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*Obstructions to Nielsen realization*

Let  $M$  be a manifold, and let  $Mod(M)$  be its mapping class group. The Nielsen realization problem for diffeomorphisms asks, “Can a given subgroup  $G < Mod(M)$  be lifted to the diffeomorphism group  $Diff(M)$ ?” This question about group actions is related to a question about flat connections on fiber bundles with fiber  $M$ . In the case  $M$  is a closed surface, the answer is “yes” for finite  $G$  (by work of Kerckhoff) and “no” for  $G = Mod(M)$  (by work of Morita). For most infinite  $G < Mod(M)$ , we don’t know. I will discuss some obstructions that can be used to show that certain groups don’t lift. Some of this work is joint with Nick Salter.