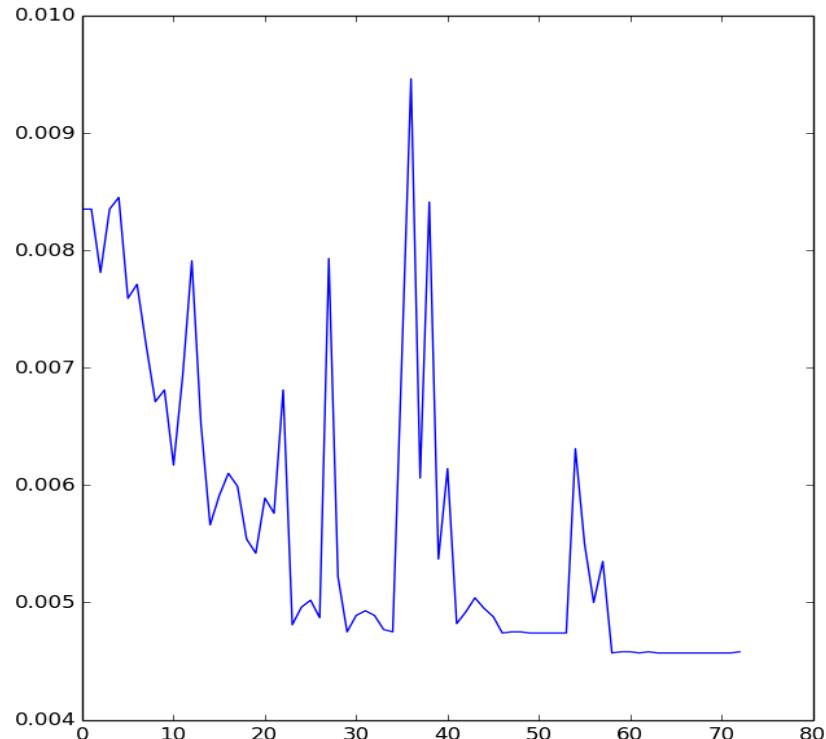
The screenshot shows the Eclipse IDE interface with the following details:

- Title Bar:** Java - OptimizationAirfoil/NLOpt_module.py - Eclipse - /Users/nicolasgiammetta/Documents/Insa/Annee3/Semestre2/Projet_tuteure/Python
- Toolbar:** Standard Eclipse toolbar with icons for file operations, search, and navigation.
- Project Explorer:** Shows several projects: DataTreatment, NACA, *NLOpt_module, opti_2_var, opti_2_var_sup, Output, Plotting, Opti, PlotDataTreatment, and test.
- Code Editor:** Displays Python code for optimization, specifically using the nlopt module. The code includes imports for nlopt, numpy, os, Plotting, and matplotlib.pyplot, and defines a function myfunc that calculates a value based on input x and arguments arg. It also sets up an optimization object opt with bounds and an objective function.
- PyDev Scripting Console:** Located at the bottom left, it shows a list of scripts being reloaded from the Eclipse Python plugin directory. The list includes:
 - pyedit_create_lines_on_commas.py
 - pyedit_enable_editor_wrap.py
 - pyedit_example.py
 - pyedit_example2.py
 - pyedit_import_to_string.py
 - pyedit_kill_shells.py
 - pyedit_wrap_paragraph.py
- Status Bar:** At the bottom right, it shows "Writable", "Insert", "34 : 19", and a page number "8".

Minimisation de C_D sous $C_L=0.5$

- Avec Nelder-Mead :

Départ: $m=0.0, p=0.0, t=0.12$ (Profil 1) $CD=0.00835$

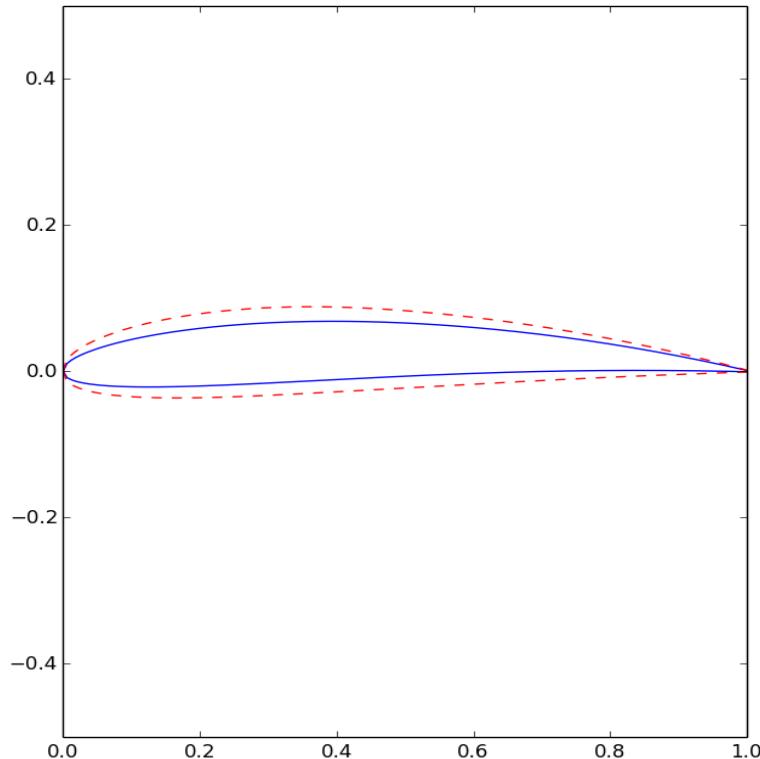
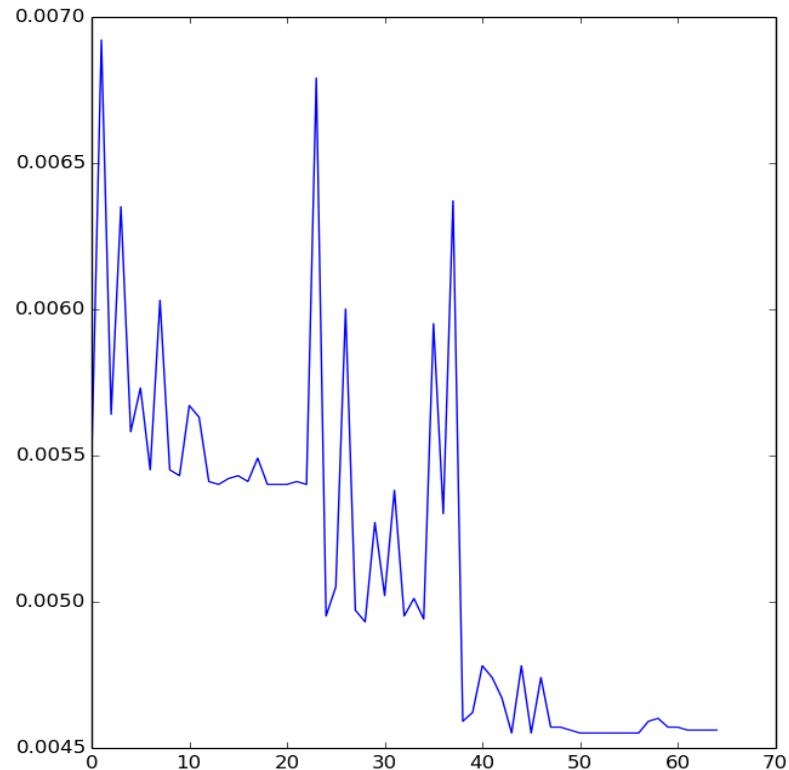


Arrivée: $m=0.0287$, $p=0.496$ et $t=0.077$ $CD=0.0458$

Minimisation de C_D sous $C_L=0.5$

- Avec Nelder-Mead :

Départ : $m=0.03, p=0.45, t=0.12$ (Profil 2) $CD=0.00549$

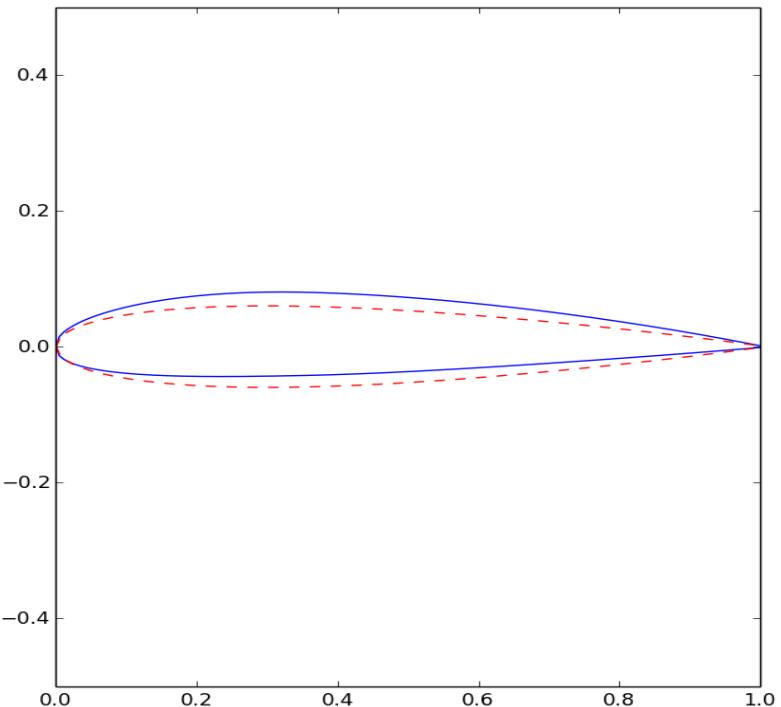
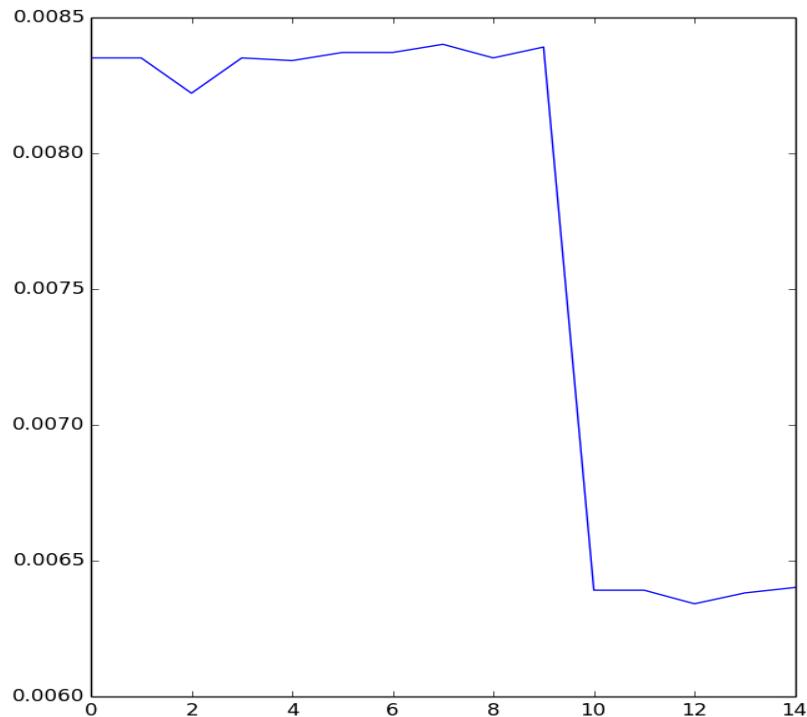


Arrivée: $m=0.0294, p=0.5$ et $t=0.083$ $CD=0.00456$

Minimisation de C_D sous $C_L=0.5$

- Avec BFGS:

Départ: $m=0.0, p=0.0, t=0.12$ $CD=0.00835$

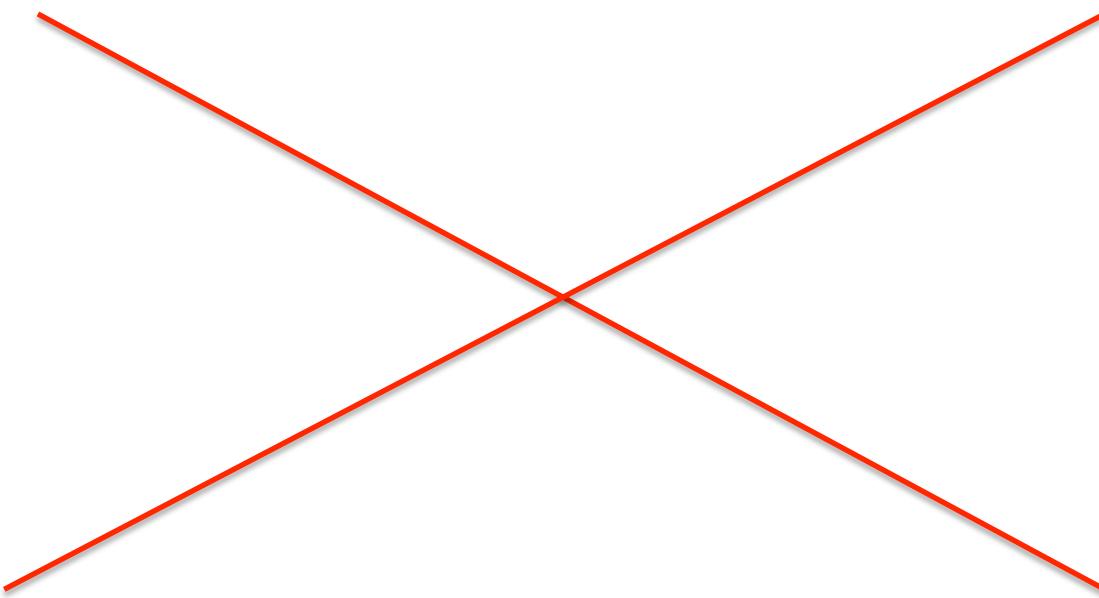


Arrivée: $m=0.019$, $p=0.35$ et $t=0.125$ $CD=0.0064$

Minimisation de C_D sous $C_L=0.5$

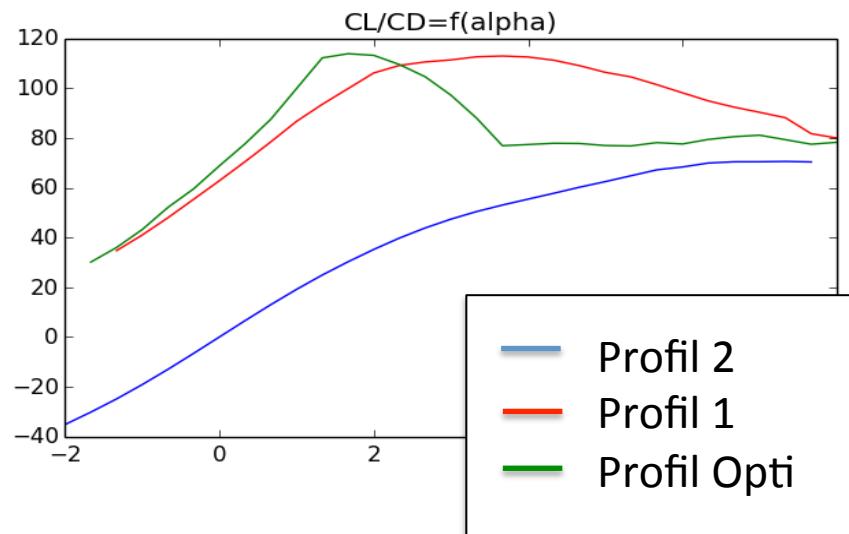
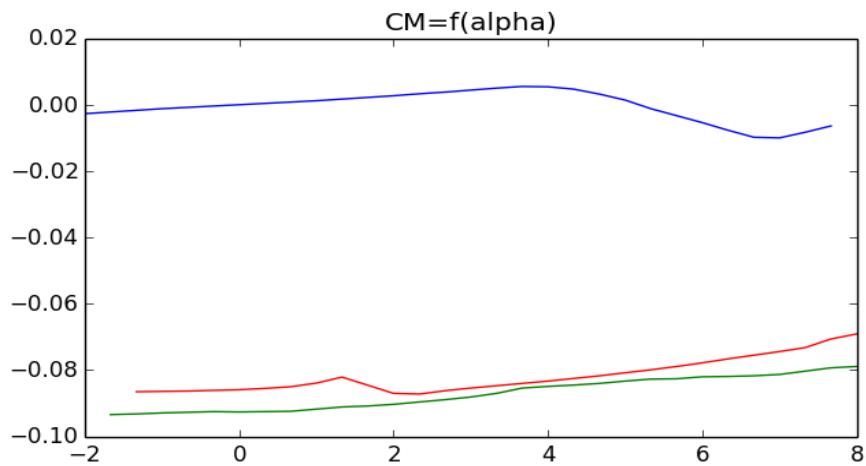
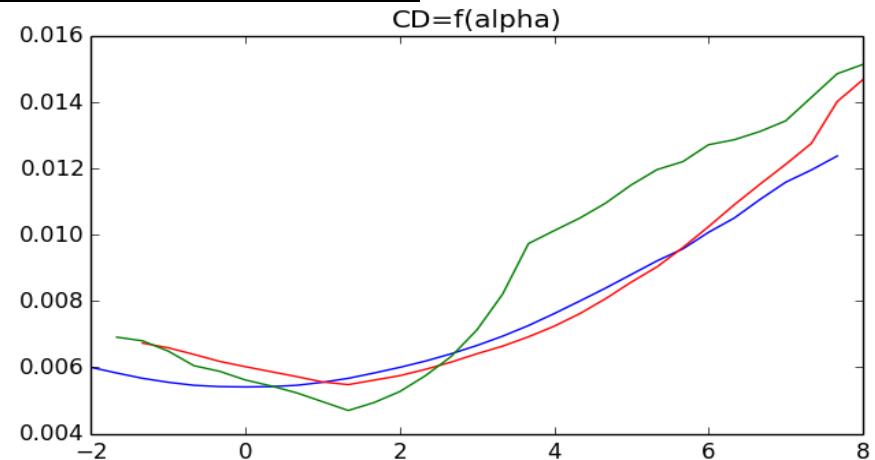
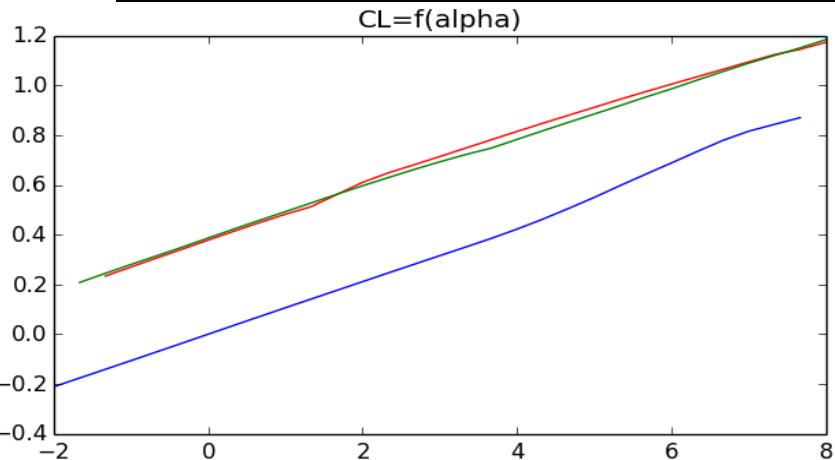
- Avec BFGS:

Départ ($m=0.03, p=0.45, t=0.12$) $CD=0.00549$



Minimisation de C_D sous $C_L=0.5$

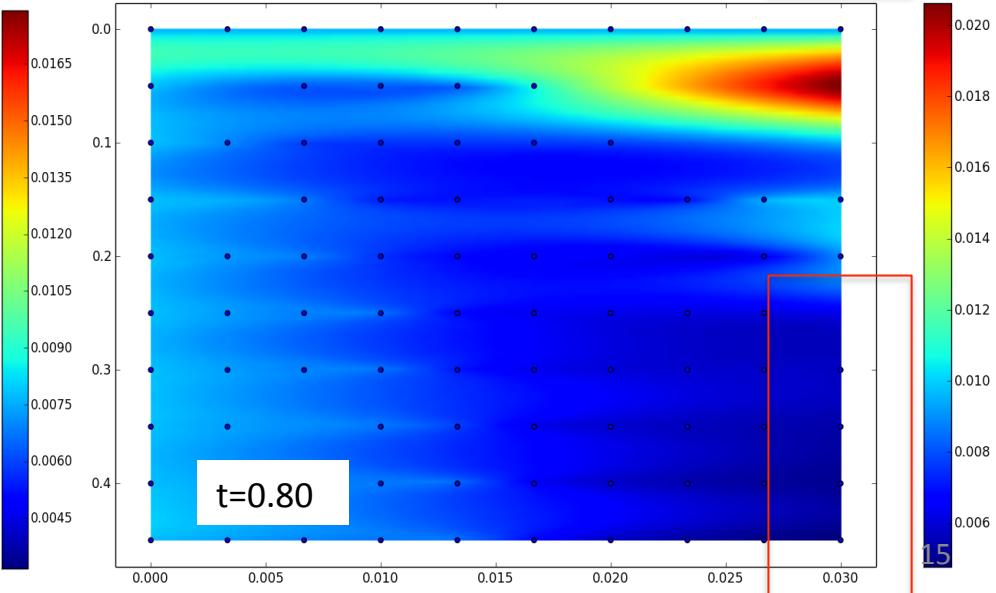
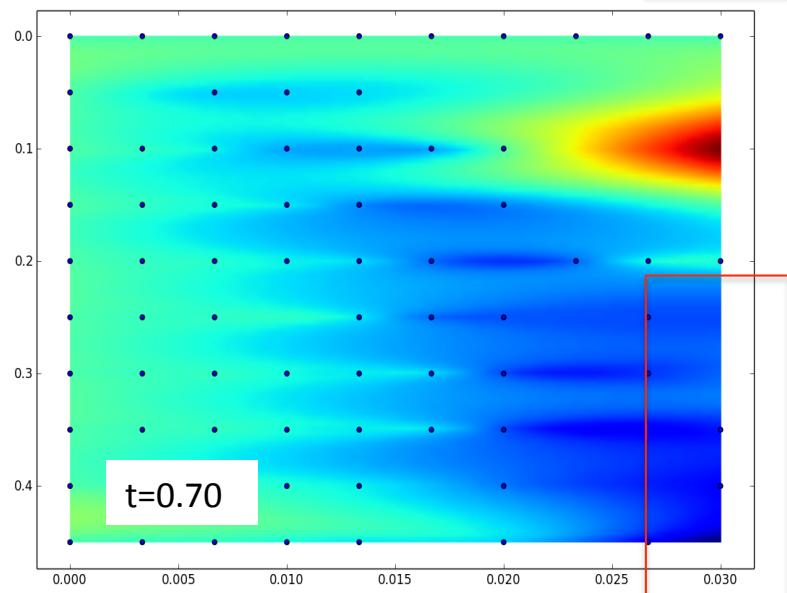
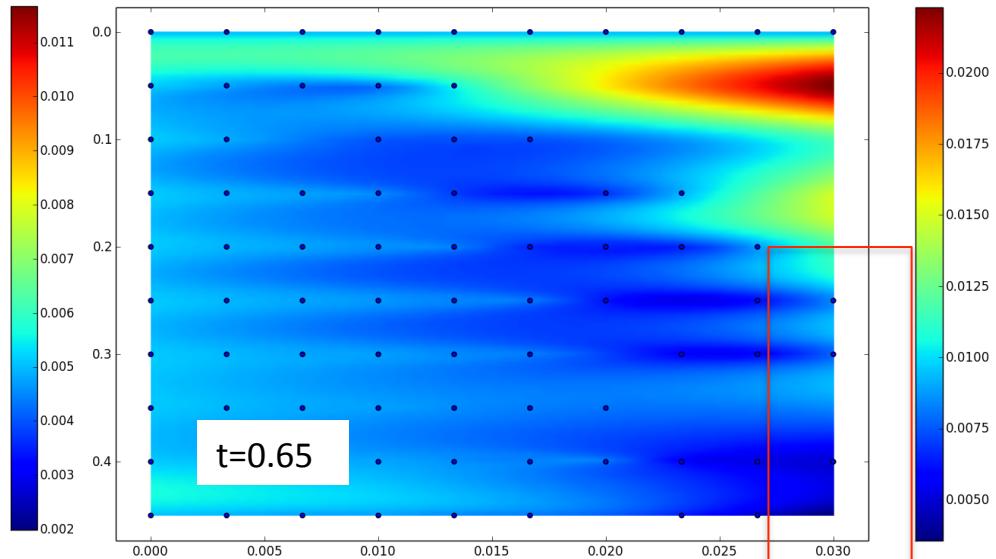
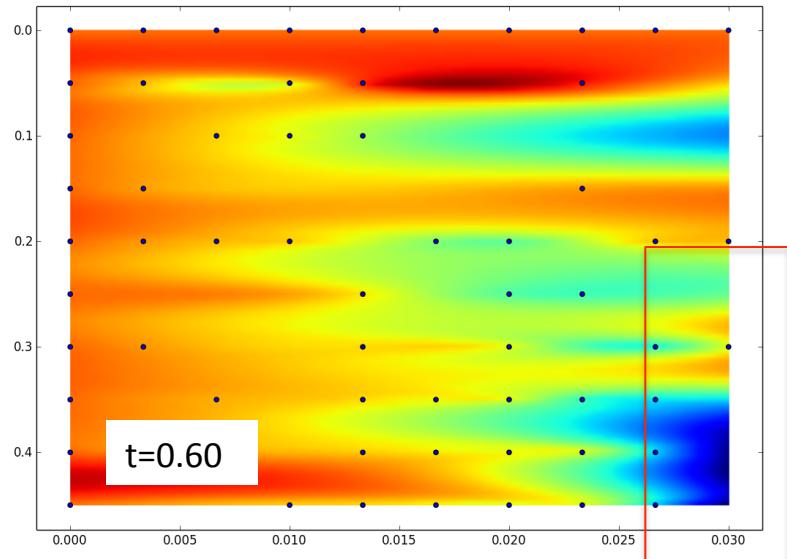
- Comparaison des caractéristiques:



BFGS, une optimisation ratée

- Pourquoi?
- Où se situe le problème?
- Que faire?

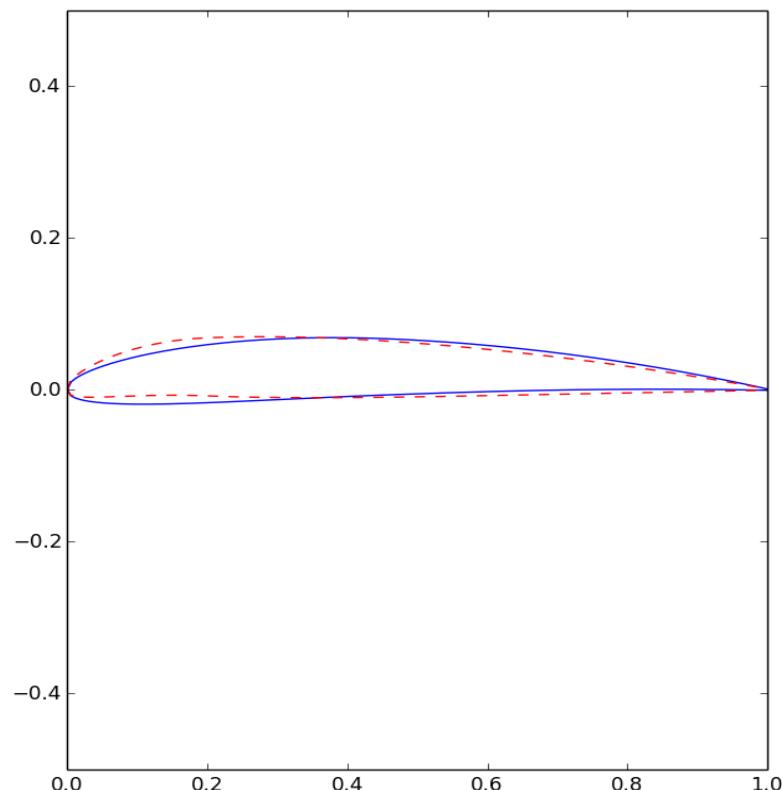
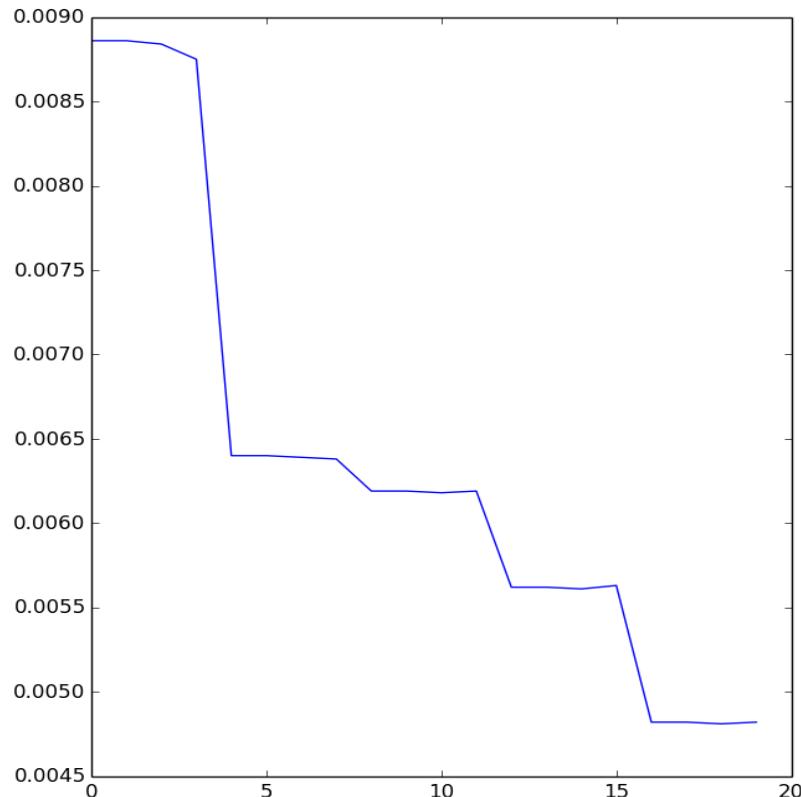
Tracés de C_D pour $C_L=0.5$ à t fixé



Minimisation de C_D sous $C_L=0.5$ et $m=0.03$

- Avec BFGS:

Départ: $m=0.03$ (contrainte), $p=0.2$, $t=0.08$ $CD=0.00886$

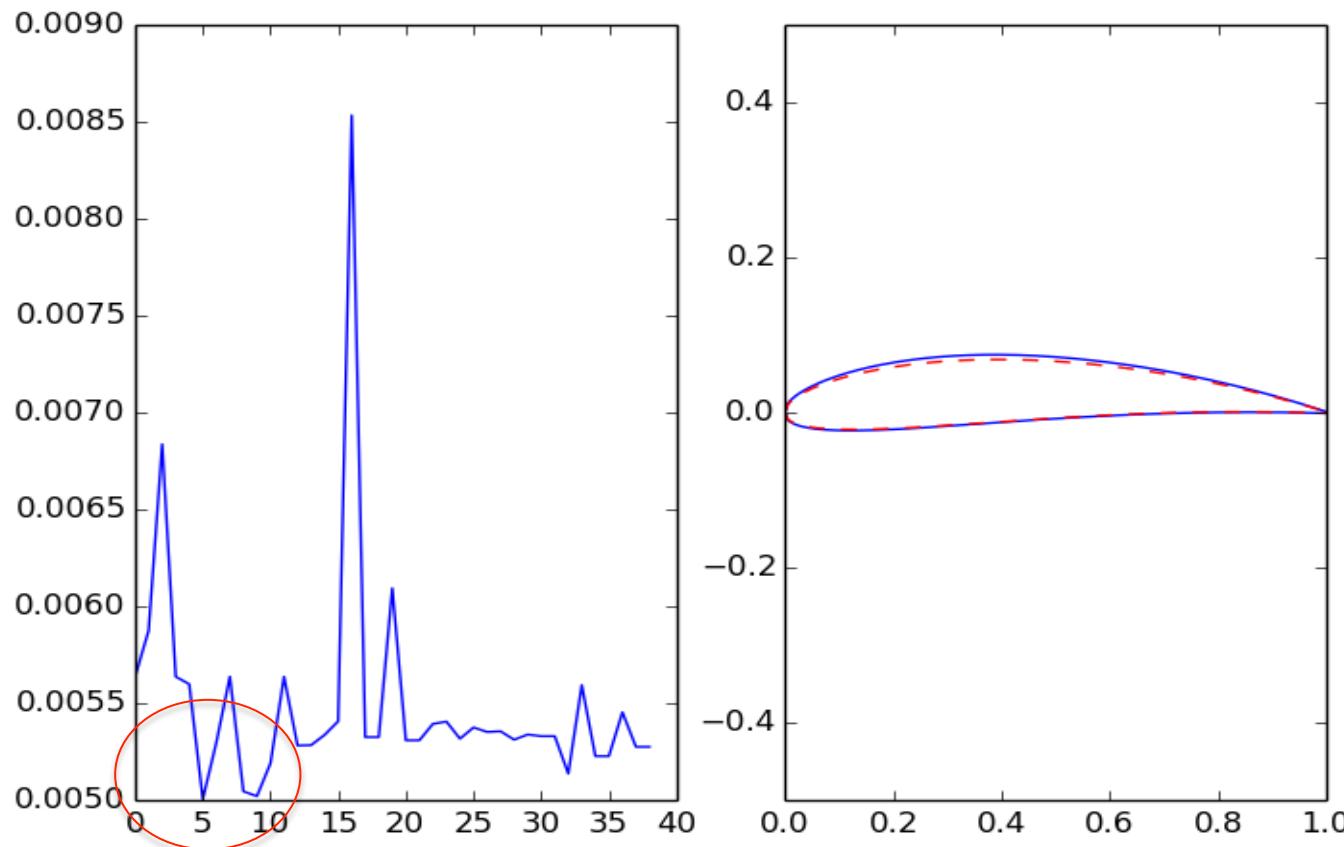


Arrivée: $m=0.03, p=0.45, t=0.081$ $CD=0.00482$

Optimisation multi-objectifs

- Avec Nelder-Mead:

Départ: Profil Optimisé $m=0.0294$, $p=0.5$ et $t=0.083$ $CD_{moy}=0.00569$



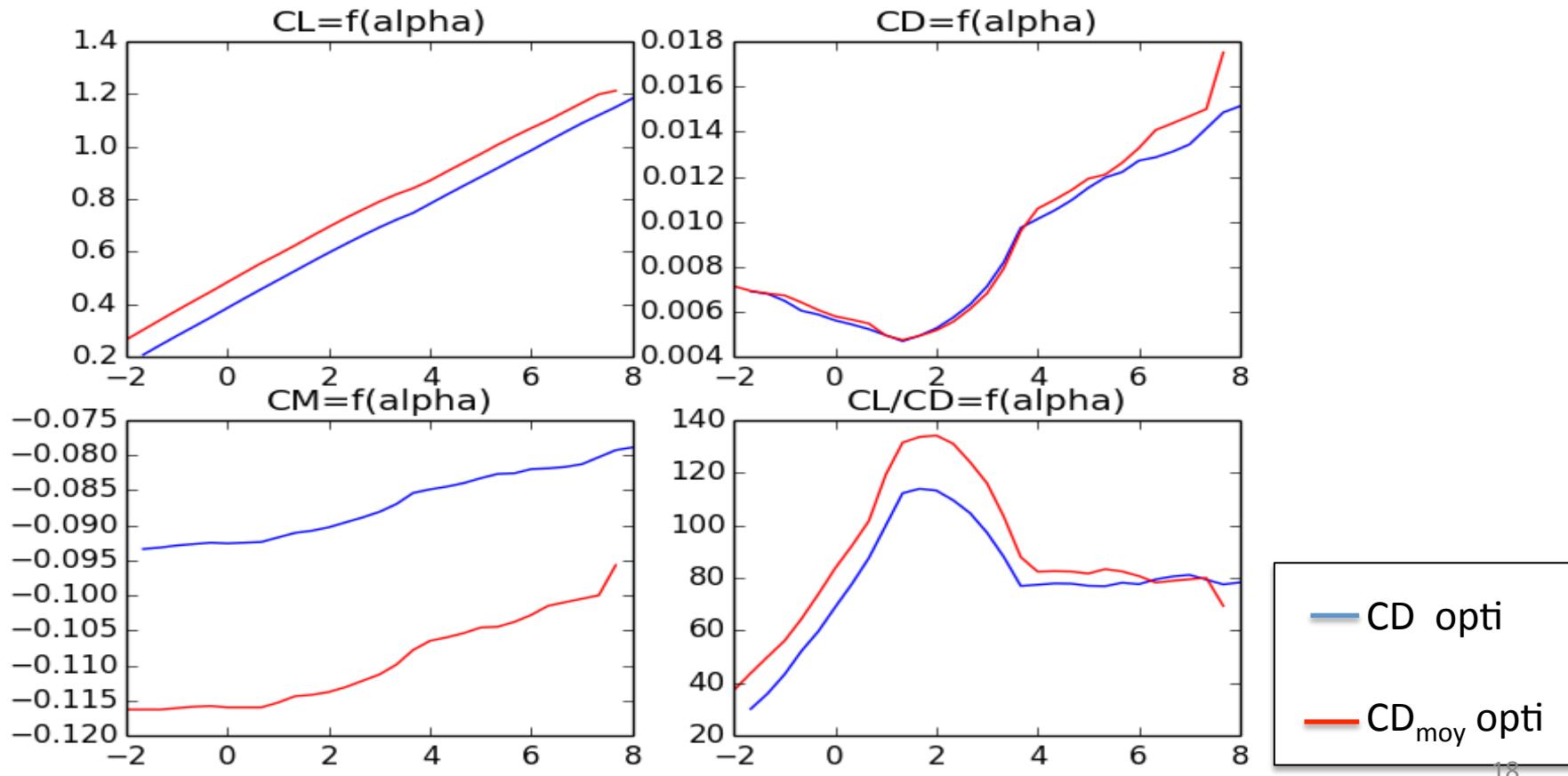
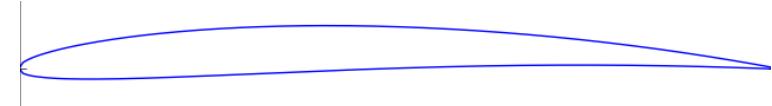
Arrivée: $m=0.032$ $p=0.48$ $t=0.09$ $CD_{moy}=0.005275$.

Optimisation multi-objectifs

$C_L=0.5 \text{ à } 0.7$

- À l'itération n=5:

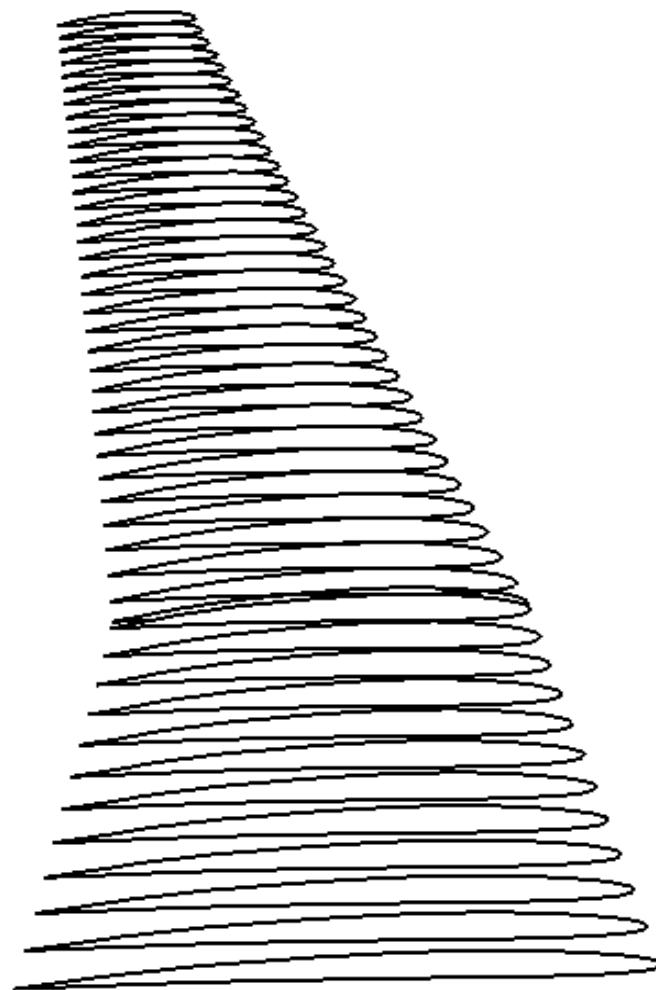
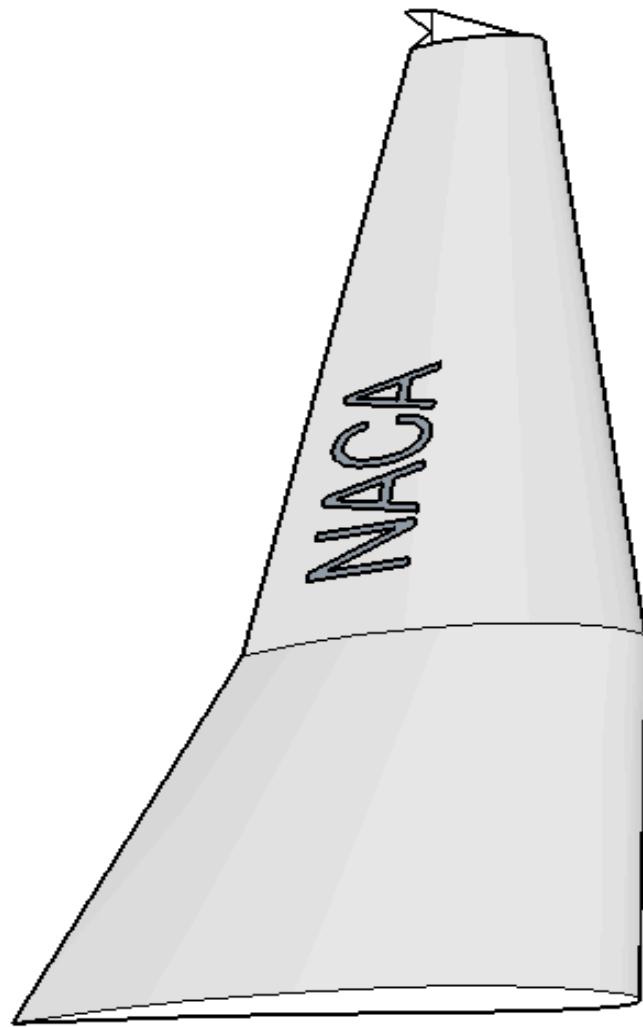
$m=0.037, p=0.5 \text{ et } t=0.083 \quad CD_{moy}=0.005005$



Conclusion

- Cadre d'un problème d'optimisation
 - Création d'une fonction objectif -> DataTreatment
 - Algorithmes d'optimisation
 - BFGS
 - Nelder-Mead
 - Interprétation des calculs
 - D'autres pistes à suivre -> multi-objectifs

Ouverture



Merci de votre attention

Avez-vous des questions ?

