VIR Progress

Duncan Wilkie

3 March 2022

What We're Doing, Again

Knot Floer homology

$\downarrow$

Powerful, but hard-to-compute knot invariant

$\downarrow$

$\widehat{HFK}(K) = \bigoplus_{i,s} HFK_i(K, s)$

of 1-1 knots

$\downarrow$

Class of knots one can compute it for

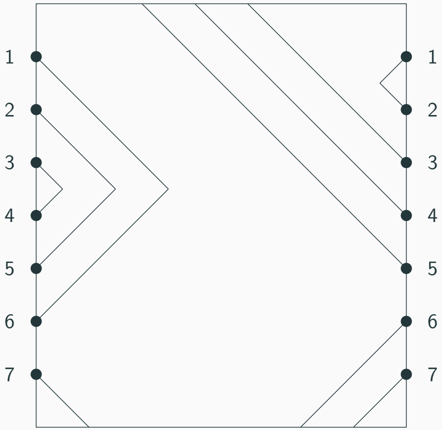
$\downarrow$

Can be split into two arcs, each "simple" on a torus

What We're Doing, Again

- 1-1 knots are represented by 4 integers $[p, a, b, r]$.
- Can read off $\widehat{HFK}$ from diagram constructible from $[p, a, b, r]$

E.g. $[7, 3, 1, 5] \mapsto$



What We've Done

- Large jumps in grading—why?
  - Looked for combinatorial predictors of jumps among $[p, a, b, r]$.
  - General methods for detecting combinatorial patterns: alien coding, inductive logic programming, symbolic regression, syntax-guided synthesis, Berlekamp-Massey algorithm.
  - Dead end; $[p, a, b, r]$ is unlikely to hold much topological data.
- Automatically drawing diagrams
  - It's 2023; why use your hands?
  - `heegaard{p}{a}{b}{r}`, `ucover{p}{a}{b}{r}` $\mapsto$ TikZ diagrams
  - Works in many cases

Where We're Going

- s/grading jumps/multiplicity of top grading/
  - In $\bigoplus_{i,s} \widehat{HFK}_i(K, s)$, sometimes there is one topmost "bin," and sometimes there are several
  - What does this say about the knot?
  - What does this say about the diagram?
- Fix drawing bugs
  - Sometimes algo is just wrong.
  - Make warped lines match up in universal cover, so one can see connected regions.

$\square$