

# On the use of senders for asymmetric tuples of cliques in Ramsey Theory

Thomas Lesgourgues

*UNSW*

A graph  $G$  is  $q$ -Ramsey for a  $q$ -tuple of graphs  $(H_1, \dots, H_q)$  if every  $q$ -edge-coloring of  $G$  contains a monochromatic copy of  $H_i$  in color  $i$ , for some  $i \in [q]$ . Over the last few decades, researchers have investigated a number of questions related to this notion, aiming to understand the properties of graphs that are  $q$ -Ramsey for a fixed tuple. Among the tools developed while studying questions of this type are gadget graphs, called signal senders and determiners, which have proven very useful for building Ramsey graphs with certain properties. However, until now these gadgets have been shown to exist and used mainly in the two-color setting or in the symmetric multicolor setting, and our knowledge about their existence for multicolor asymmetric tuples is extremely limited. In this paper, we construct such gadgets for any tuple of cliques  $\mathcal{T} = (K_{t_1}, \dots, K_{t_q})$ , which allows us to prove a number of results about the class of minimal (with respect to subgraph inclusion)  $q$ -Ramsey graphs for  $\mathcal{T}$ .