VCU Discrete Mathematics Seminar
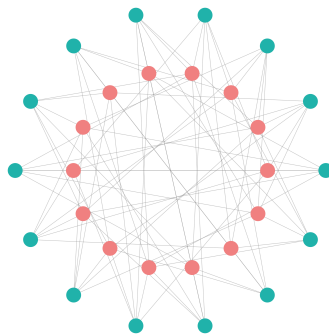
The BCI problem

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Wednesday, Nov. 5
1:00-1:50 EST

In person in 4145 Harris Hall. And a Zoom option:
`https://vcu.zoom.us/j/81475528886`
`password=graphs2357`

Graphs are point-line incidence structures, often used in mathematics to help visualize algebraic structures by representing group elements as the points and drawing edges according to a chosen incidence rule. Perhaps the most well-known example of such an encoded graph is a *Cayley graph*, which encodes how elements of a group are related to one another by a fixed set of generators. A *Haar graph* is a related construction that generalizes directed Cayley graphs (Cayley digraphs) by forcing bipartiteness.

The *Bi-Cayley Isomorphism* (BCI) problem asks: given two Haar graphs built from the same group G, can we tell whether they are the same (i.e. isomorphic) just by looking at a certain list of "obvious" symmetries inherited from G itself?

In this talk, I will describe a broader version of this question, where our "certain list of symmetries" includes one additional map. We will then focus on the case when the group G is abelian. Except for one special situation, we can reduce the BCI problem to a simpler problem about a related quotient or component graph and, in almost all cases, reduce further to the more familiar *Cayley isomorphism problem*.

For the DM seminar schedule, see:

`https://go.vcu.edu/discrete`