Bocconi

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**Bocconi University**
**Room 3-E4-SR03**
**Via Röntgen 1, Milano (3° floor)**

# Recent Progress on Approximating Correlation Clustering: The Power of LP Hierarchies


## Speaker

**Vincent Cohen-Addad**
Research Scientist
Google Research



## Abstract

We consider the classic Correlation Clustering problem: Given a complete graph where edges are labelled either + or −, the goal is to find a partition of the vertices that minimizes the number of the +edges across parts plus the number of the −edges within parts.
The problem is known since the early 2000s to admit a linear relaxation which can be rounded to a 2.5-approximation using a simple pivot rounding procedure dating back to 2005 [Ailon, Charikar, Newman]. This remained the best known until 2015 when a 2.06-approximation using a slightly refined pivot rounding was presented by Chawla, Makarychev, Schramm and Yaroslavtsev. Beating 2 then stood out as an important barrier given that 2 was the integrality gap of this linear program.

In 2022, in a joint work with Euiwoong Lee, Alantha Newman, we [CLN22] presented a 1.994-approximation algorithm for the problem using the Sherali-Adams hierarchy, hence breaking through the integrality gap and improving upon the 2.06- approximation.

Last year, in a joint work with Euiwoong Lee, Shi Li, Alantha Newman, we significantly improved the state-of-the-art by providing a 1.73-approximation for the problem. Our approach introduces a preclustering of Correlation Clustering instances that allows us to essentially ignore the error arising from the correlated rounding used by [CLN22]. This additional power simplifies the previous algorithm and analysis. More importantly, it enables a new set-based rounding that complements the previous roundings. A combination of these two rounding algorithms yields the improved bound. This year, in a joint work with Nairen Cao, Euiwoong Lee, Shi Li, Alantha Newman, and Lukas Vogl, we show how to improve the approximation even further,
down to 1.43. I'll review the key ideas that led to these results.


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DEPARTMENT OF COMPUTING SCIENCES