



## Seminar/Talk

# TCS Seminar - From Sorting under Partial Information to Universal Optimality

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Host:

Comparison based sorting is a well understood problem. There are many algorithms that sort  $n$  items in  $O(n \log n)$  comparisons, and this is tight since  $\log(n!) \sim n \log n$ . But what if you already know that some elements are smaller than others? Can you then sort in fewer than  $(n \log n)$  comparisons? We can encode this prior information as a directed acyclic graph  $G$  that contains a vertex for every item, and an edge  $x \rightarrow y$  if we already know that  $x < y$ . If there are  $e(G)$  sorted orders (permutations) compatible with  $G$ , then any algorithm must perform  $(\log e(G))$  comparisons. The problem of Sorting from Partial Information is to match this bound, that is, to design an efficient algorithm that, given the graph  $G$ , sorts the items in  $O(\log e(G))$  comparisons. Such an algorithm is optimal in a very strong sense: Not only is it optimal for every input size  $n$ , but it is optimal for every graph  $G$ ; we call such an algorithm universally optimal. There are many fundamental problems that have textbook algorithms with a running time of  $(n \log n)$ . For these problems, we ask: Can we design algorithms that run in  $o(n \log n)$  time on subsets of inputs characterized by a graph  $G$ ? Can we achieve universal optimality? This concept applies not only to graph algorithms such as Dijkstra's or Prim's, but also to a wide range of fundamental problems, including set intersection and convex hulls.

**Thursday, June 18, 2026 11:30am - 12:30pm**

Office Bldg West / Ground floor / Foyer seminar room (I21.EG.128)



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