

[\(https://unsplash.com/\)](https://unsplash.com/)

N. NISSE

# Graphs

This lecture presents different ways to efficiently address « difficult » (NP-hard) problems.

 S2     3 ECTS     24h     OPT     EN     [nicolas.nisse@sophia.inria.fr](mailto:nicolas.nisse@sophia.inria.fr) (<mailto:nicolas.nisse@sophia.inria.fr>)

## Description

We focus on two approaches:

- approximation algorithms where the optimality of the desired solutions is relaxed;
- and parameterized (FPT) algorithms where exact solutions are expected but whose « combinatorial complexity » depends on some parameter (not necessarily the size of the instance).

In other words, parameterized algorithms compute exact solutions (for NP-hard problems in general instances) in polynomial time in specific classes of instances. Parameterized complexity is one of the current hot topics in theoretical computer science. Considered problems to illustrate these methods are classical optimization prob-

lems such as Load Balancing problems and graph problems such as Traveling Salesman Problem, Vertex Cover, Independent Set...

## Grading

- Midterm Exam or Scientific presentation depending on the number of students (1/3).
- Final Exam (2/3)

## Resources

- **Mainly chapters 8 et 9** (<http://www-sop.inria.fr/members/Nicolas.Nisse/lectures/>)
- **Approximation Algorithms** ([https://doc.lagout.org/science/0\\_Computer%20Science/2\\_Algorithms/Approximation%20Algorithms%20%5BVazirani%202010-12-01%5D.pdf](https://doc.lagout.org/science/0_Computer%20Science/2_Algorithms/Approximation%20Algorithms%20%5BVazirani%202010-12-01%5D.pdf)), Vazirani.
- **Parameterized Complexity** (<https://www.mimuw.edu.pl/~malcin/book/parameterized-algorithms.pdf>), Cygan et al.
- **Exact Exponential Algorithms** (<http://www.ii.uib.no/~fomin/BookEA/BookEA.pdf>), Fomin and Kratsch.
- M. Cygan, F.V. Fomin, L. Kowalik, D. Lokshtanov, D. Marx, M. Pilipczuk, M. Pilipczuk, S. Saurabh: Parameterized Algorithms. Springer 2015, ISBN 978-3-319-21274-6, pp. 3-555.



## À PROPOS

L'unité pédagogique informatique regroupe les enseignants d'informatique de la faculté des sciences (licence, master et parcours MIAGE) de l'Université Côté d'Azur. [Plus › \(/\)](#)

## SERVICES

[Contact \(/contact/\)](/contact/)

[RSS \(/feed.xml\)](/feed.xml)

[Atom \(/atom.xml\)](/atom.xml)

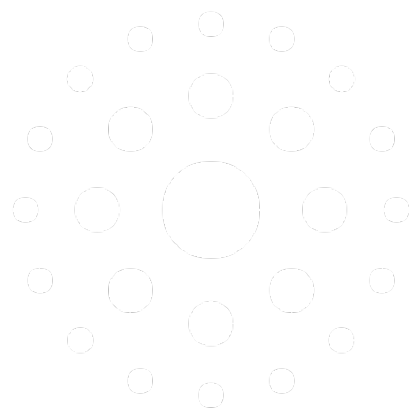
[sitemap.xml \(/sitemap.xml\)](/sitemap.xml)



# SYSTÈMES NUMÉRIQUES POUR L'HUMAIN

## ÉCOLE UNIVERSITAIRE DE RECHERCHE

<https://ds4h.univ-cotedazur.fr>



UNIVERSITÉ  
CÔTE D'AZUR

<https://univ-cotedazur.fr>

Ce site est construit avec Jeekyll avec un thème graphique basé sur [FEELING RESPONSIVE \(HTTP://PHLOW.GITHUB.IO/FEELING-RESPONSIVE/\)](http://phlow.github.io/feeling-responsive/) par [PHLOW \(HTTP://PHLOW.DE/\)](http://phlow.de/).