

# Vincent Cohen-Addad

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**Research interests and results:** My work focuses on designing and analyzing algorithms for optimization problems arising from data analysis and machine learning applications, or that are classic optimization problems.

My approach is both *prescriptive* and *descriptive*. On the one hand, I have designed several algorithms that are proven to achieve the best possible approximation guarantees for various problems, mainly for clustering or network design problems.

On the other hand, an important part of my previous work was dedicated to the analysis of widely-used heuristics and proving that they have good performance guarantees in some realistic scenarios, thus explaining their practical success.

I have also some interests in learning theory, game theory, graph theory, and fixed-parameter tractable algorithms.

## Employment

**2019 (Jun.- Jul.)** Visiting researcher at Google AI, Zurich.

**2017-** Researcher (Chargé de recherche) at Centre National de la Recherche Scientifique (CNRS), Sorbonne Université, Paris.

**2016-2017** Postdoctoral researcher supported by a Marie Skłodowska-Curie Individual Fellowship, University of Copenhagen, hosted by Prof. Mikkel Thorup.

**2013-2016** PhD student & teaching assistant, École normale supérieure and University Paris-Diderot, Paris.

## Education

**2016 Ph.D.** CS department of the École normale supérieure (Paris) under the supervision of Claire Mathieu.

**2013 M.Sc.** Master Parisien de Recherche en Informatique (MPRI), Paris-Diderot Univ. Summa cum laude.

**2011 Sc.B.** École normale supérieure of Lyon and Claude Bernard University.

## Awards and Grants

**2019** Best Paper Award at SoCG 2019 for “Almost Tight Lower Bounds for Hard Cutting Problems in Embedded Graphs” with Éric Colin de Verdière, Daniel Marx, and Arnaud de Mesmay.

**2018** P.I. of the ANR JCJC project “FOCAL” on the foundations of clustering algorithms ( $\approx 170000$  €).

**2017** EATCS Distinguished Dissertation Award 2016.

**2017** Ph.D Award Charles Delorme.

**2017** Ph.D Award of the Programme Gaspard Monge pour l’Optimisation.

**2017** Marie Skłodowska-Curie Individual Fellowship.

**2014** Third place at the Google Paris Hashcode contest (Algorithmic and programming contest at Google).

**Popular Science**

- The french popular science journal “Pour la Science” wrote an article on our paper about the resolution of the Steinberg conjecture [http://www.pourlascience.fr/ewb\\_pages/a/actu-peut-on-colorier-une-carte-avec-trois-couleurs-la-conjecture-de-steinberg-invalidee-37006.php](http://www.pourlascience.fr/ewb_pages/a/actu-peut-on-colorier-une-carte-avec-trois-couleurs-la-conjecture-de-steinberg-invalidee-37006.php)
- I gave an interview for the national radio “France Culture” <https://www.franceculture.fr/emissions/la-methode-scientifique/la-methode-scientifique-jeudi-30-novembre-2017>
- I wrote a popular science article for the blog of the french computer science society on the website of the Le Monde newspaper <http://binaire.blog.lemonde.fr/2017/01/19/en-quete-dune-bonne-crepe/>.

**Selected Publications**

- 2019** Local Search Yields Approximation Schemes for  $k$ -Means and  $k$ -Median in Euclidean and Minor-free Metrics. SIAM journal of Computing – special issue on FOCS’16. Prelim. version in the proceedings of the 57th Annual IEEE Symposium on Foundations of Computer Science (FOCS). Vincent Cohen-Addad, Philip N. Klein, and Claire Mathieu.
- 2019** Hierarchical Clustering: Objective Functions and Algorithms. Journal of the ACM. Prelim. version in the proceedings of the 29th Annual ACM-SIAM Symposium on Discrete Algorithms (SODA) and in Advances in Neural Information Processing Systems 28 (NIPS). Vincent Cohen-Addad, Varun Kanade, Frederik Mallmann-Trenn, and Claire Mathieu.
- 2018** A Fast Approximation Scheme for Low-Dimensional  $k$ -Means. Proceedings of the 29th Annual ACM-SIAM Symposium on Discrete Algorithms (SODA). Vincent Cohen-Addad.

**Service**

- 2019** Expert for the evaluation of proposals of the H2020 call H2020-MSCA-IF-2019 for the European Commission.
- 2019** Co-Organizer of the ICERM Workshop on Data Science in Low-Dimensional Space – Brown University.
- 2019** Hiring committee of Université Paris-Dauphine, Université Paris-Diderot.
- 2018** SIAM Journal of Computing Special Issue on FOCS’18 Editor.
- 2018** Program committee of the 59th Annual IEEE Symposium on Foundations of Computer Science (FOCS’18).
- 2017** Program committee of the 25th Annual European Symposium. on Algorithms (ESA’17).

**All Refereed Publications**

- 2020** Approximation Schemes for Capacitated Clustering in Doubling Metrics.  
To appear in the proceedings of the 30th Annual ACM-SIAM Symposium on Discrete Algorithms (SODA).  
Vincent Cohen-Addad.
- 2020** Instance-Optimality in the Noisy Value-and Comparison-Model.  
To appear in the proceedings of the 30th Annual ACM-SIAM Symposium on Discrete Algorithms (SODA).  
Vincent Cohen-Addad, Frederik Mallmann-Trenn and Claire Mathieu.
- 2019** Subquadratic High-Dimensional Hierarchical Clustering.  
To appear in the proceedings of the conference on Neural Information Processing Systems (NeurIPS) 2019.  
Amir Abboud, Vincent Cohen-Addad and Hussein Houdrouge.
- 2019** Fully Dynamic Consistent Facility Location.  
To appear in the proceedings of the conference on Neural Information Processing Systems (NeurIPS) 2019.  
Vincent Cohen-Addad, Niklas Hjuler, Nikos Parotsidis, David Saulpic and Chris Schwiegelshohn.
- 2019** Inapproximability of Clustering in  $\ell_p$ -metrics.  
To appear in the proceedings of the 60th Annual IEEE Symposium on Foundations of Computer Science (FOCS).  
Vincent Cohen-Addad and Karthik C. S..

- 2019** Near-Linear-Time Approximation Schemes for Clustering in Doubling Metrics.  
To appear in the proceedings of the 60th Annual IEEE Symposium on Foundations of Computer Science (FOCS).  
Vincent Cohen-Addad, Andreas Emil Feldmann and David Saulpic.
- 2019** A Polynomial-Time Approximation Scheme for Facility Location on Planar Graphs.  
To appear in the proceedings of the 60th Annual IEEE Symposium on Foundations of Computer Science (FOCS).  
Vincent Cohen-Addad, Marcin Pilipczuk and Michał Pilipczuk.
- 2019** Efficient Approximation Schemes for Uniform-cost Clustering Problems in Planar Graphs.  
To appear in the proceedings of the 27th Annual European Symposium on Algorithms (ESA) 2019.  
Vincent Cohen-Addad, Marcin Pilipczuk and Michał Pilipczuk.
- 2019** On the Fixed-Parameter Tractability of Capacitated Clustering.  
Proceedings of the 46th International Colloquium on Automata, Languages, and Programming (ICALP) 2019.  
Vincent Cohen-Addad and Jason Li.
- 2019** Tight FPT Approximations for k-Median and k-Means.  
Proceedings of the 46th International Colloquium on Automata, Languages, and Programming (ICALP) 2019.  
Vincent Cohen-Addad, Anupam Gupta, Amit Kumar, Euiwoong Lee, and Jason Li.
- 2019** Almost Tight Lower Bounds for Hard Cutting Problems in Embedded Graphs.  
Proceedings of the 35th International Symposium on Computational Geometry (SoCG) 2019. Best Paper Award.  
Vincent Cohen-Addad, Éric Colin de Verdière, Daniel Marx, and Arnaud de Mesmay.
- 2019** Oblivious Dimension Reduction for k-Means – Beyond Subspaces and the Johnson-Lindenstrauss Lemma.  
Proceedings of the 51st ACM Symposium on Theory of Computing (STOC) 2019.  
Joint work with Luca Becchetti, Marc Bury, Vincent Cohen-Addad, Fabrizio Grandoni, and Chris Schwiegelshohn
- 2019** Lower Bounds for Text Indexing with Mismatches and Differences.  
Proceedings of the 30th Annual ACM-SIAM Symposium on Discrete Algorithms (SODA).  
Vincent Cohen-Addad, Laurent Feuilloley and Tatiana Starikovskaya.
- 2018** Clustering Redemption – Beyond the Impossibility of Kleinberg’s Axioms.  
Advances in Neural Information Processing Systems 29 (NeurIPS).  
Vincent Cohen-Addad, Varun Kanade and Frederik Mallmann-Trenn.
- 2018** Balanced Centroidal Power Diagrams for Redistricting.  
To appear in the proceedings of the 26th International Conference on Advances in Geographic Information Systems (SIGSPATIAL).  
Vincent Cohen-Addad, Philip Klein and Neal Young.
- 2018** Fast Fencing.  
Proceedings of the 50th ACM Symposium on Theory of Computing (STOC).  
Mikkel Abrahamsen, Anna Adamaszek, Karl Bringmann, Vincent Cohen-Addad, Mehran Mehr, Eva Rotenberg, Alan Roytman, and Mikkel Thorup.
- 2018** A Fast Approximation Scheme for Low-Dimensional k-Means.  
Proceedings of the 29th Annual ACM-SIAM Symposium on Discrete Algorithms (SODA).  
Vincent Cohen-Addad.
- 2018** A near-linear approximation scheme for multicuts of embedded graphs with a fixed number of terminals.  
Proceedings of the 29th Annual ACM-SIAM Symposium on Discrete Algorithms (SODA).  
Vincent Cohen-Addad, Éric Colin de Verdière, and Arnaud de Mesmay.
- 2018** Hierarchical Clustering: Objective Functions and Algorithms.  
Proceedings of the 29th Annual ACM-SIAM Symposium on Discrete Algorithms (SODA).  
Vincent Cohen-Addad, Varun Kanade, Frederik Mallmann-Trenn, and Claire Mathieu.
- 2018** The Bane of Low-Dimensionality Clustering.  
Proceedings of the 29th Annual ACM-SIAM Symposium on Discrete Algorithms (SODA).  
Vincent Cohen-Addad, Arnaud de Mesmay, Eva Rotenberg, and Alan Roytman.
- 2017** Hierarchical Clustering Beyond the Worst-Case.  
Advances in Neural Information Processing Systems 28 (NIPS).  
Vincent Cohen-Addad, Varun Kanade, and Frederik Mallmann-Trenn.

- 2017** Fast and Compact Exact Distance Oracle for Planar Graphs.  
Proceedings of the 58th Annual IEEE Symposium on Foundations of Computer Science (FOCS).  
Vincent Cohen-Addad, Søren Dahlgaard, and Christian Wulff-Nilsen
- 2017** On the Local Structure of Stable Clustering Instances.  
Proceedings of the 58th Annual IEEE Symposium on Foundations of Computer Science (FOCS).  
Vincent Cohen-Addad and Chris Schwiegelshohn.
- 2017** Online Optimization of Smoothed Piecewise Constant Functions.  
Proceedings of the 20th International Conference on Artificial Intelligence and Statistics (AISTATS).  
Vincent Cohen-Addad and Varun Kanade.
- 2017** Steinberg’s Conjecture is False.  
Journal of Combinatorial Theory, Serie B (JCTB).  
Vincent Cohen-Addad , Michael Hebdige, Dan Kral, Zhentao Li, and Esteban Salgado.
- 2016** Local Search Yields Approximation Schemes for  $k$ -Means and  $k$ -Median in Euclidean and Minor-free Metrics.  
SIAM Journal of Computing – Special issue on FOCS’16. Preliminary version in the proceedings of the 57th Annual IEEE Symposium on Foundations of Computer Science (FOCS).  
Vincent Cohen-Addad, Philip N. Klein, and Claire Mathieu.
- 2016** The Invisible Hand of Dynamic Market Pricing.  
Proceedings of the 17th Conference on Economics and Computations (EC).  
Vincent Cohen-Addad, Alon Eden, Michal Feldman, and Amos Fiat.
- 2016** Diameter and  $k$ -Center Clustering in Sliding Windows.  
Proceedings of the 43rd International Colloquium on Automata, Languages, and Programming (ICALP).  
Vincent Cohen-Addad, Chris Schwiegelshohn, and Christian Sohler.
- 2016** Approximating Connectivity Domination in Weighted Bounded-Genus Graphs.  
Proceedings of the 48th ACN Symposium on the Theory of Computing (STOC).  
Vincent Cohen-Addad, Éric Colin de Verdière, Philip N. Klein, Claire Mathieu, and David Meierfrankenfeld.
- 2016** Algorithmic Aspects of Switch Cographs.  
Discrete Applied Mathematics, vol. 200.  
Vincent Cohen-Addad, Michel Habib, and Fabien de Montgolfier.
- 2015** A Fixed Parameter Tractable Approximation Scheme for the Optimal Cut Graph of a Surface.  
Proceedings of the 23rd European Symposium on Algorithms (ESA).  
Vincent Cohen-Addad, Arnaud de Mesmay.
- 2015** Effectiveness of Local Search for Geometric Optimization.  
Proceedings of the 31st Annual Symposium on Computational Geometry (SoCG).  
Vincent Cohen-Addad and Claire Mathieu.
- 2014** Energy-efficient Algorithms for Non-preemptive Speed-scaling.  
Proceedings of the 12th Workshop on Approximation and Online Algorithms (WAOA).  
Vincent Cohen-Addad, Zhentao Li, Claire Mathieu, and Ioannis Millis.