

PhD and Postdoc position

for the project

"Towards a Quantitative Theory of Integer Programming"

at

CWI.

I am looking for one PhD student and one postdoctoral researcher with a strong interest in the theory and practice of Integer Programming (IP). The research will be supported by the ERC grant "Towards a Quantitative Theory of Integer Programming" and will take place at CWI in Amsterdam. The goals of this research are (1) to develop a quantitative theory that can explain the effectiveness of the prevalent techniques used for solving IPs (e.g. branch & bound, cutting planes, diving heuristics, etc.), (2) to develop new and effective techniques for solving IPs and (3) to build new connections between the study of IP, theoretical computer science and optimization. The research projects are designed to be interdisciplinary and are expected to require combining techniques from various areas of optimization (first order methods, interior point methods, simplex algorithms), theoretical computer science (discrepancy theory, fixed parameter tractability, smoothed analysis) and geometry (convex geometry, geometry of Euclidean lattices). Some sample research questions include:

- Can one obtain non-trivial upper bounds on the size of branch & bound trees produced by standard branching rules?
 - Is there a cutting plane based polynomial time approximation scheme for the metric traveling salesman problem? More generally, can one develop a cutting plane framework with provable convergence guarantees?
 - Can one automate basic FPT algorithms using the branch & bound framework?
 - Can one demonstrate the efficiency of the simplex method for solving related sequences of linear programs (as one would encounter within branch & bound or cutting plane generation)?
 - Can one develop practical rounding heuristics using discrepancy minimization algorithms?
- Is there a $2^{O(n)}$ -time algorithm for general integer programming?

The application deadline is November 15th. For more information, please consult the official advertisements here:

Postdoc: <https://www.cwi.nl/jobs/vacancies/postdoc-on-the-subject-of-towards-a-quantitative-theory-of-integer-programming-1>

PhD: <https://www.cwi.nl/jobs/vacancies/phd-student-on-the-subject-of-towards-a-quantitative-theory-of-integer-programming>

Homepage: <https://homepages.cwi.nl/~dadush/>

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