**ΠΑΝΕΠΙΣΤΗΜΙΟ ΙΩΑΝΝΙΝΩΝ**

**ΤΜΗΜΑ ΜΑΘΗΜΑΤΙΚΩΝ**


Εβδομαδιαίο Σεμινάριο

# Coloring and 2-Domination Problems on Permutation Graphs

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A $k$-coloring of a graph $G = (V, E)$ is a partition of the vertex set $V = V_1 + V_2 + \cdots + V_k$ such that each $V_i$ is a stable set; the coloring problem on $G$ asks for the smallest possible $k = \chi(G)$ such that $G$ has a $k$-coloring. A vertex subset $D$ of $G$ is a dominating set if every vertex of $G$ is either in $D$ or is adjacent to a vertex in $D$. The 2-domination problem on $G$ asks for a minimum-cardinality dominating set $S$ of $G$ such that the subgraph induced by $S$ contains a perfect matching. Both the coloring and the 2-domination problems on general graphs are known to be NP-complete. We define an embedding of permutation graphs in the plane which enables us to obtain equivalent versions of the problems defined on points in the plane. We take advantage of properties of this embedding and design linear-time algorithms for both the coloring and the 2-domination problems on permutation graphs; we solve the coloring problem by reducing it to the computation of the longest path on an appropriately constructed DAG and the 2-domination problem by "sweeping" the vertices of the embedding.

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