Team members of the Algorithm Project

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Analyze of Kurskal's Algorithm:

The total time complexity of Kruskal's Algorithm is:

Sorting the edges:

Sorting $|E|$ edges takes $O(|E|\log|E|)$.

Processing the edges with Union-Find:

Performing

$|E|$ FIND and UNION operations each taking $O(\log|V|)$:

$O(|E|\log|V|)$.

Since sorting dominates when $|E|$ is large, the total time complexity is:

$O(|E|\log|E|+|E|\log|V|)$.

Recall that $\log|E|$ and $\log|V|$ are related because $|E|$ can be at most $|V|^2$ (in a complete graph). Thus:
$\log|E|=O(\log|V|)$.

Substituting this relationship simplifies the total time complexity to:

$O(|E|\log|V|)$.