



# Hamilton Institute

## Counting Euler Tours of directed and undirected Graphs

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**Abstract:** The problem of determining whether a graph (directed or undirected) has an Euler Tour is easily solvable in polynomial-time - we only need to check that the graph is an Eulerian one, and that it is connected. The problem of counting the number of Euler Tours of a given graph is considerably more interesting and difficult: in the case of directed Eulerian graphs, there is a well-known polynomial-time algorithm which uses the Matrix-Tree Theorem and the BEST theorem to exactly count Euler tours; in the case of undirected Eulerian graphs, the problem is known to be #P-complete and very few results are known.

In this talk I introduce the background to this problem, and sketch two very different results of my own in this area:

- a study of the number of Euler Tours in the random directed graph model (joint with P. Creed), which implies that certain simple algorithms for approximately sampling/counting tours run in expected polynomial-time;
- a polynomial-time algorithm for exactly counting Euler Tours of undirected graphs of bounded treewidth (joint with P.Chebolu and R.Martin).

**Venue:** Seminar Room, Hamilton Institute, Rye Hall, NUI Maynooth

**Time:** 2.00pm - 3.00pm

Travel directions are available at [www.hamilton.ie](http://www.hamilton.ie)