

16th
International
Symposium
on Graph
Drawing

Connected
Rectilinear
Graphs on
Point Sets

Maarten Löffler
Utrecht University

Elena Mumford
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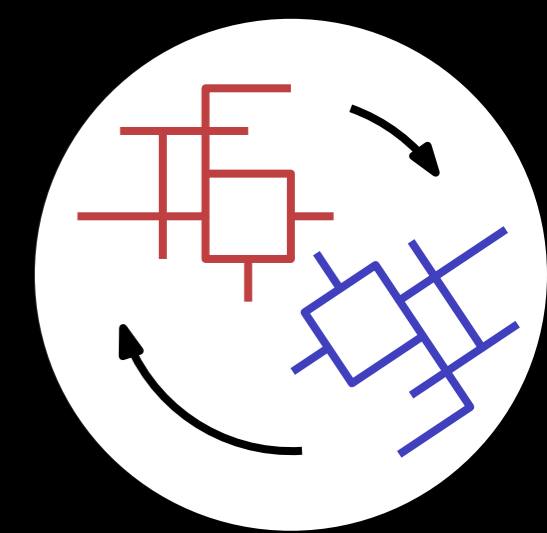
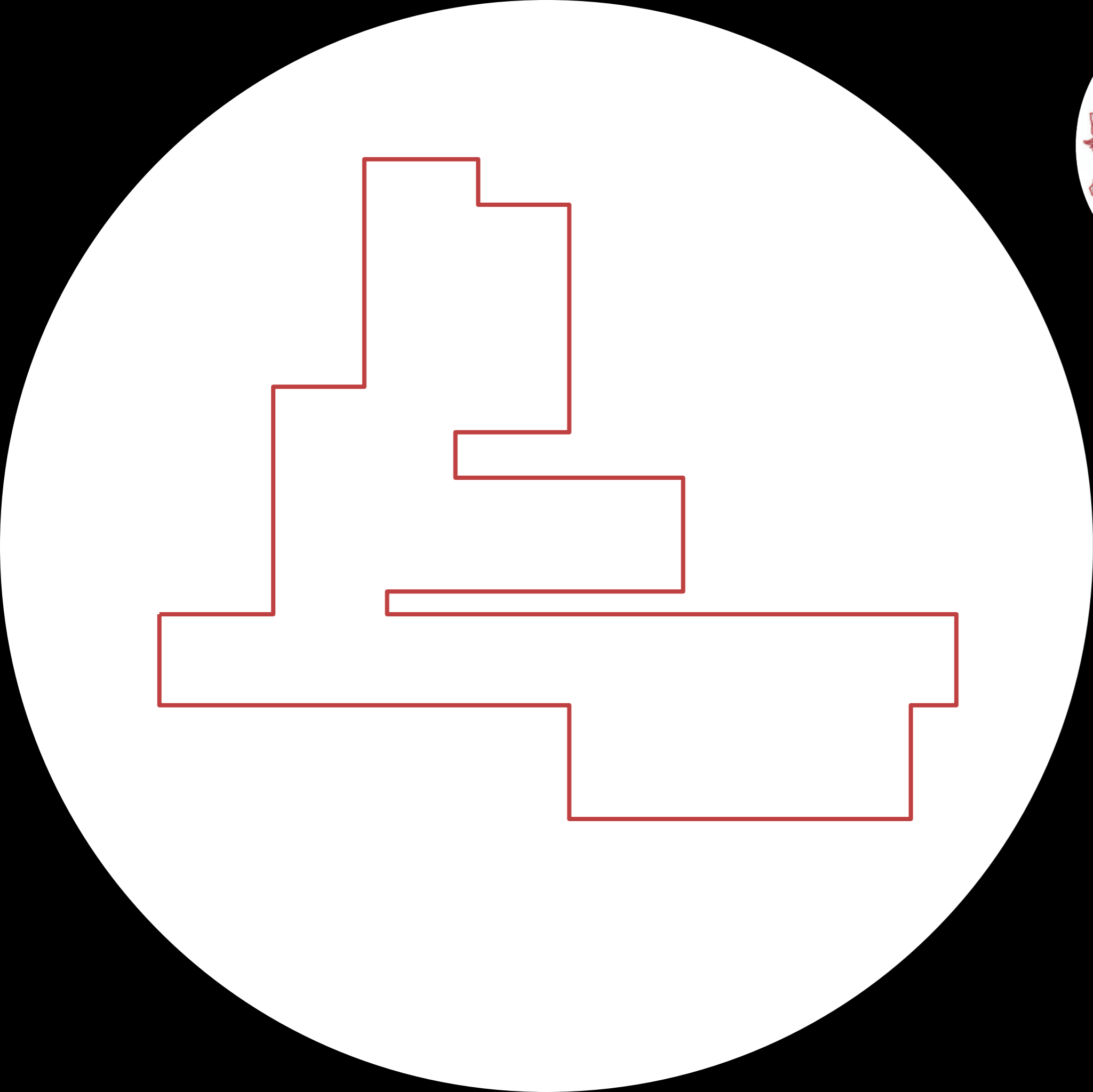
the Netherlands

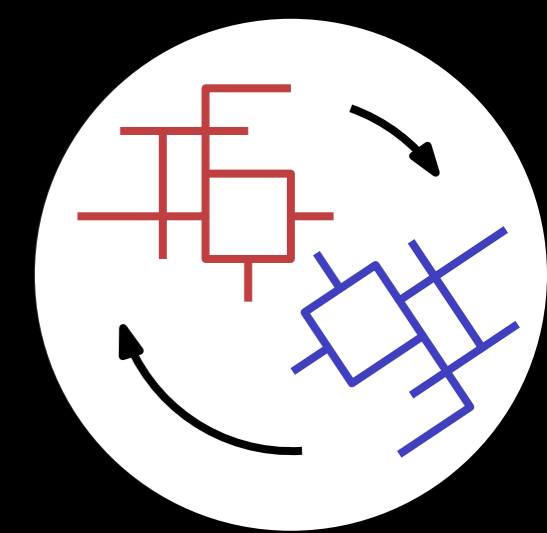
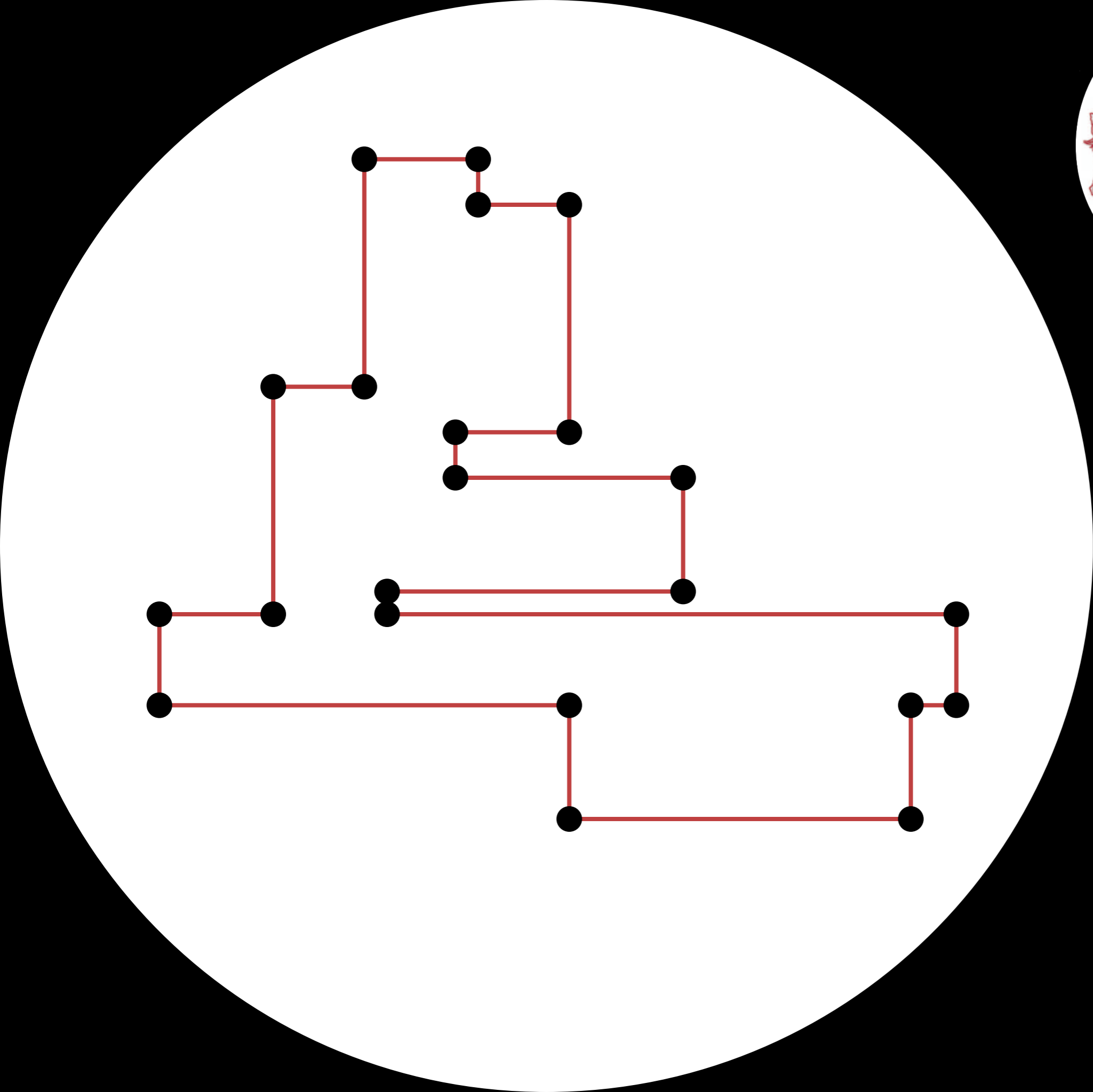
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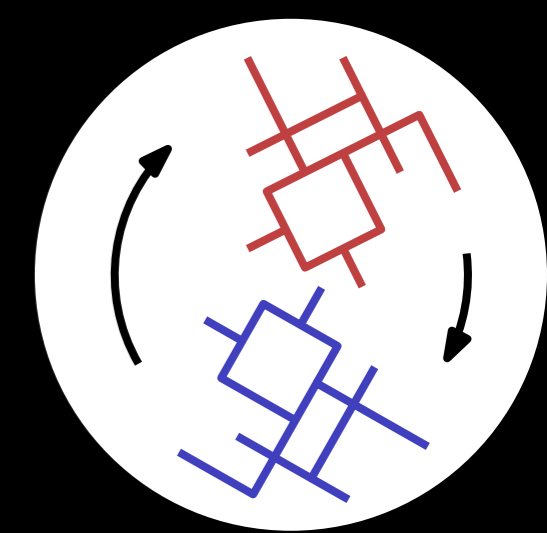
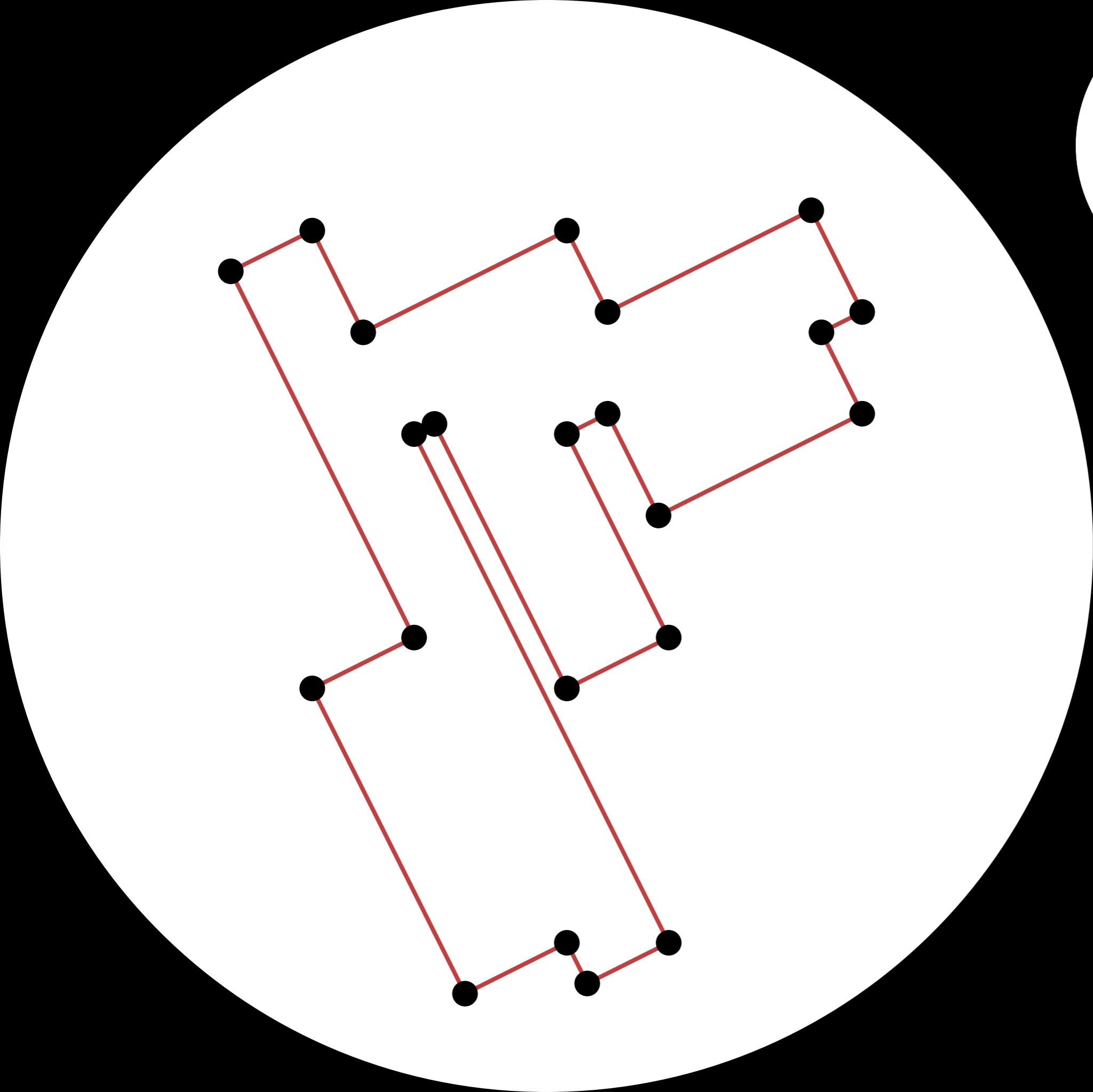
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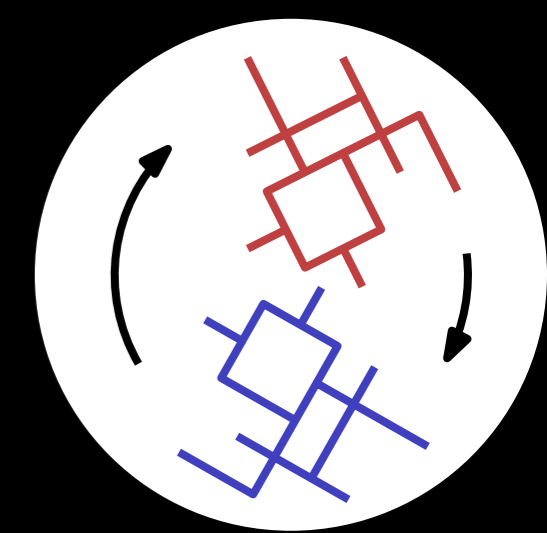
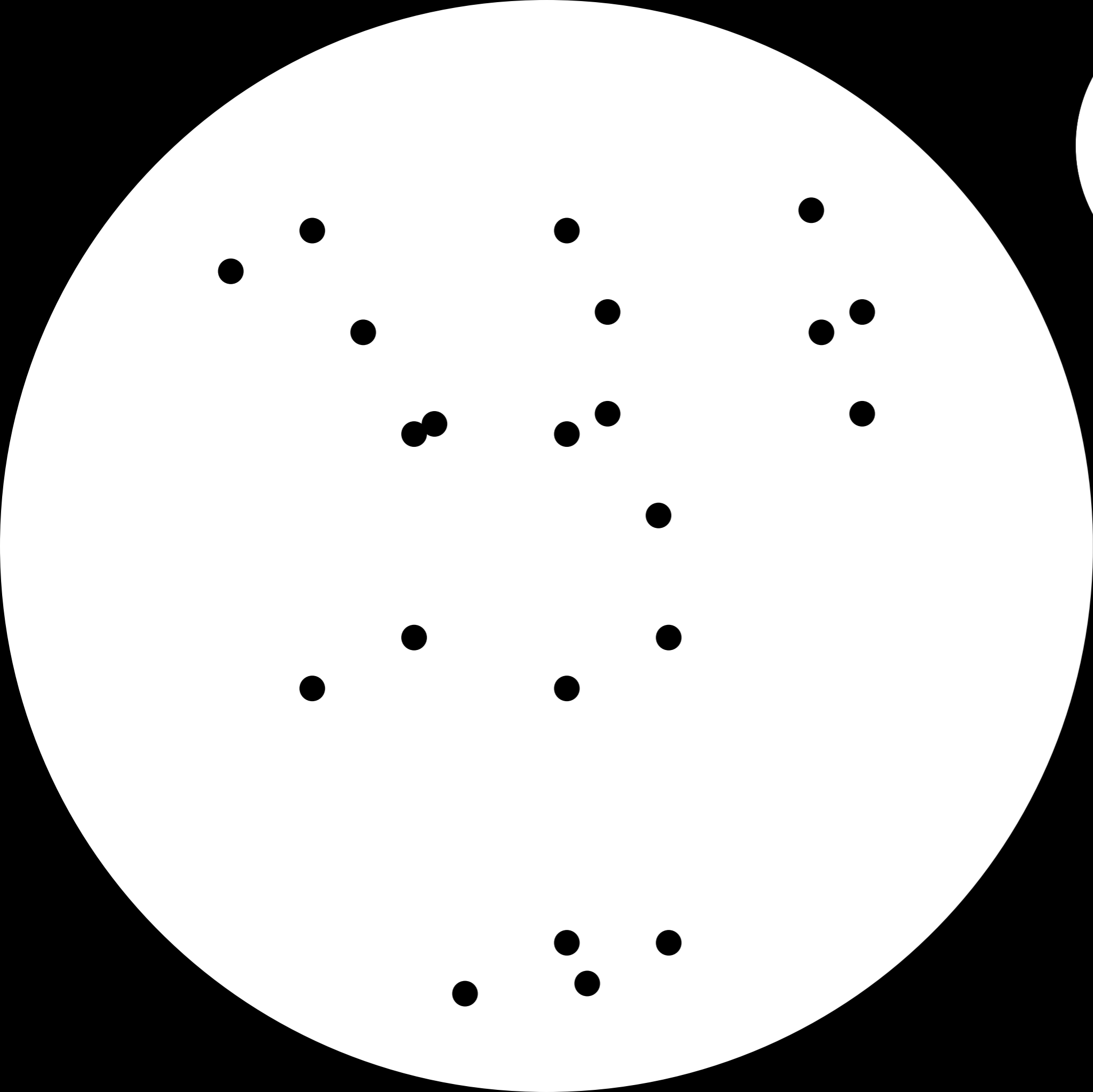
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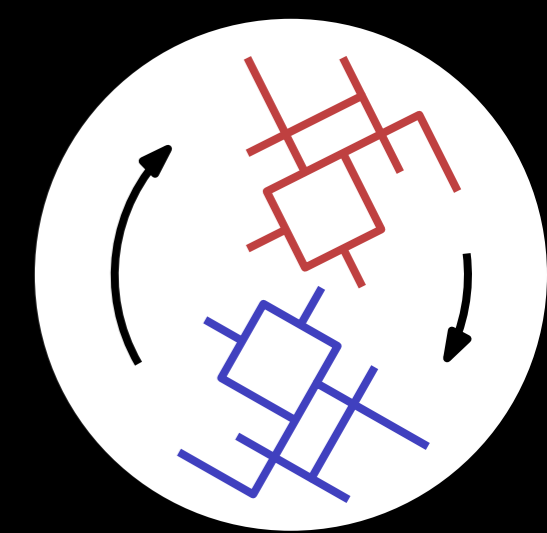
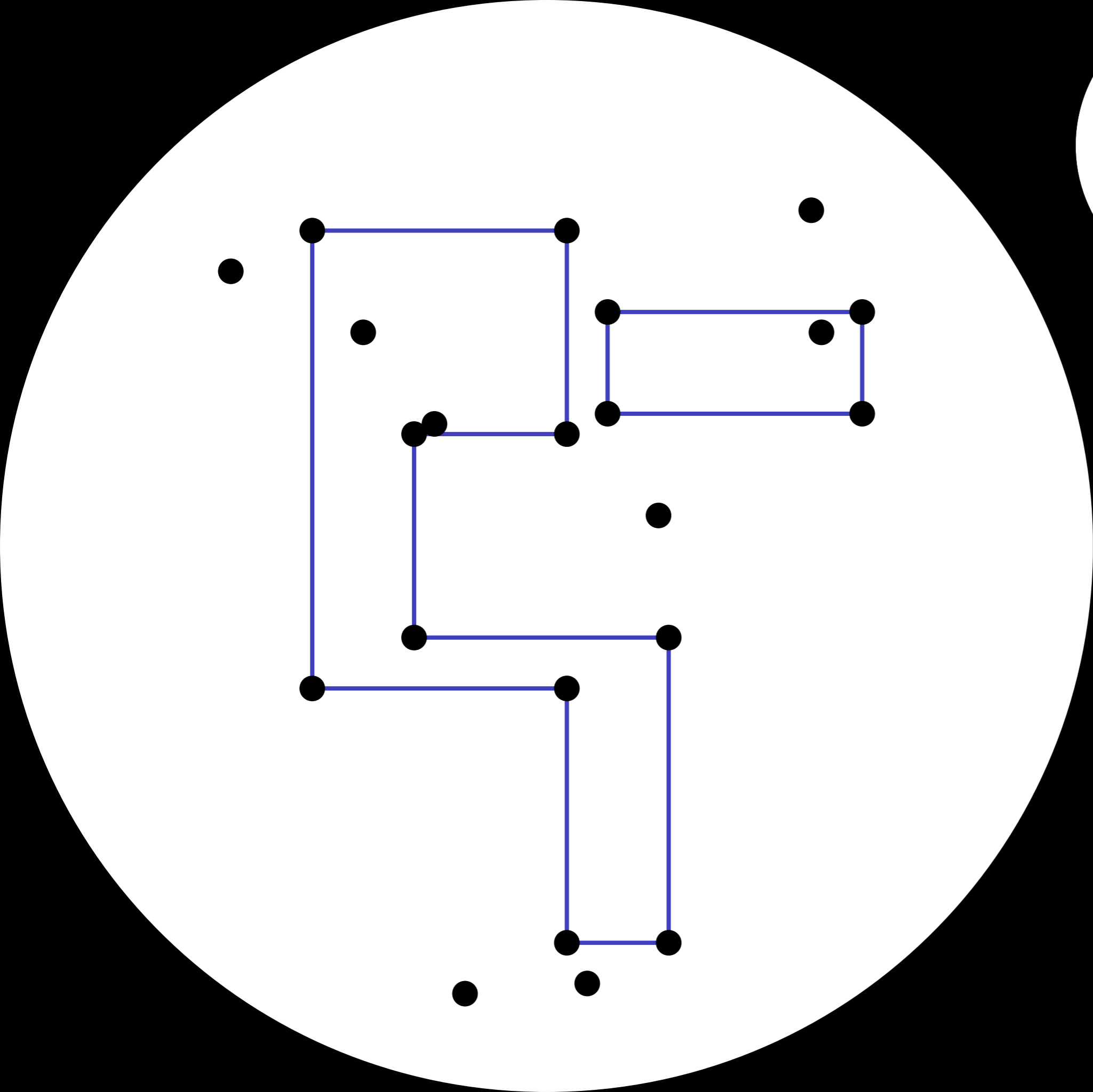
$(y + qA - pB)$ for all $A, B \in \mathbb{Z}$
 $\mathbb{Q}(s) \langle E \rangle = \mathbb{Q}(s)$ We have
 $= \sum_j y_{ij} e_j$ for all $y_i \in Y$ $\begin{cases} \delta_x^i \neq 0 \\ \delta_y^i = 0 \end{cases}$
 Moreover from what we wrote above we have
 where $x_{ij} = \sum_{0 \leq l \leq h} x_{ijl} s^l$ and $y_{ij} = \sum_{0 \leq l \leq h} y_{ijl} s^l$
 GCD is 1. $\delta_x^i = pA_i + qB_i \neq 0$ $\Delta x = \sum_{i,j} \Delta x_{ij} e_j$
 $x_{ij} = a_{ij}/b_{ij}$ $\delta_y^i = qA_i - pB_i = 0$
 $y_{ij} = c_{ij}/d_{ij}$ $D_x = \{d_x \in \mathbb{R} : d_x = |x(v_{lft}) - x(v)|, \forall v \in V\}$
 We consider the following cases:
 1. $[\mathbb{Q}(s) : \mathbb{Q}] = 1$, s is rational.
 2. $[\mathbb{Q}(s) : \mathbb{Q}] < \infty$, s is algebraic over \mathbb{Q} .
 3. $[\mathbb{Q}(s) : \mathbb{Q}] = \infty$, s is transcendental over \mathbb{Q} .
 all even values of i , $0 \leq i < w$.
 In total we move from v_i to v_{i+1}
 over a distance $(a_i + sb_i, sa_i - b_i)$
 where $a_i, b_i \in \mathbb{Z} \langle E \rangle$.



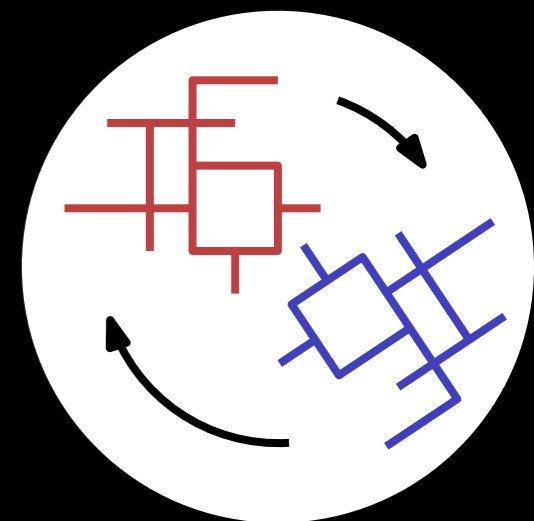






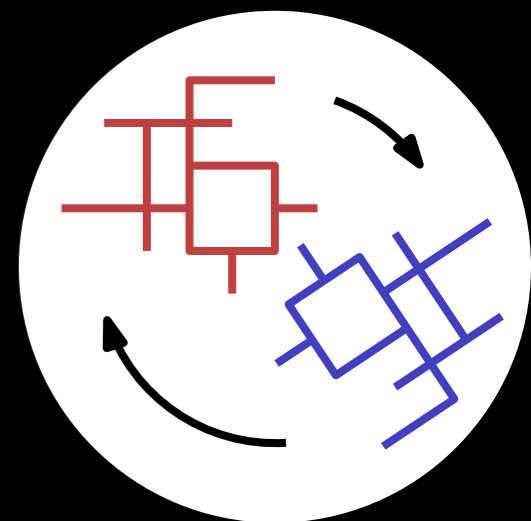


Question: How many orientations can a point set have, such that the maximal axis-parallel graph is connected?

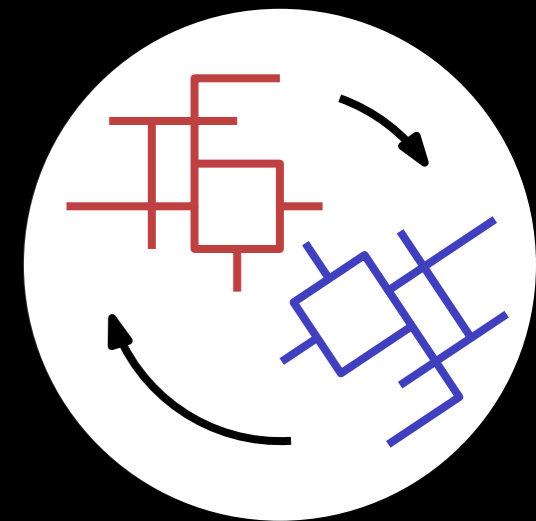


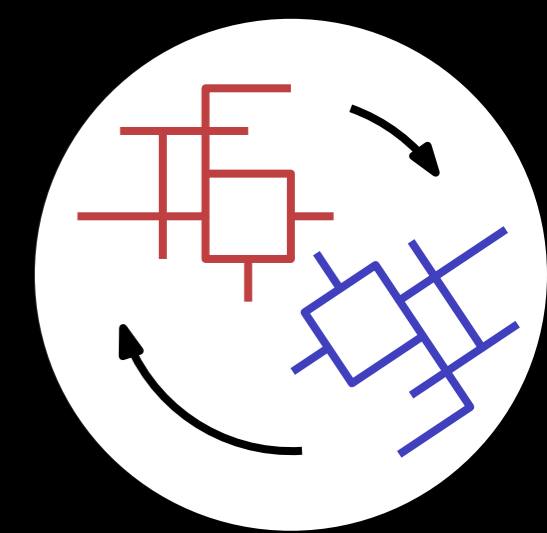
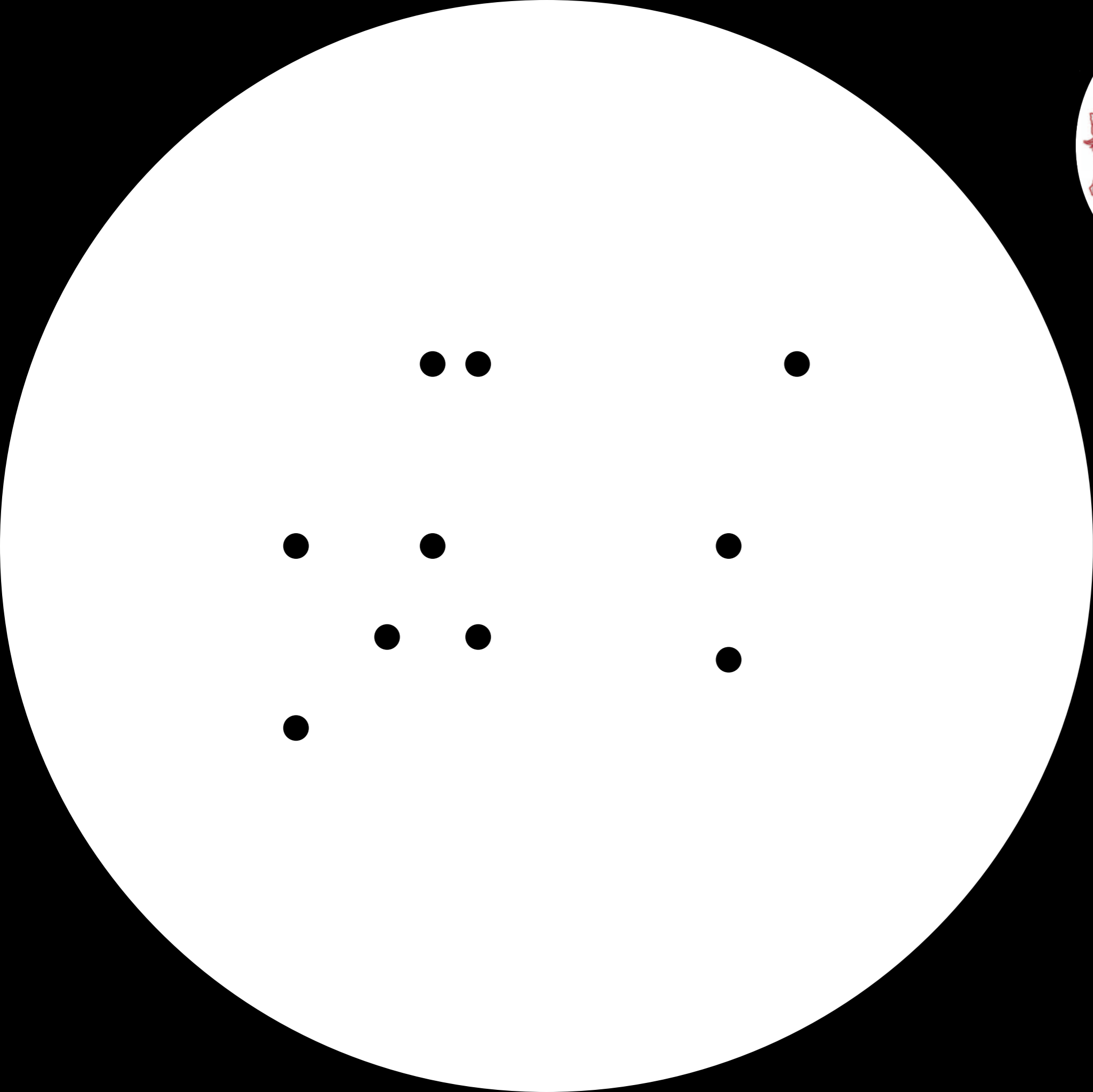
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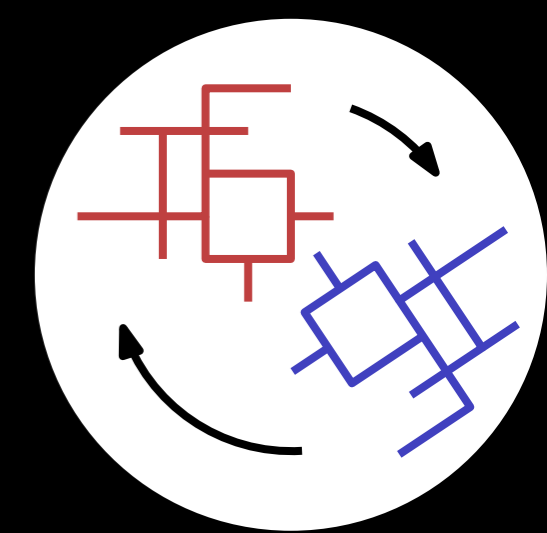
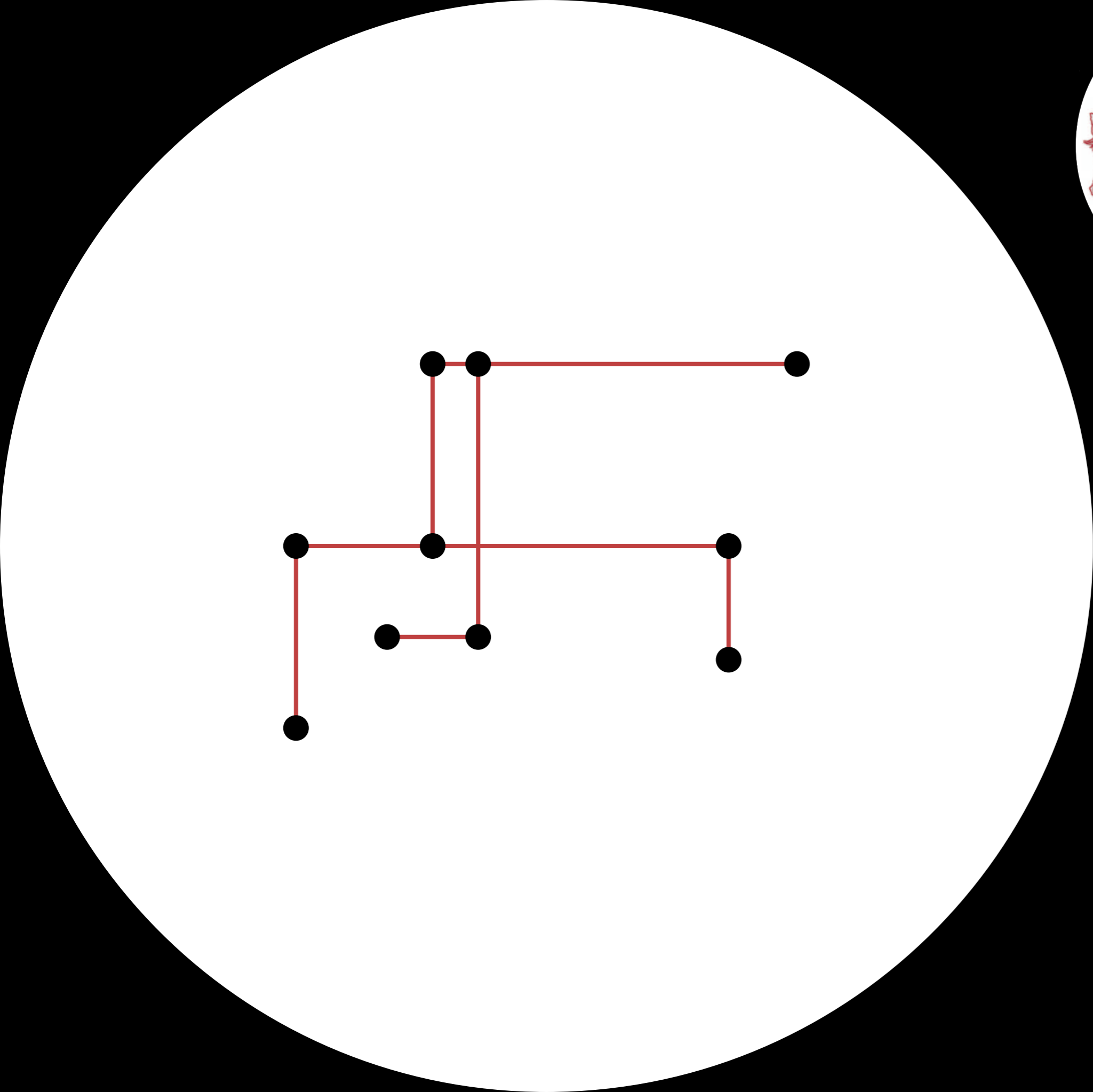
[Therese Biedl, 2007]

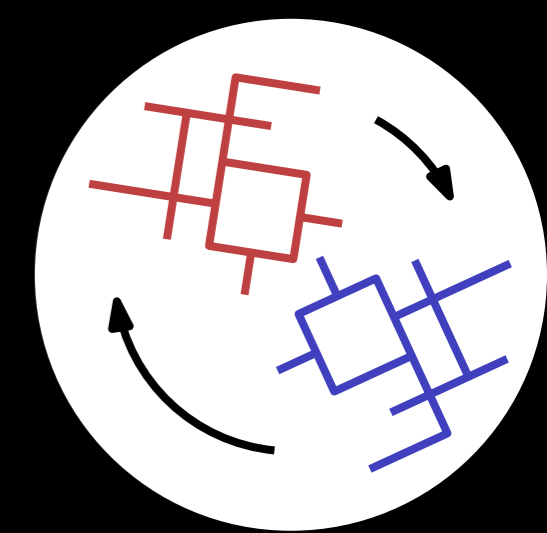
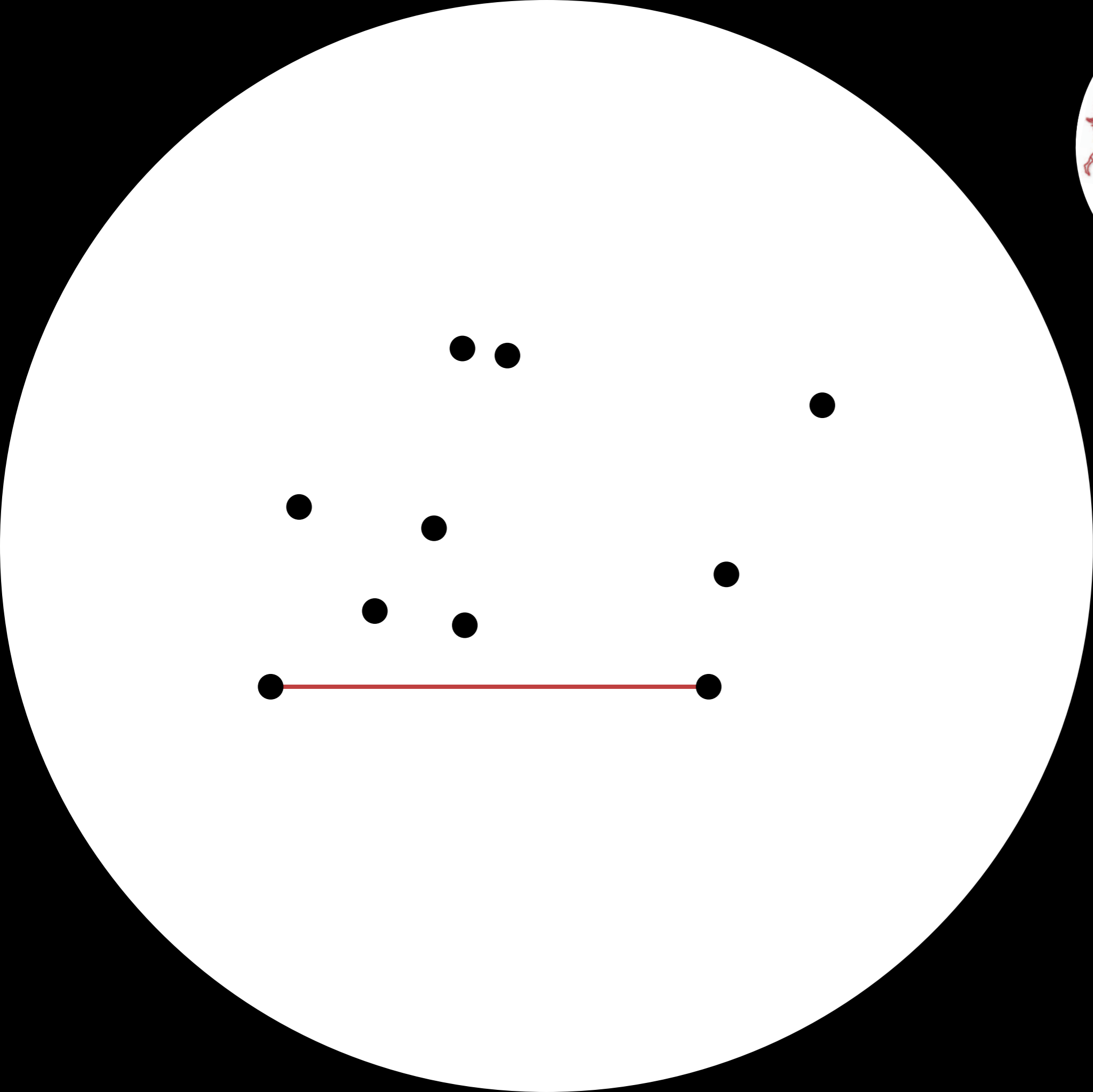


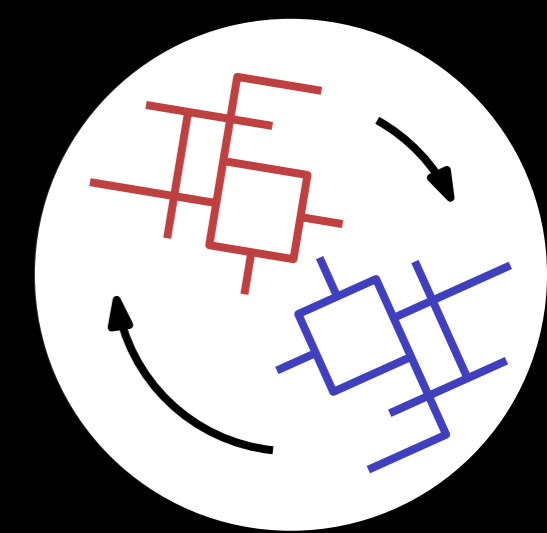
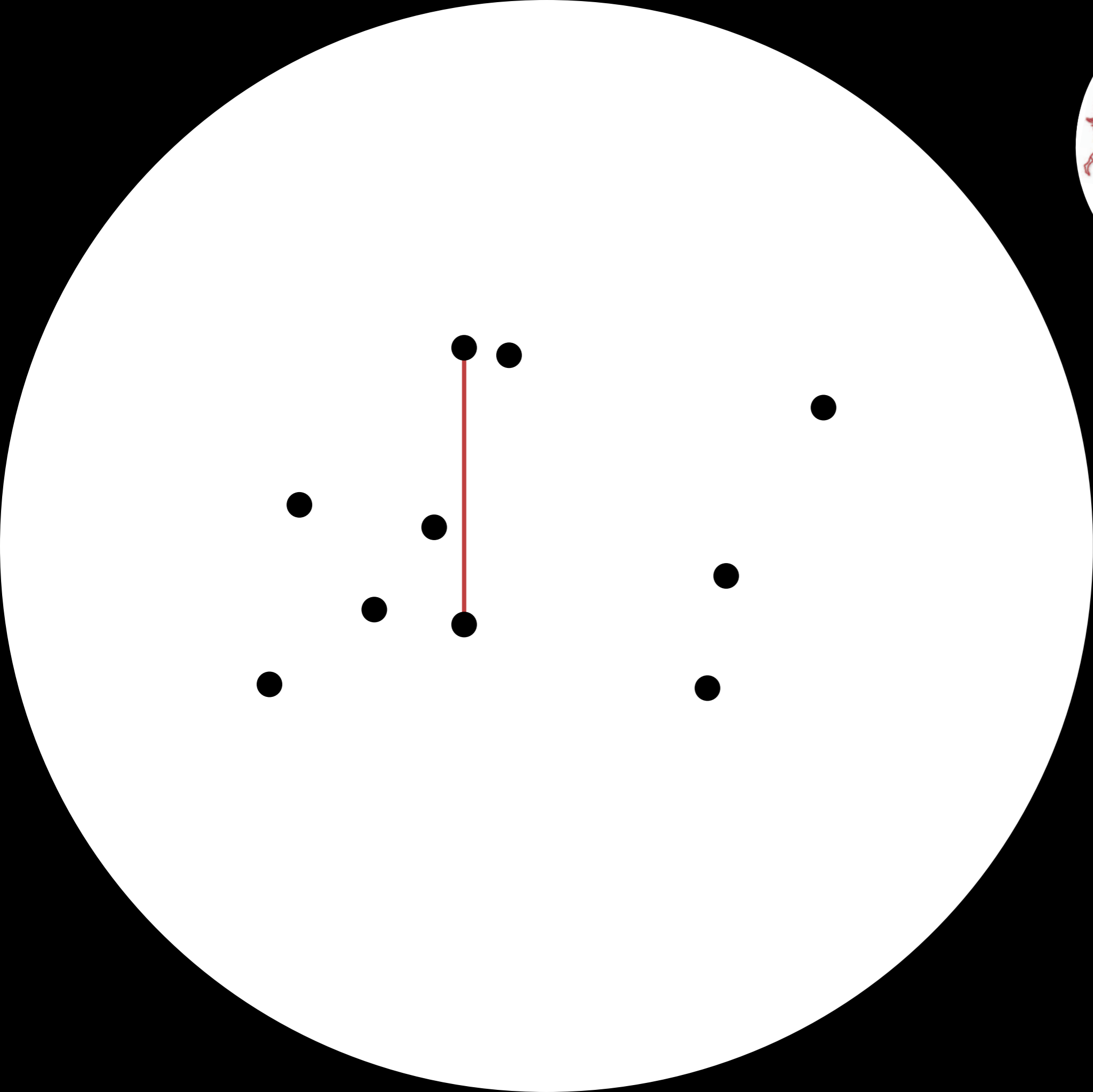
Let's look at an example point set
in all possible orientation.

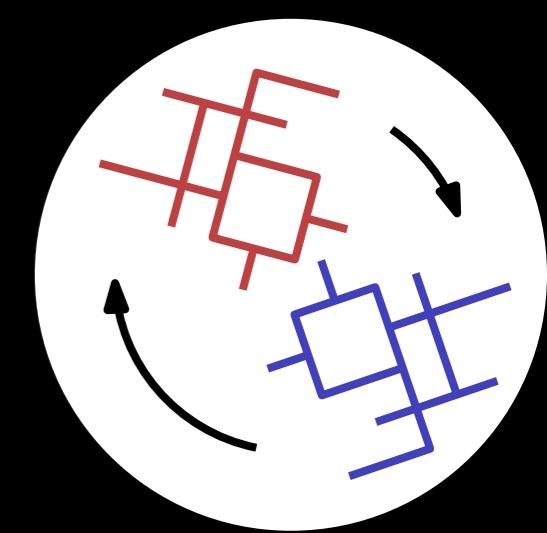
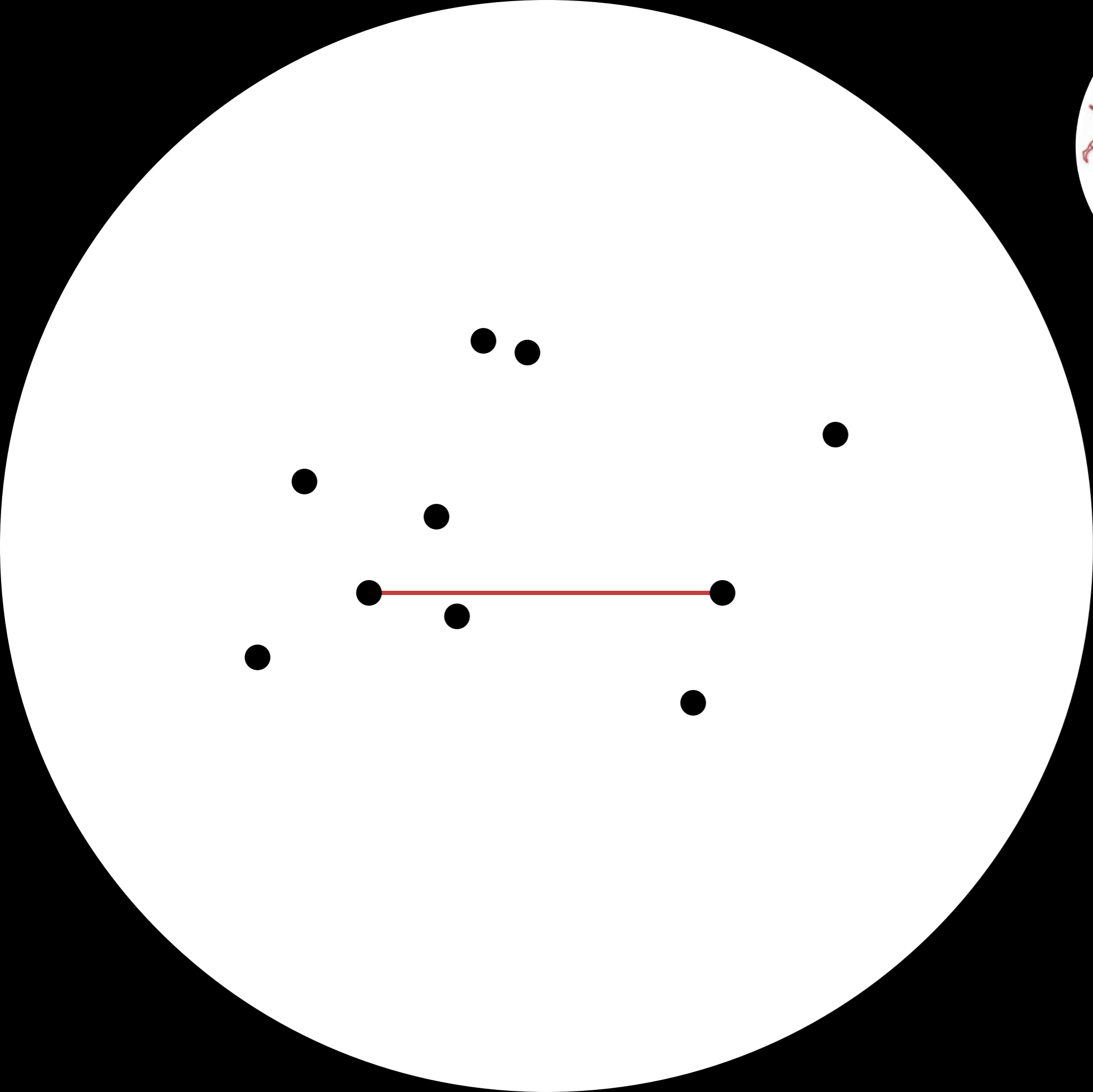


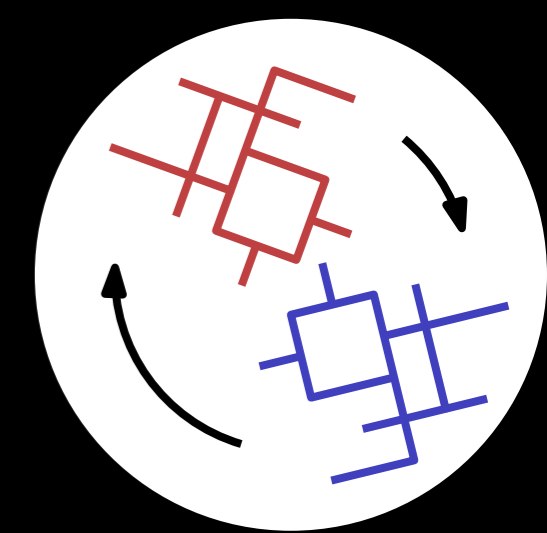
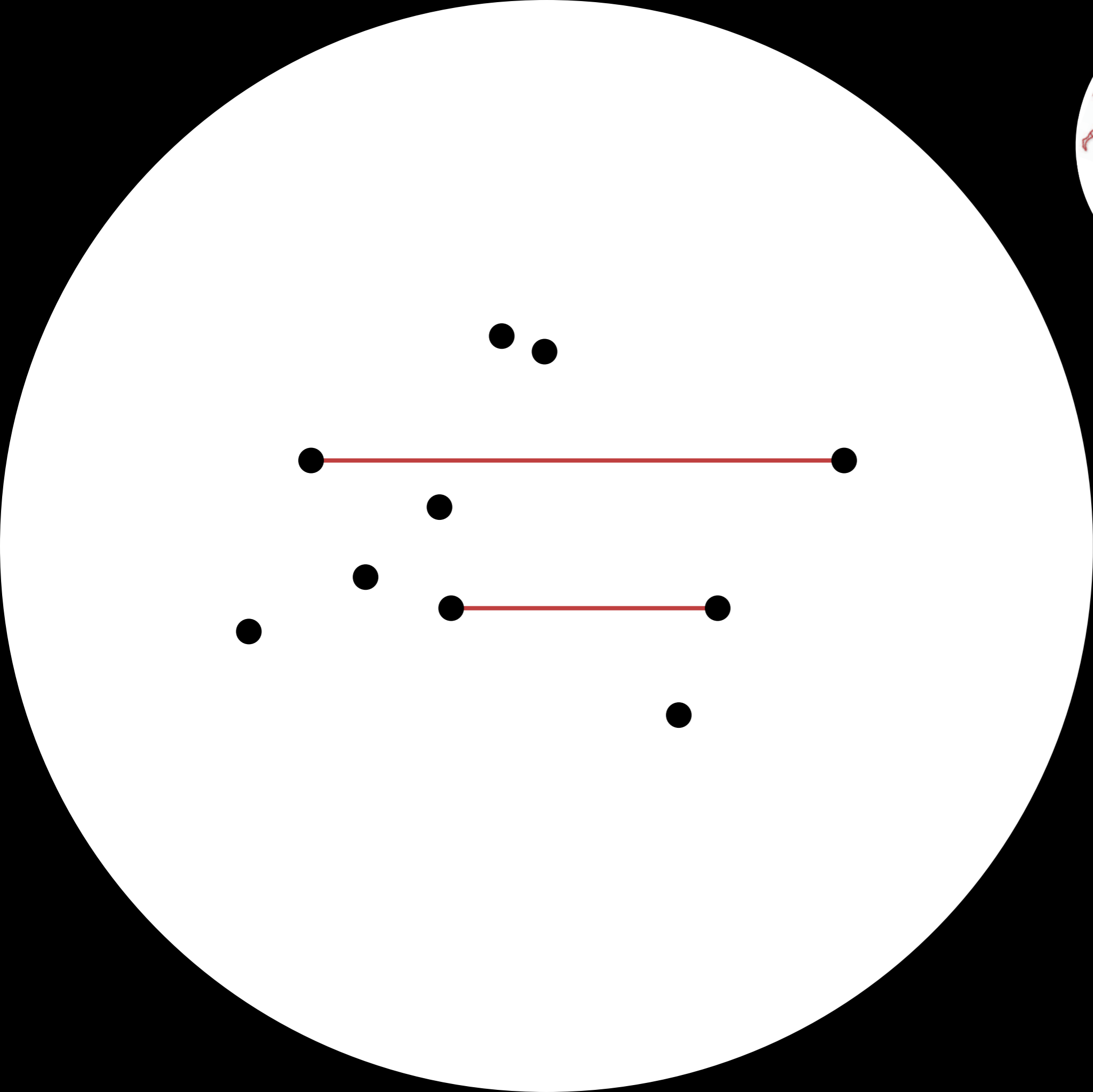


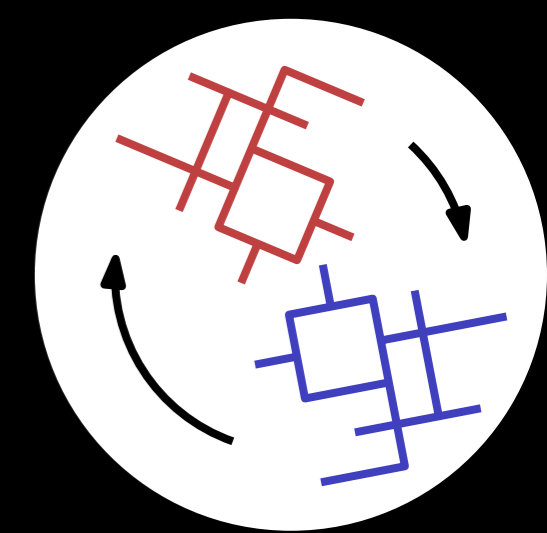
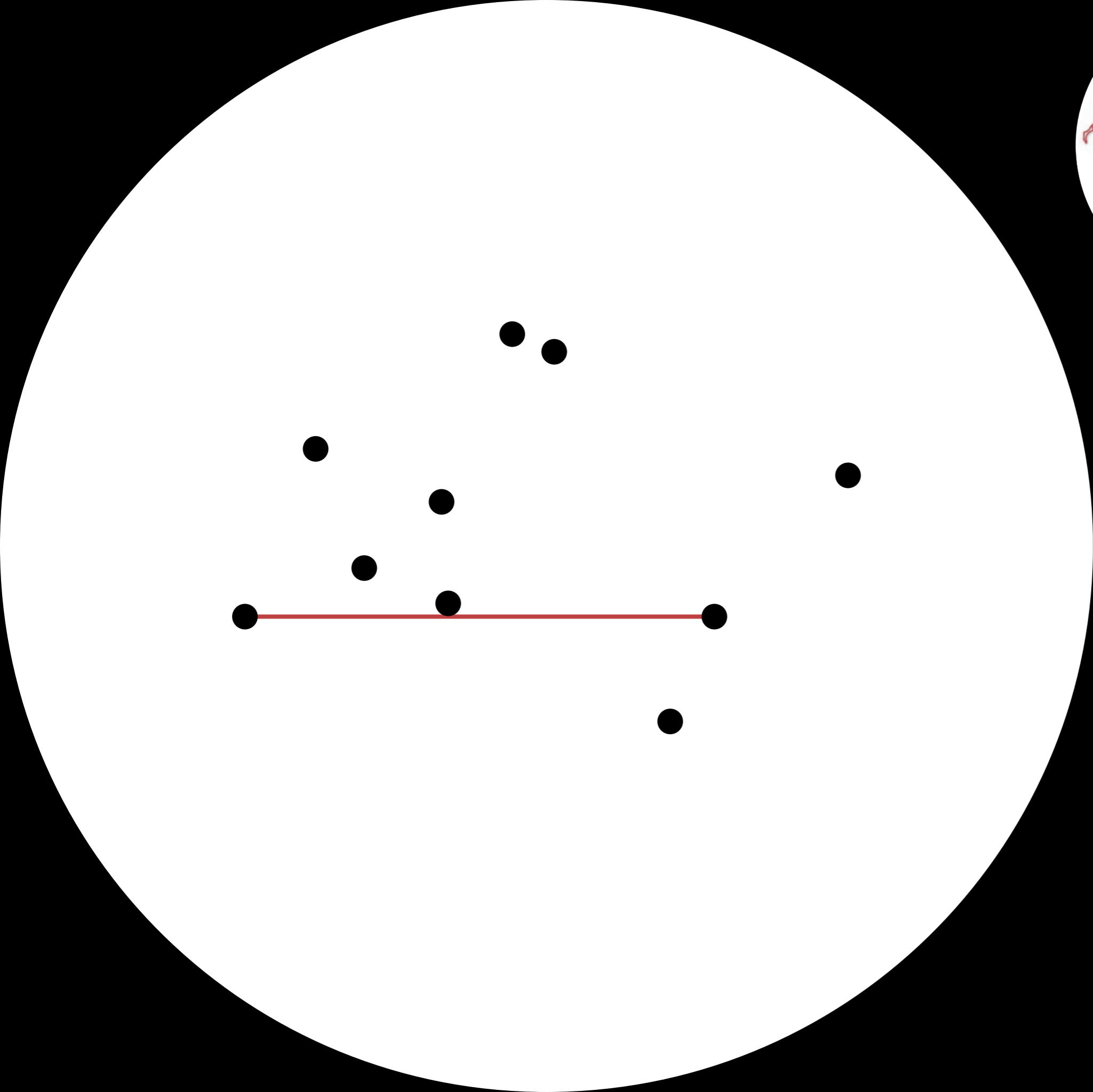


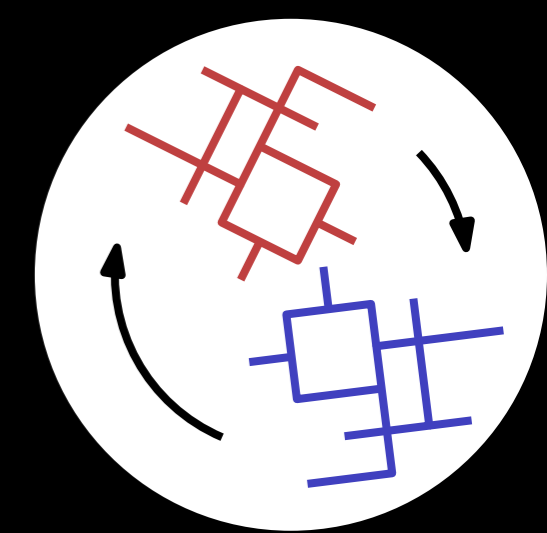
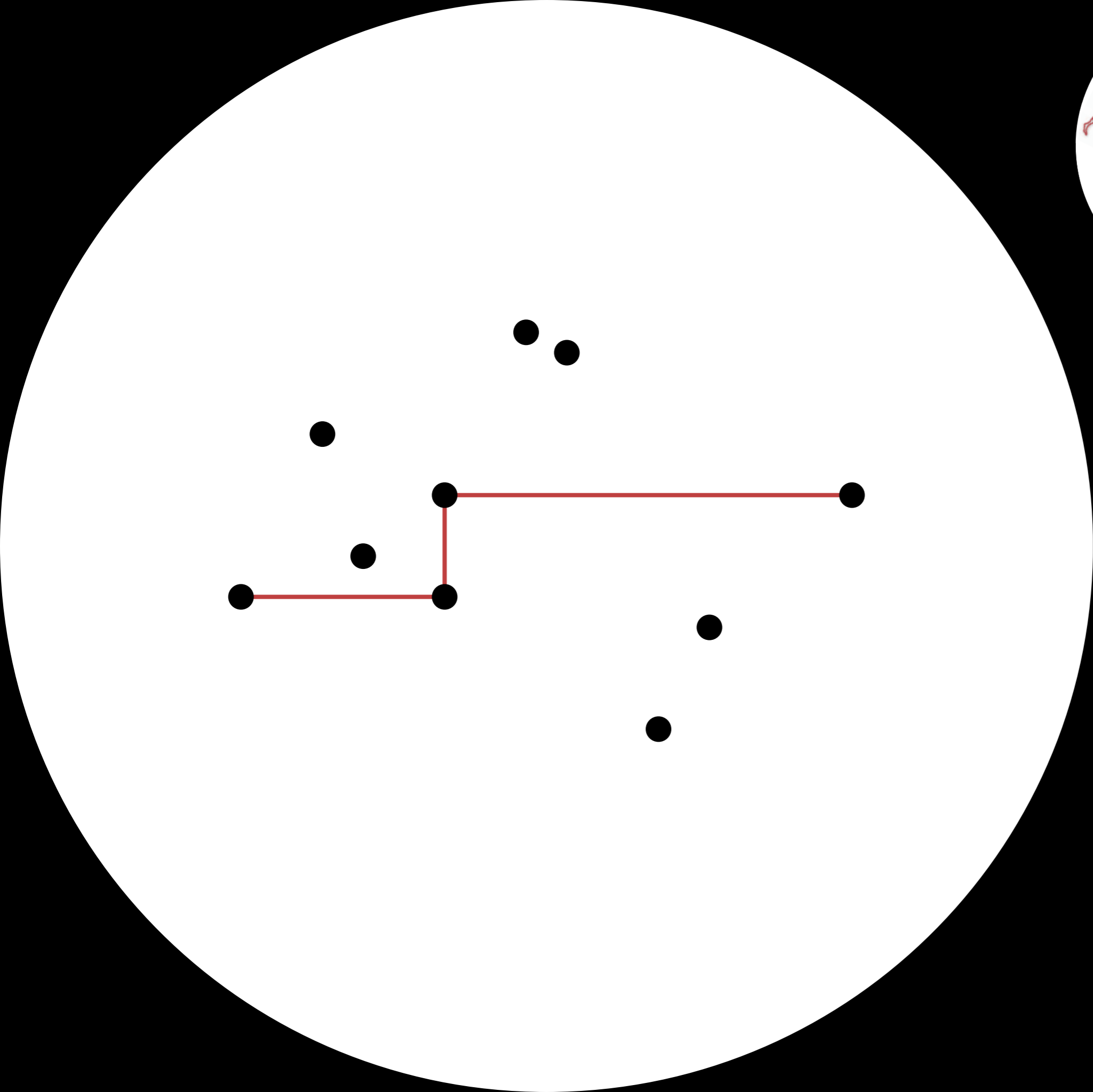


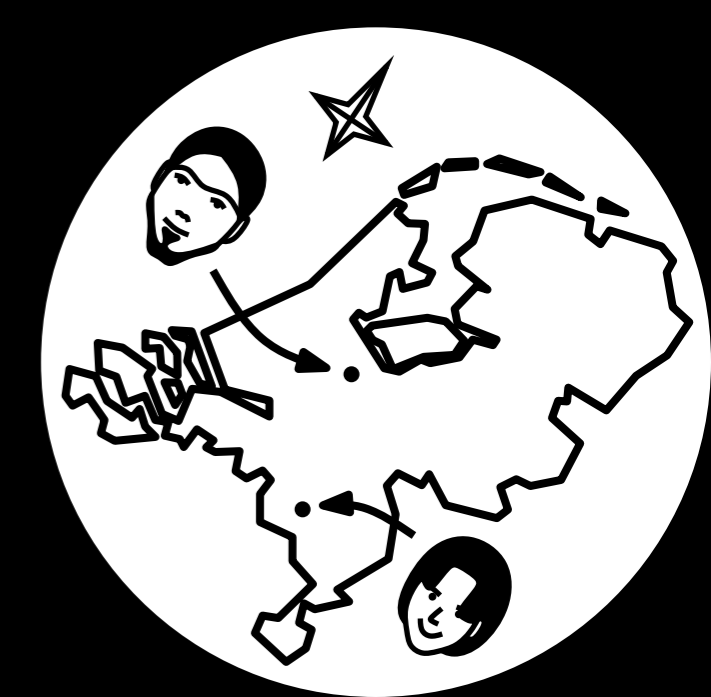
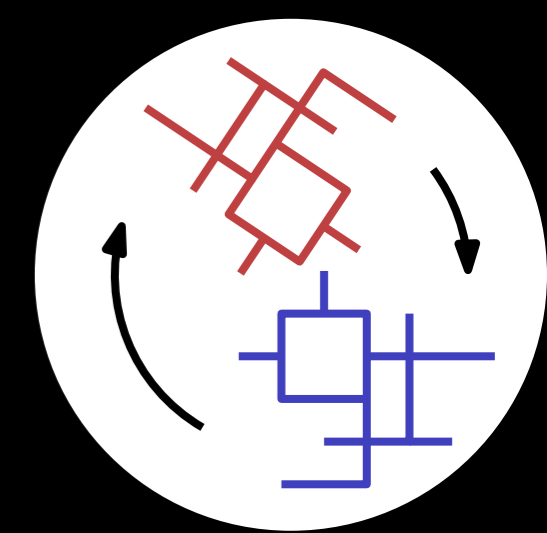
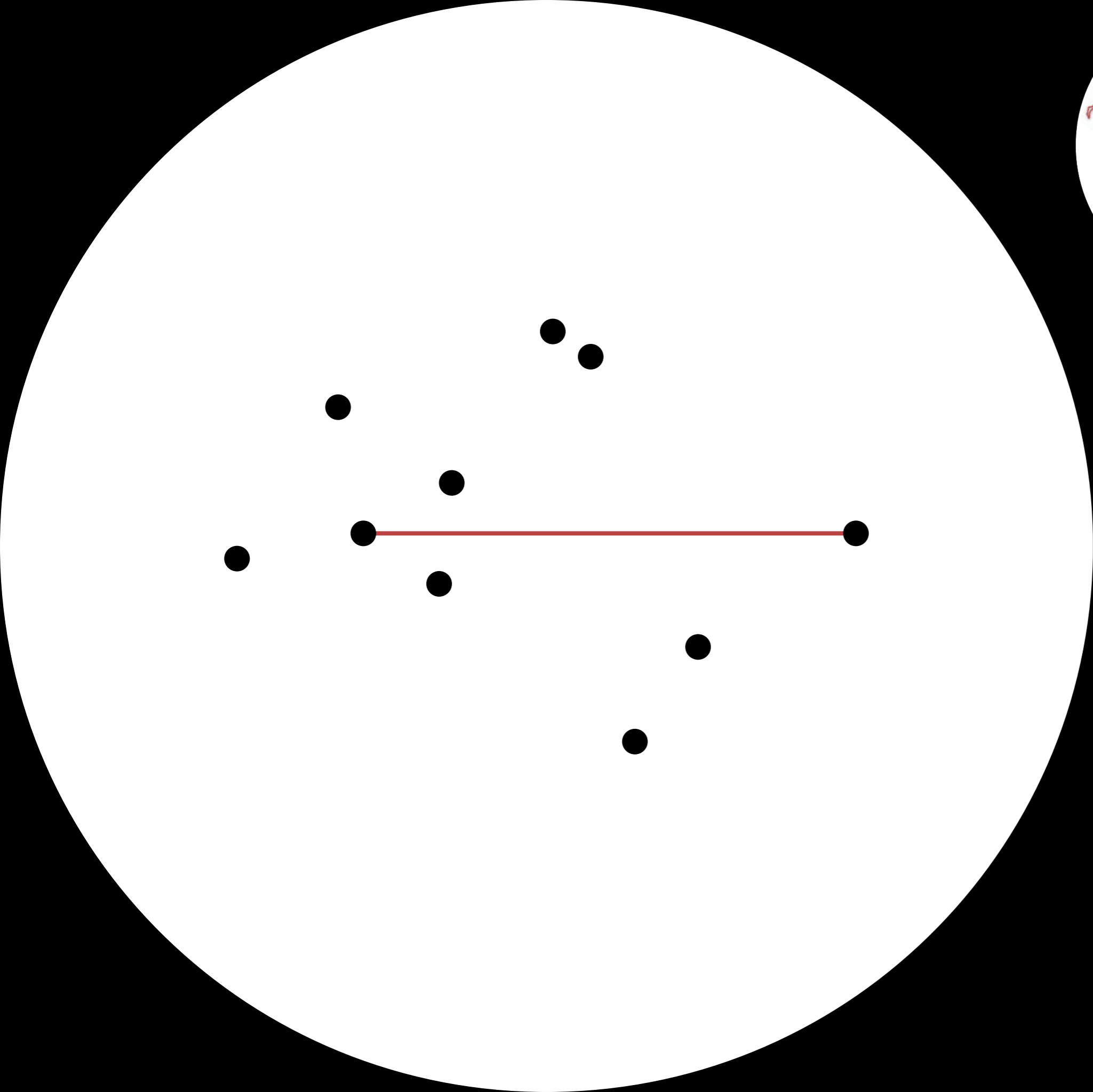


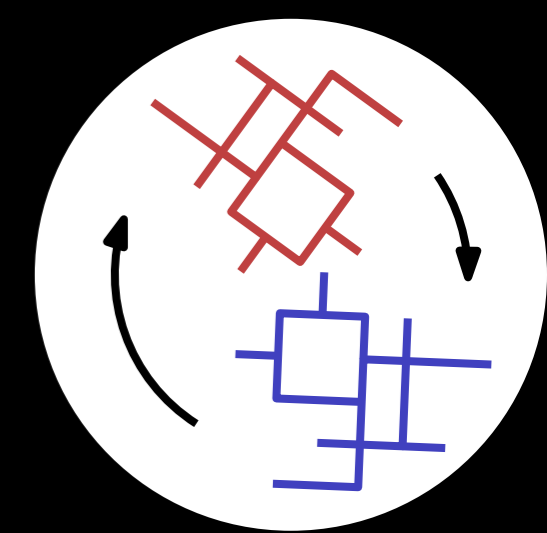
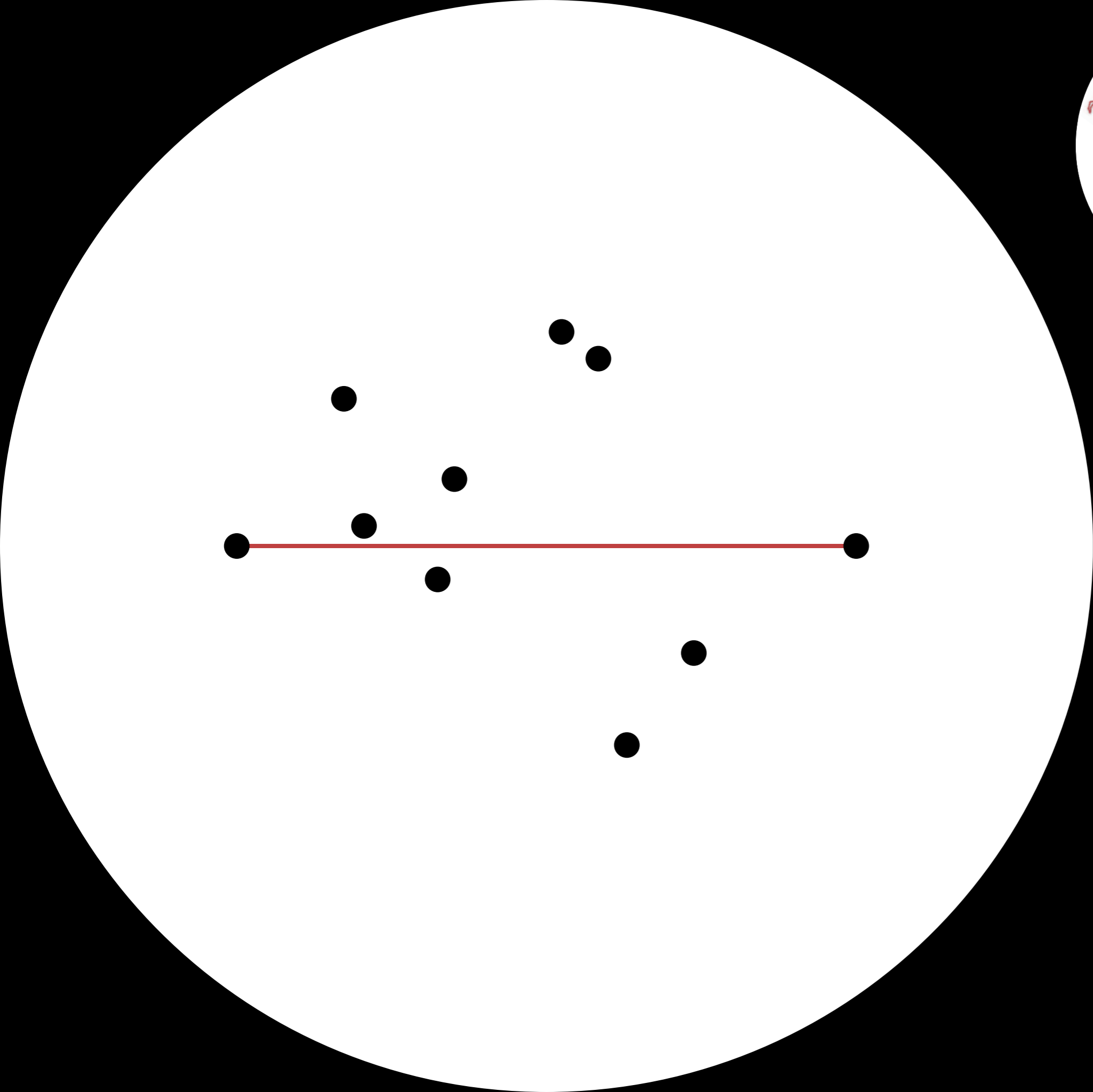


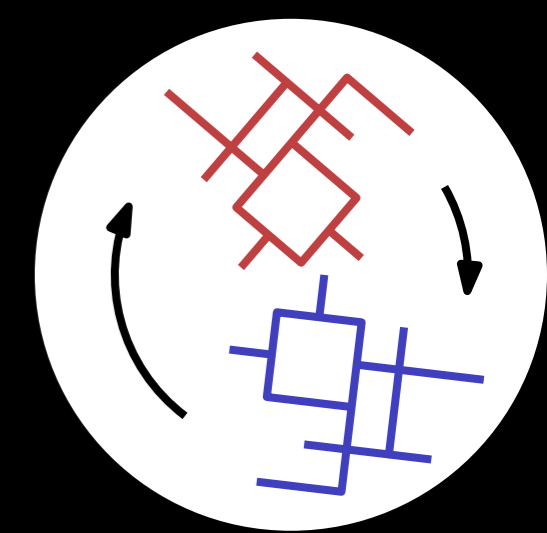
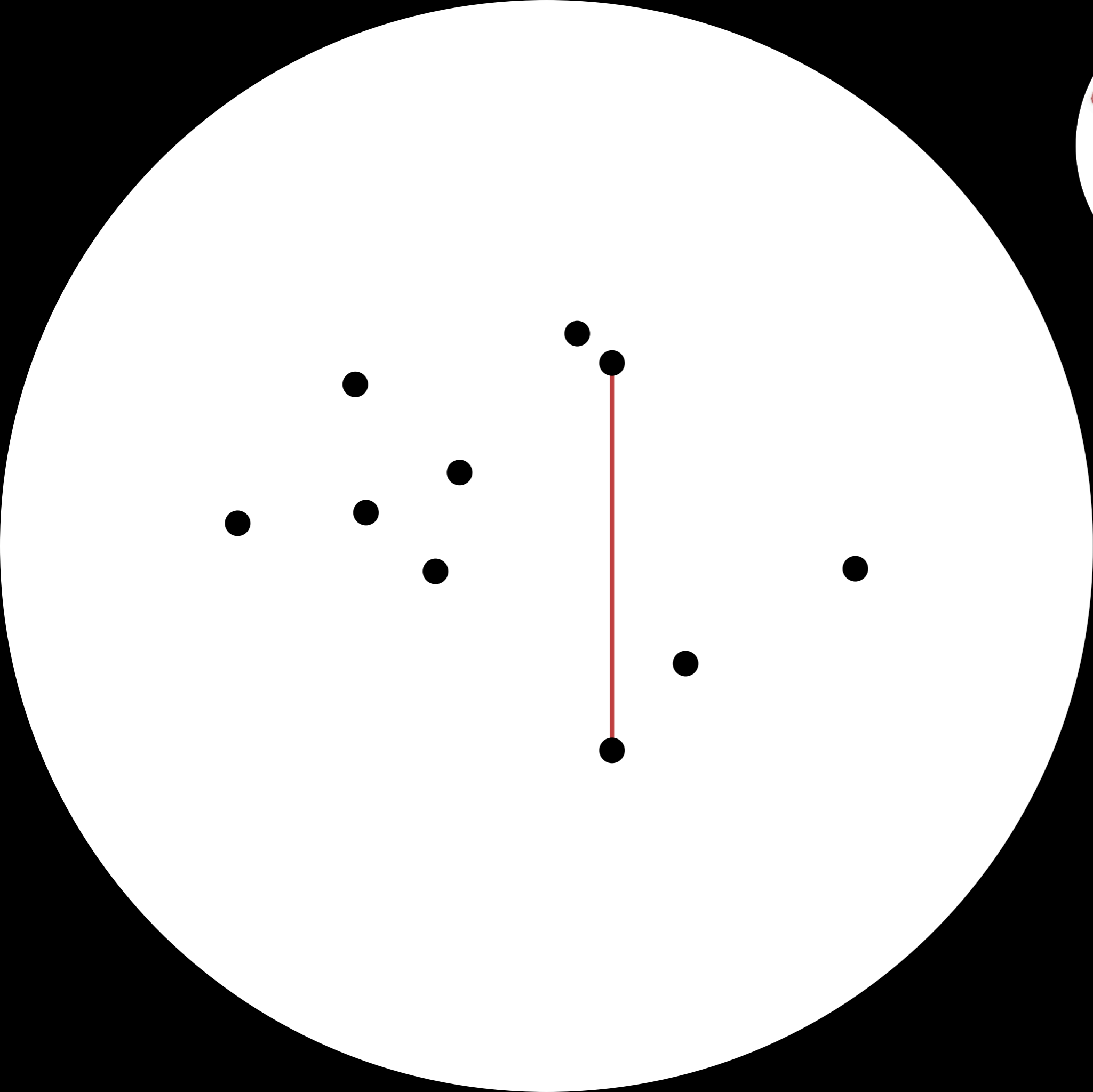


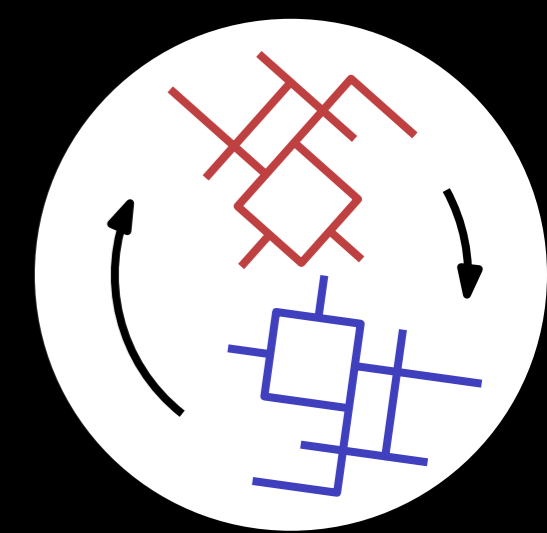
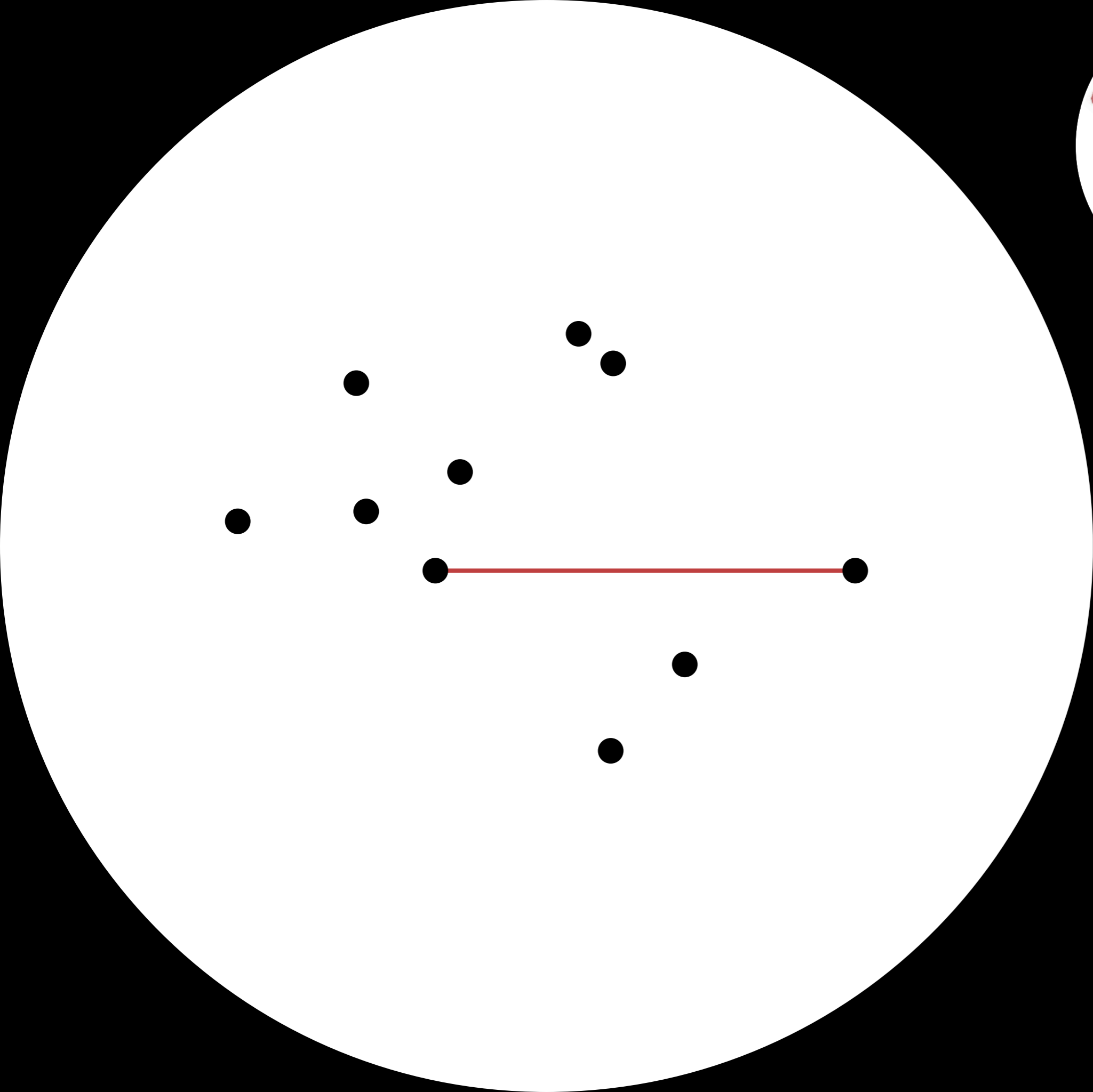


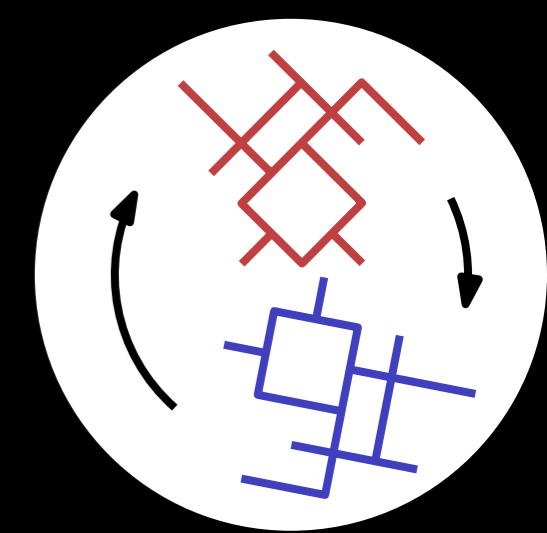
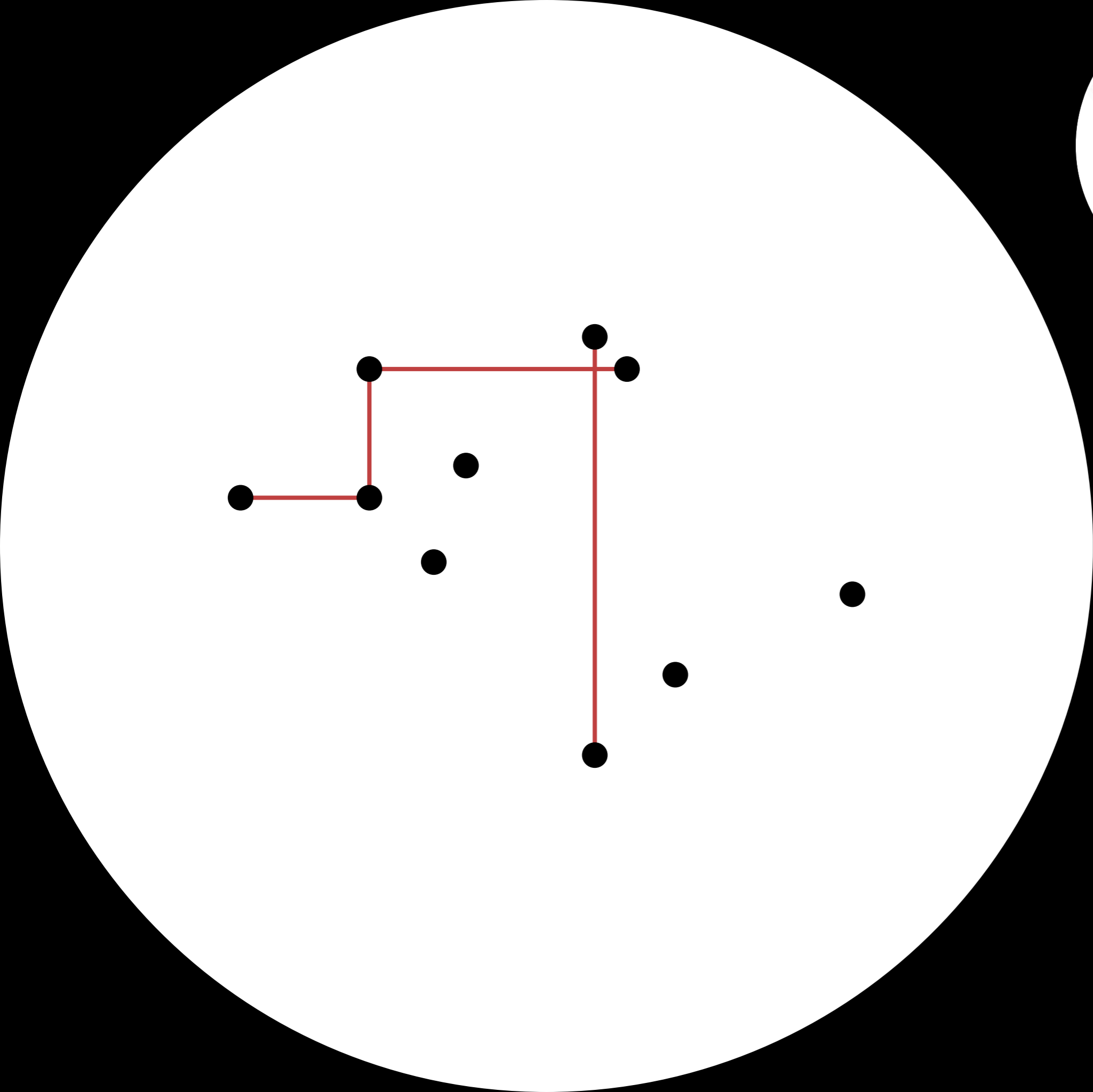


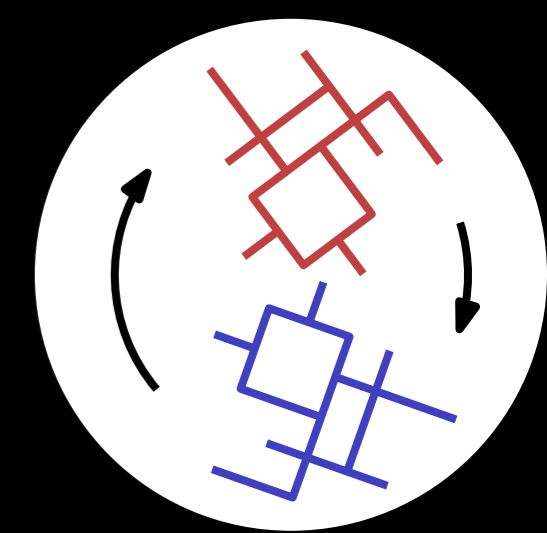
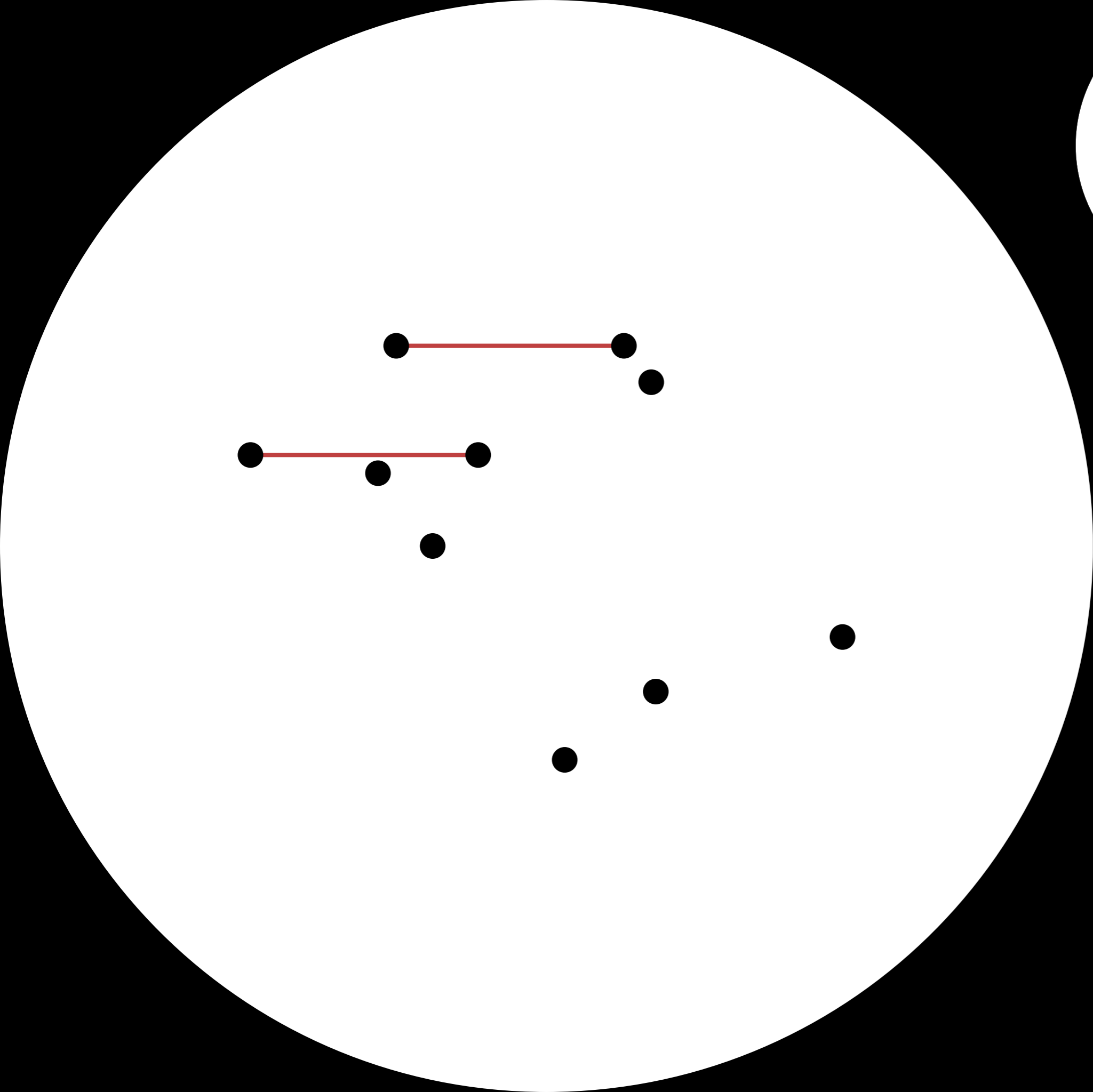


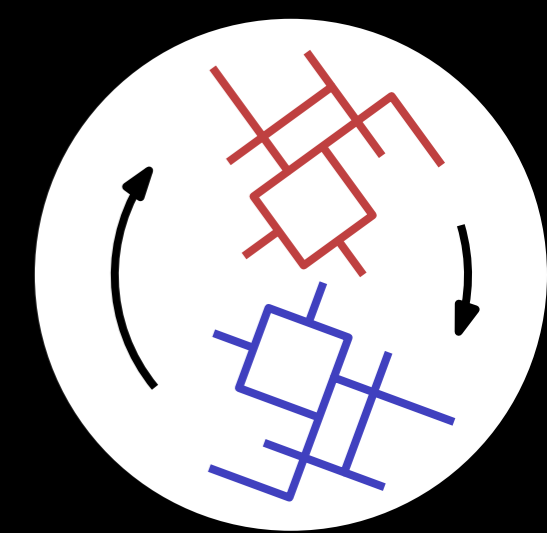
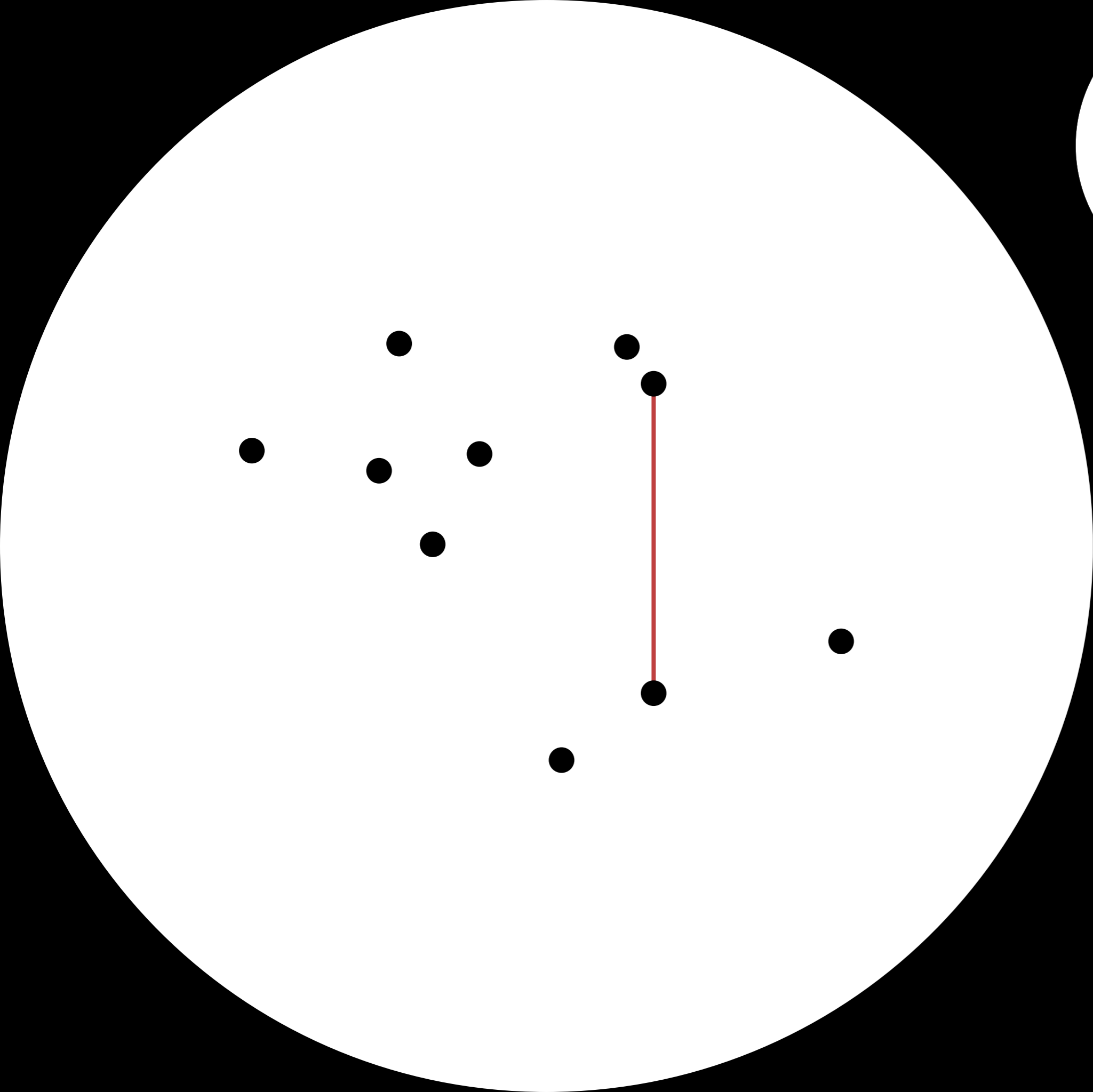


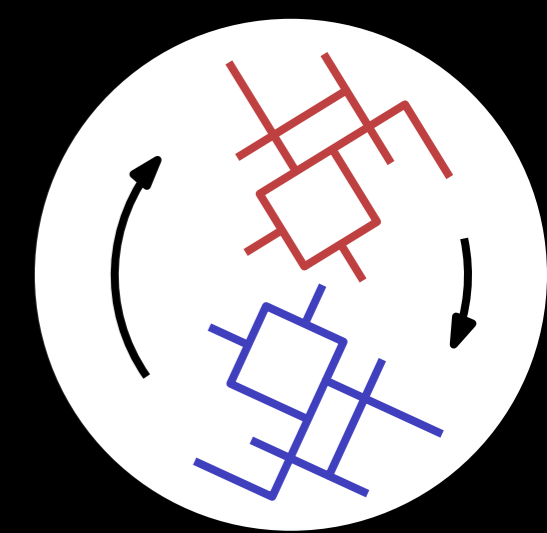
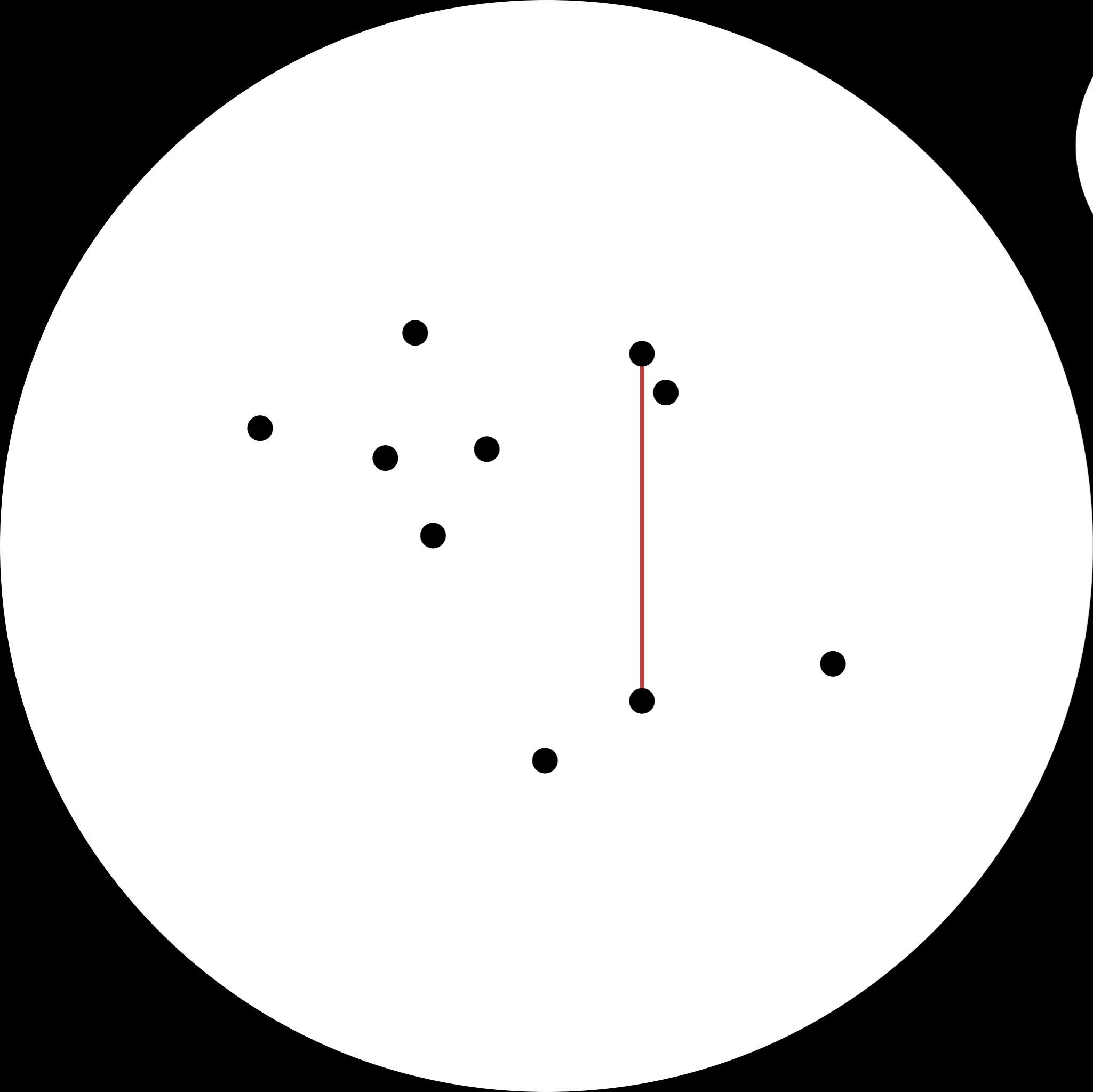


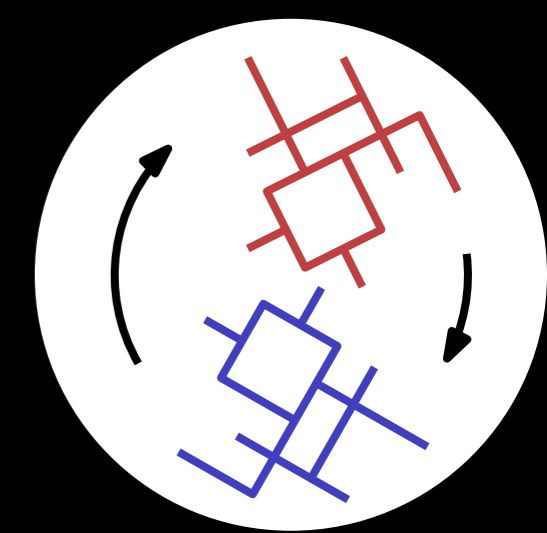
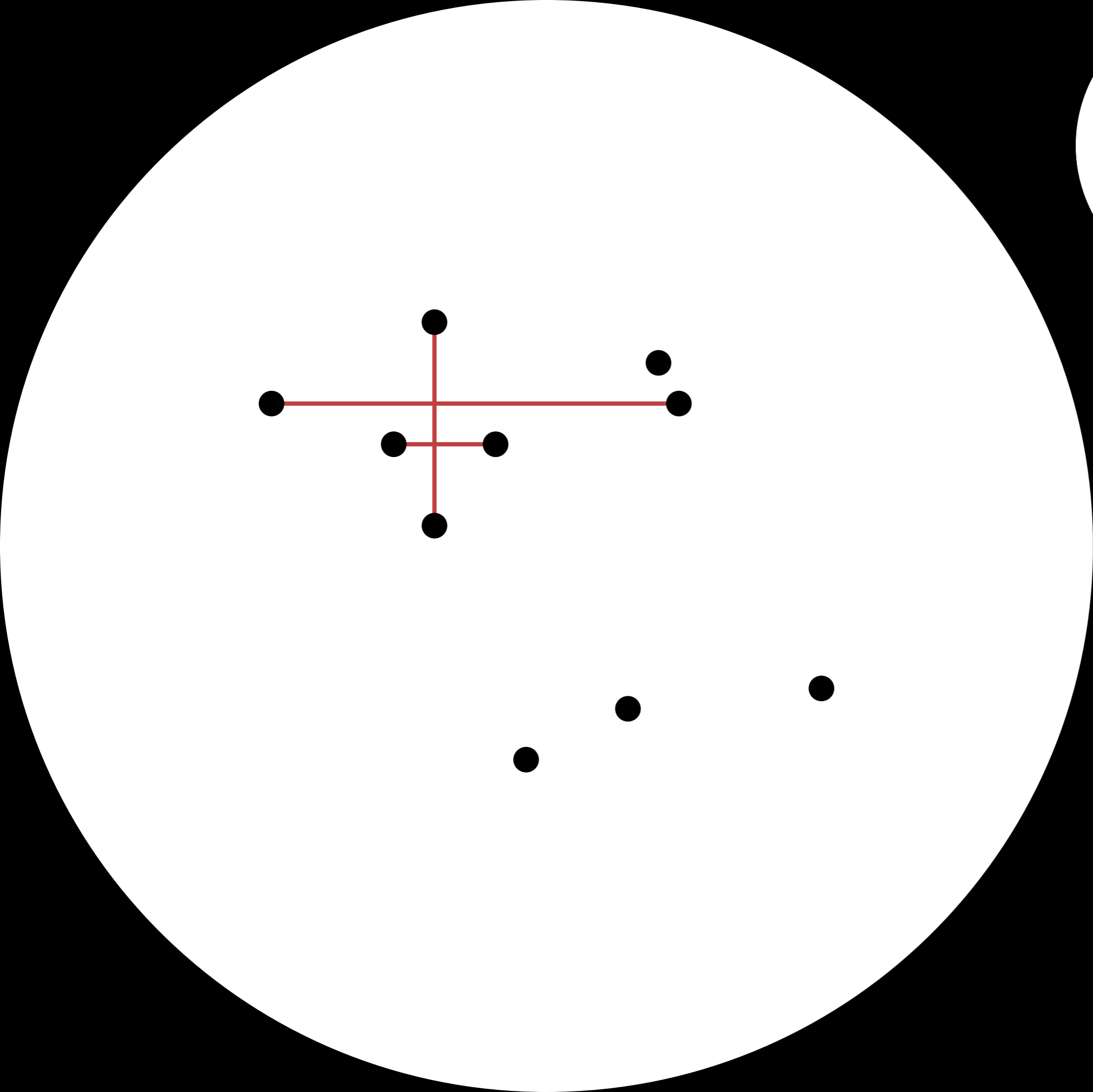


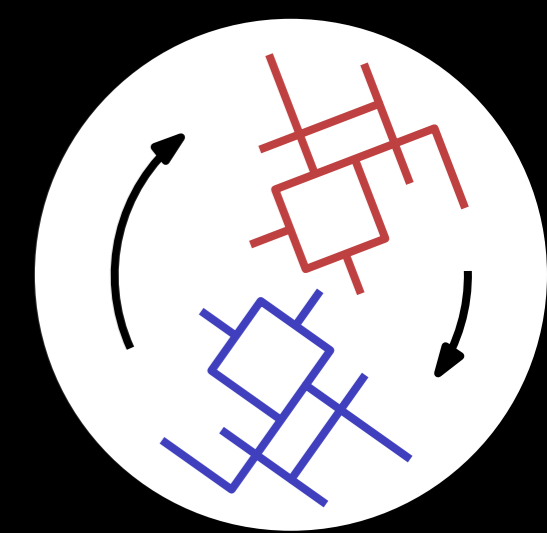
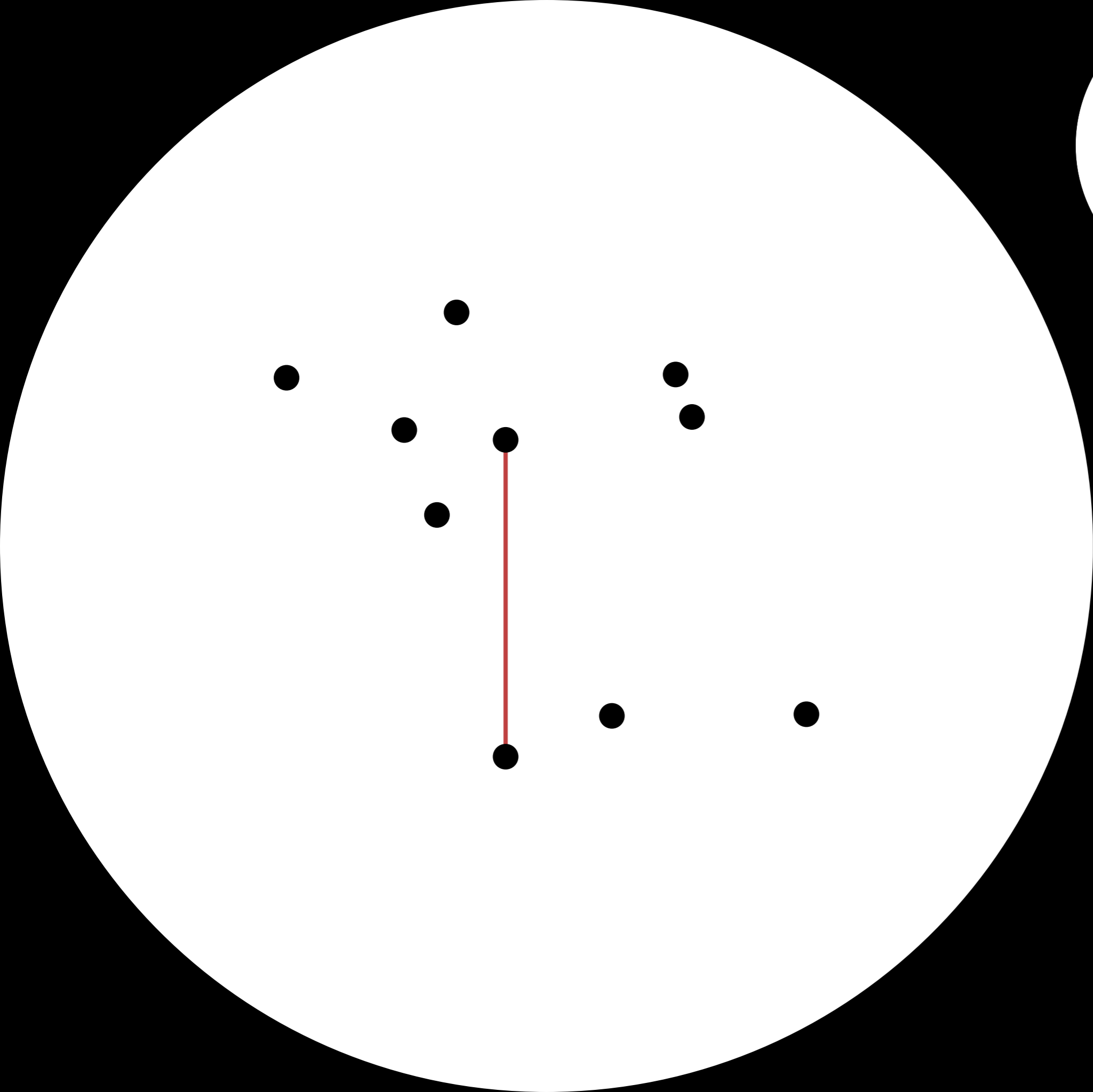


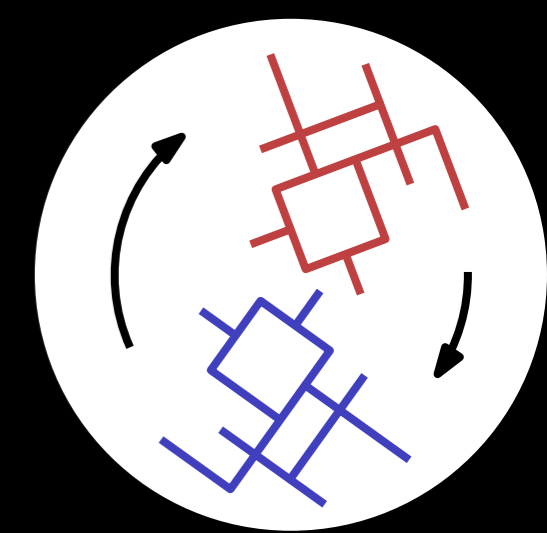
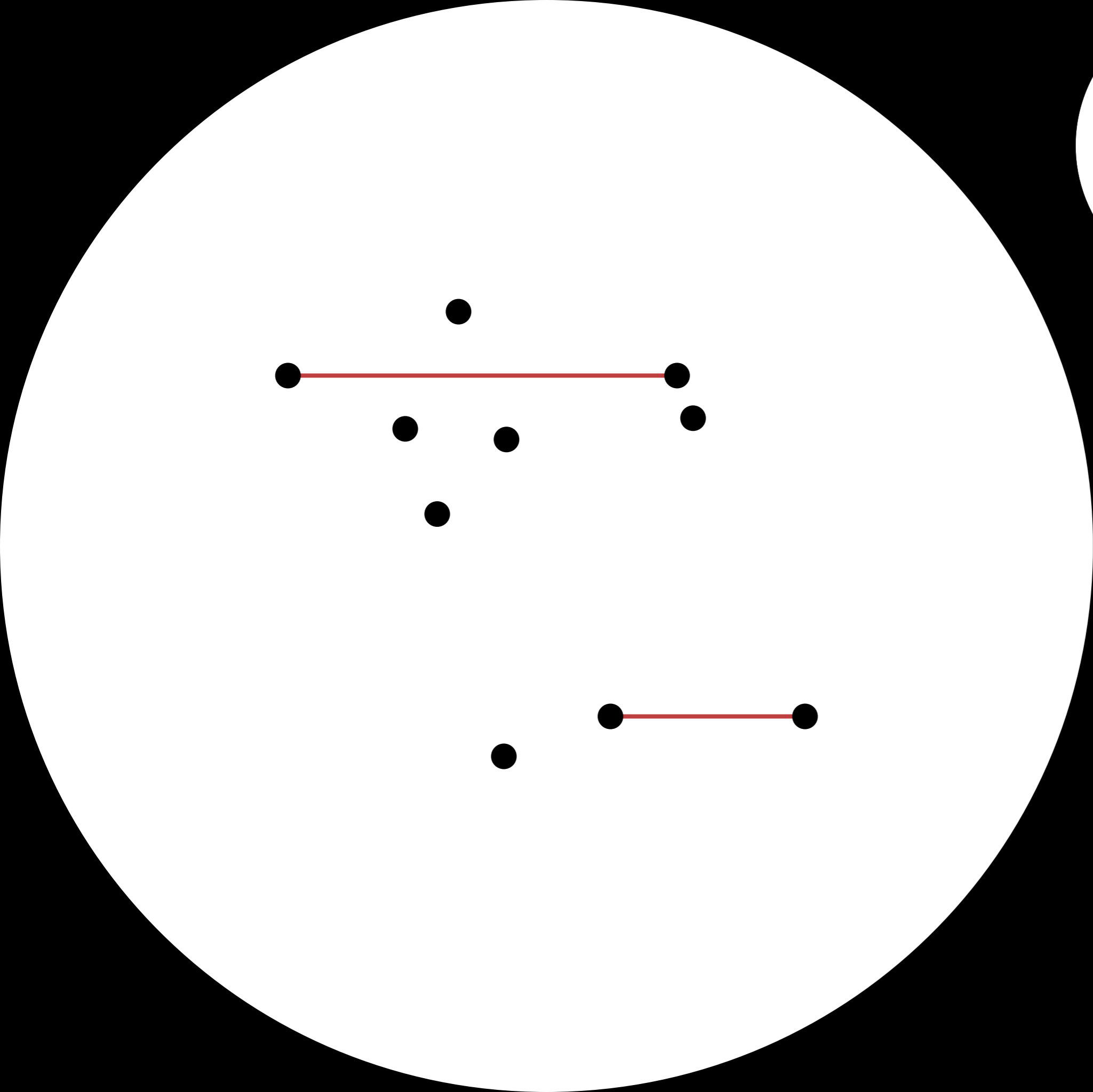


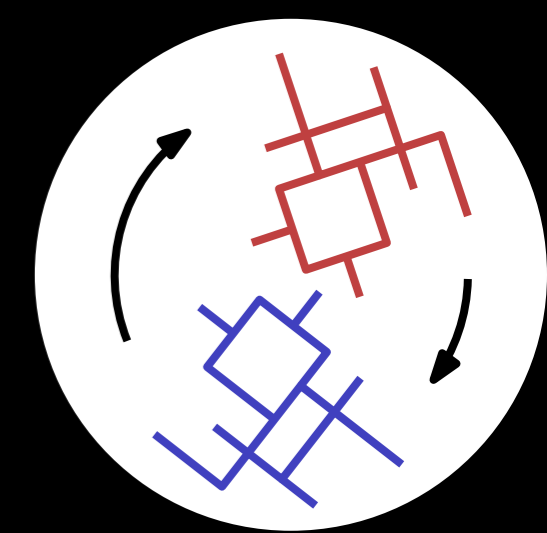
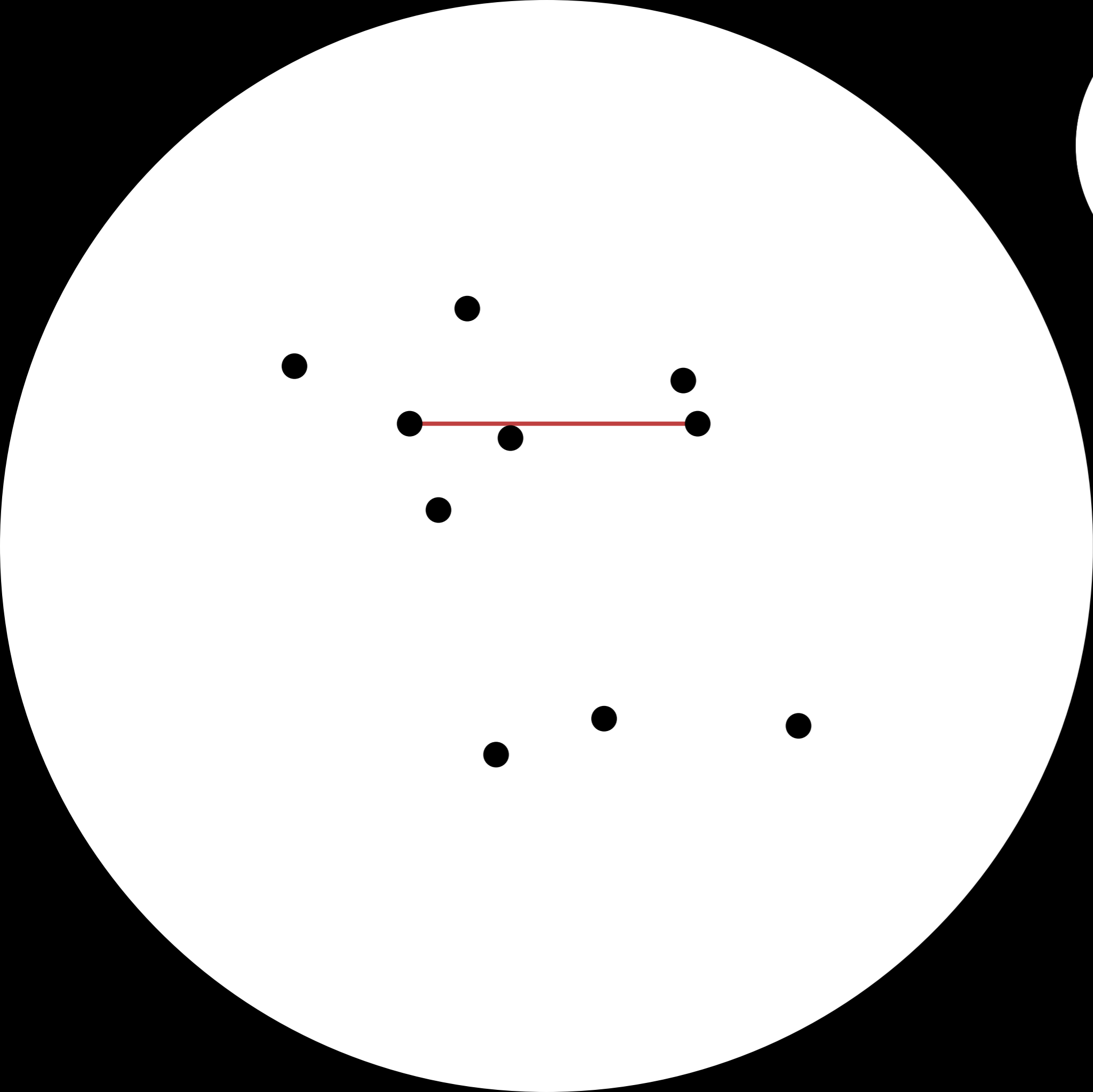


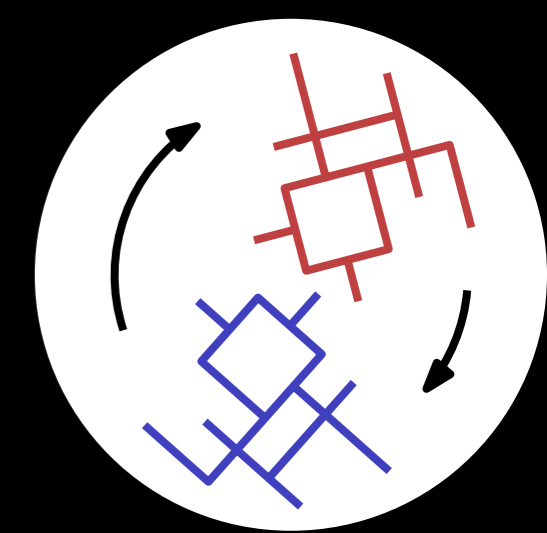
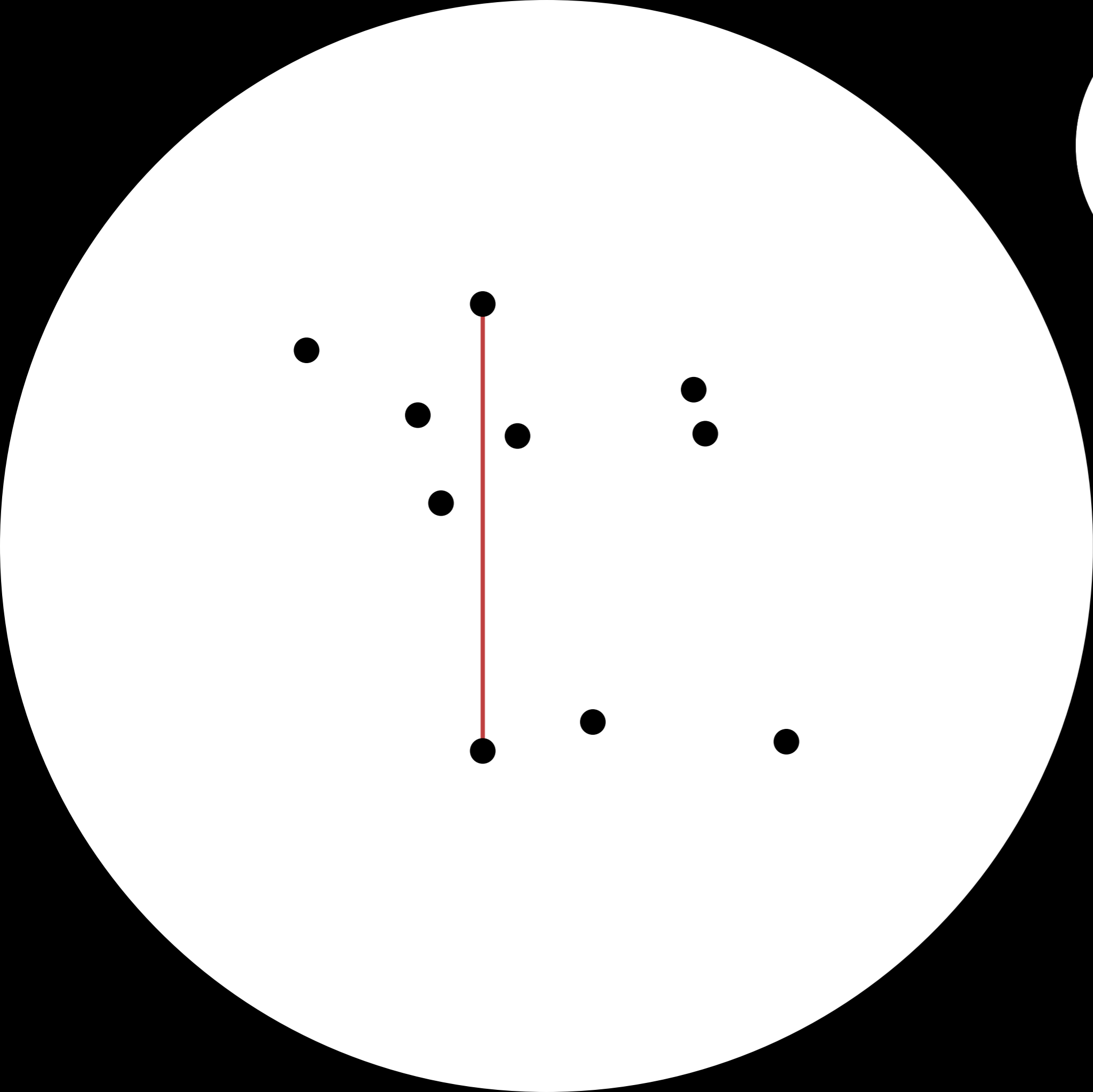


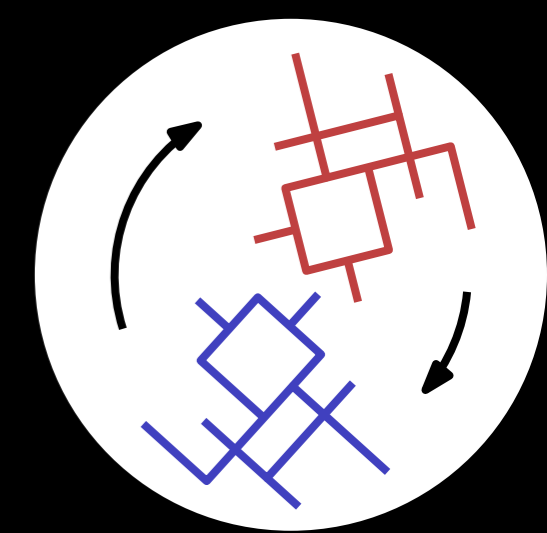
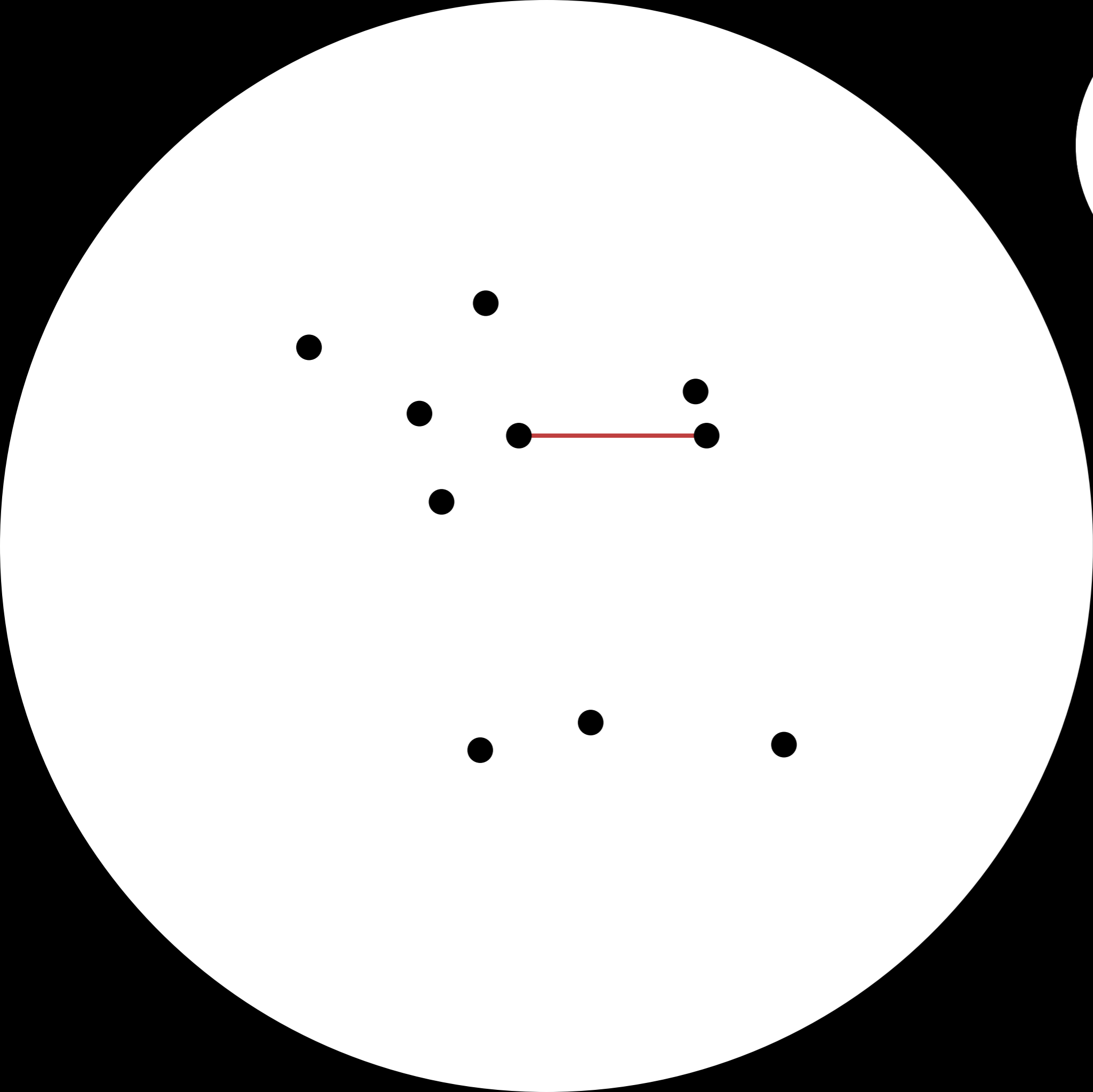


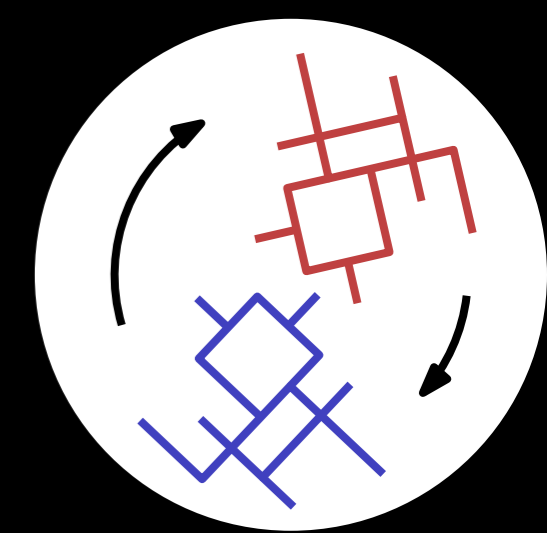
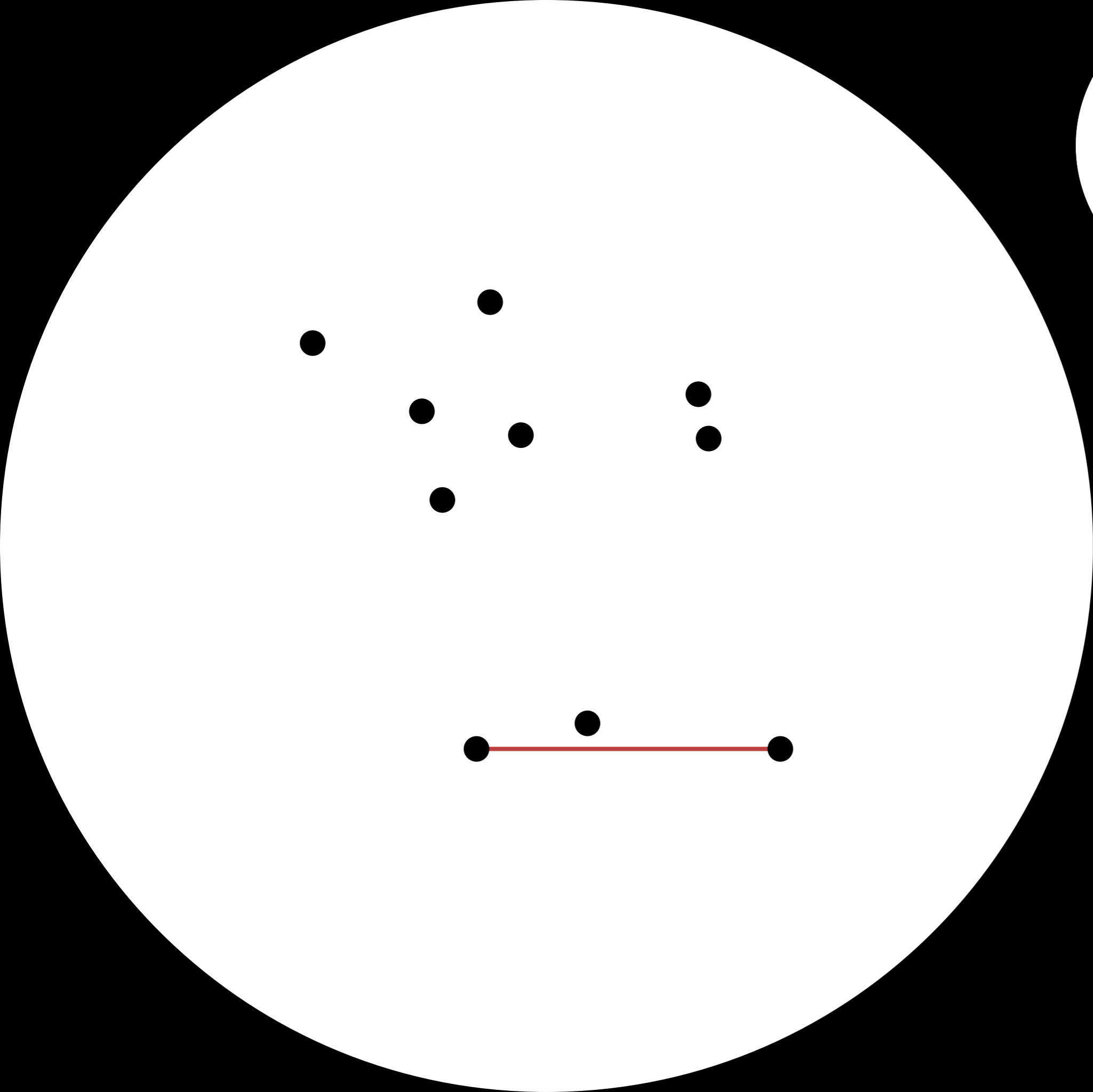


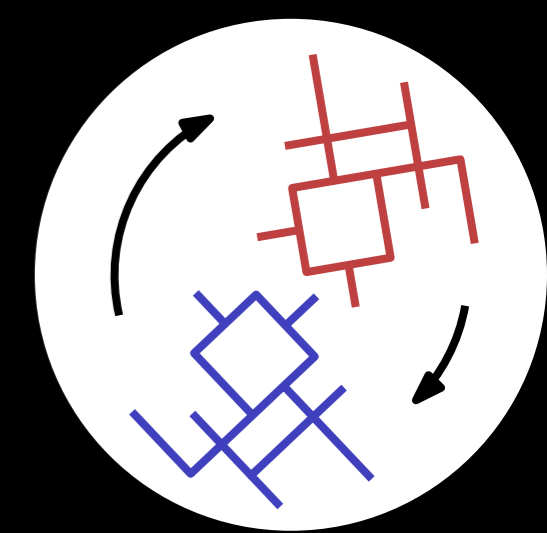
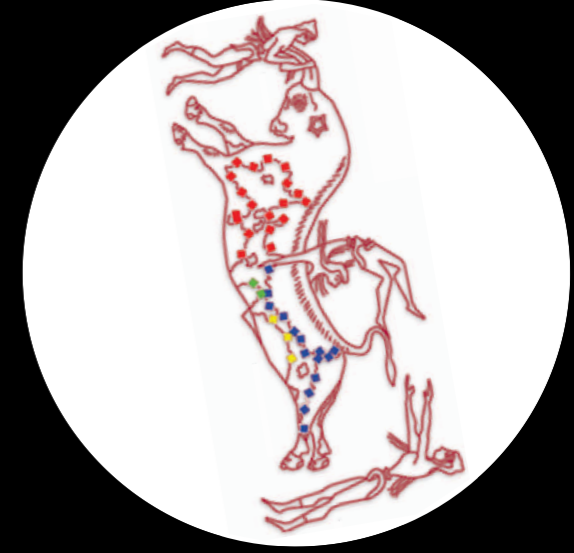
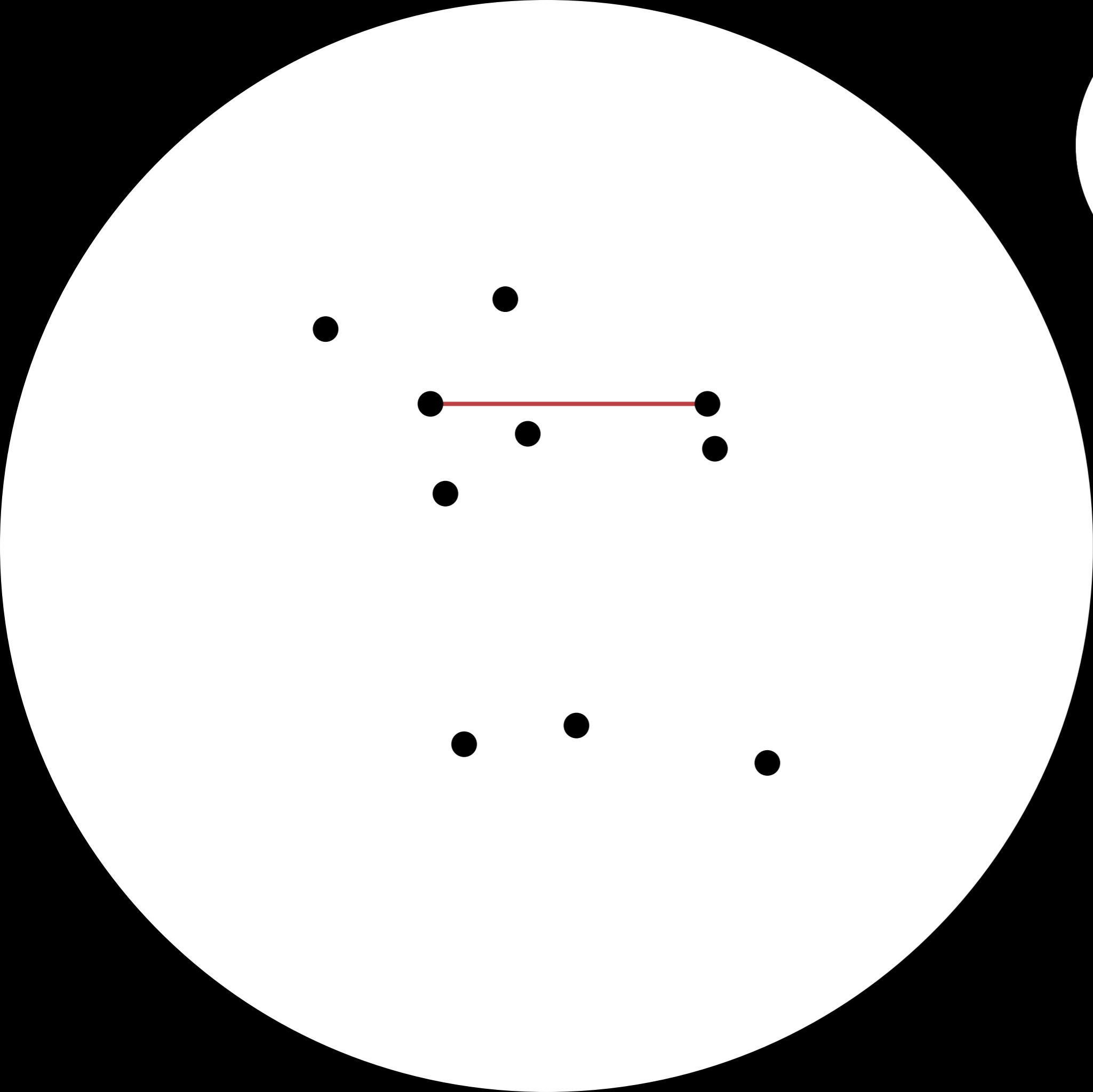


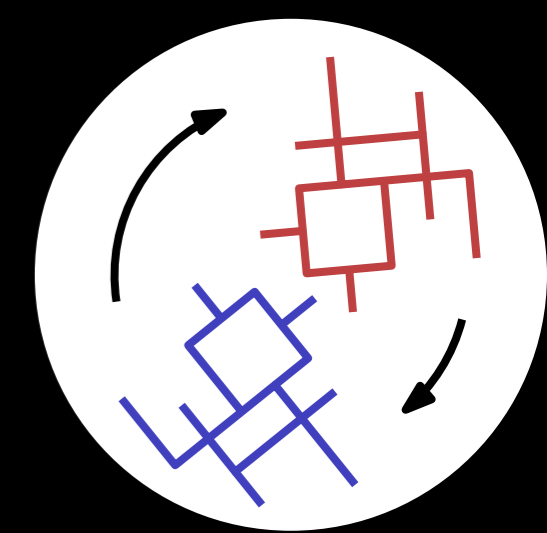
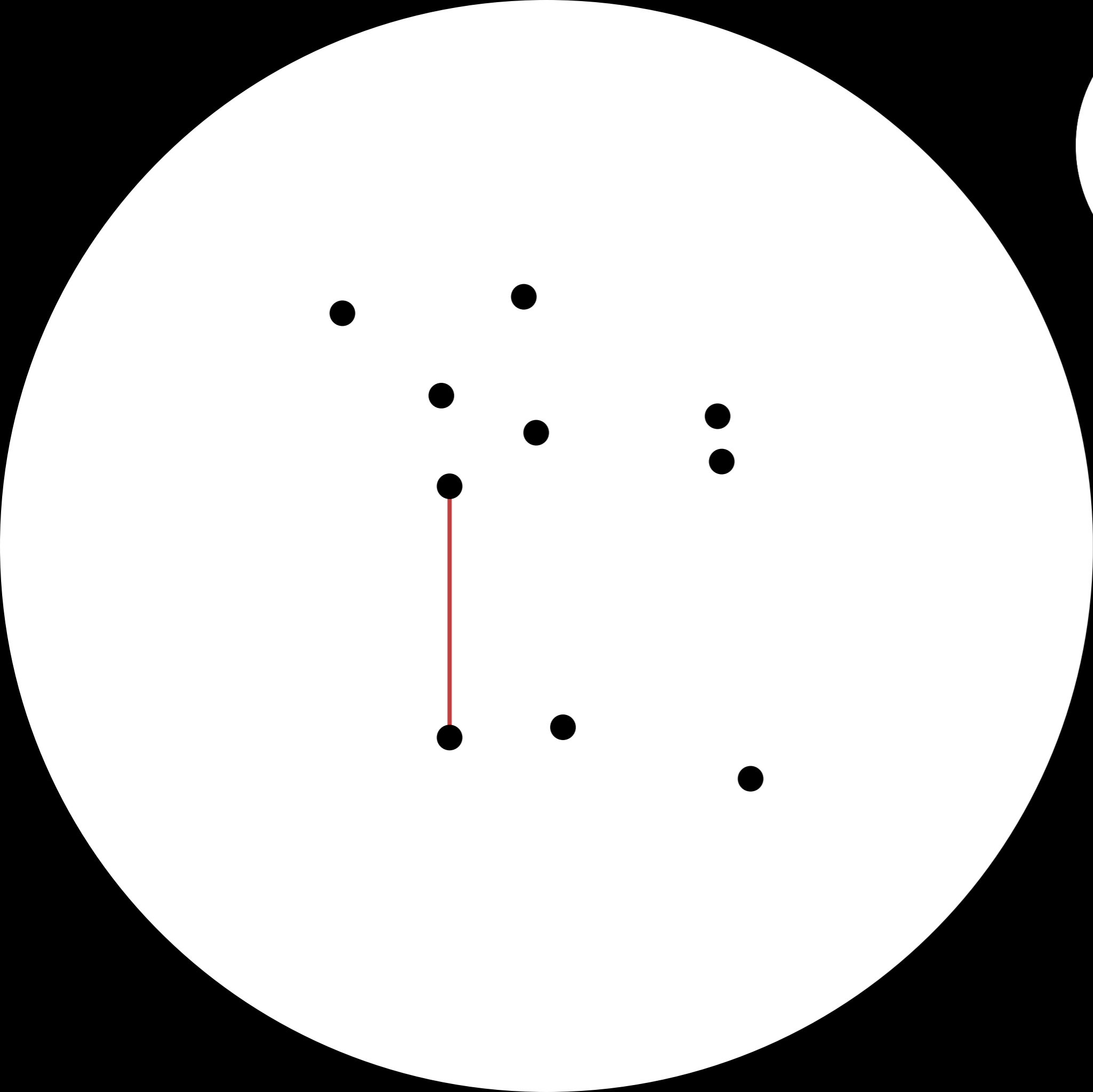


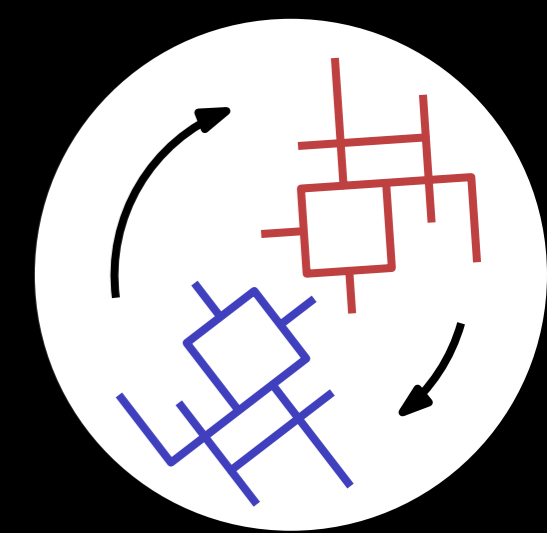
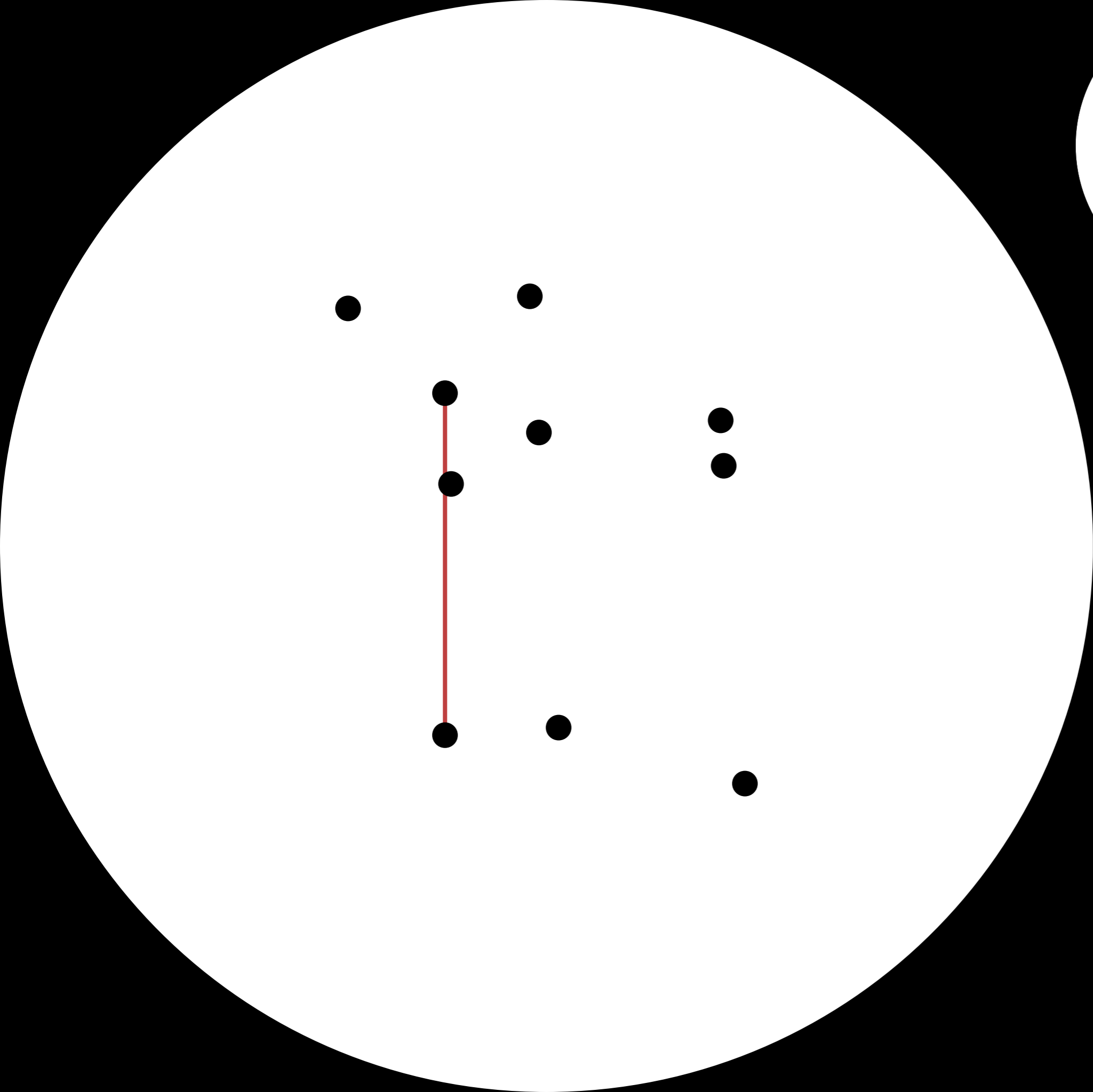


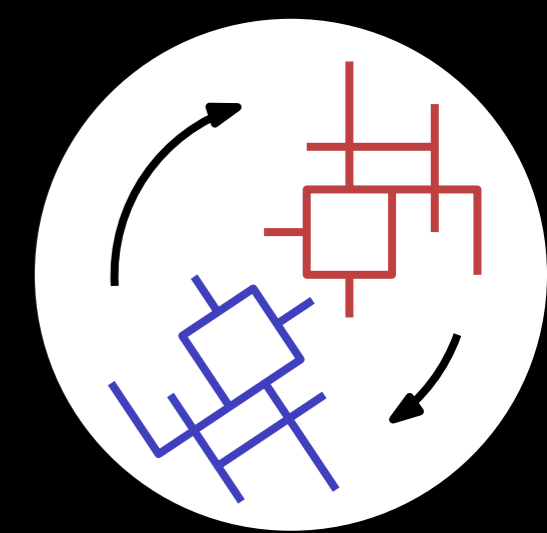
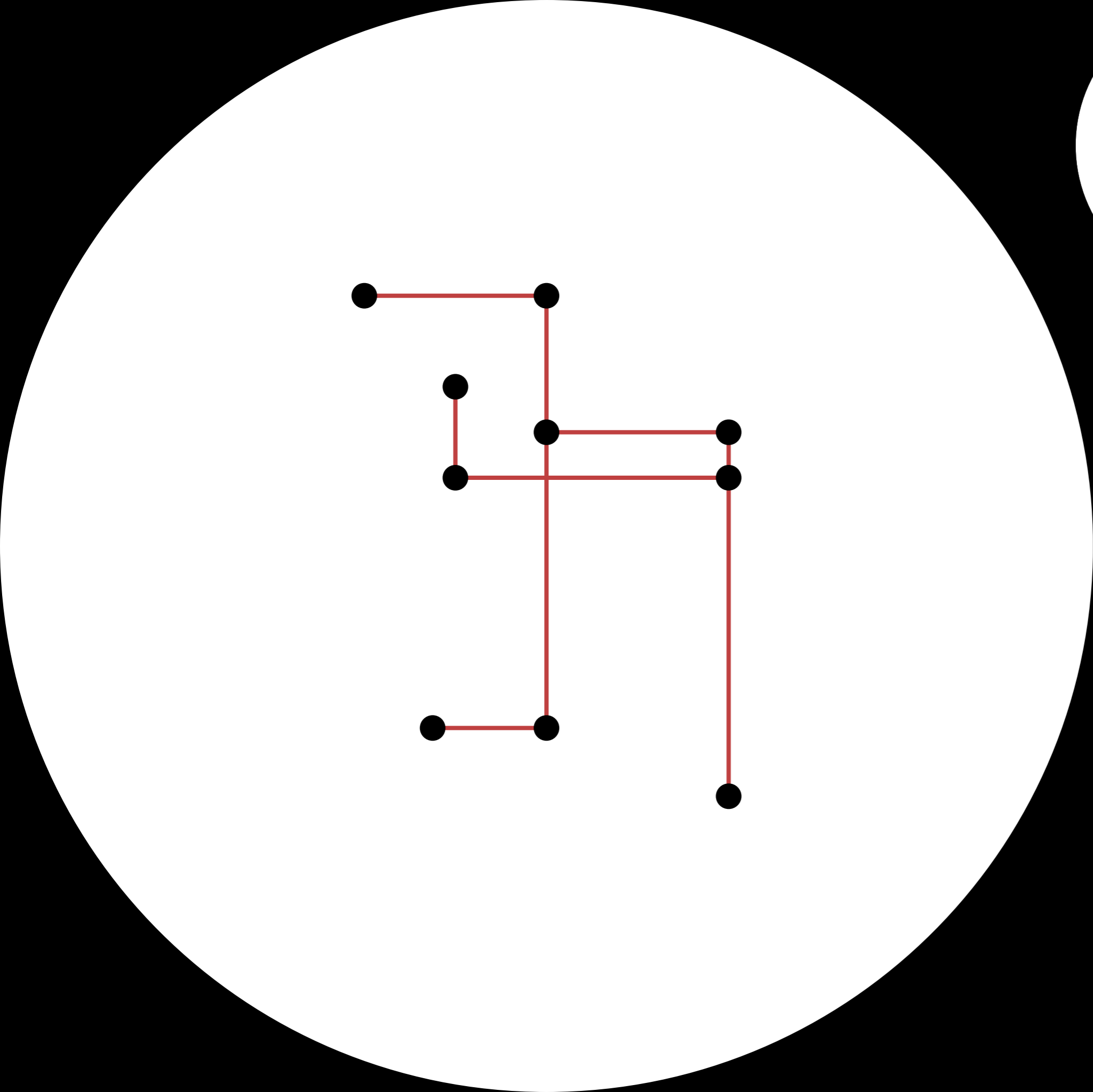




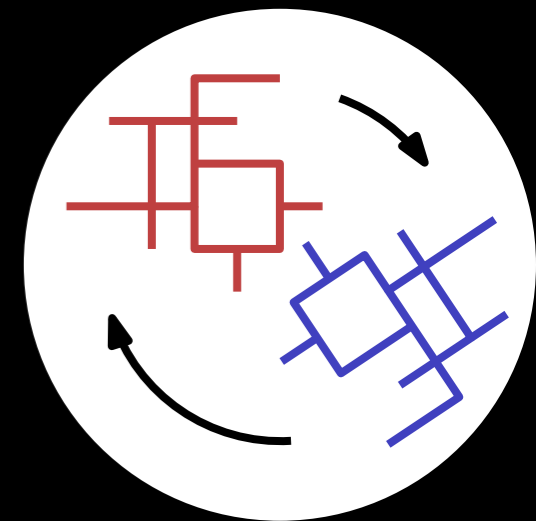




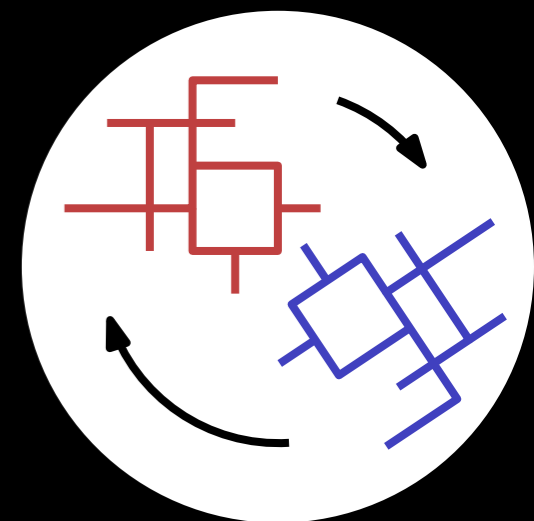




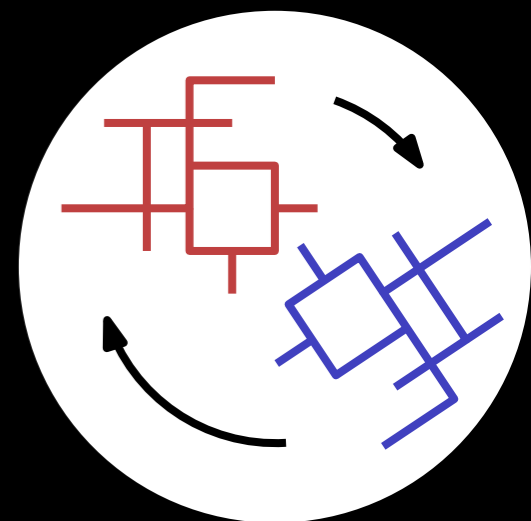
Answer: One.

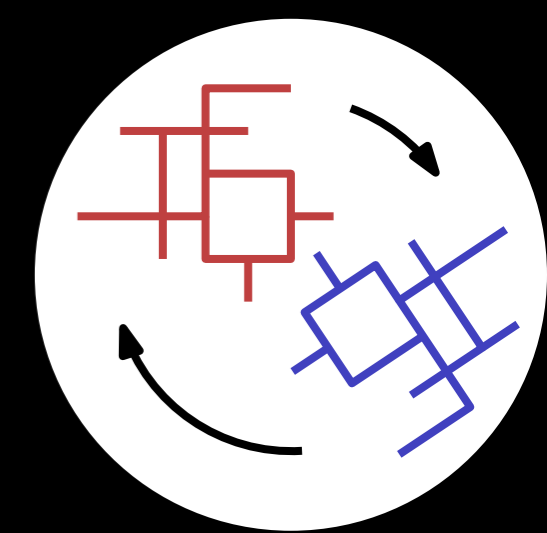
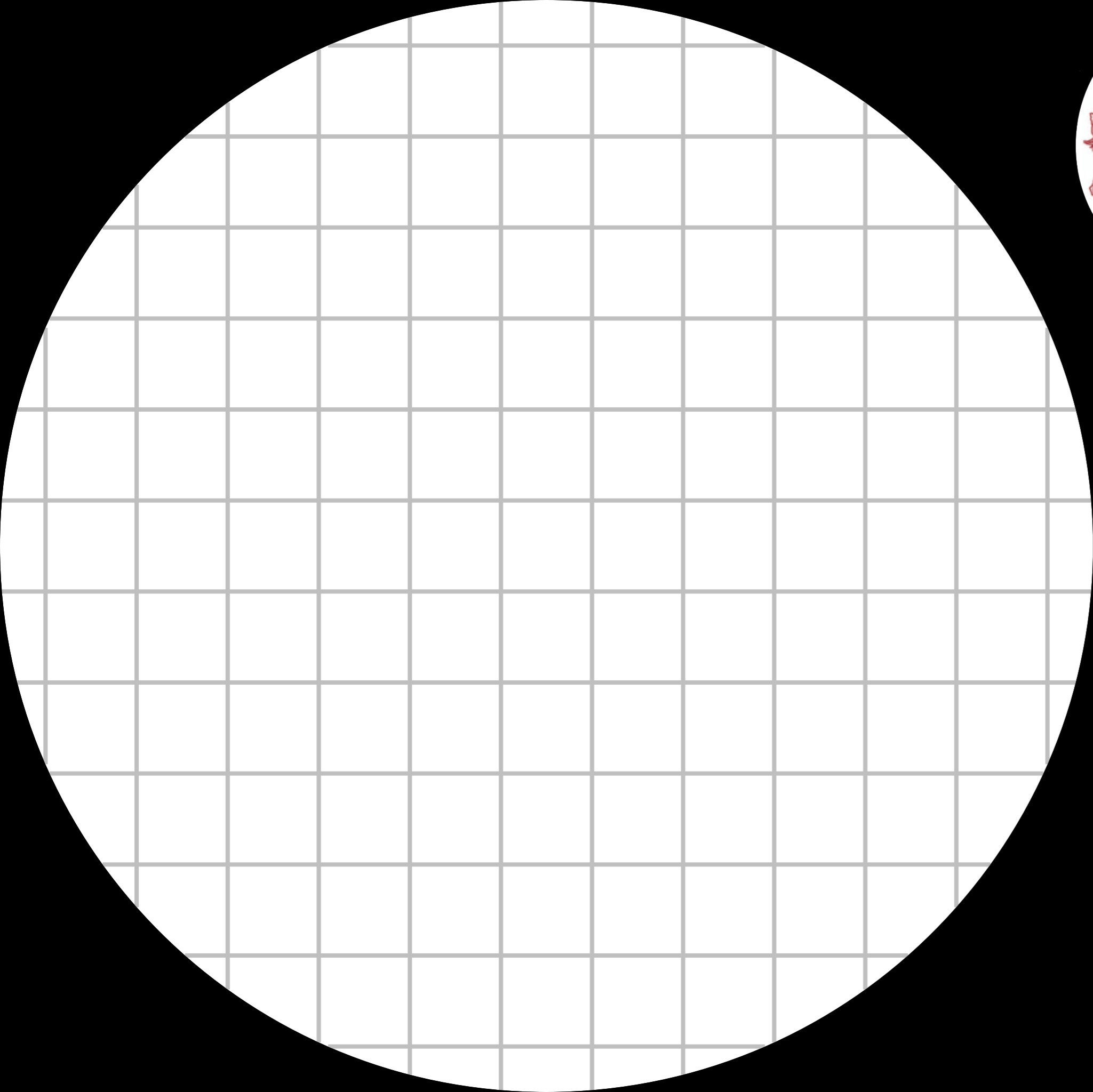


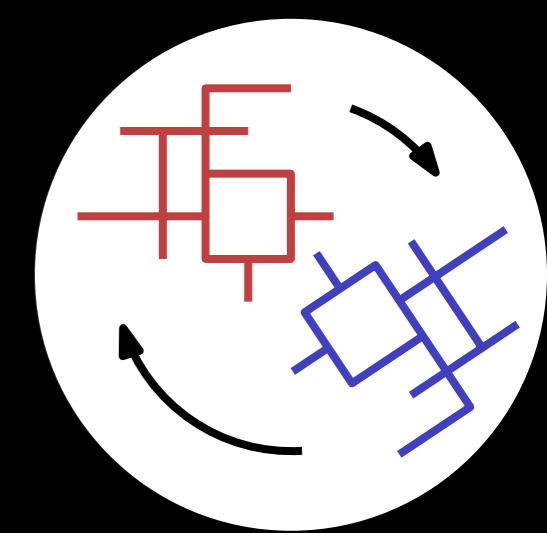
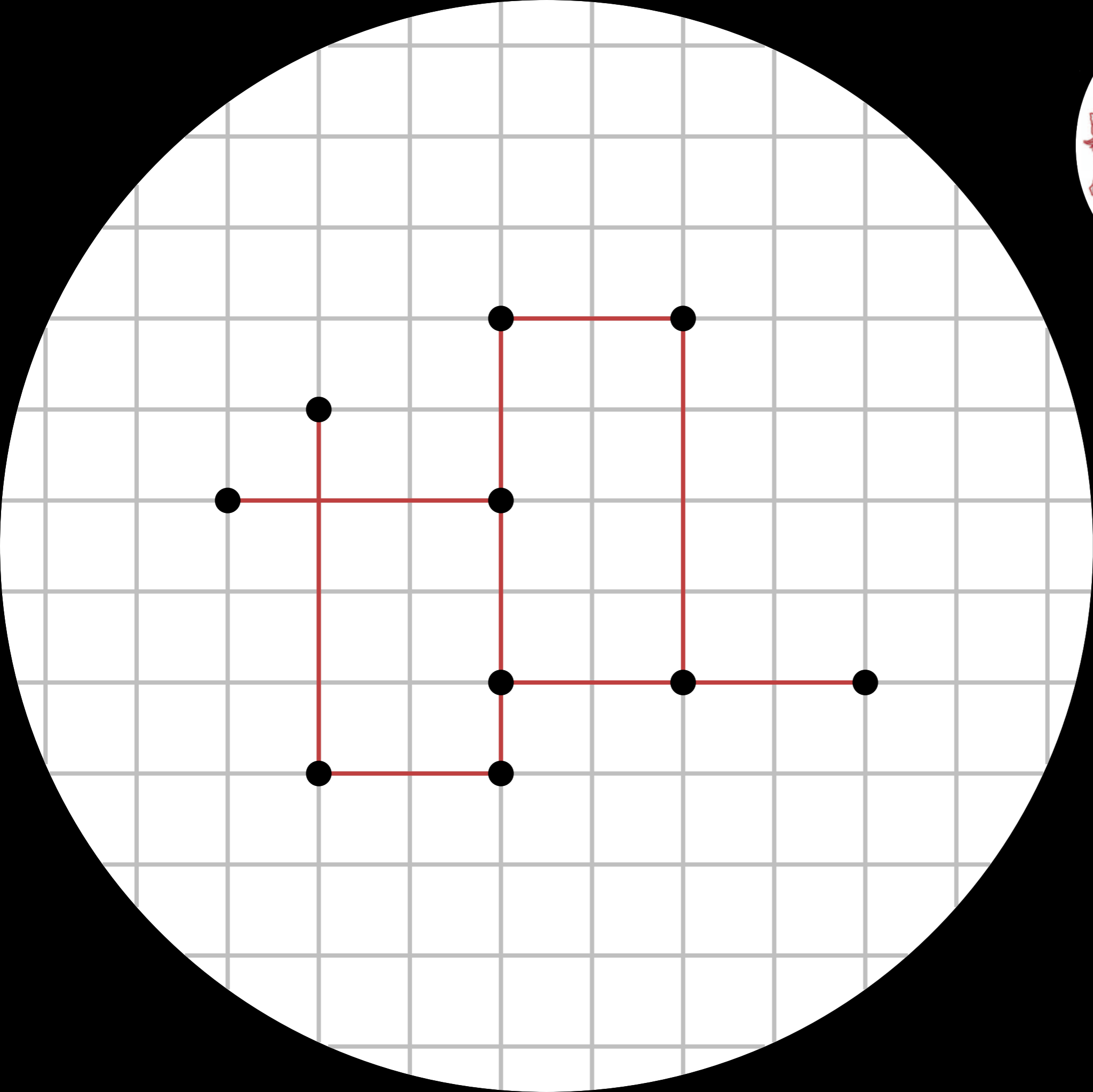
Answer: One.
(up to trivial rotations)

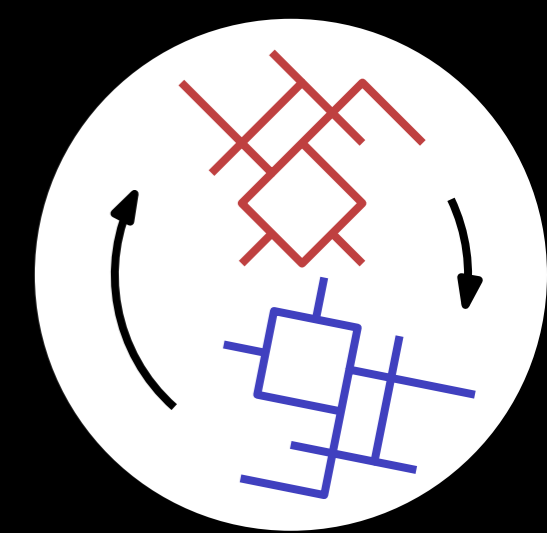
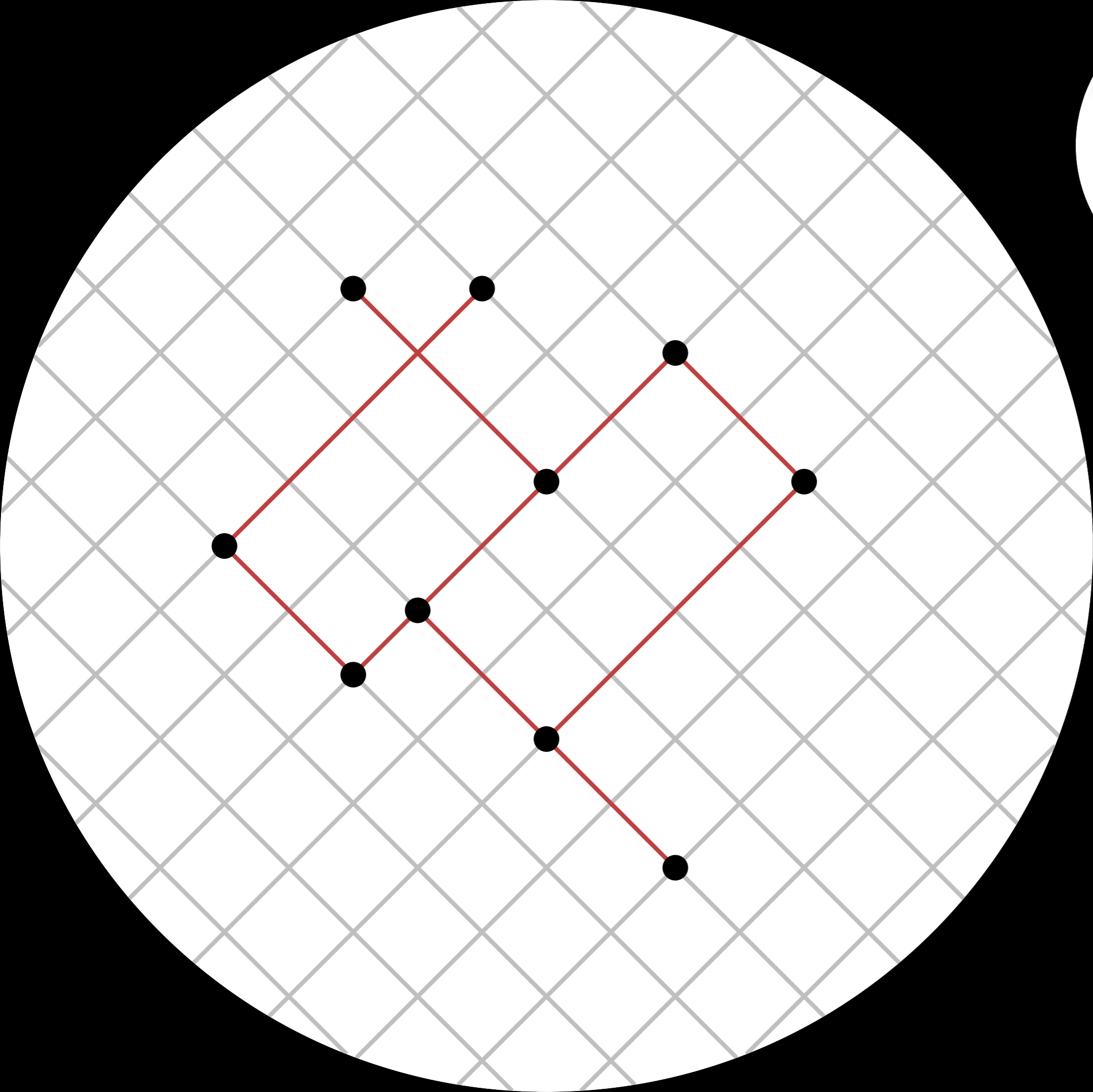


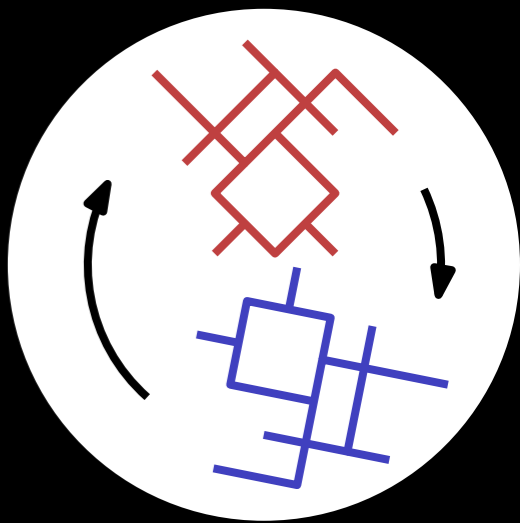
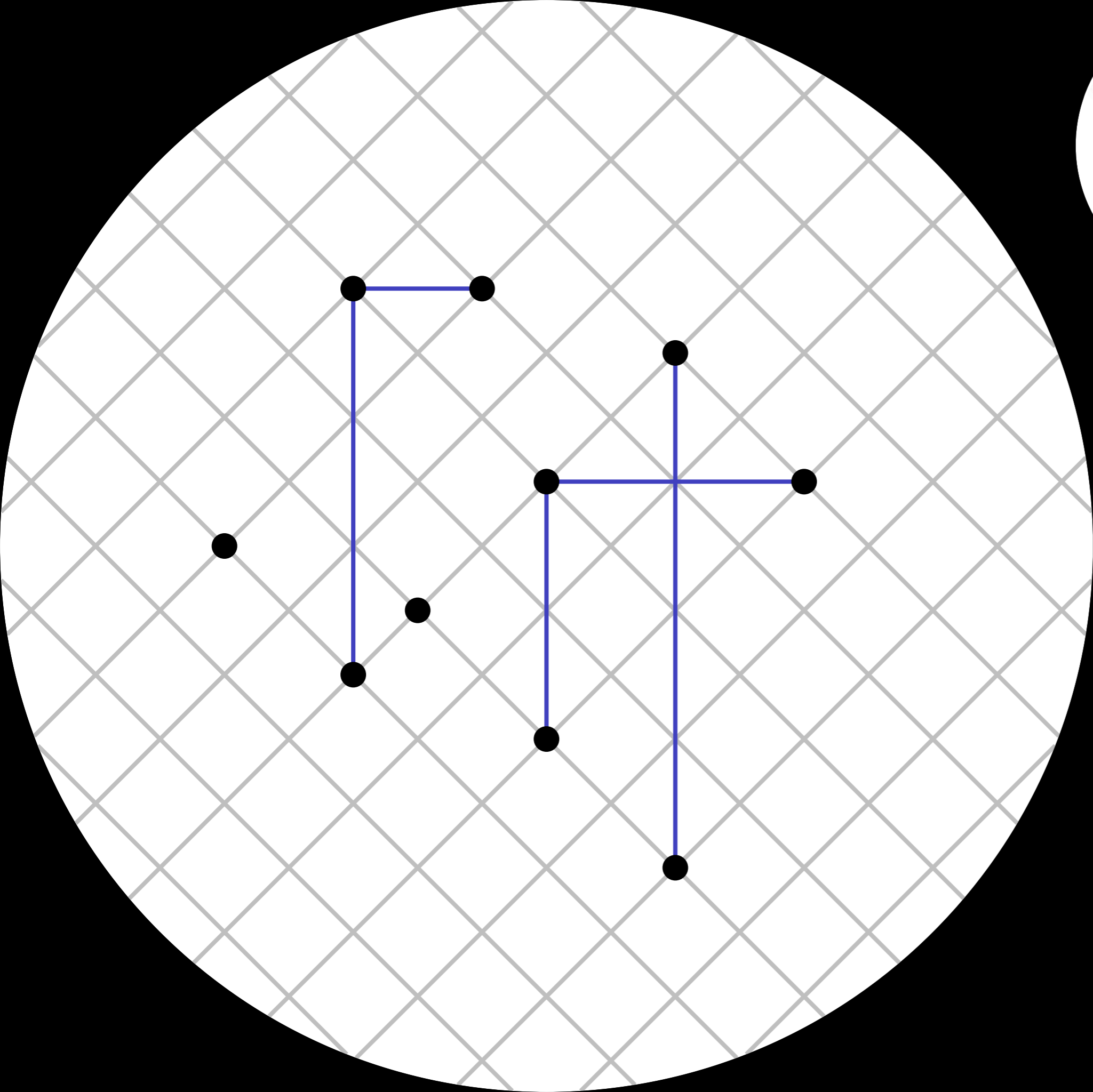
Start simple:
two dimensions,
integer coordinates,
rotation over 45° .

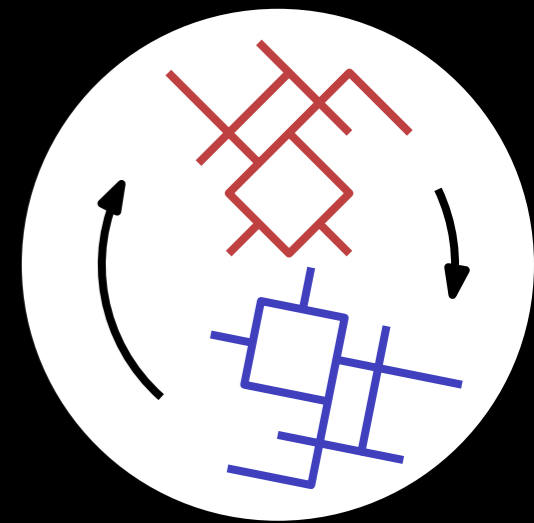
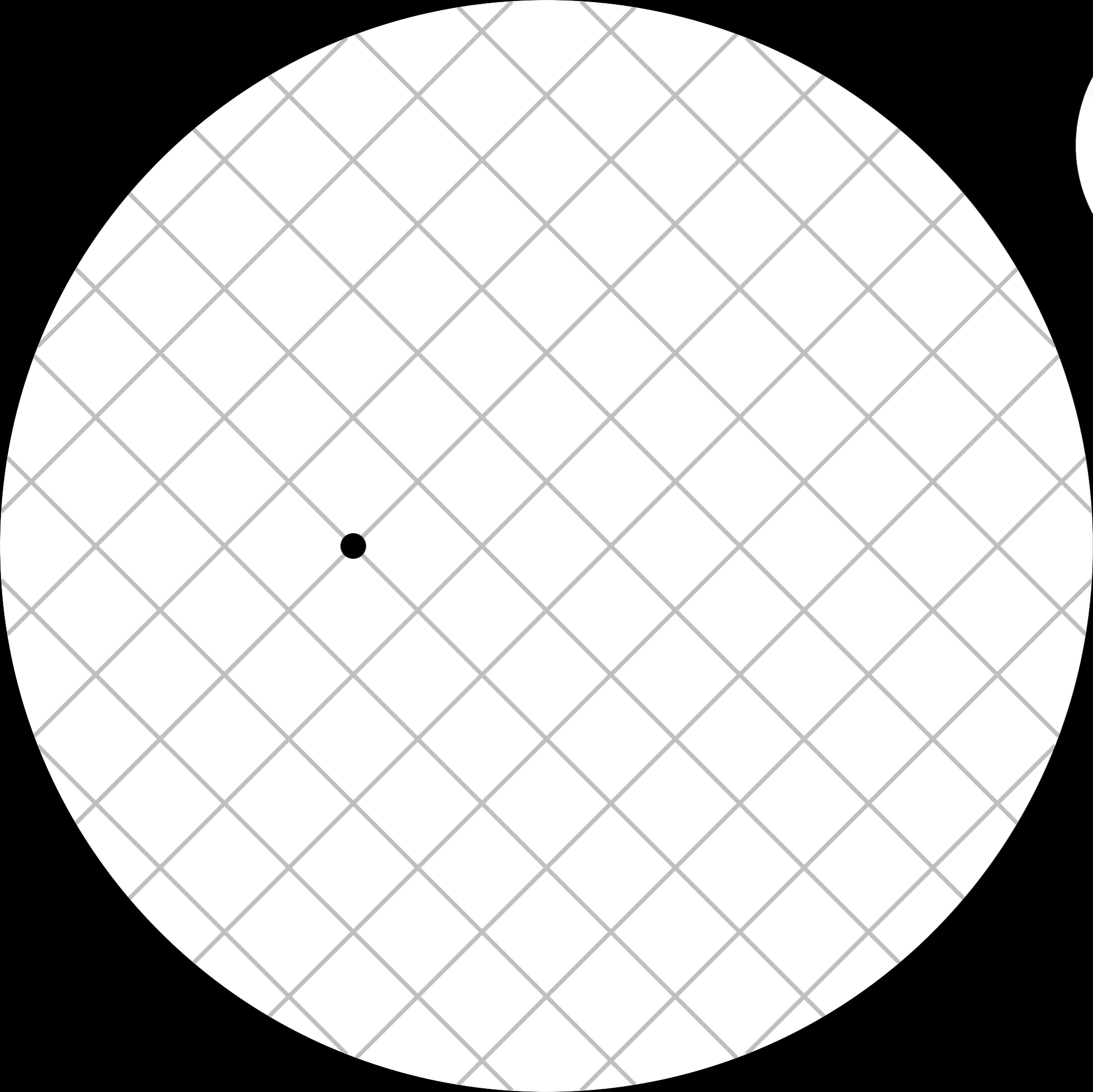


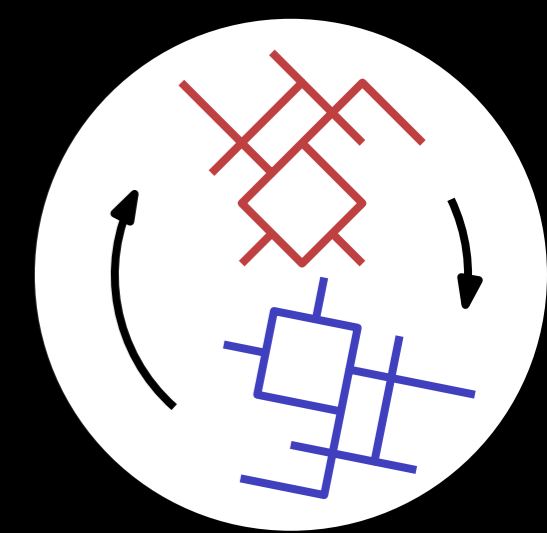
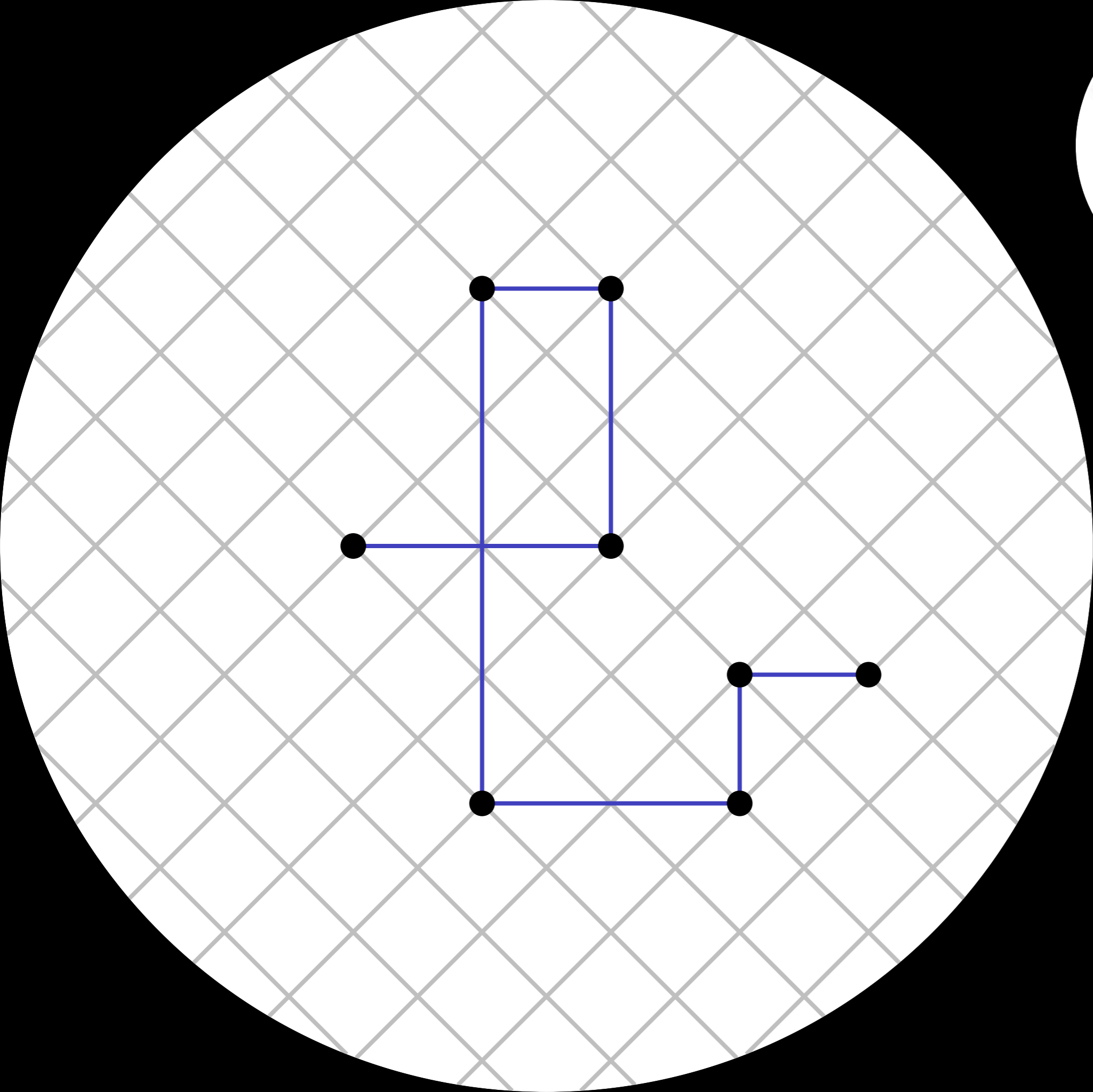


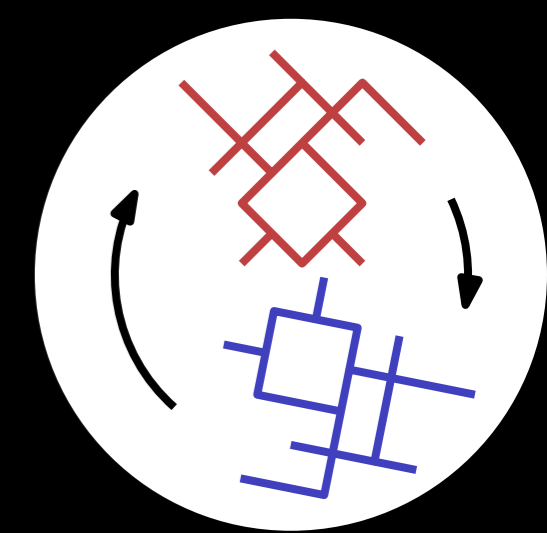
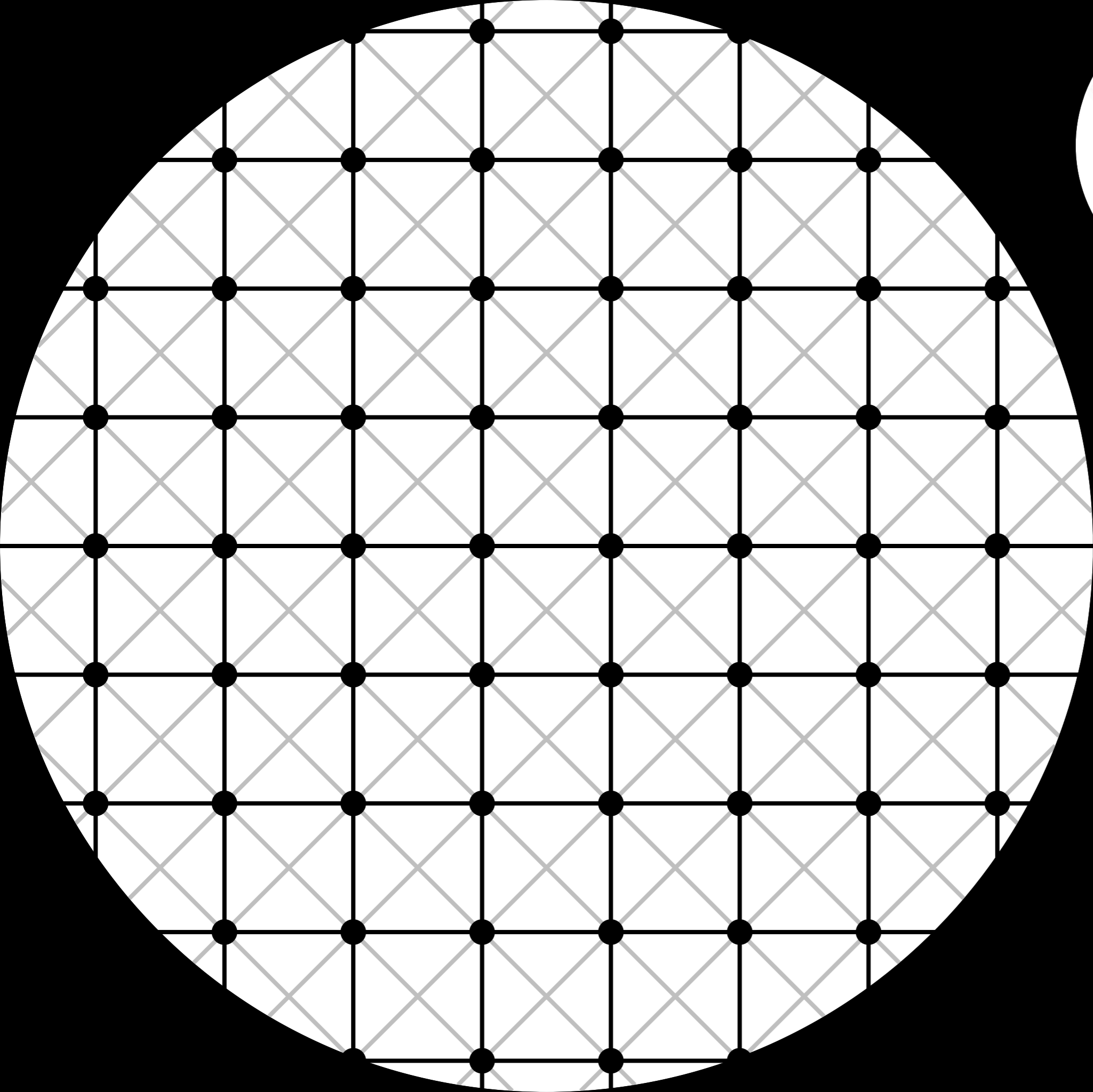


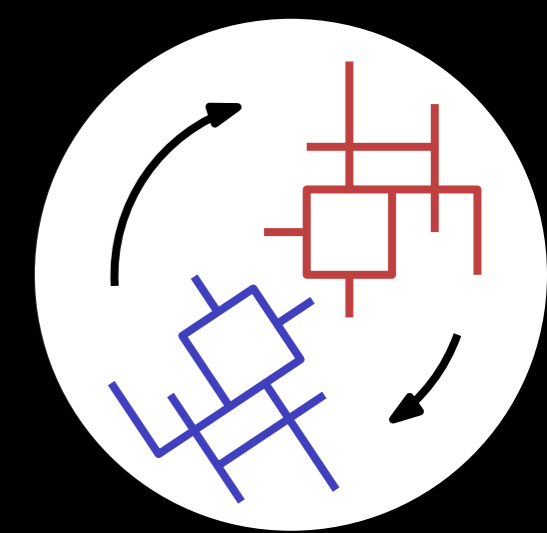
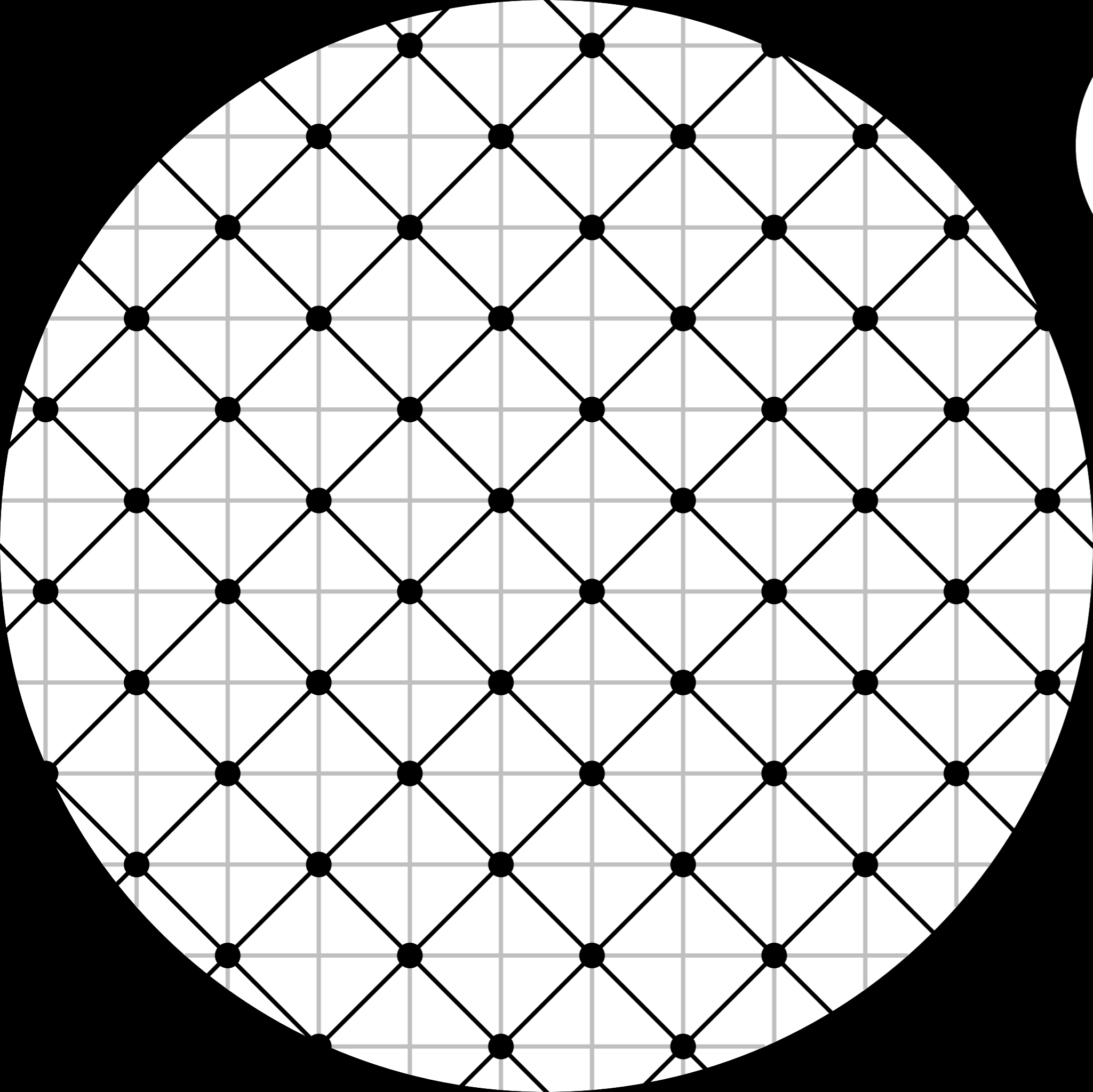


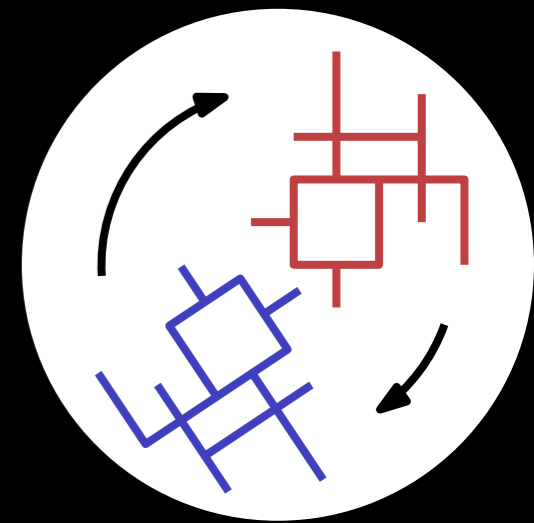
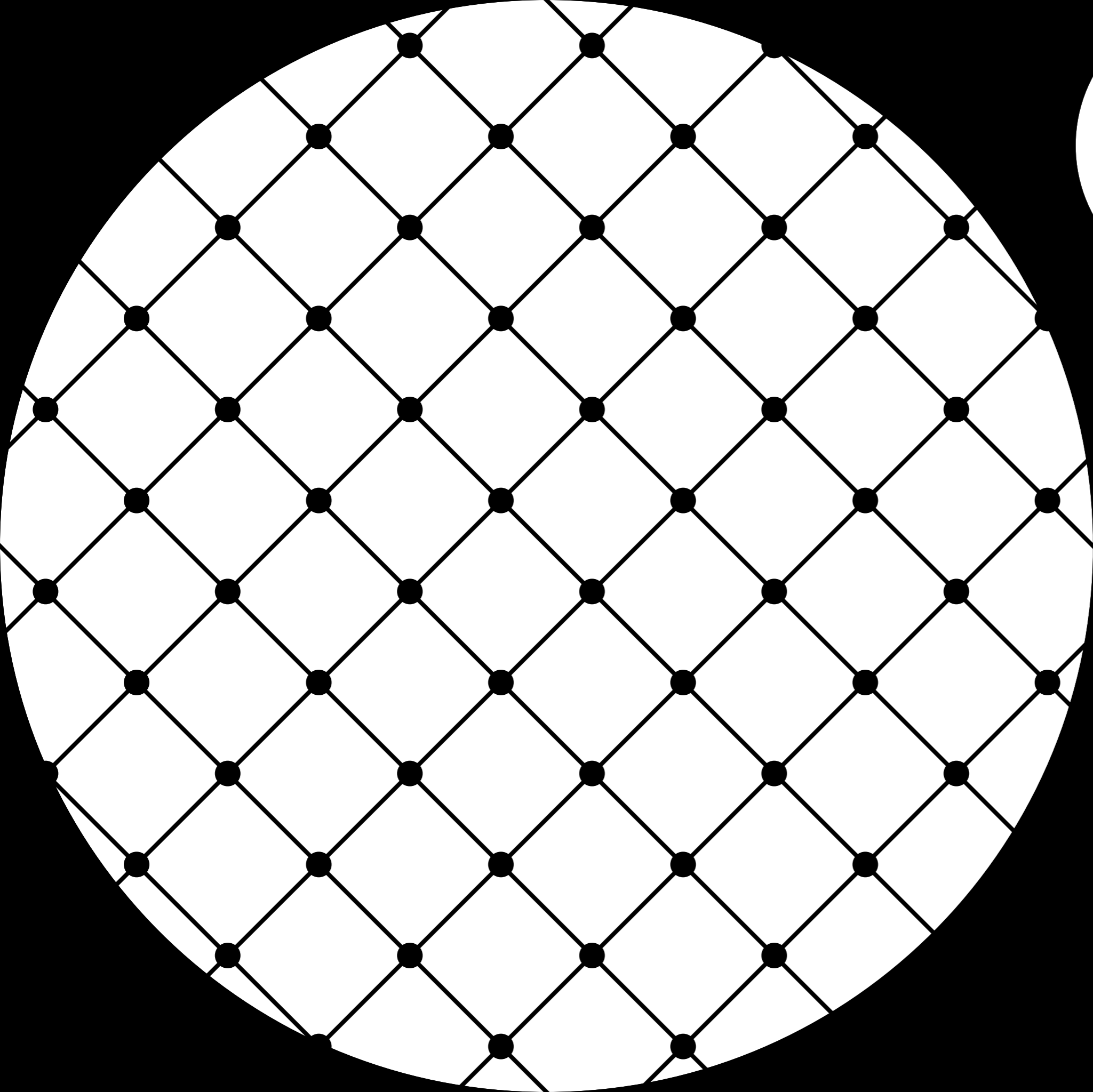


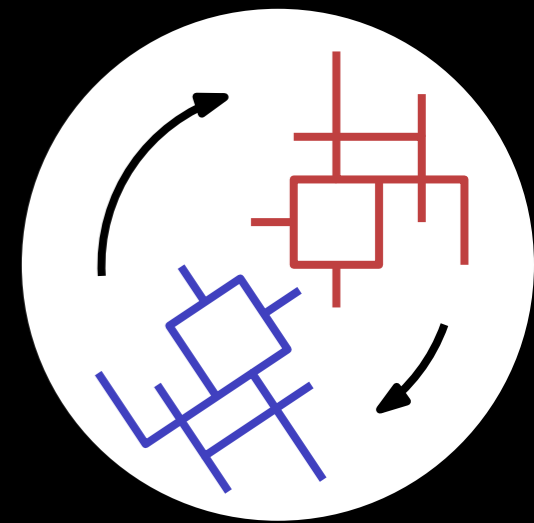
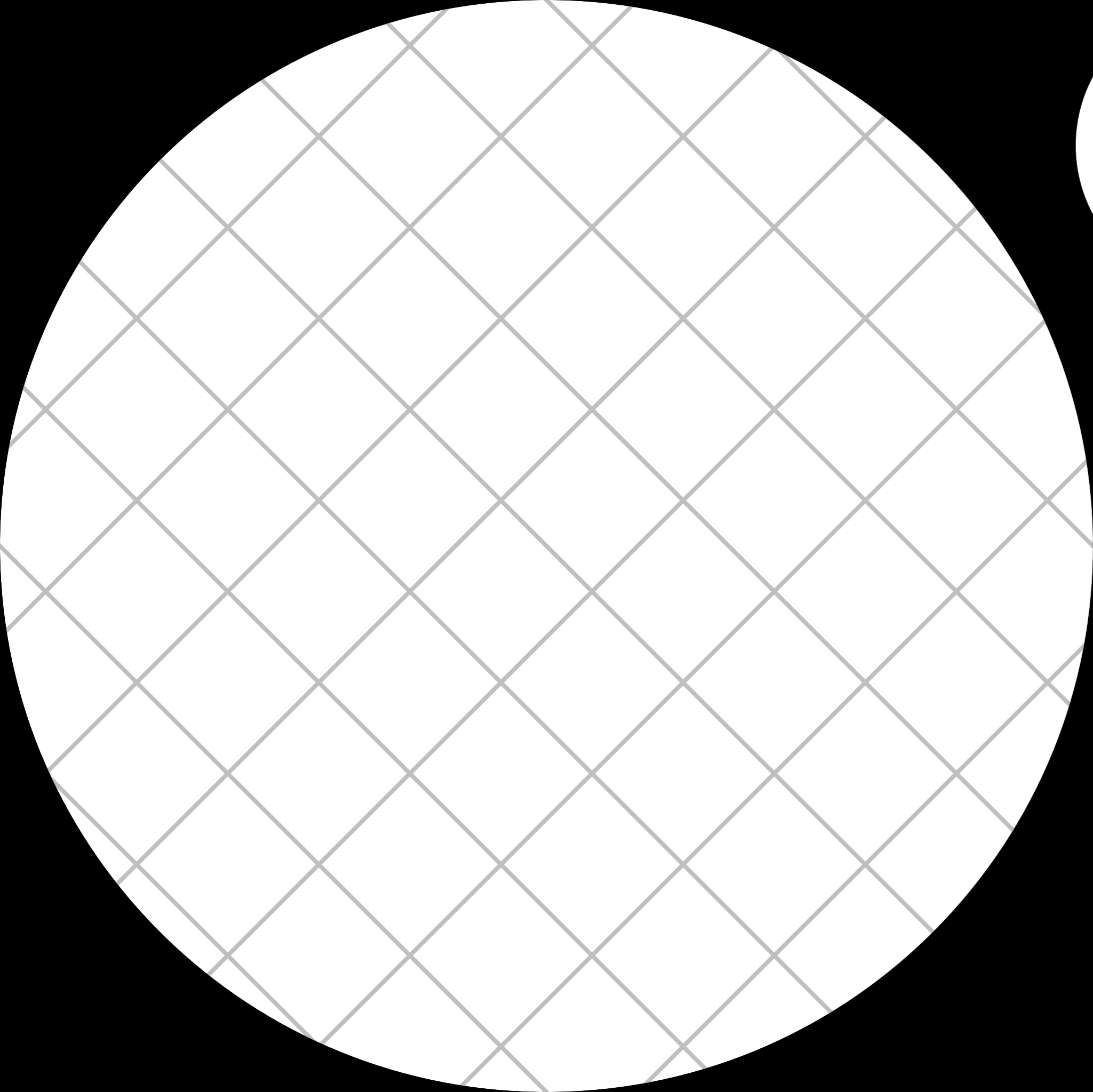


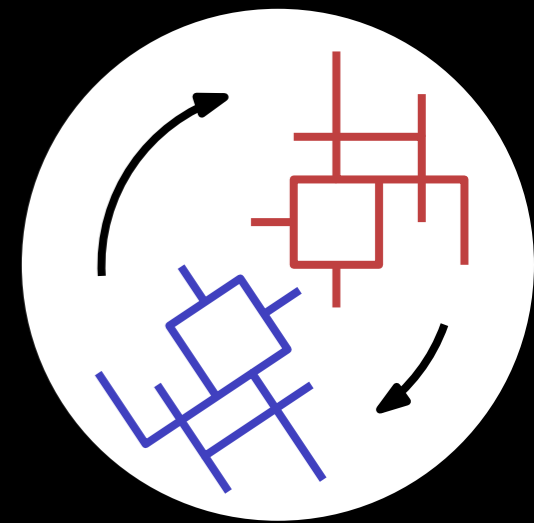
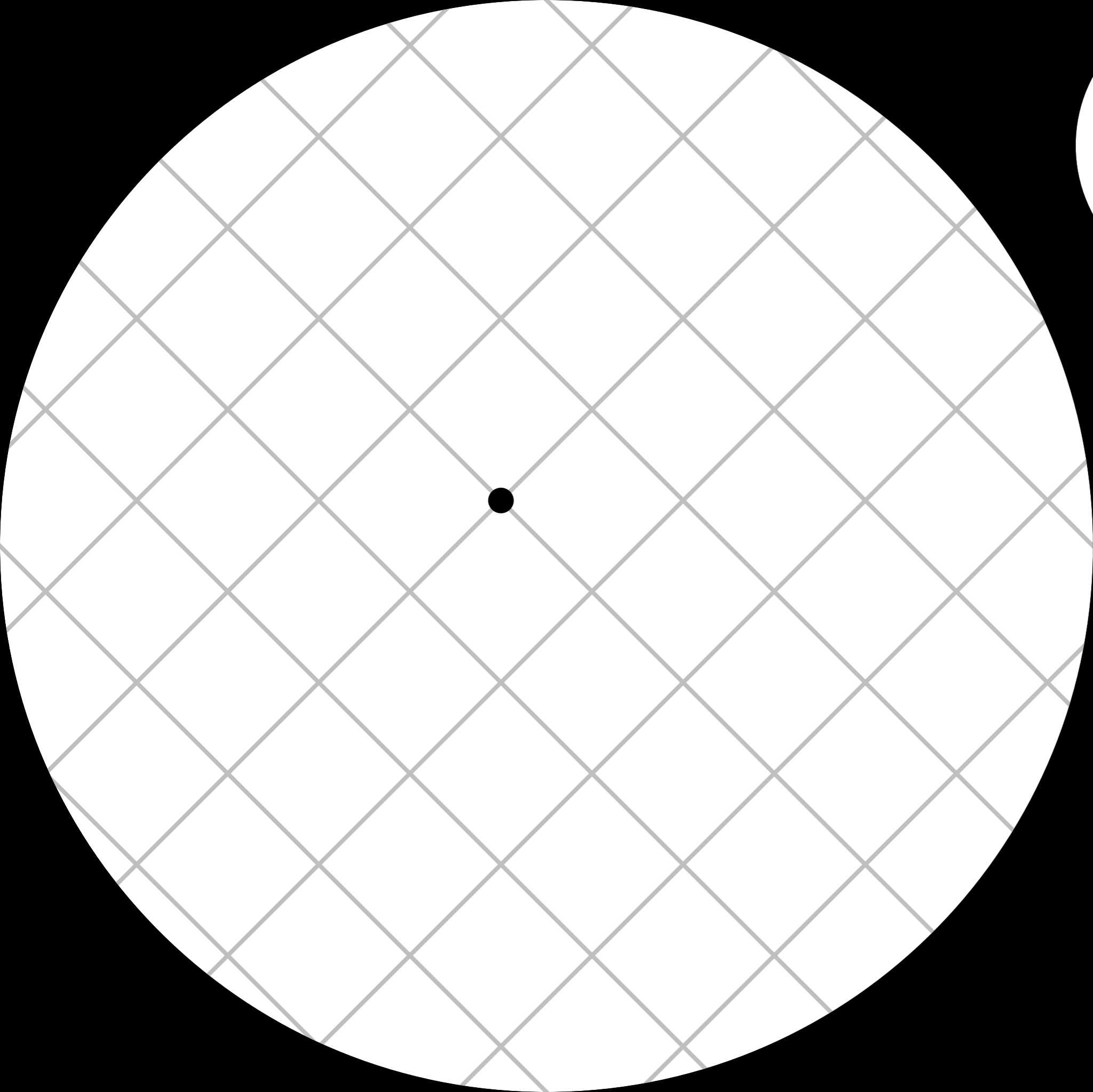


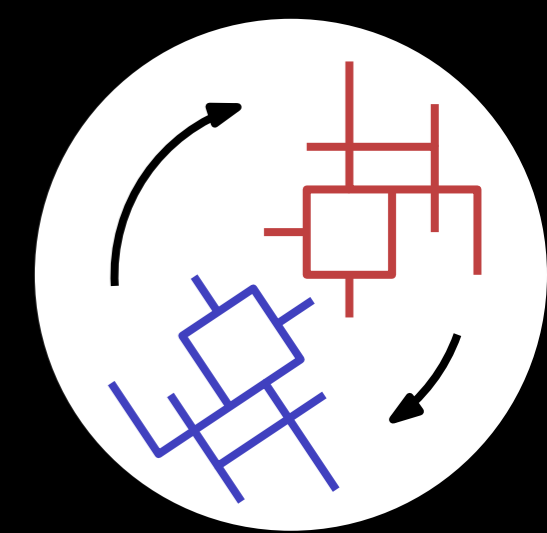
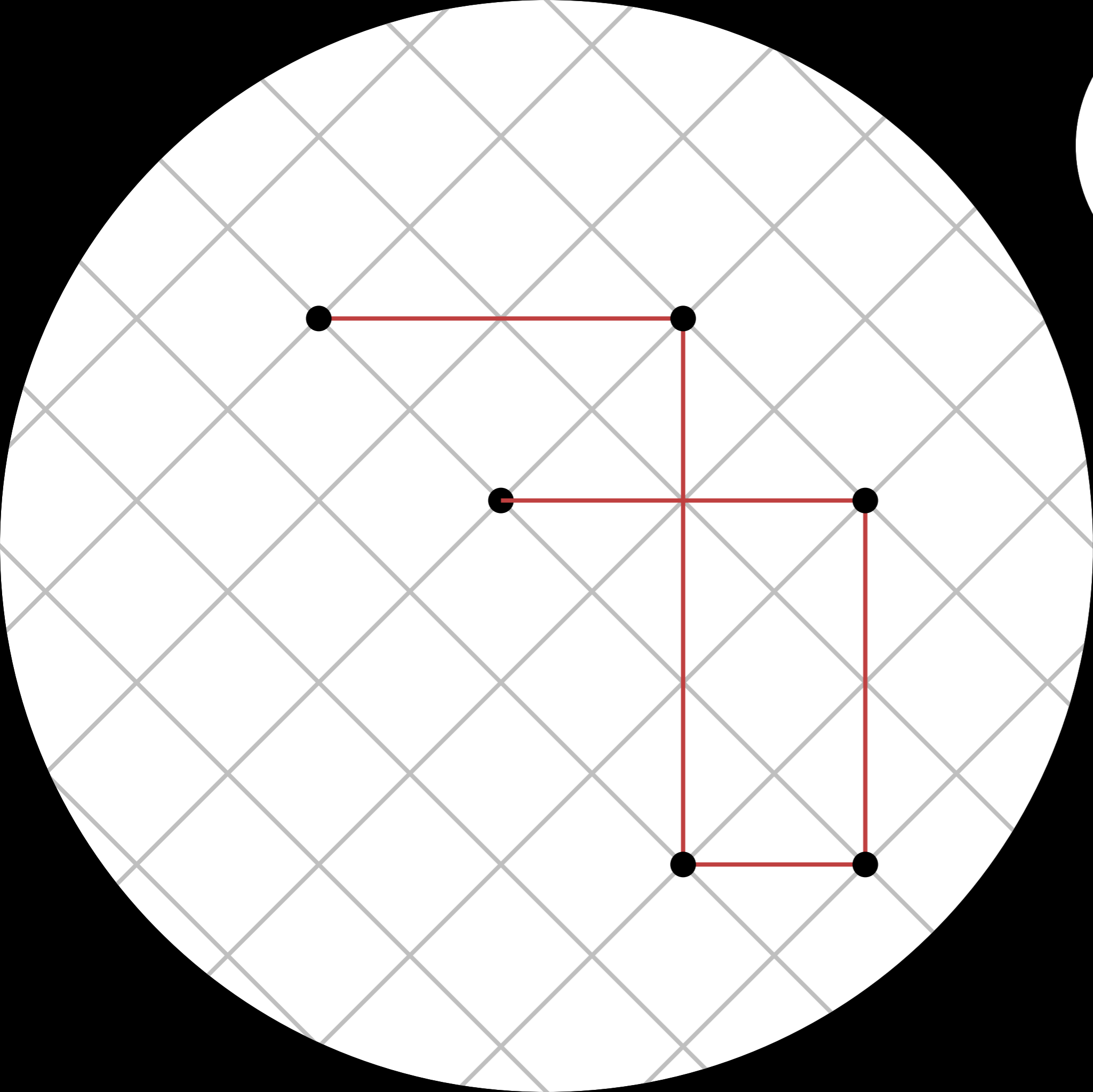


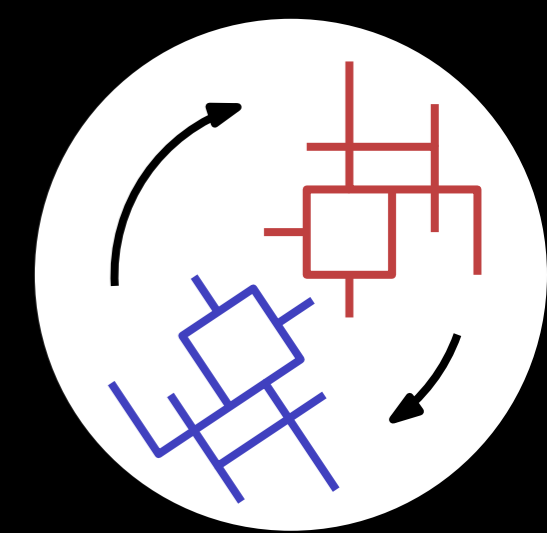
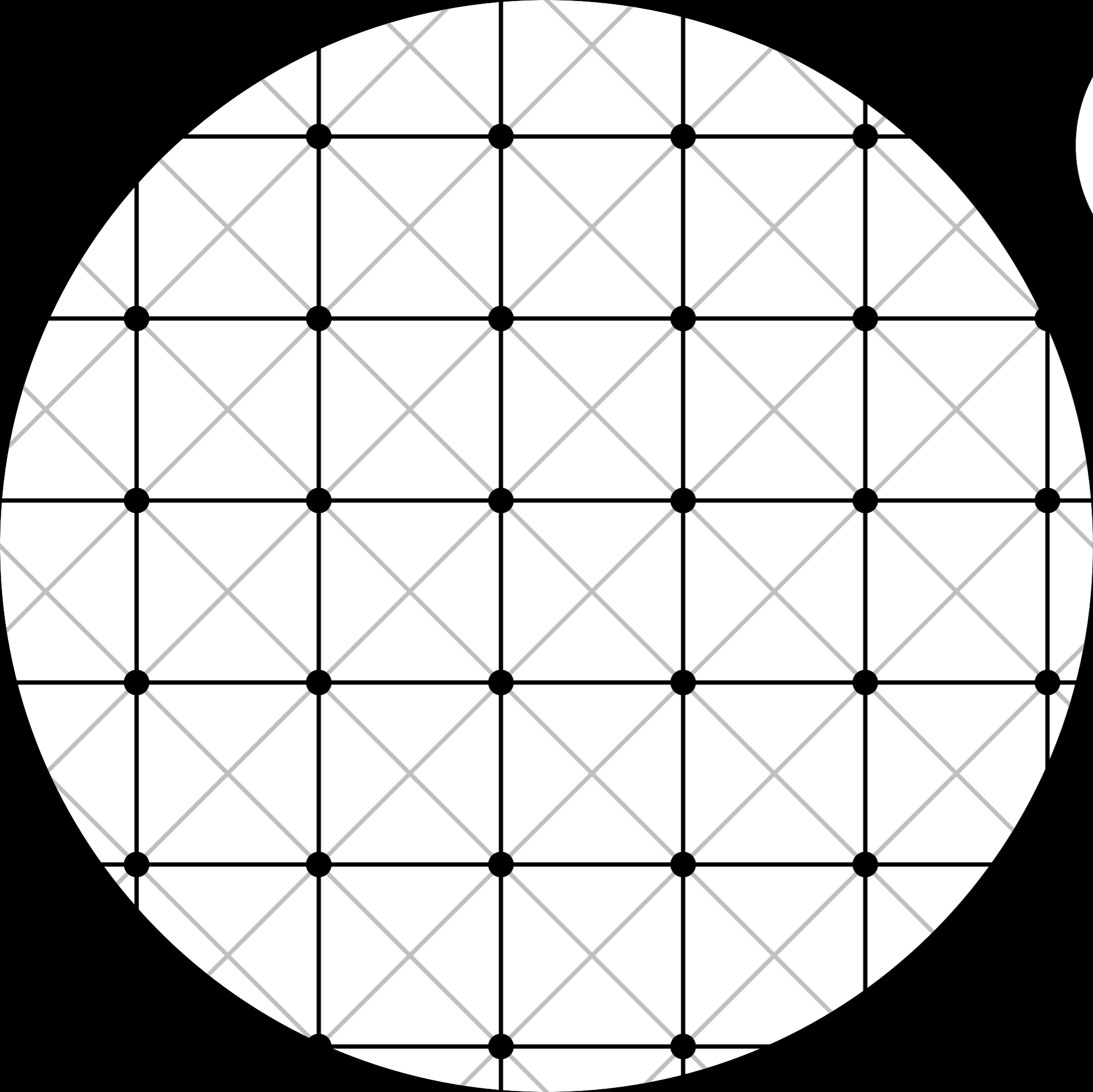


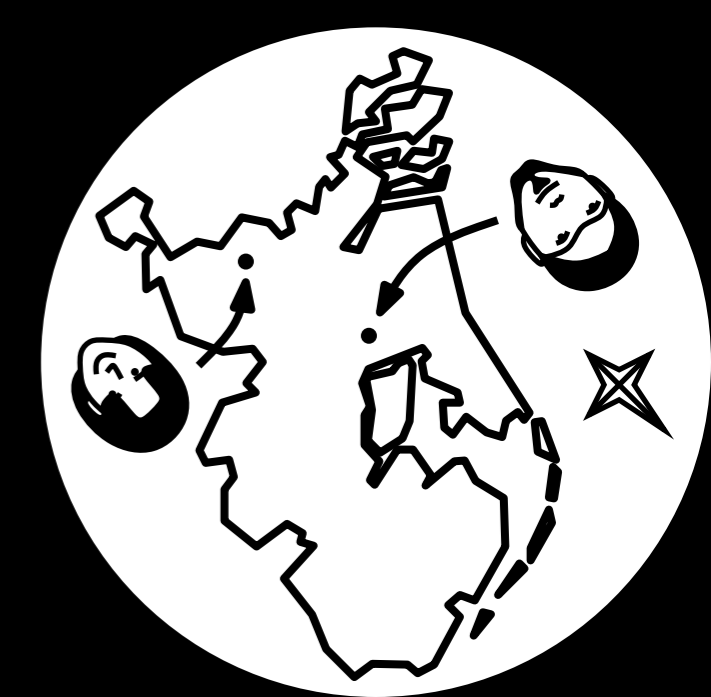
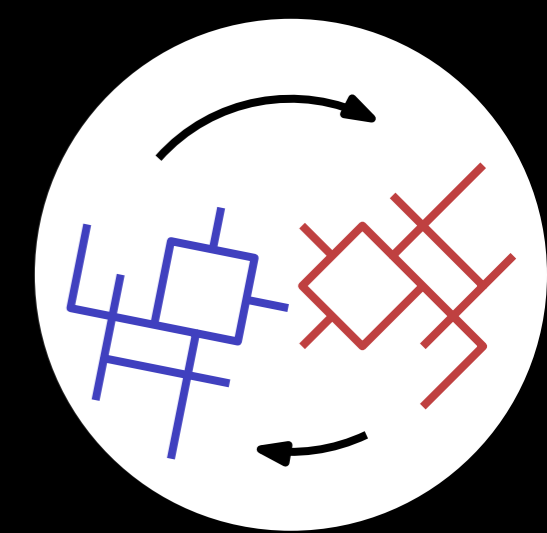
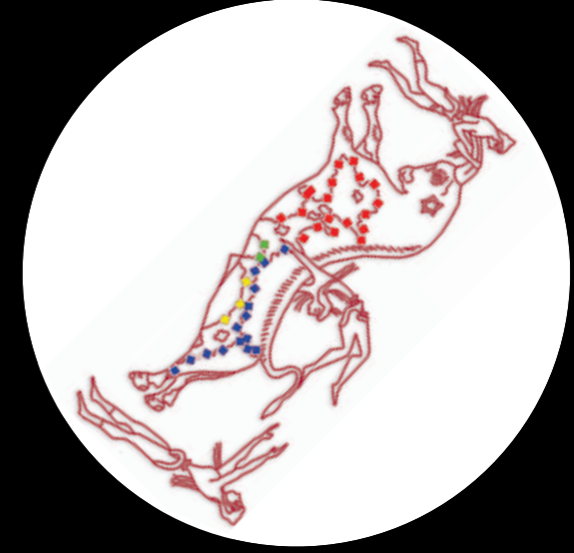
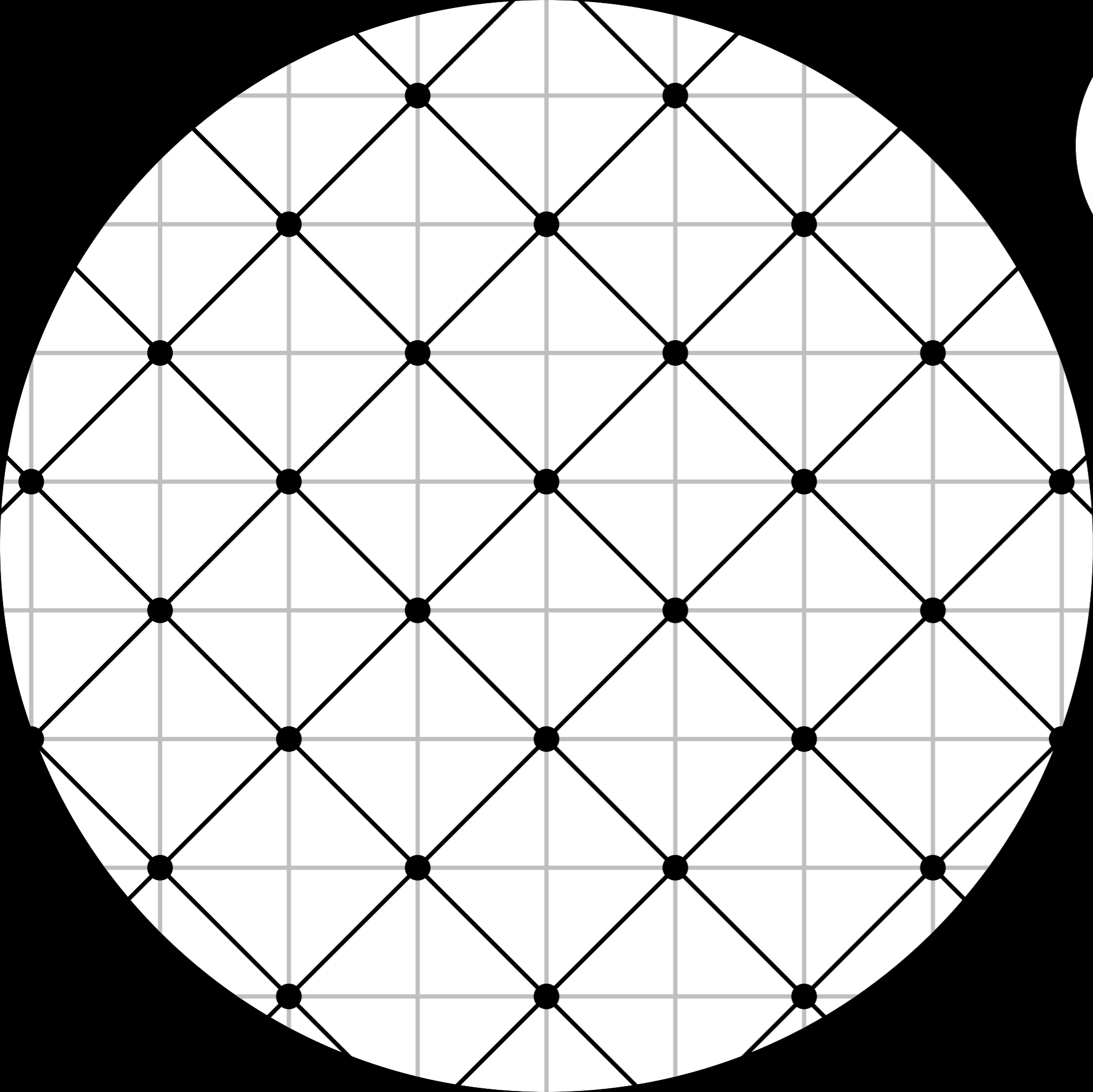


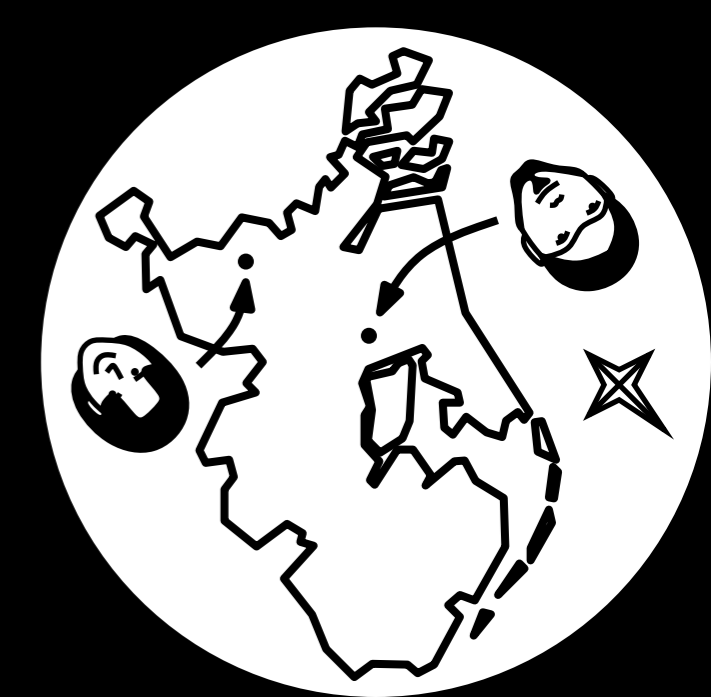
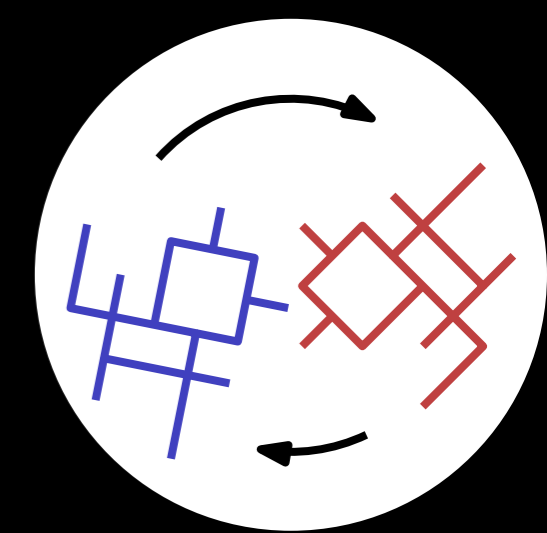
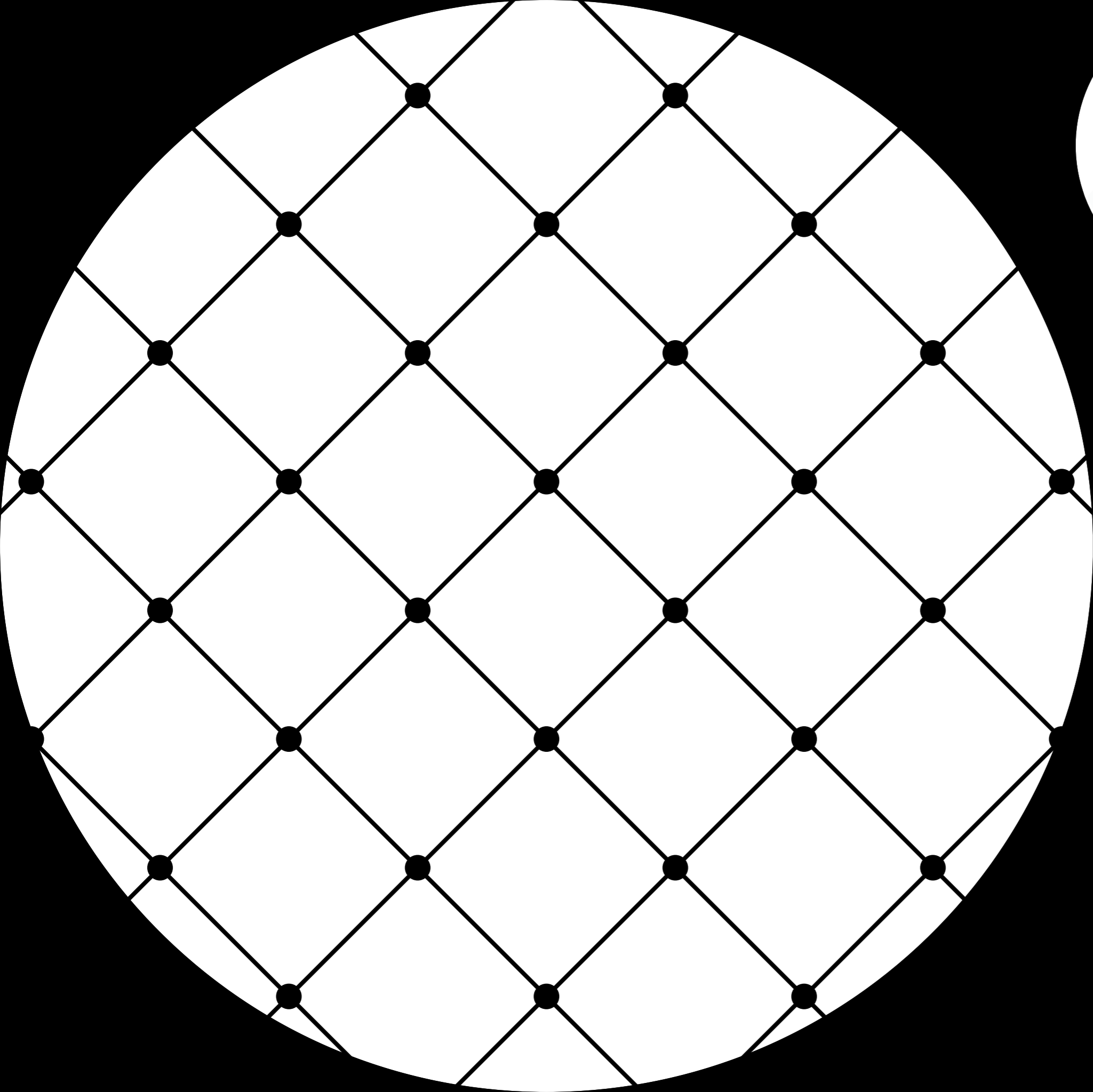


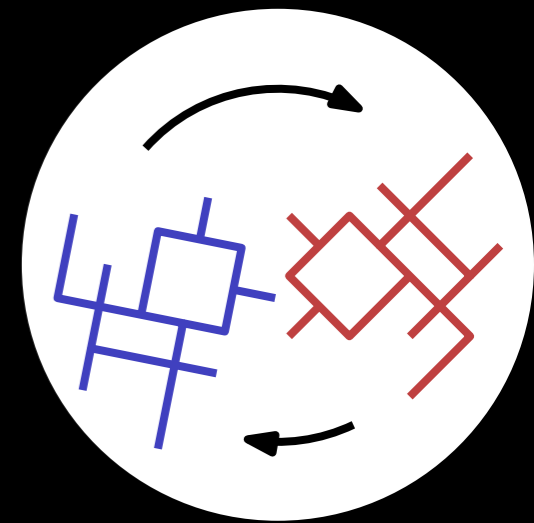
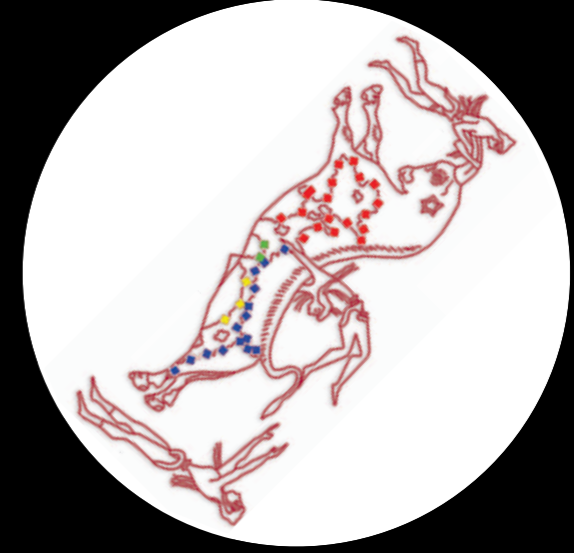
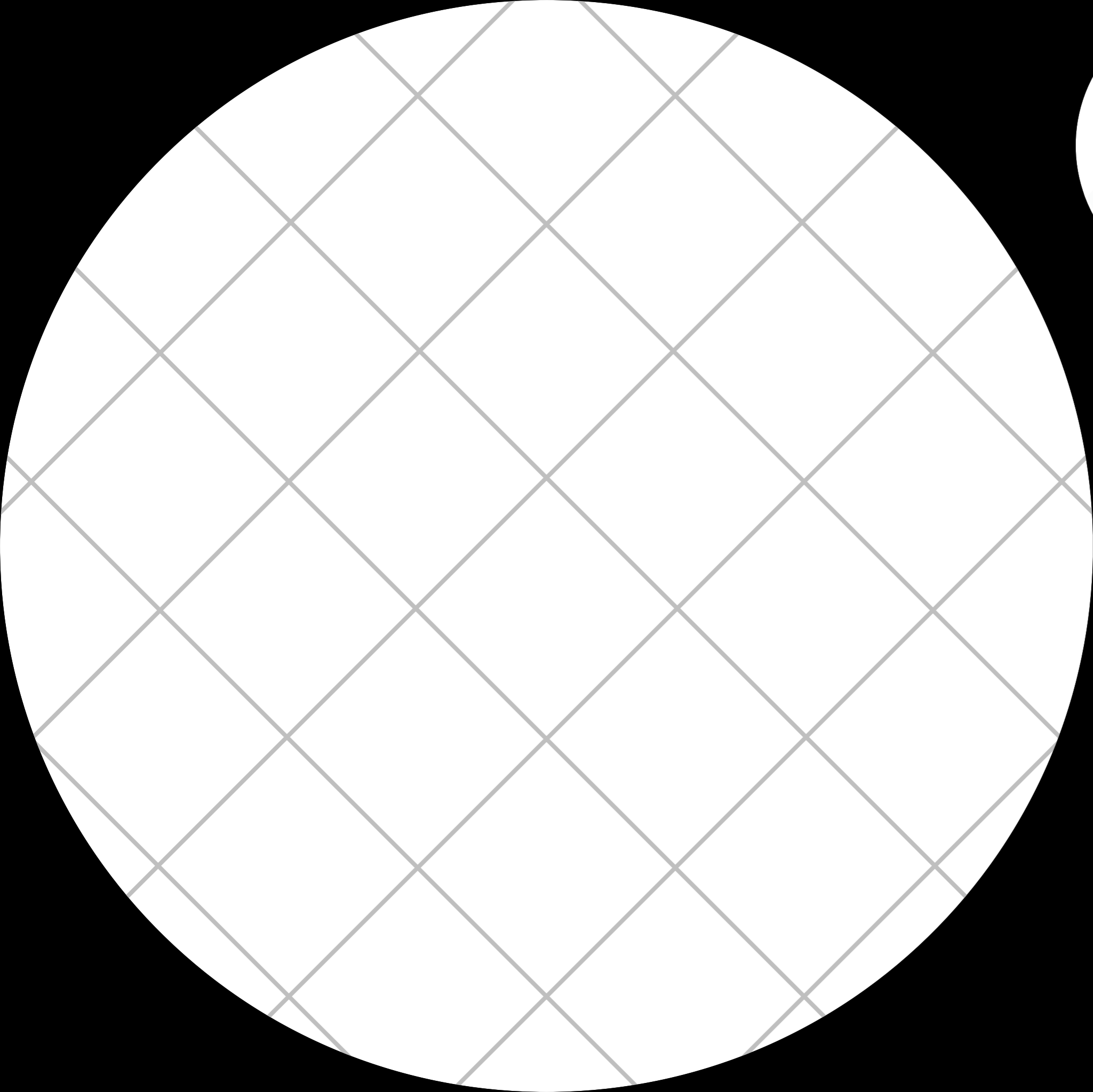




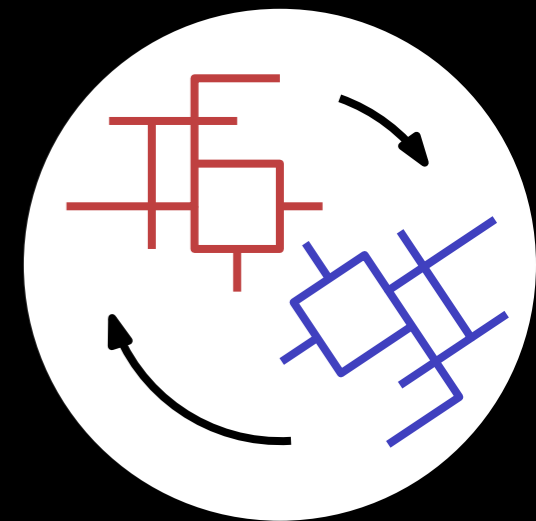


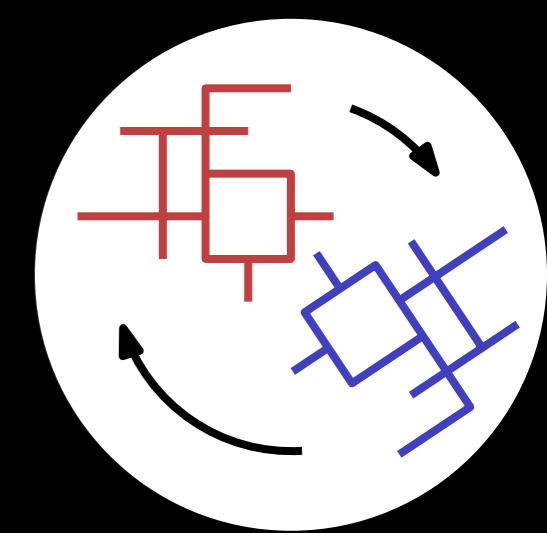
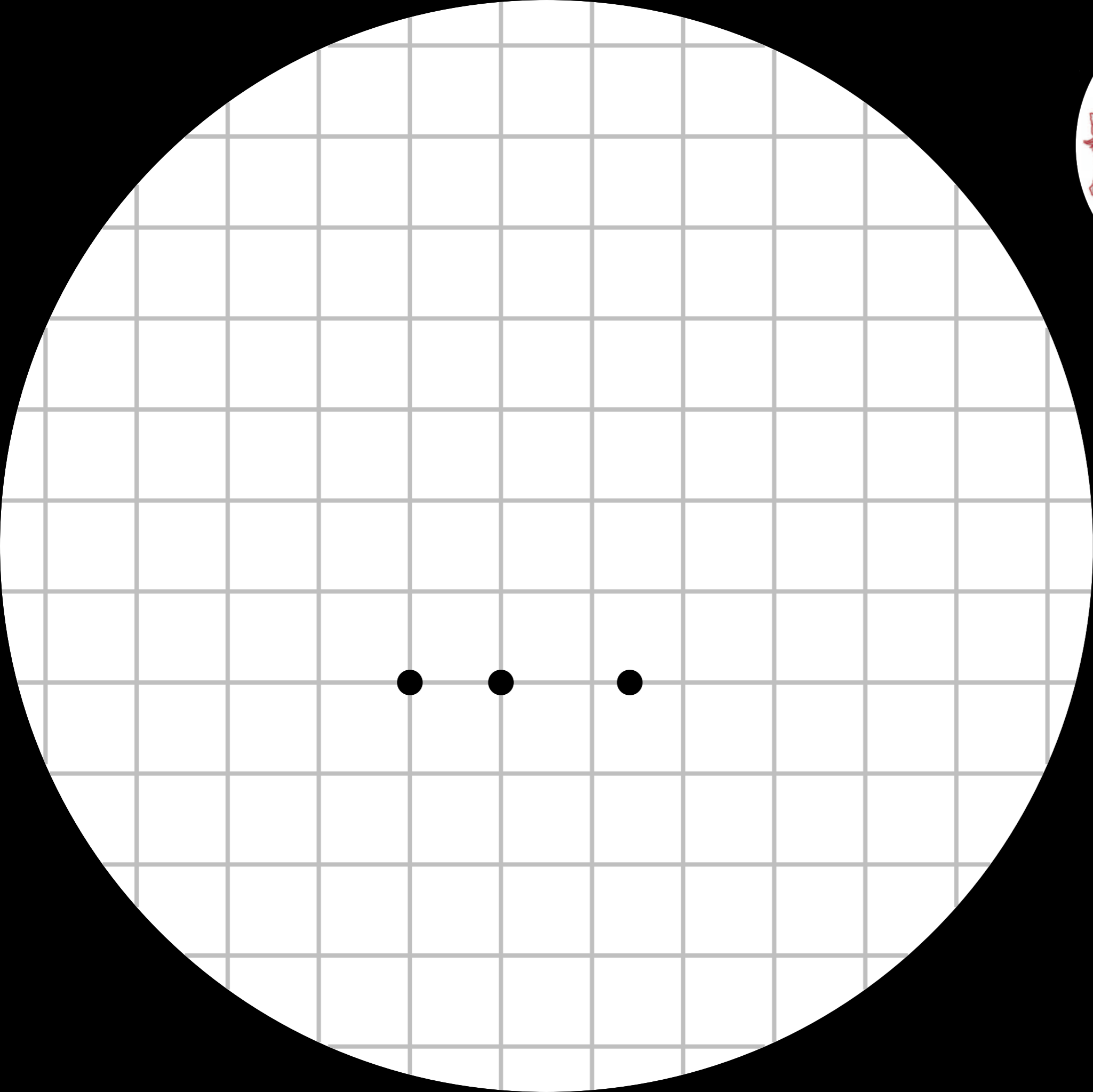


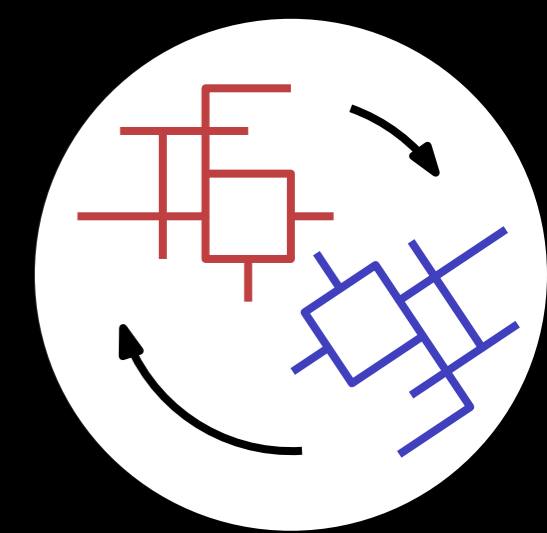
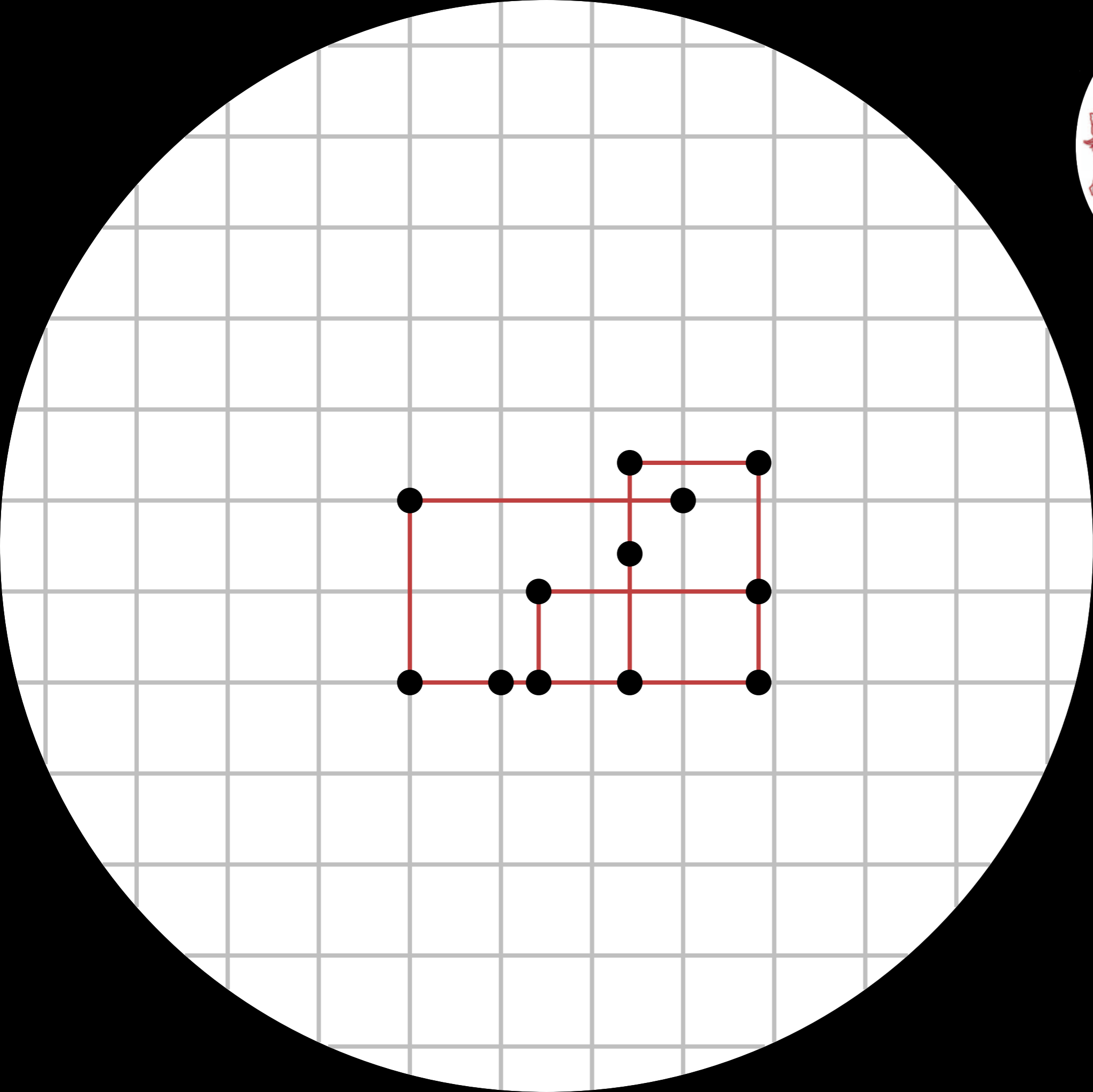


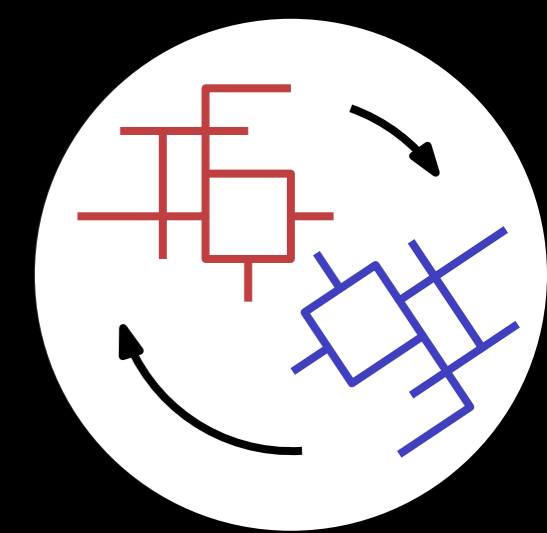
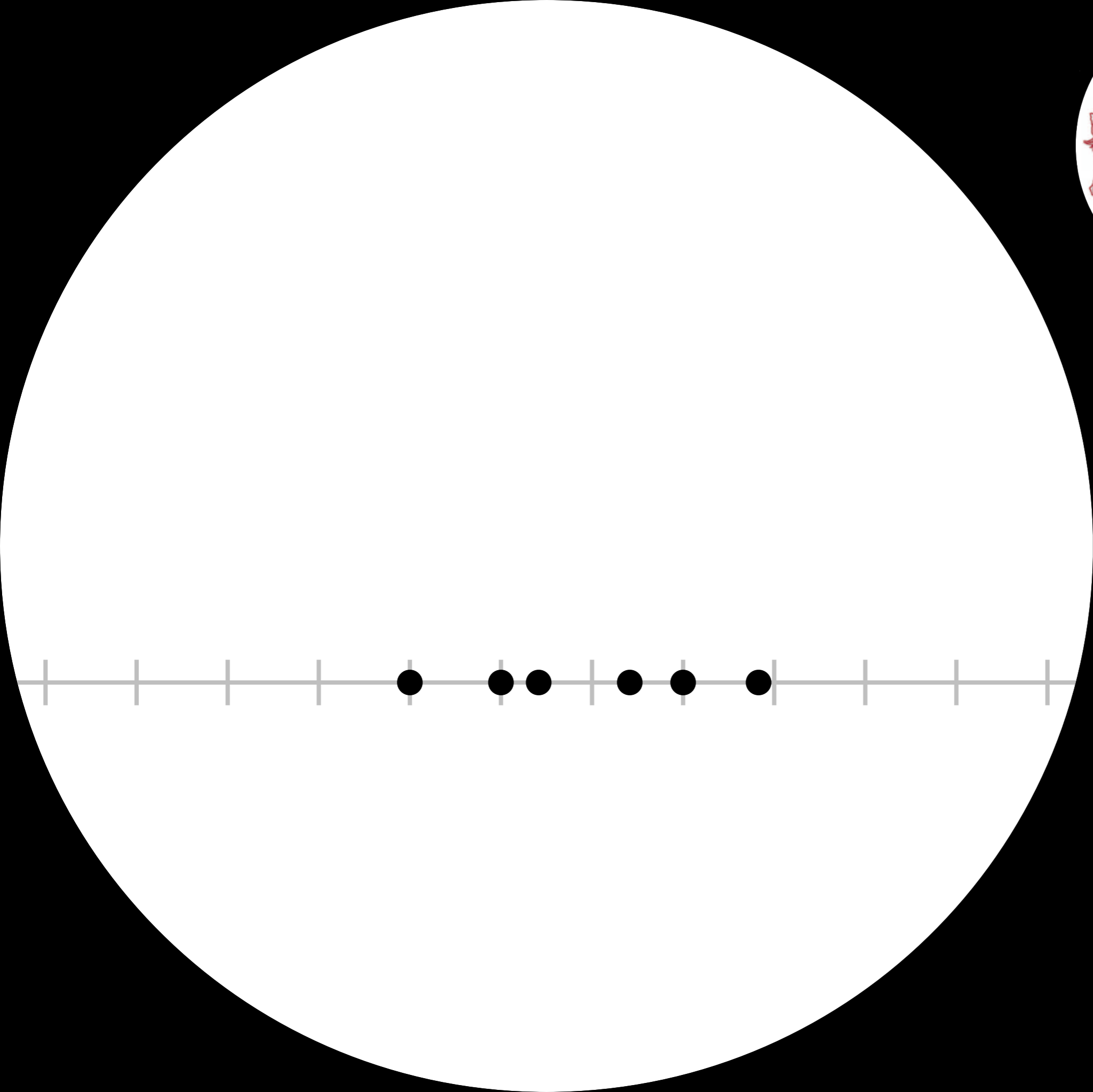


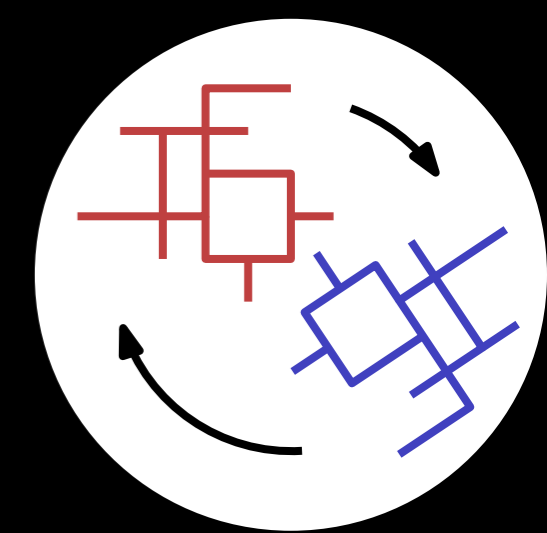
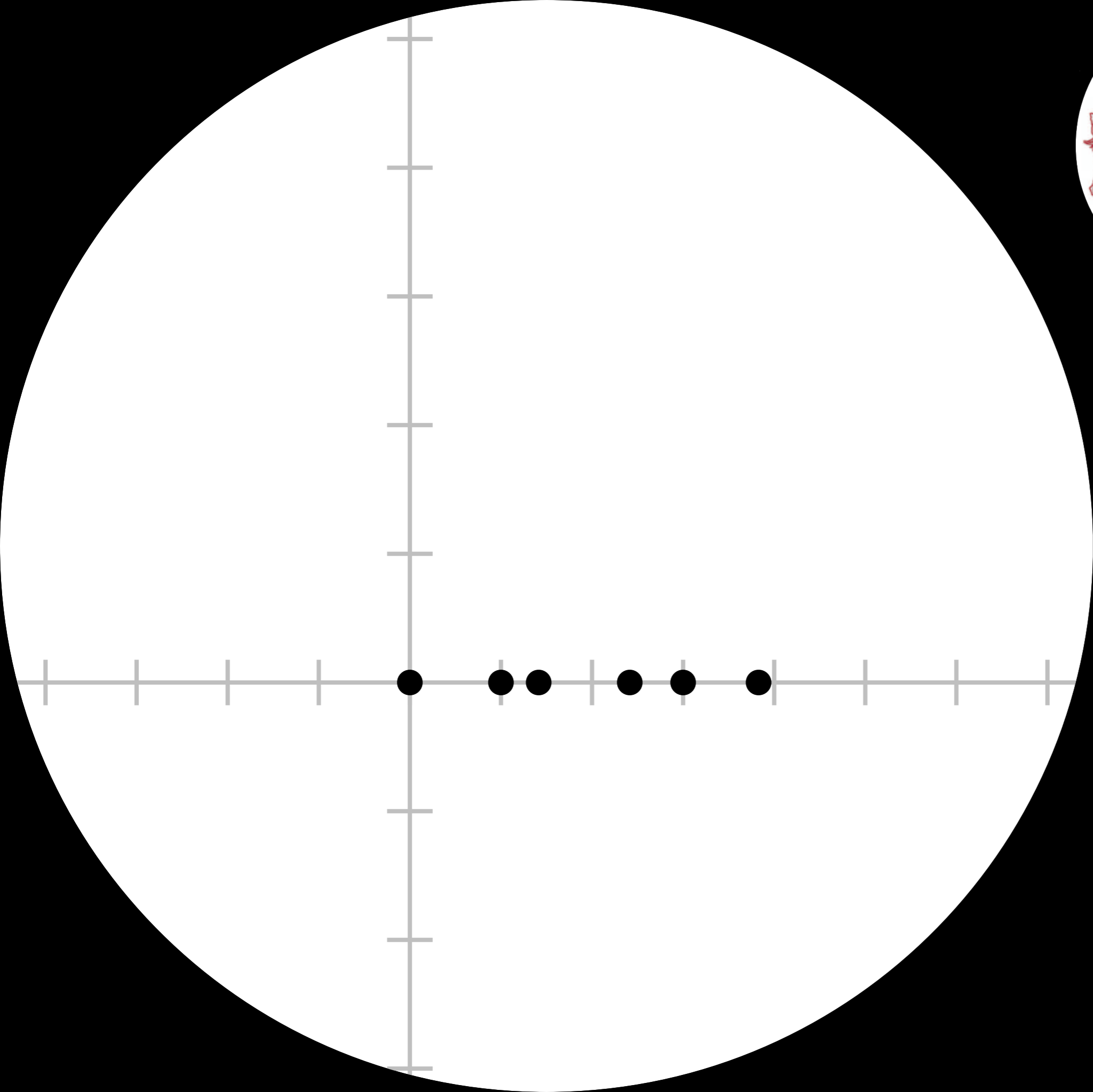
That's good, but what if my coordinates are not integers?

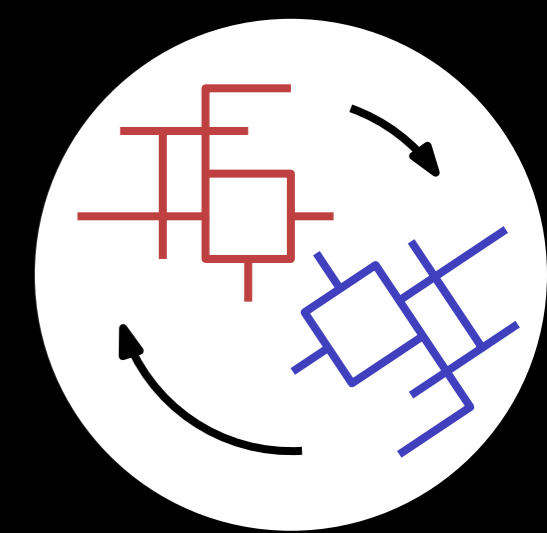
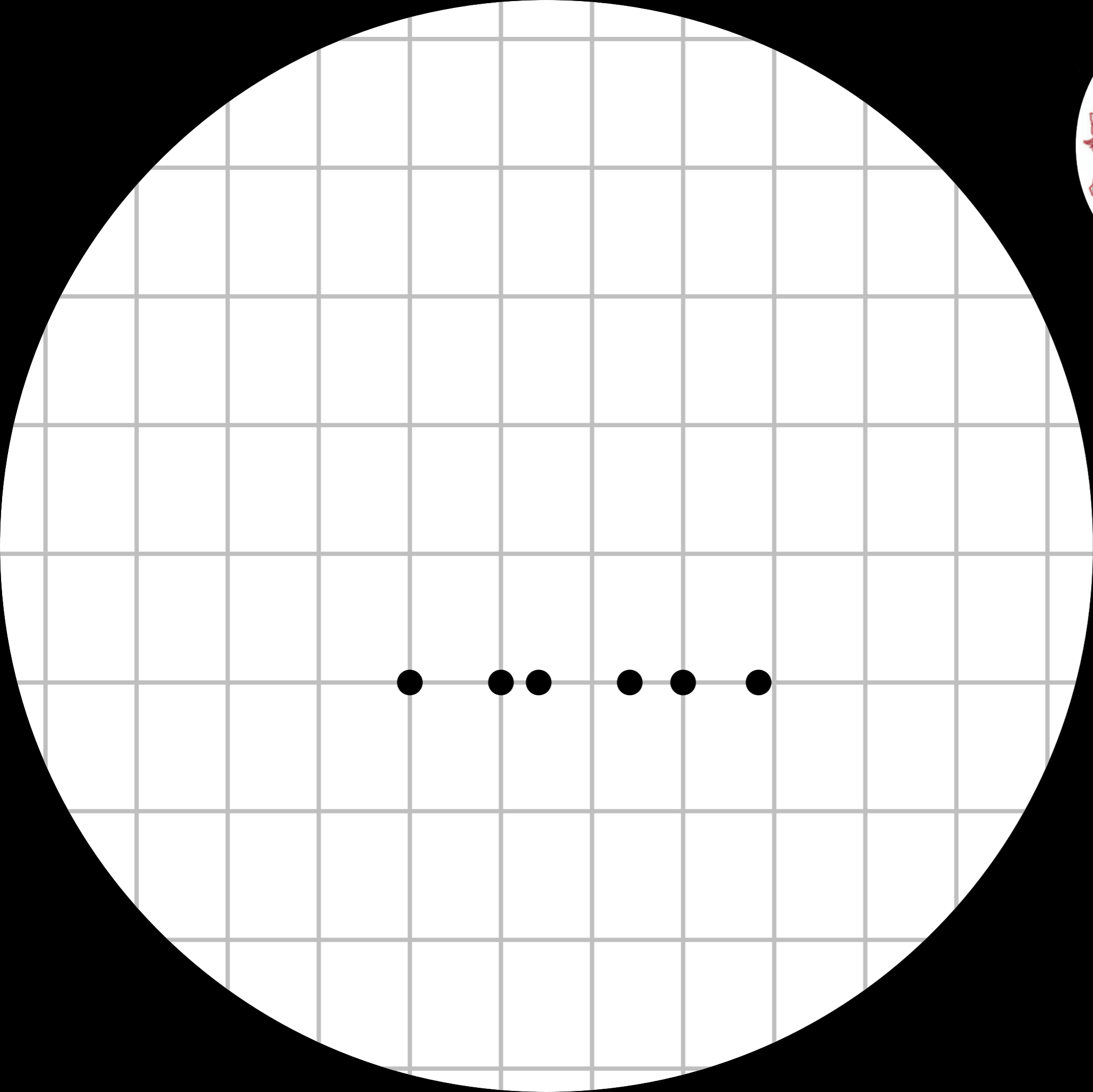


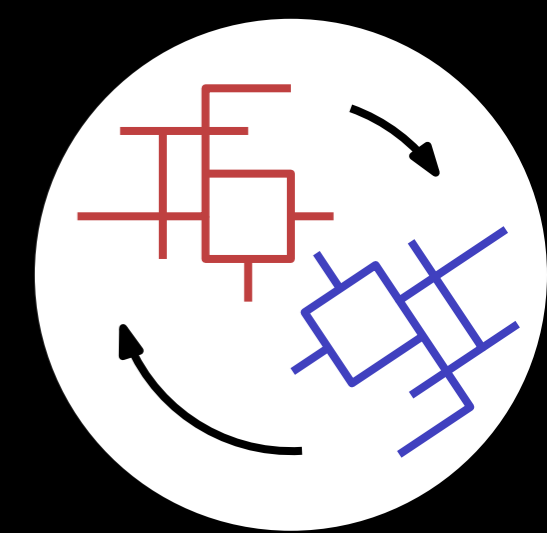
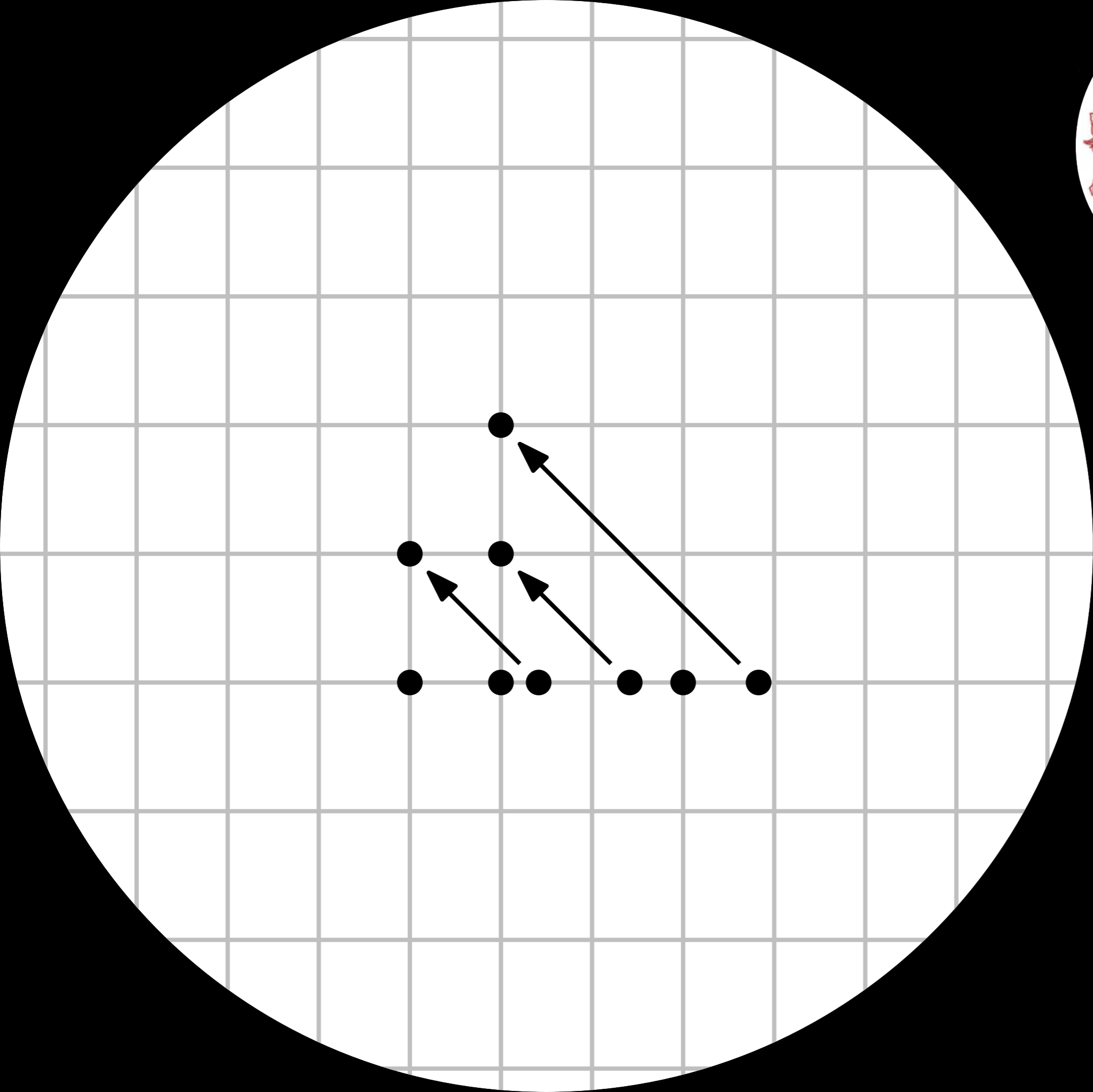


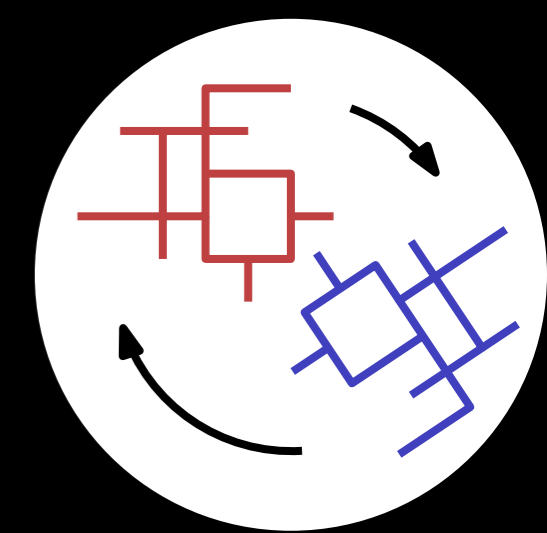
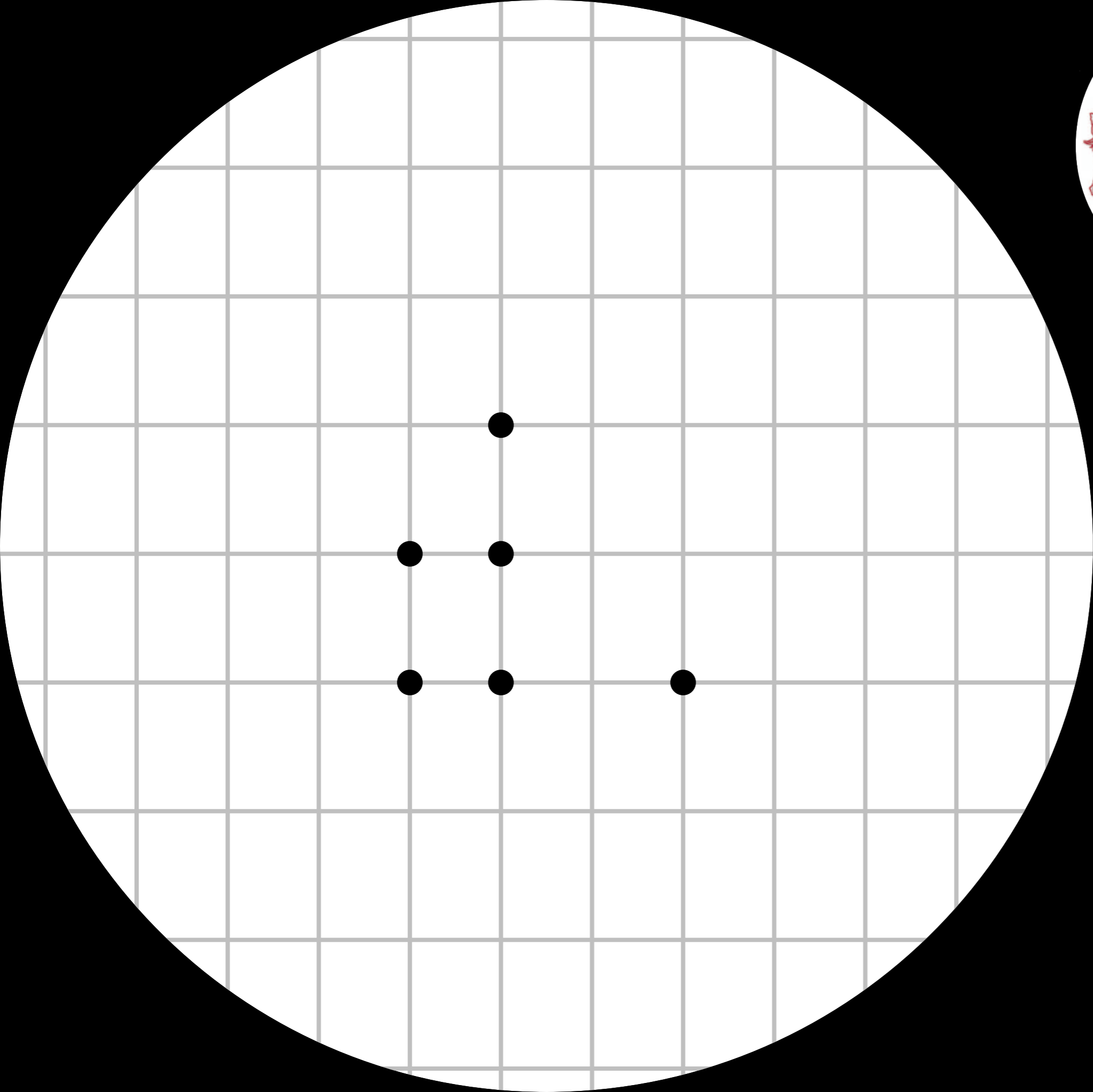


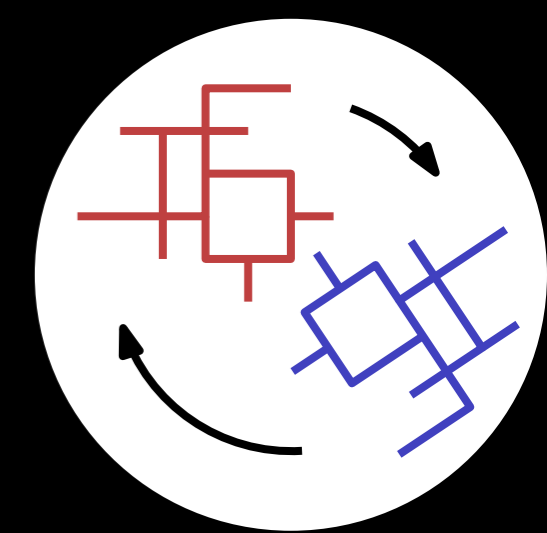
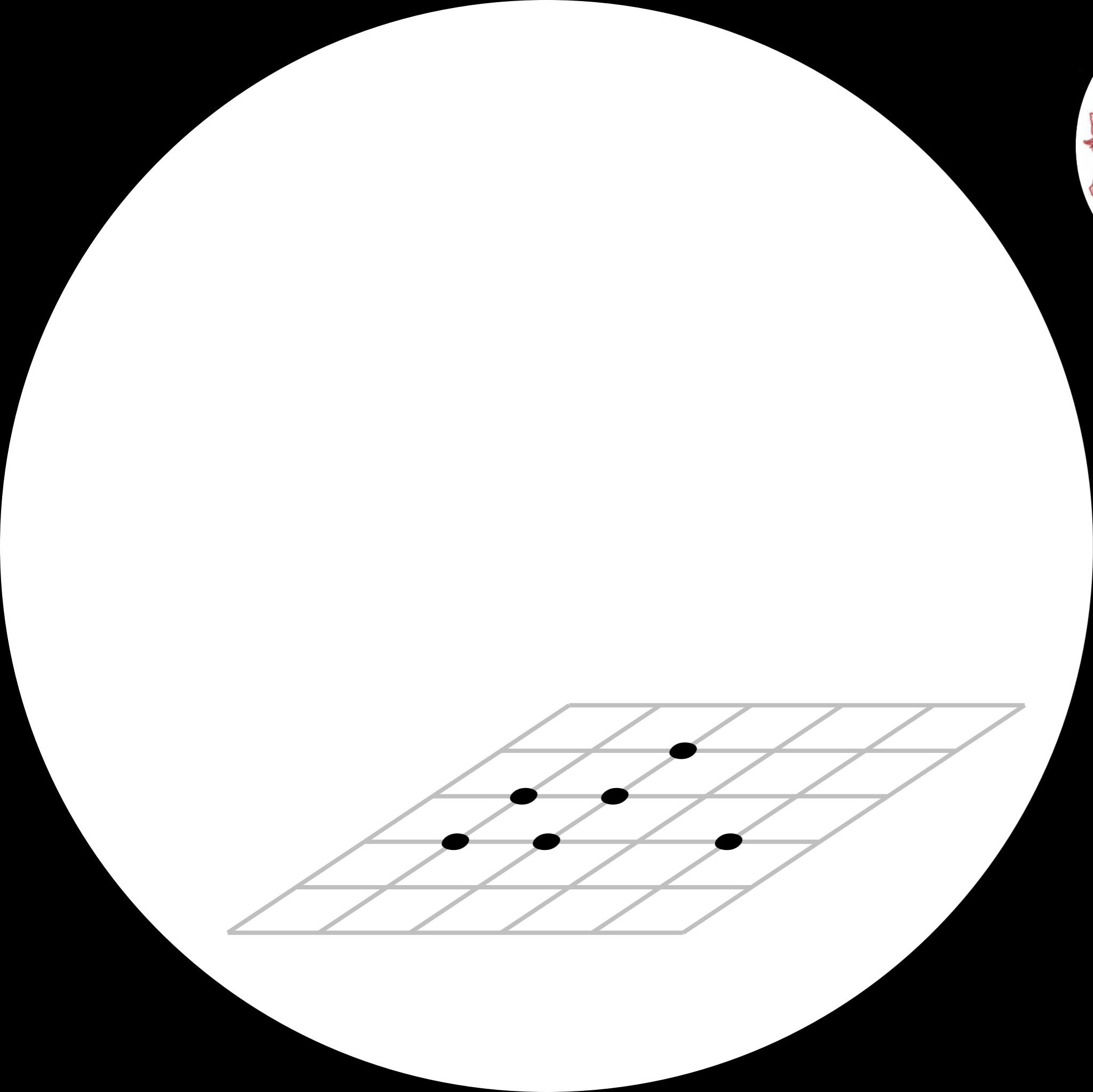


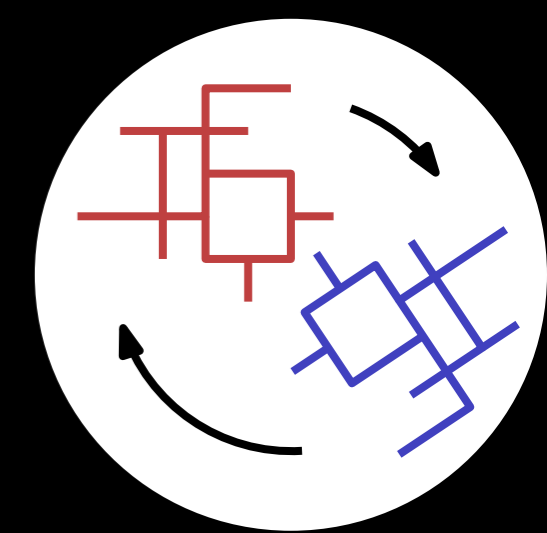
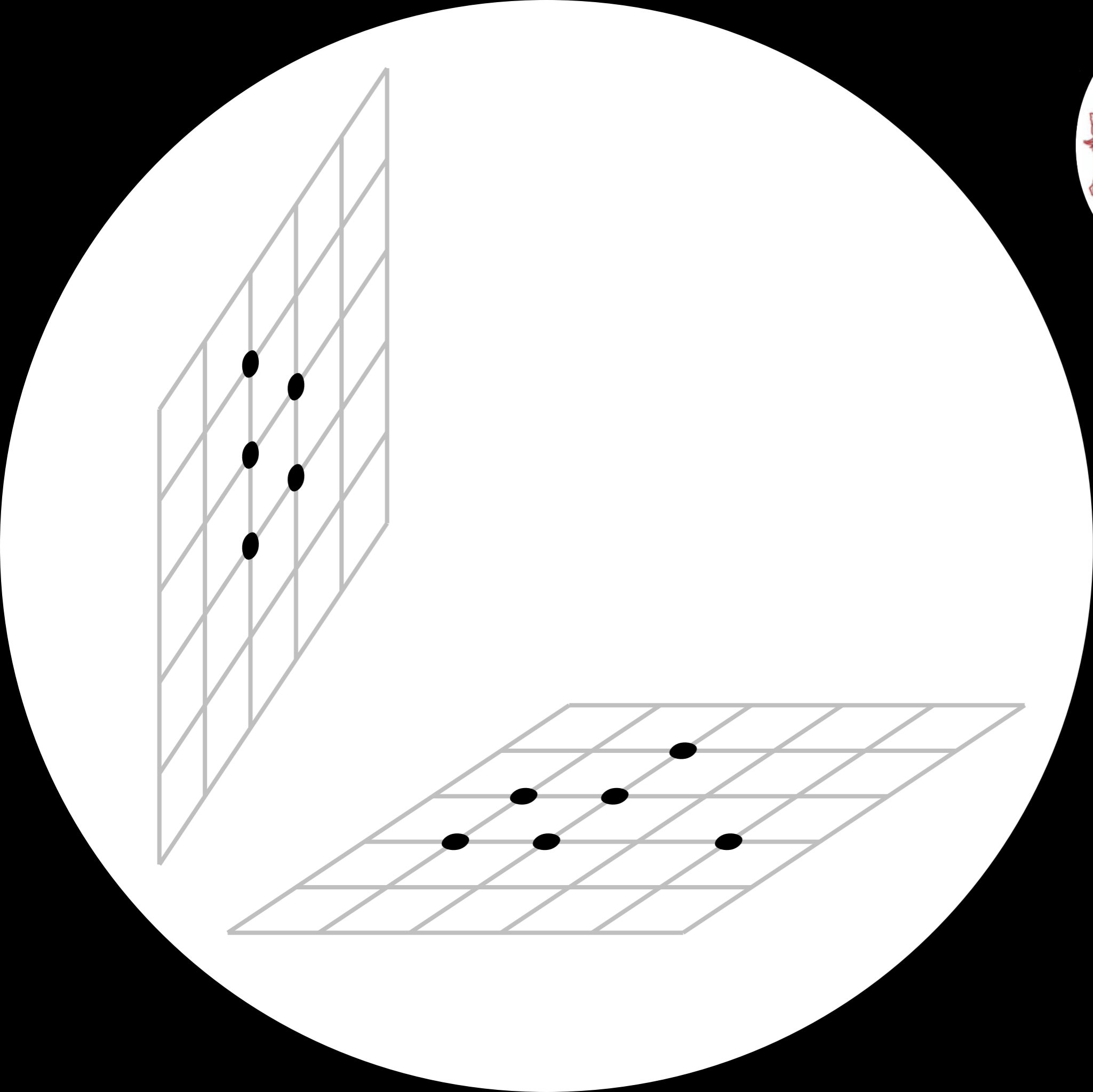


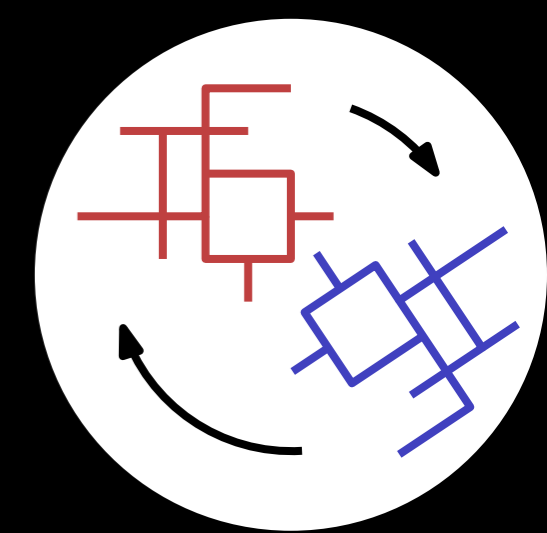
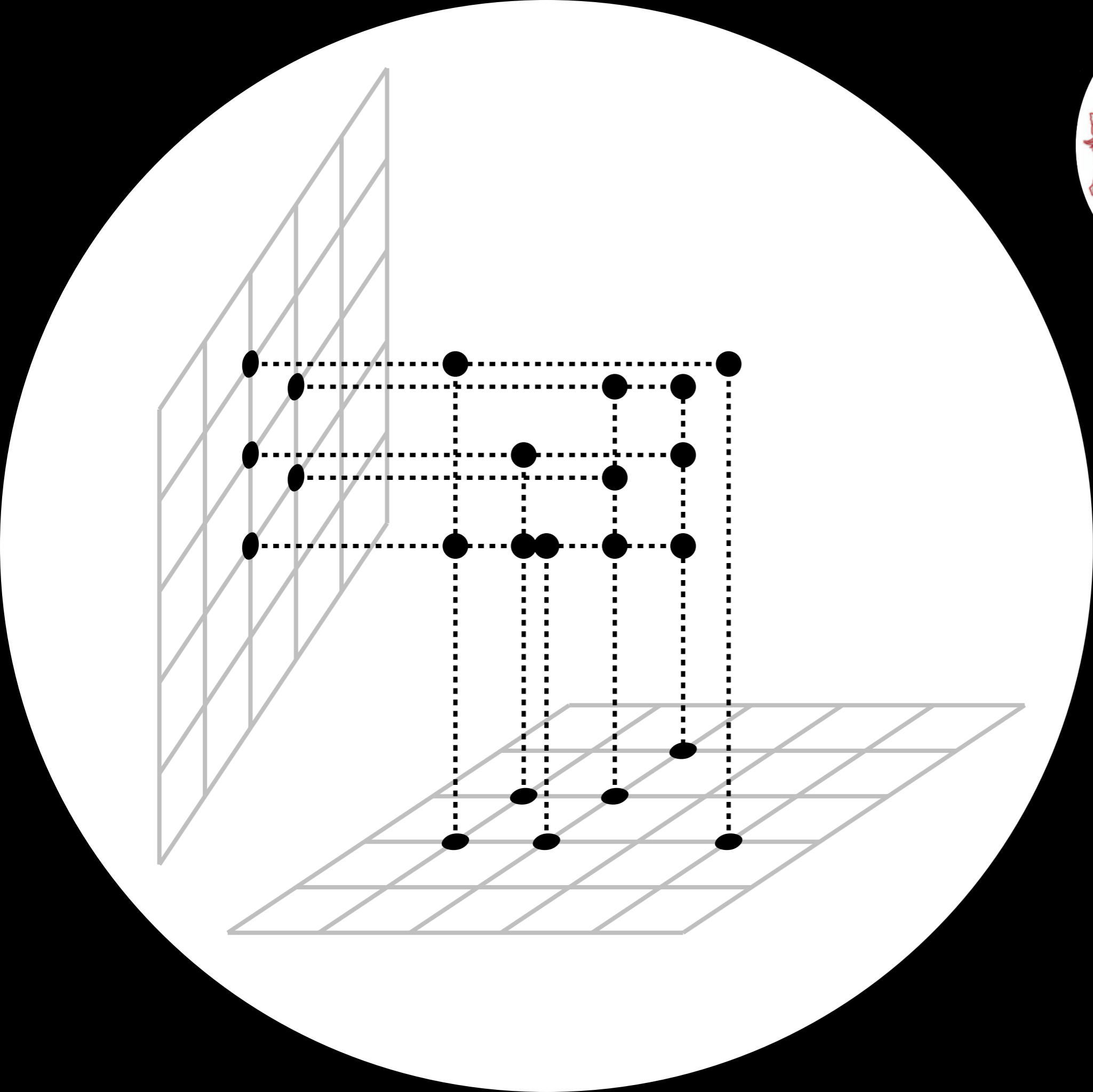


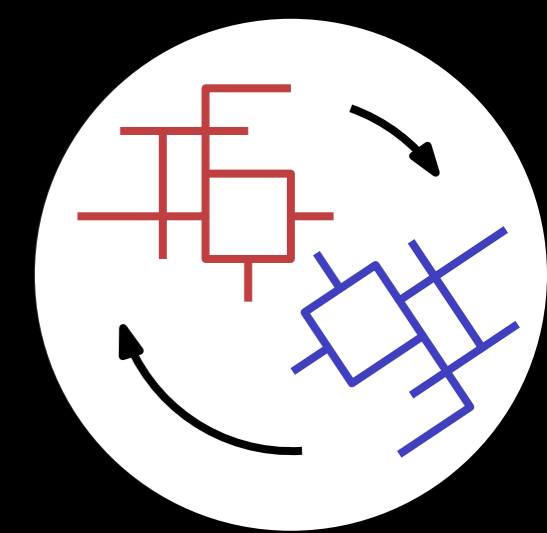
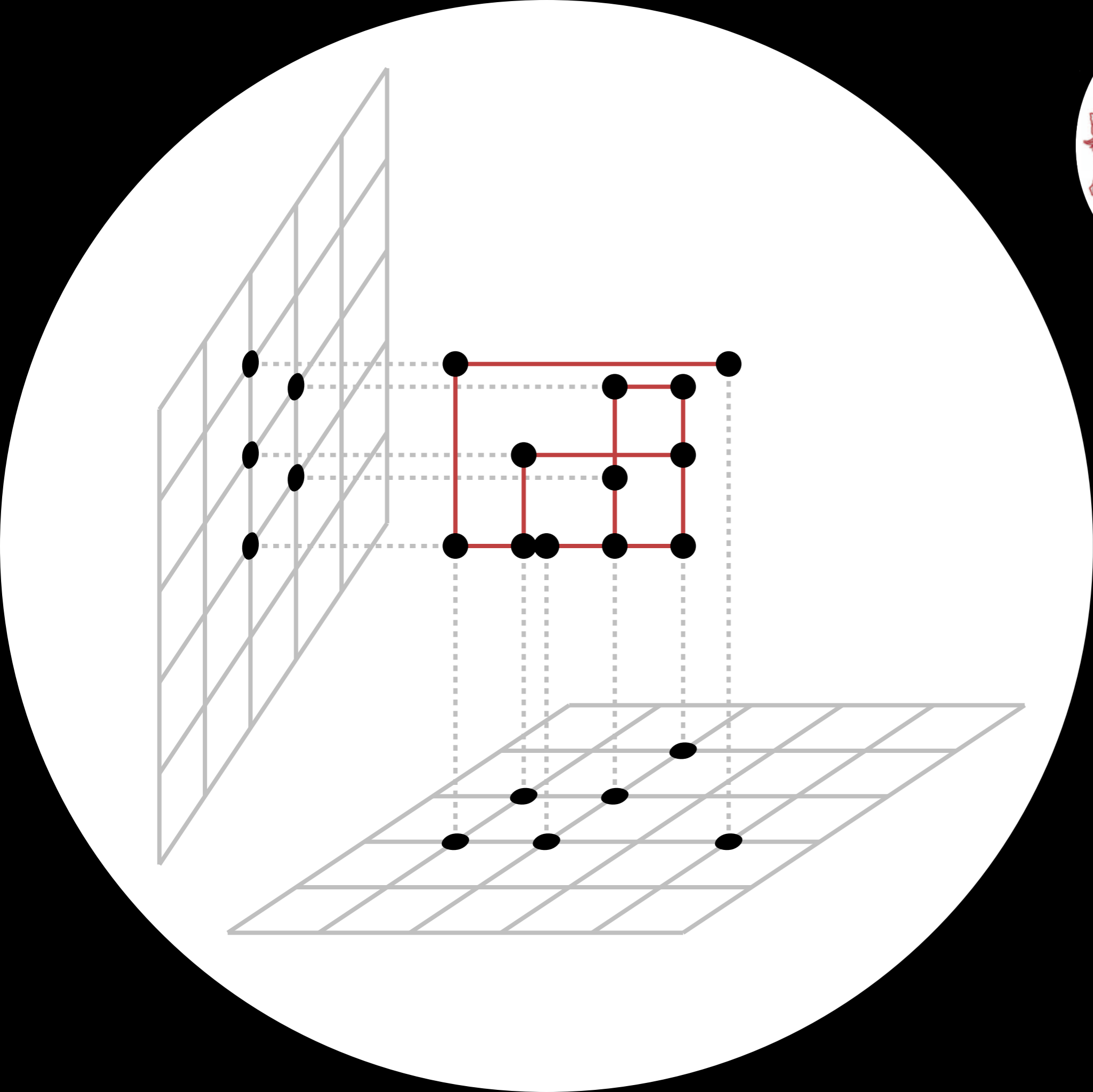


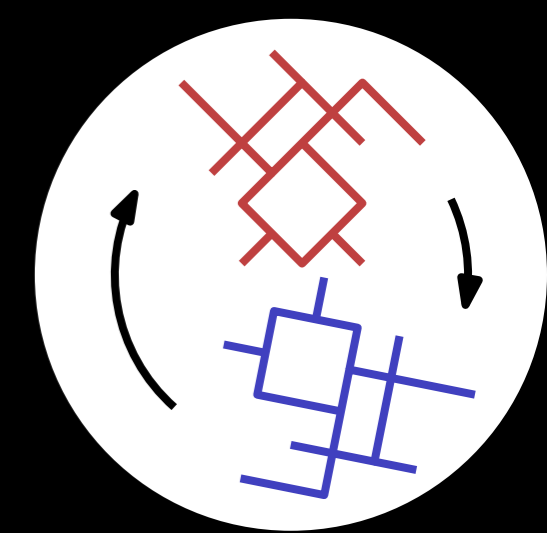
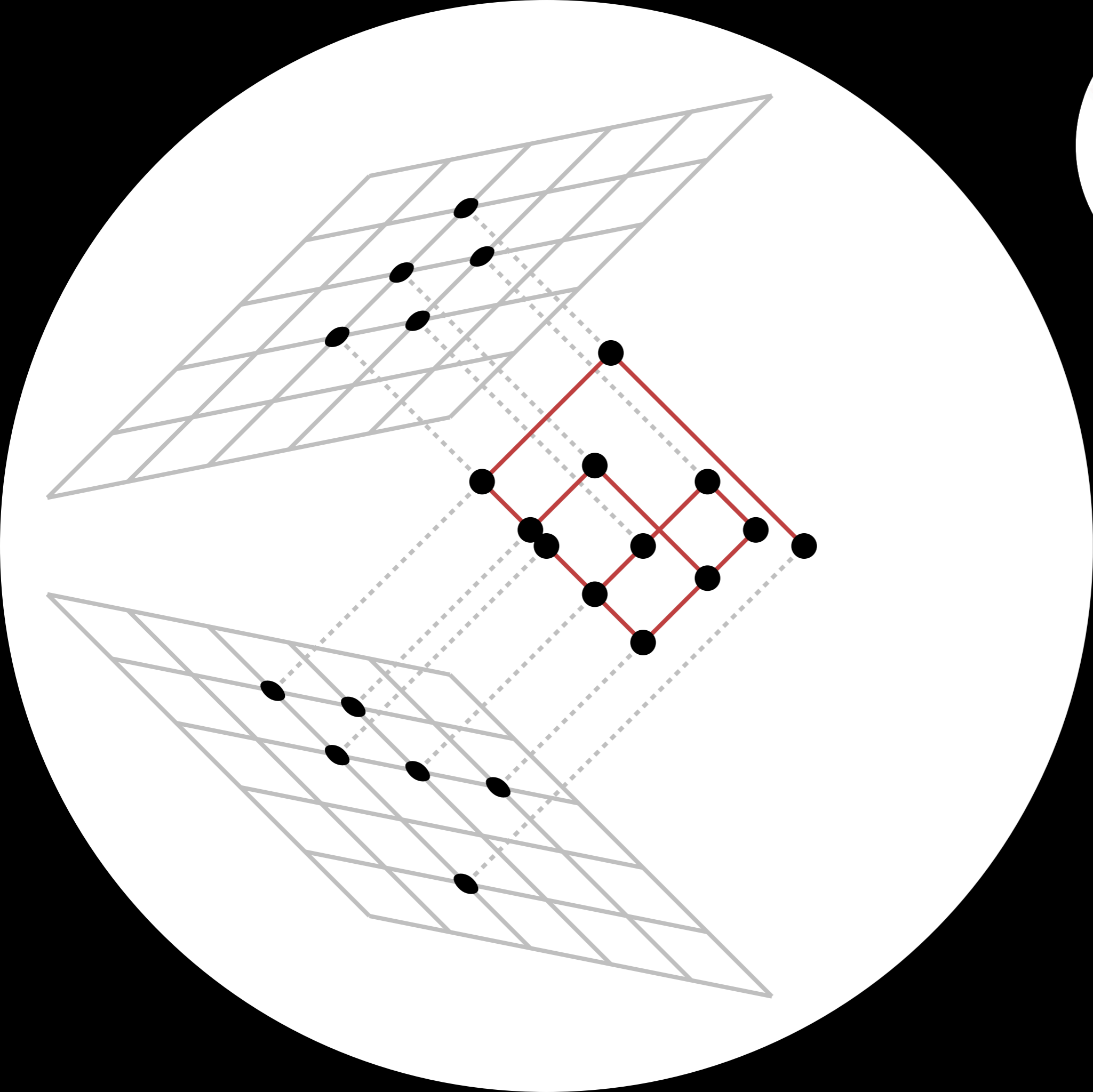


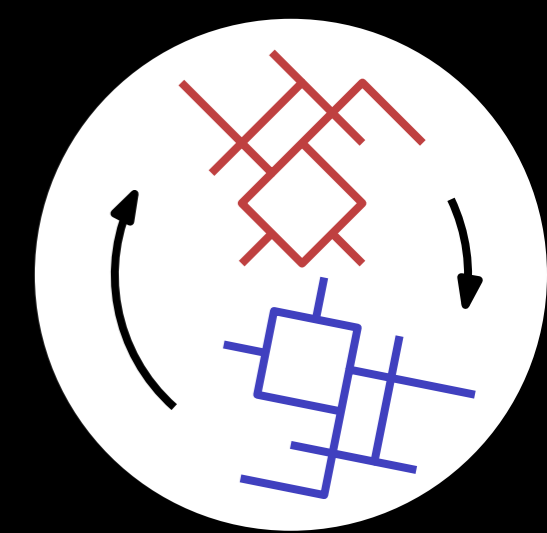
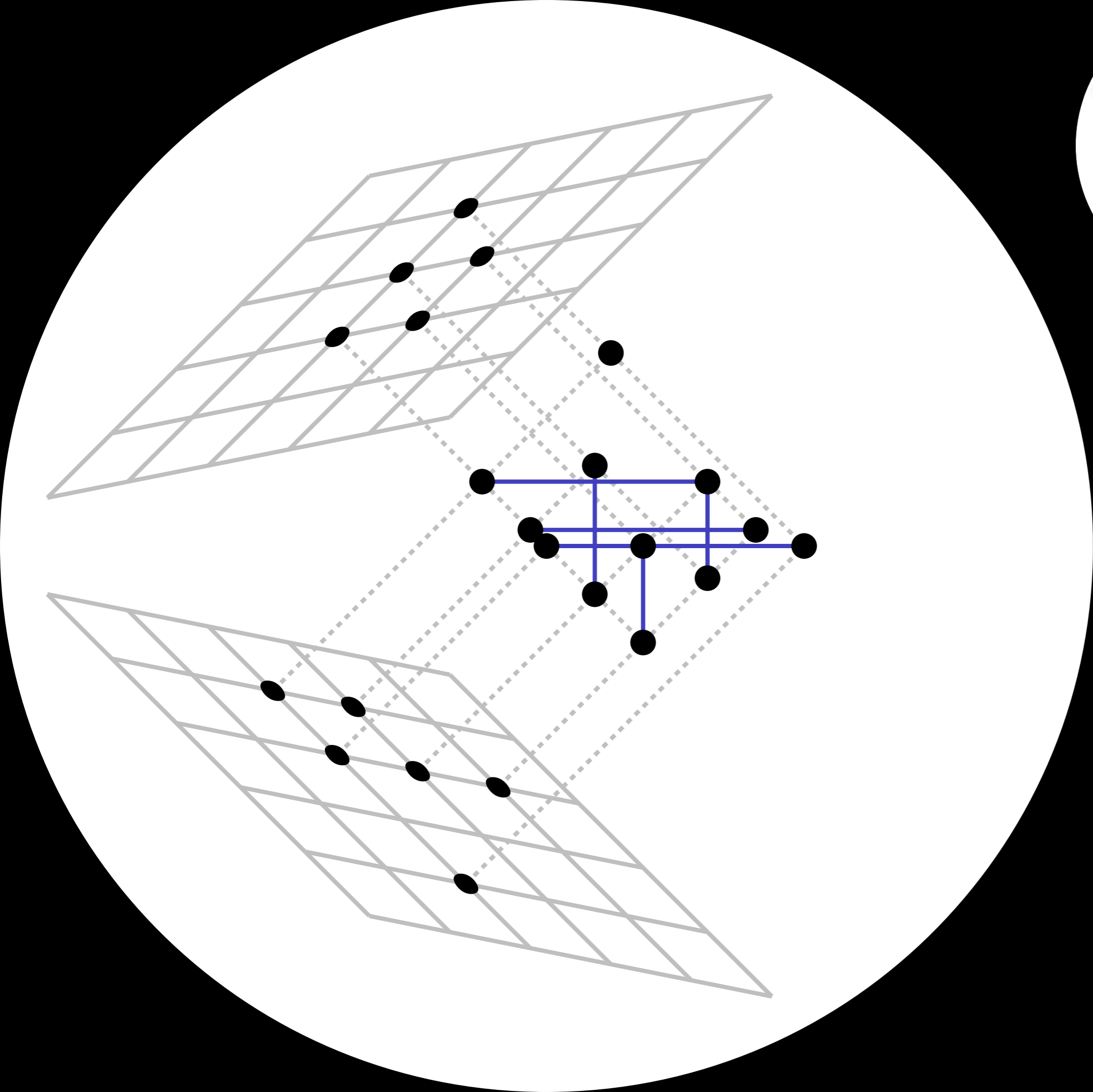




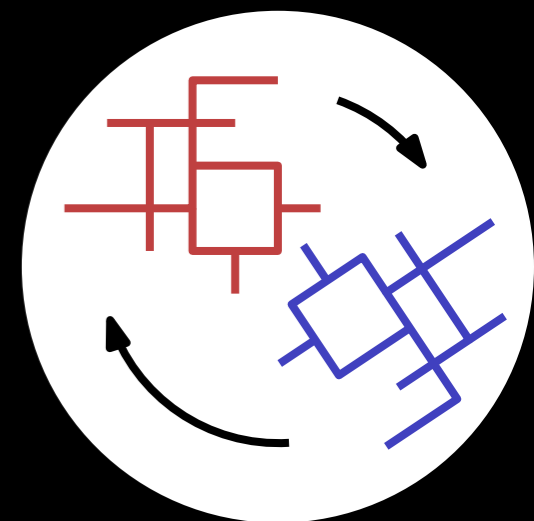


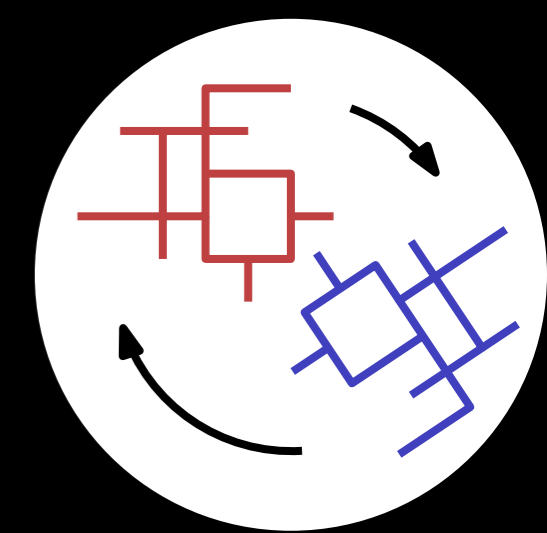
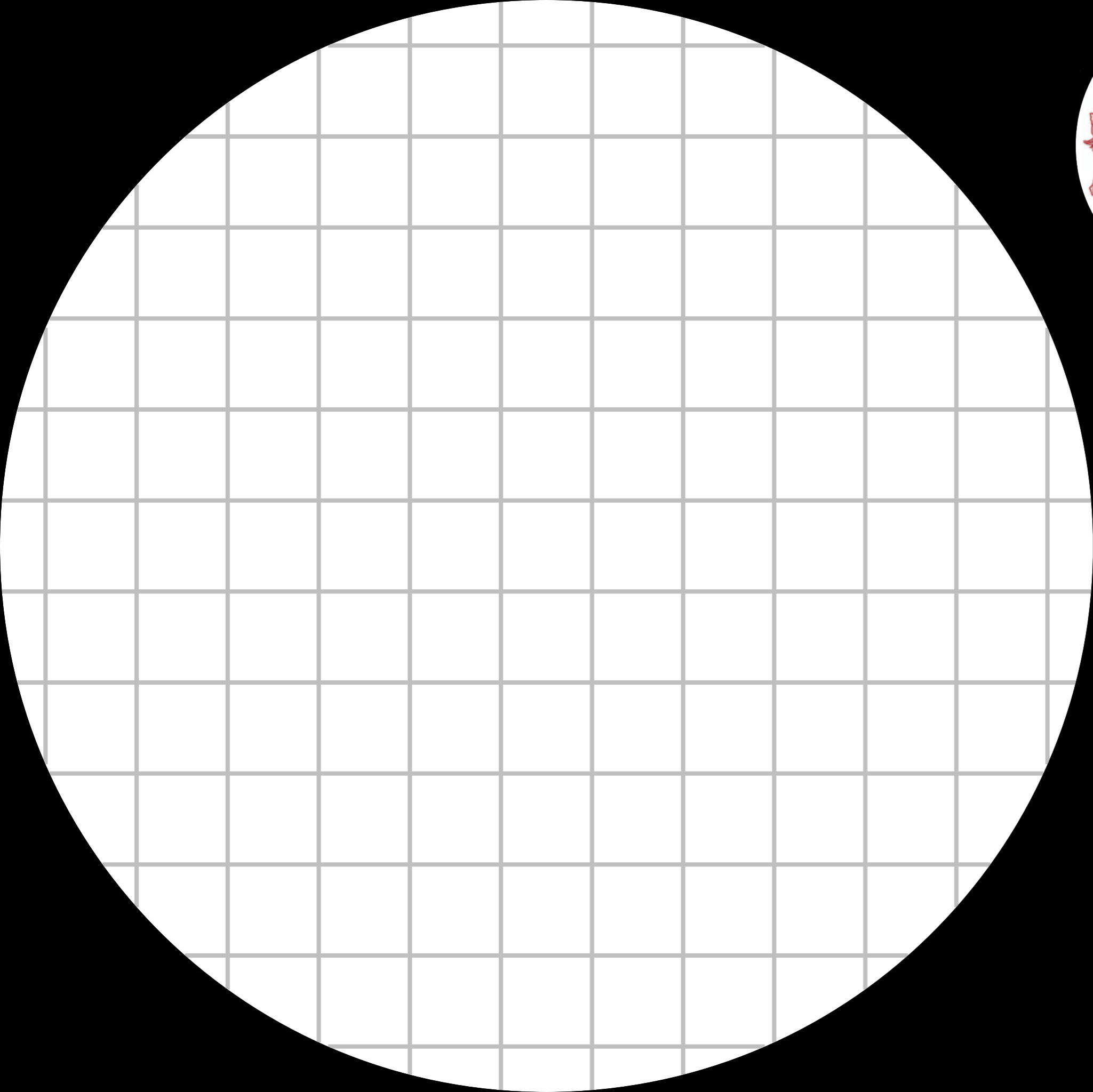


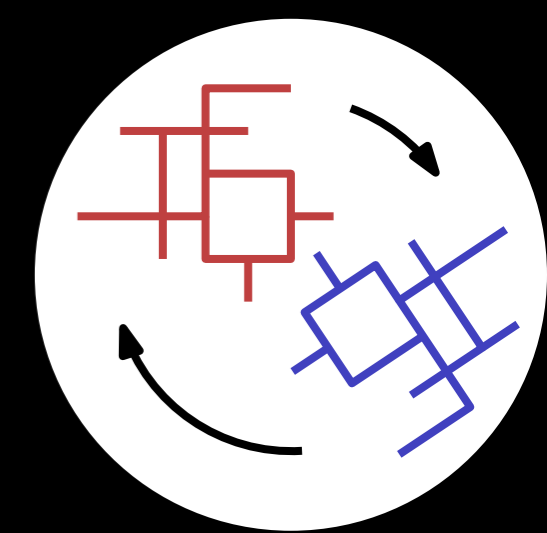
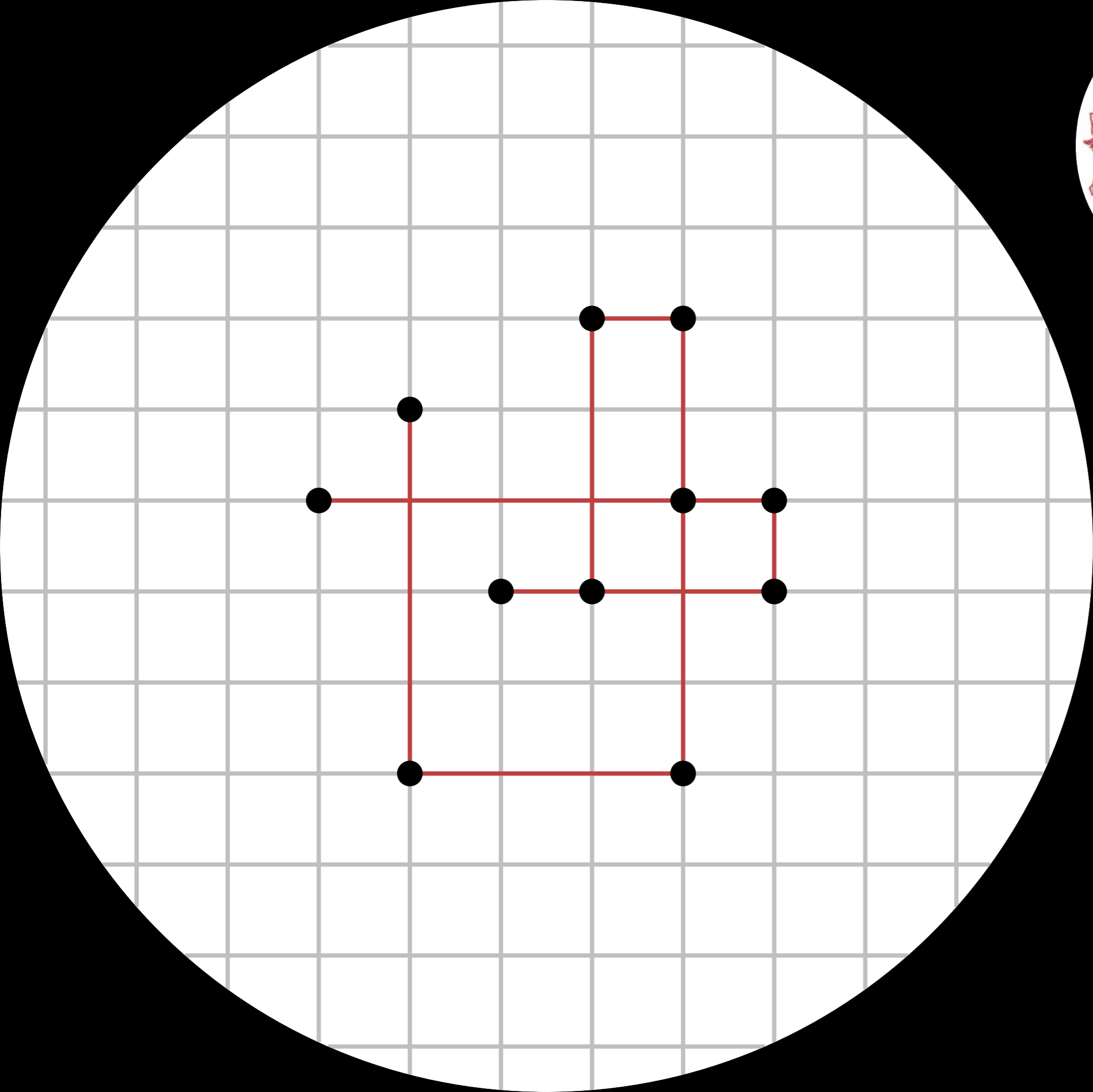


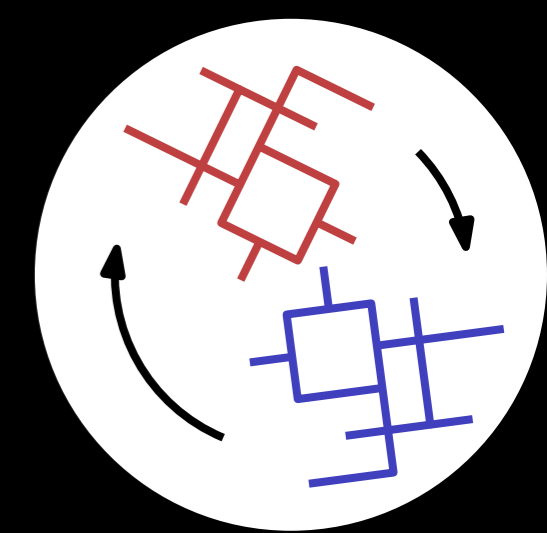
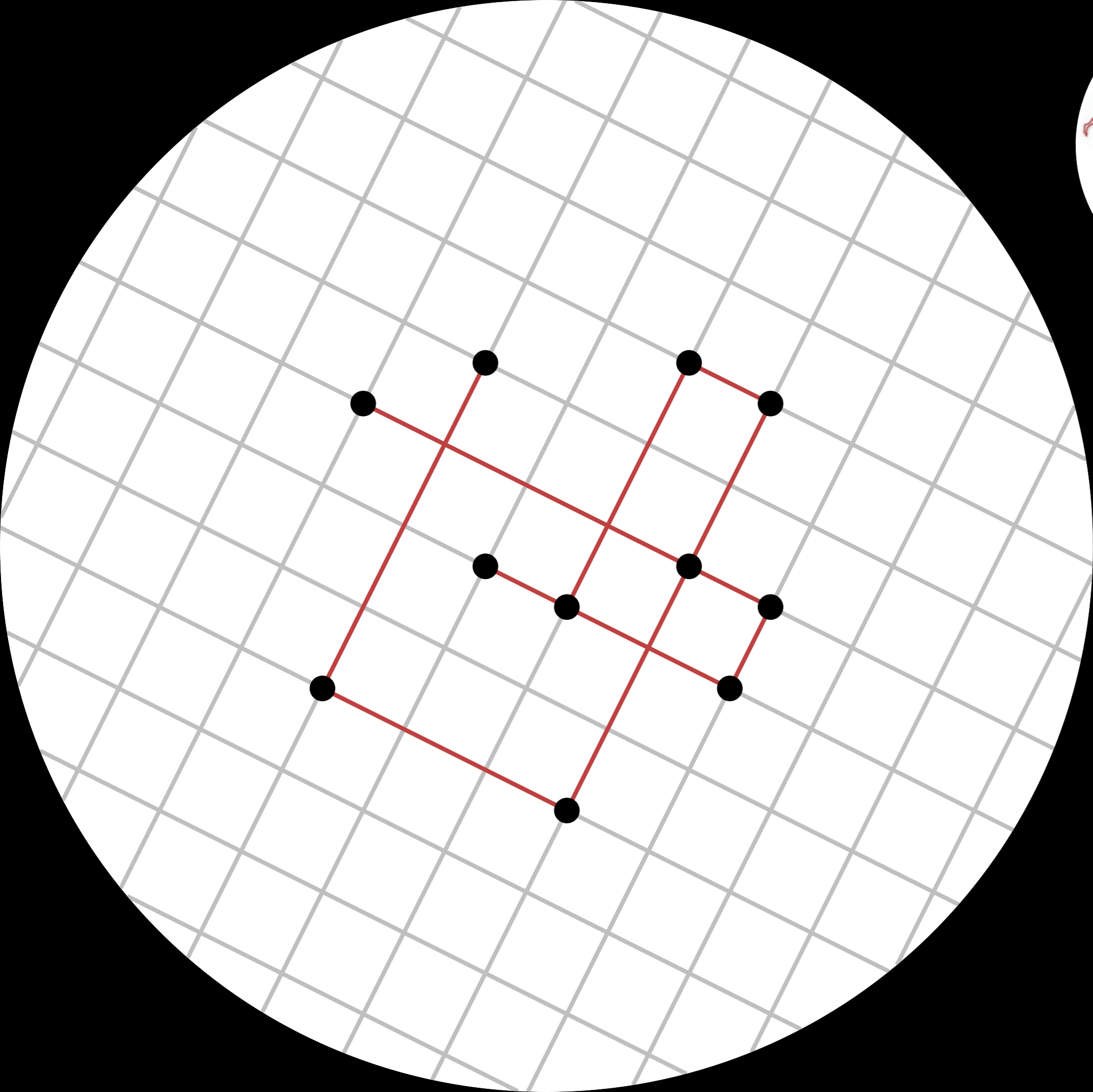


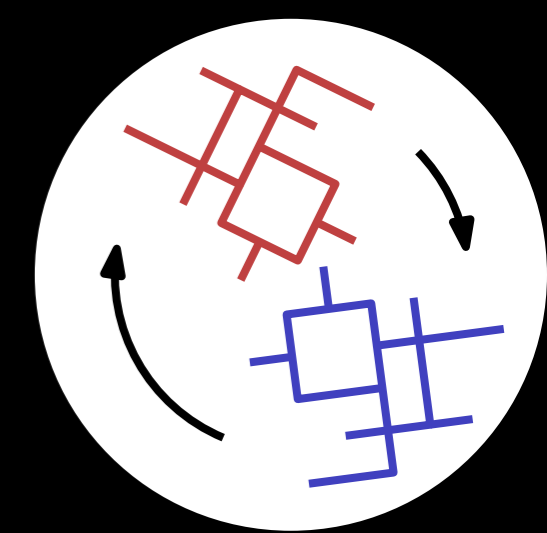
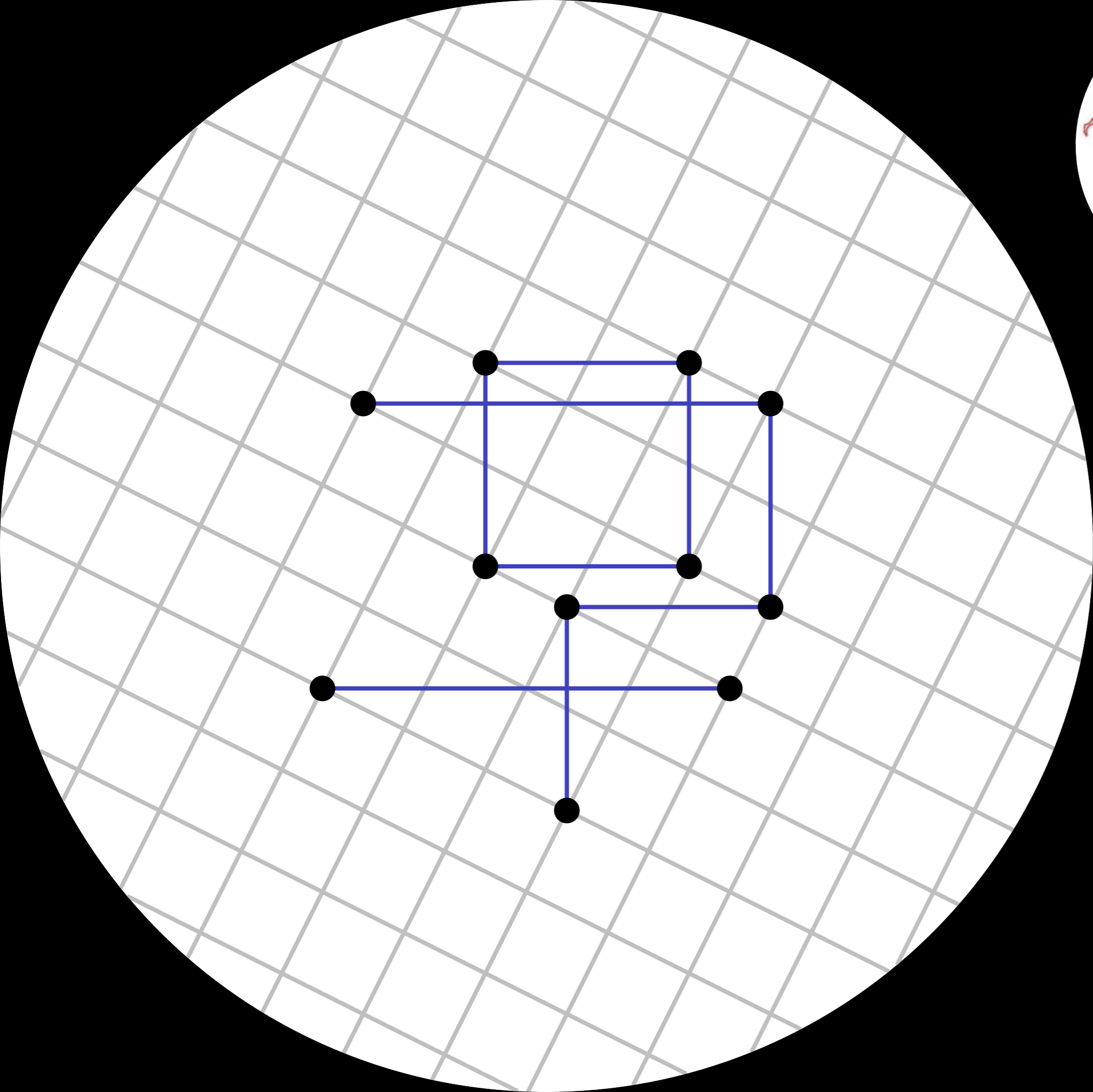
What about other slopes than 45° ?

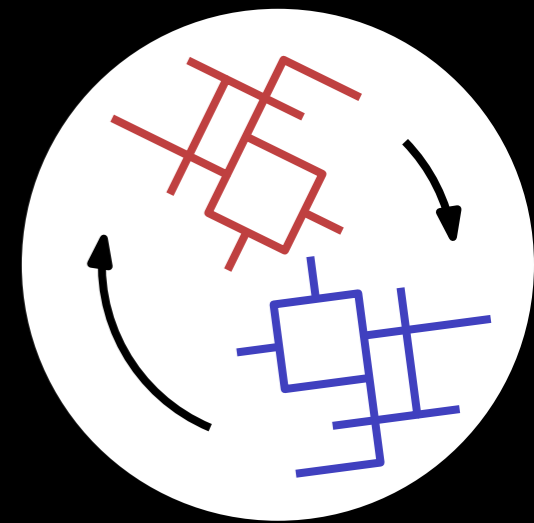
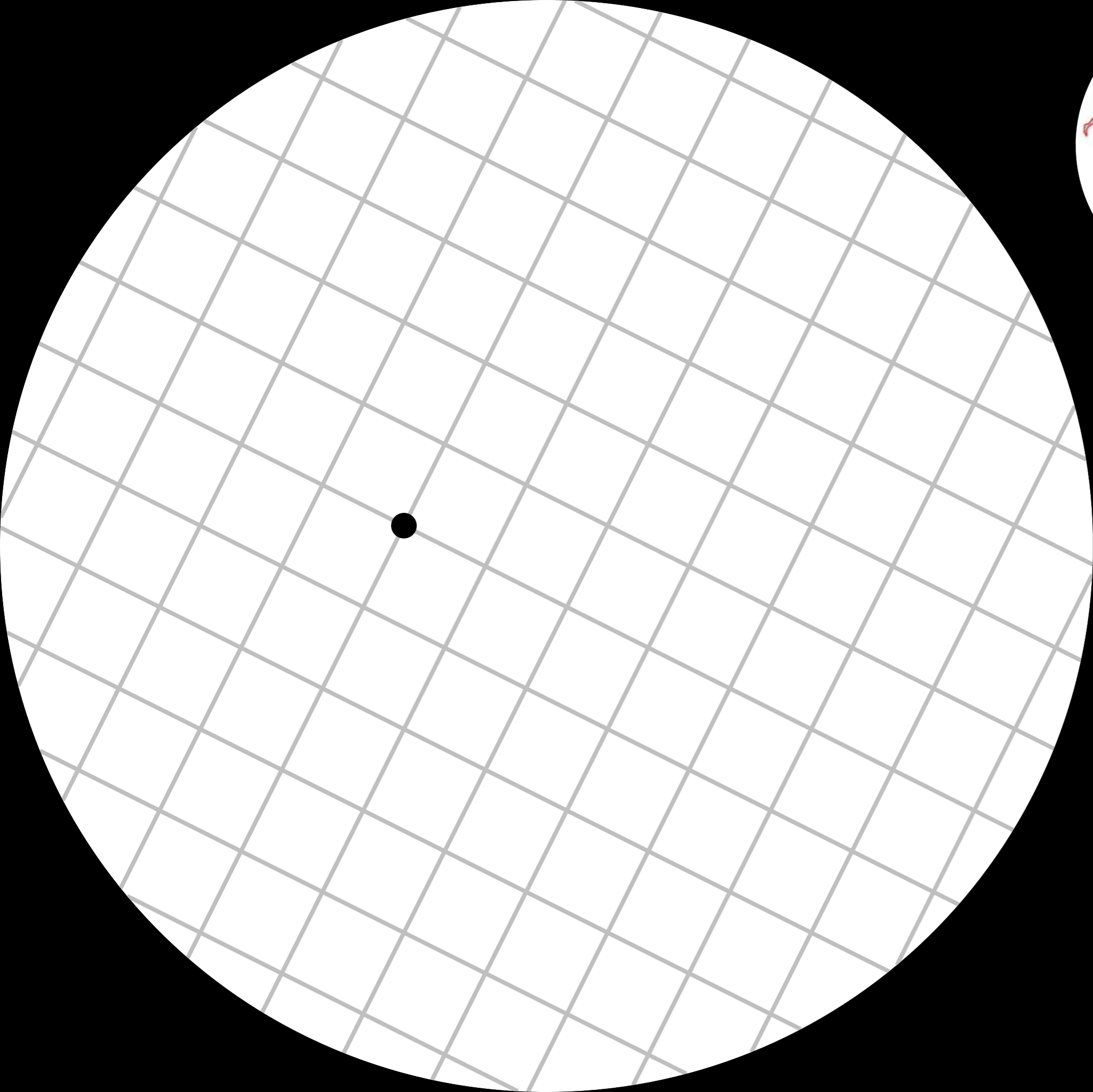


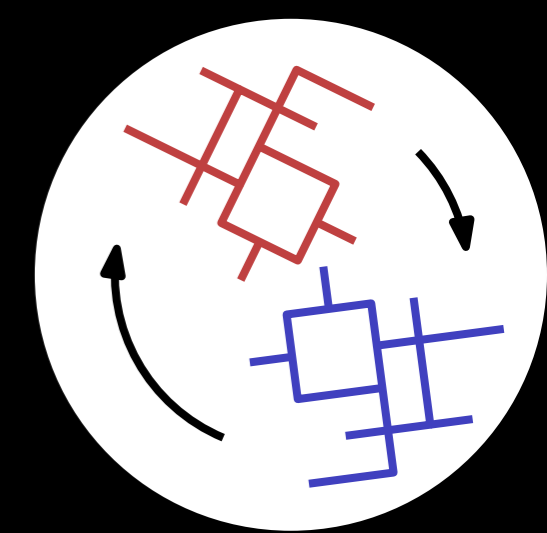
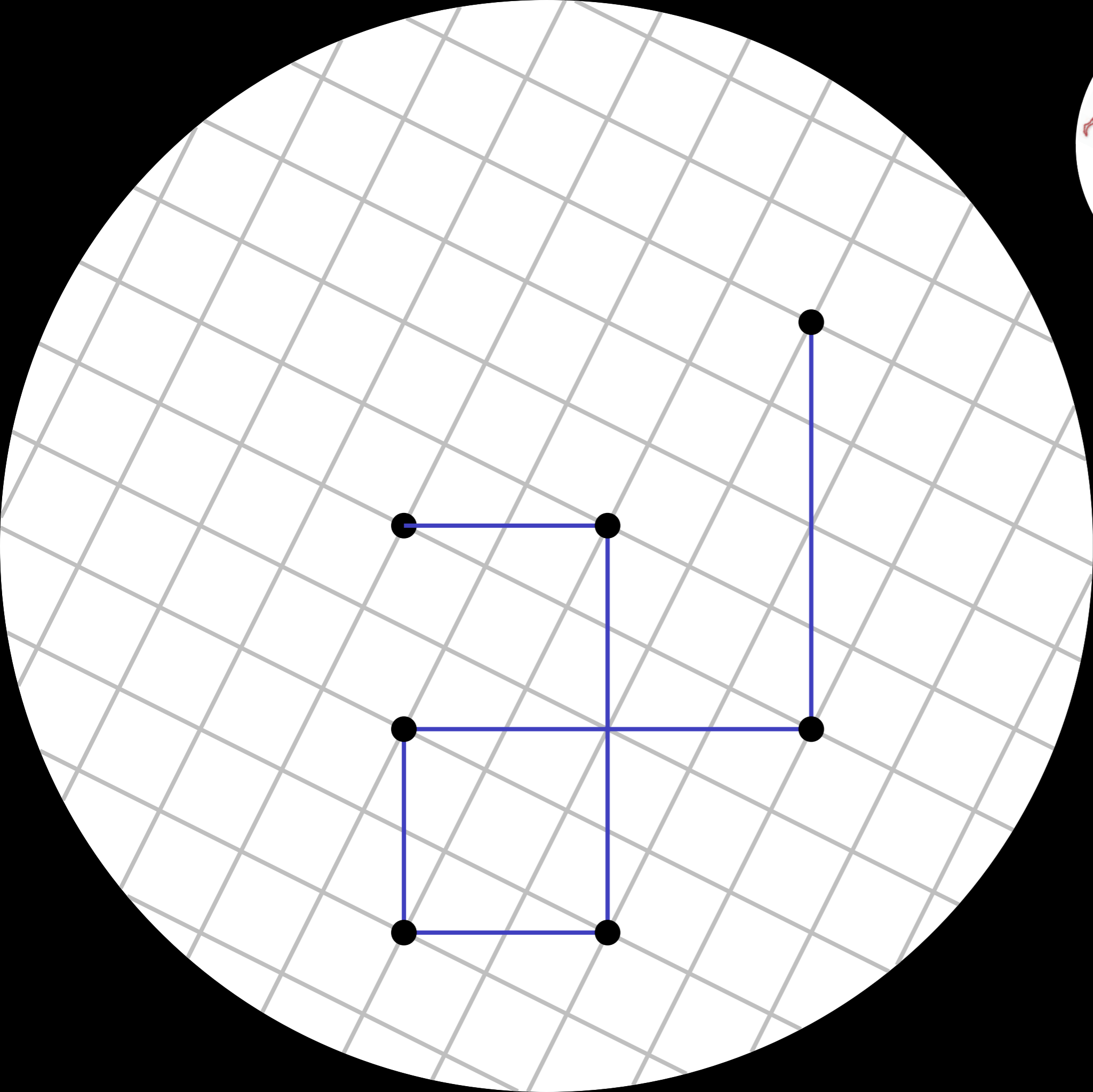


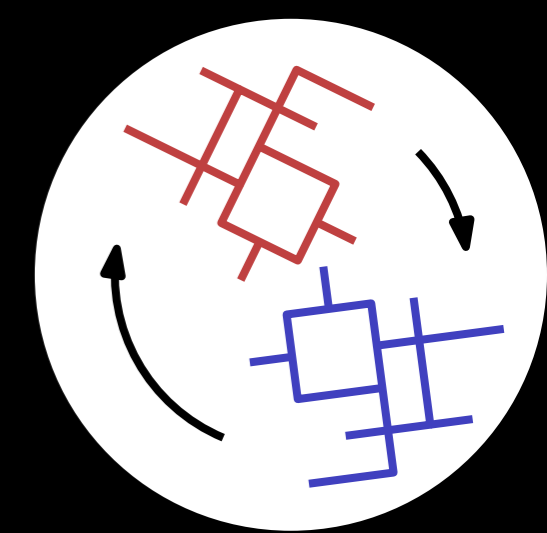
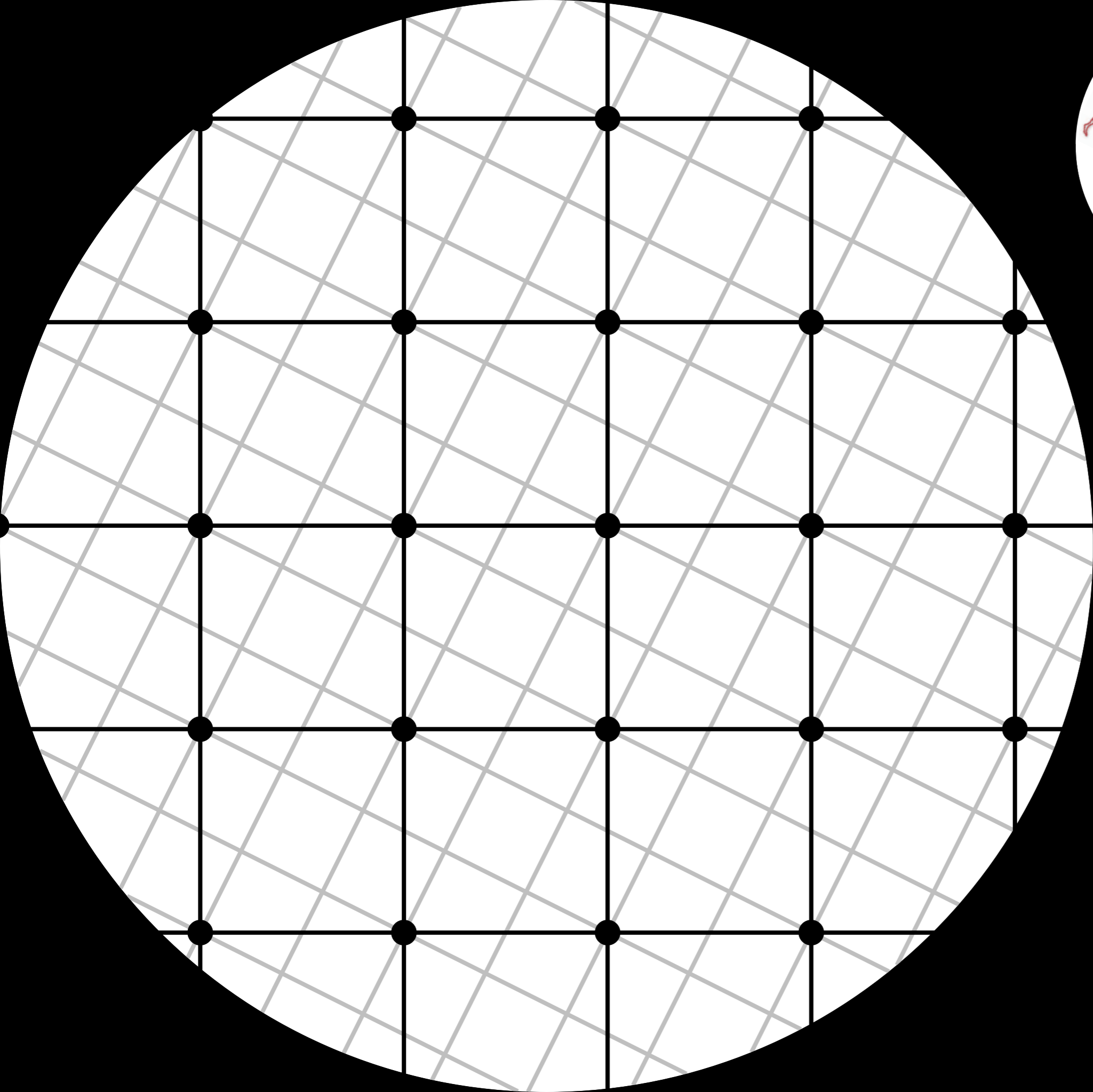


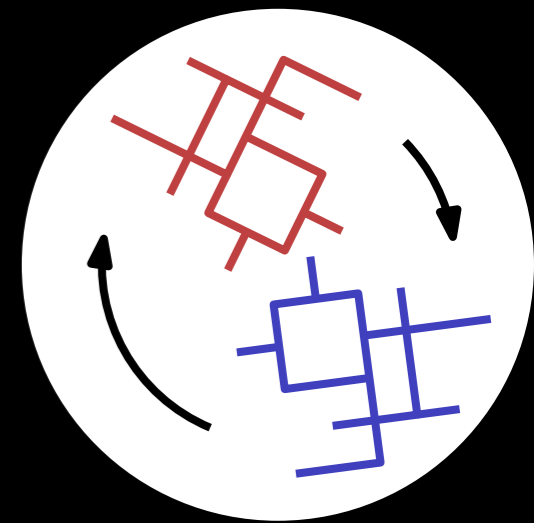
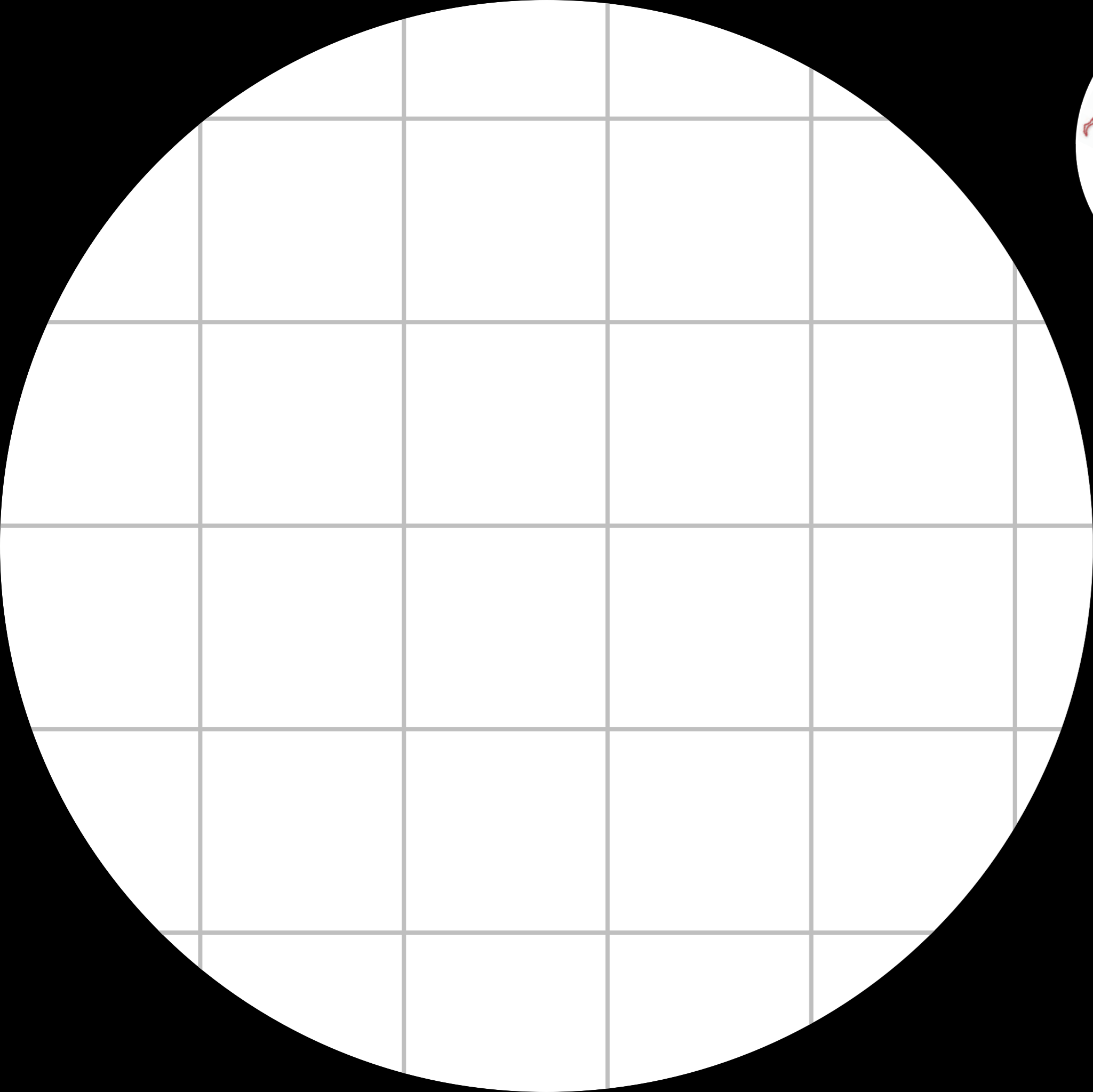




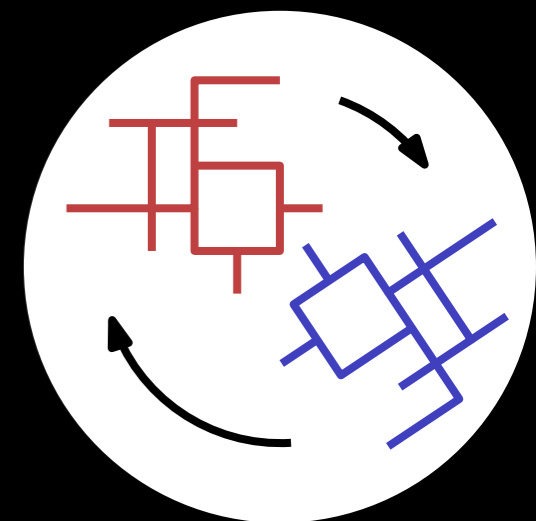


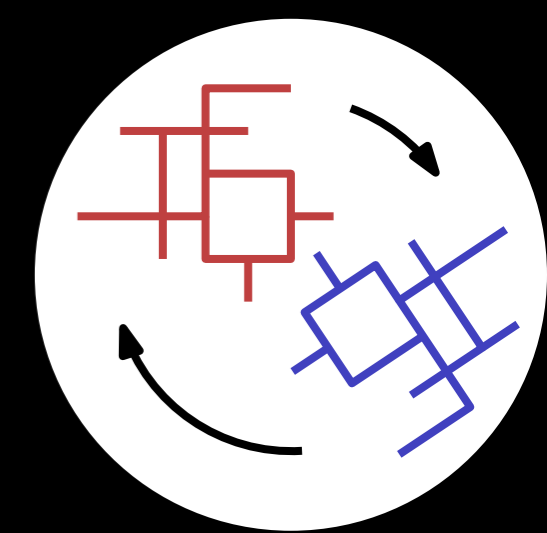
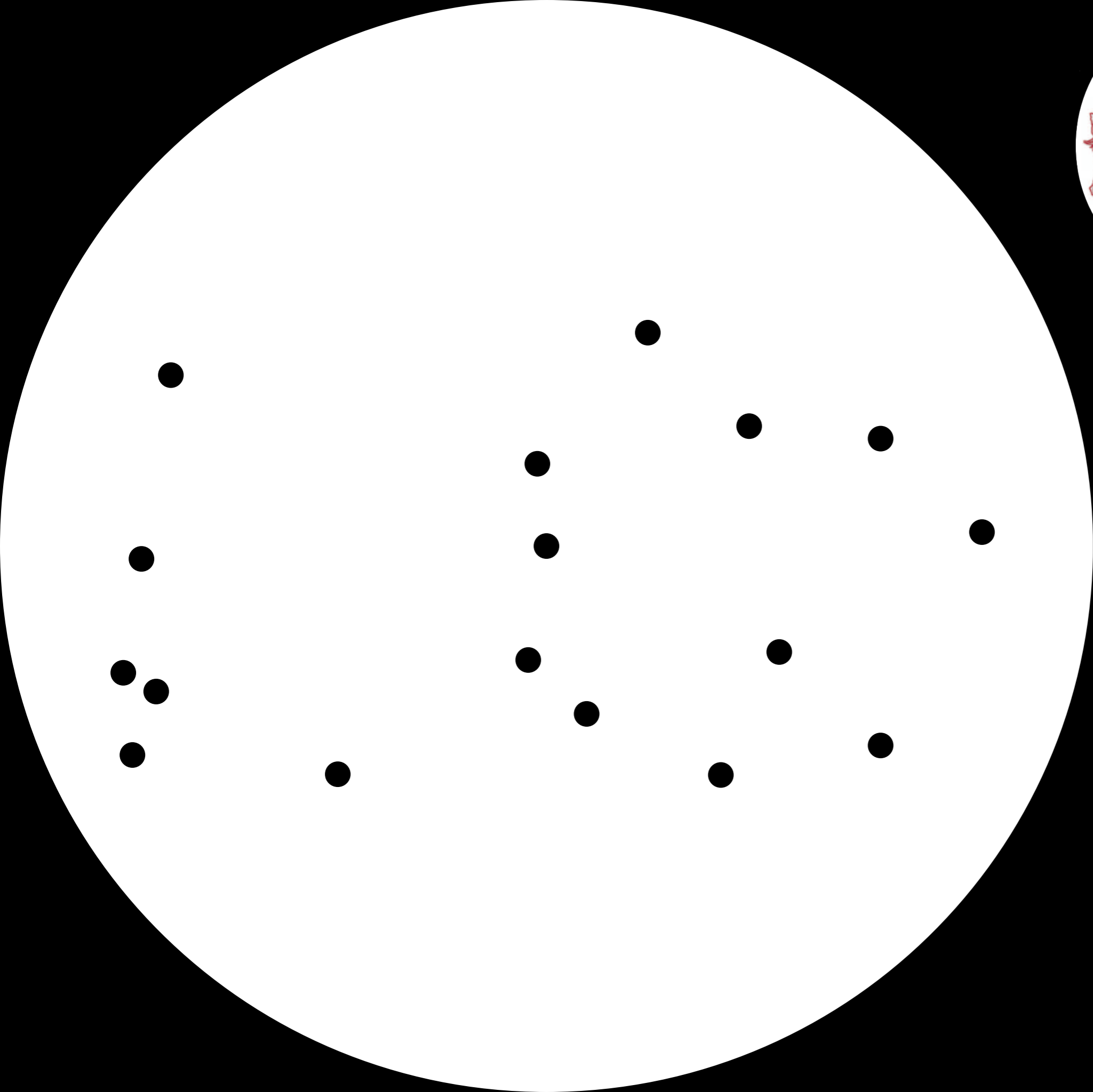


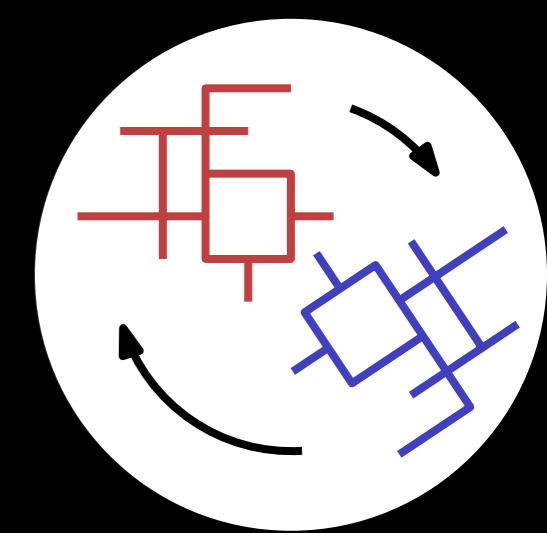
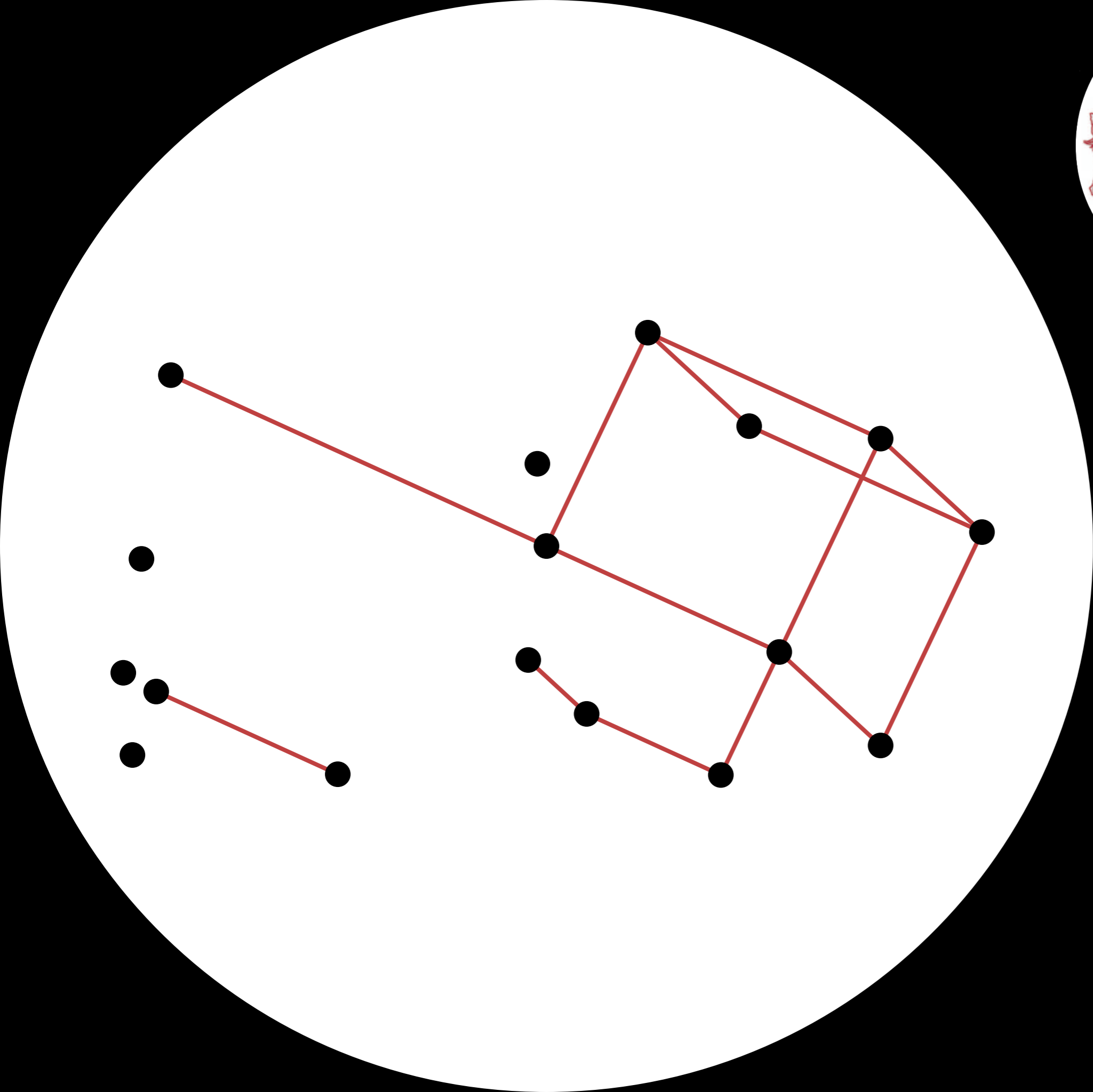


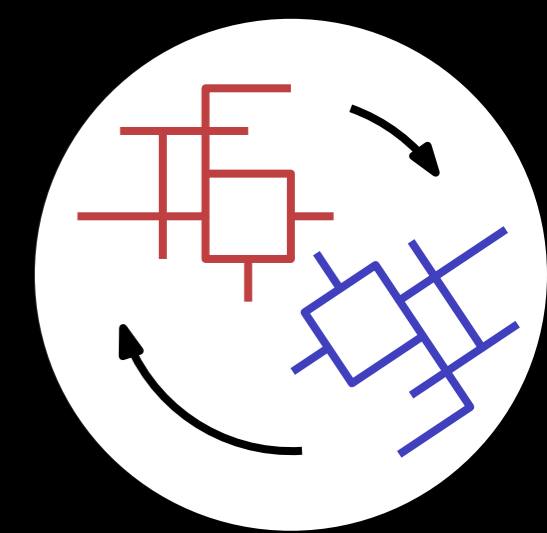
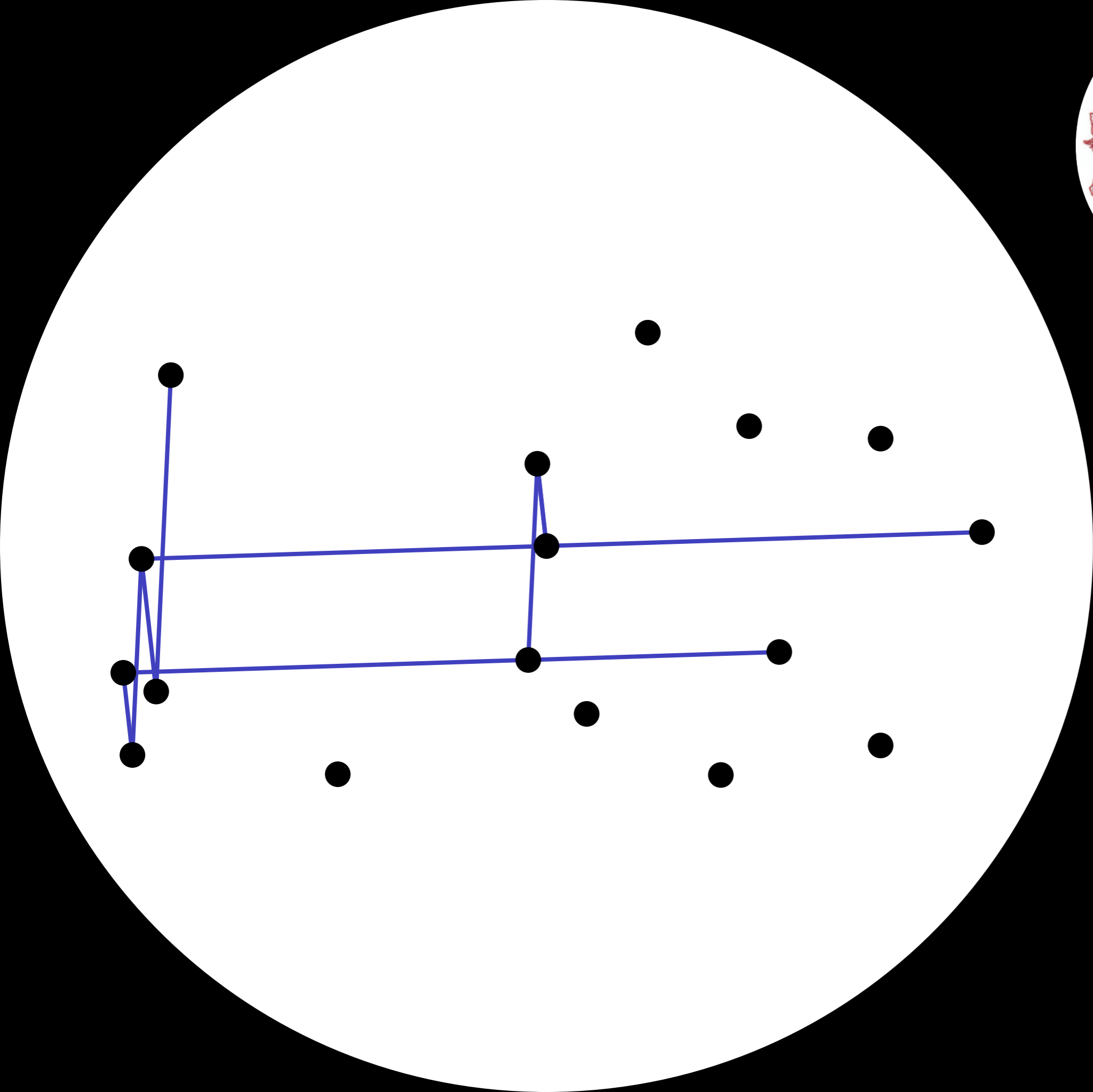


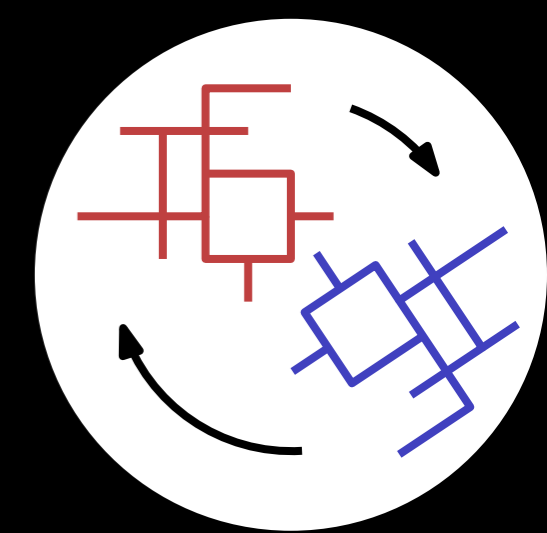
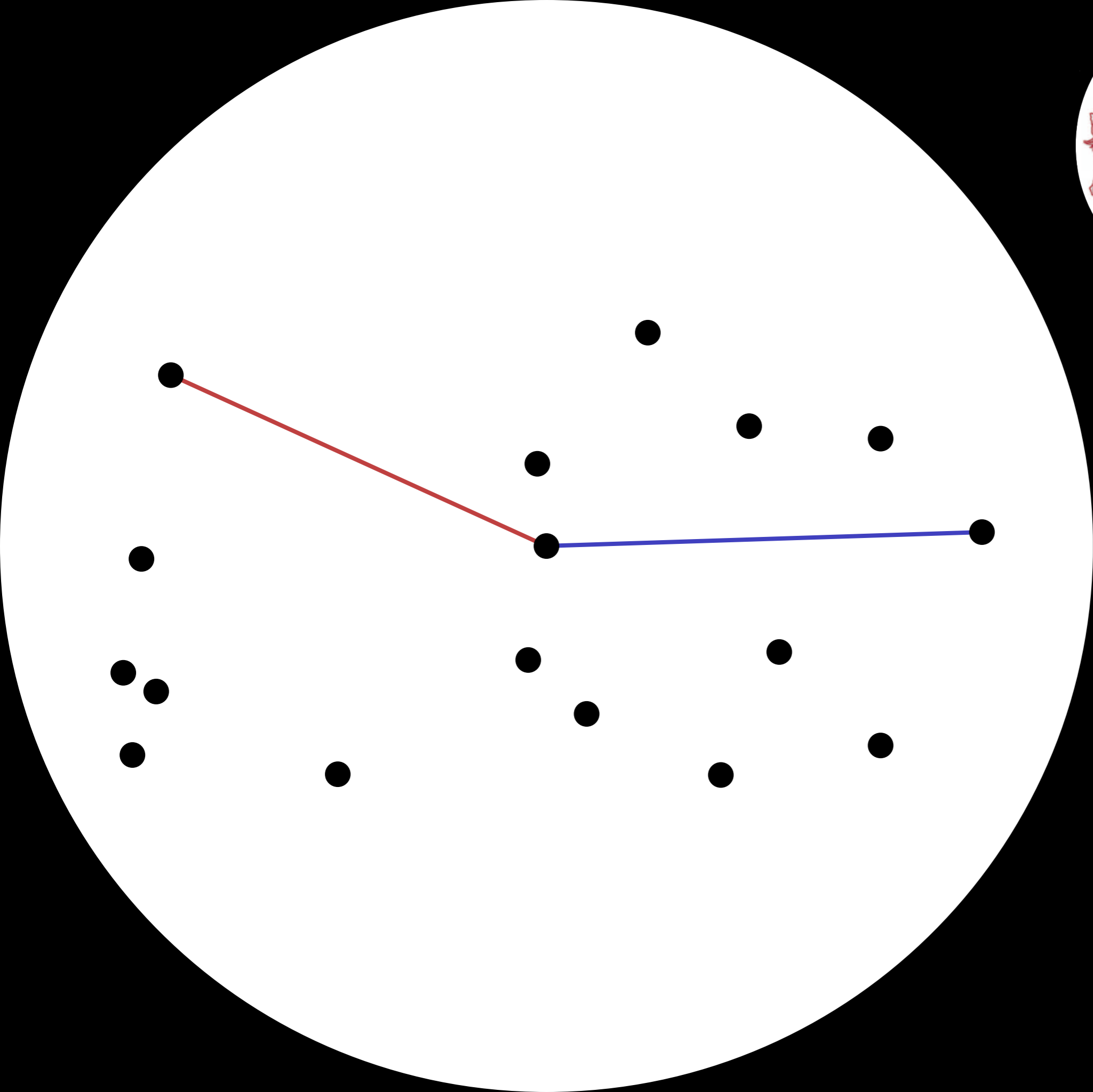
So, what happens in higher dimensions?

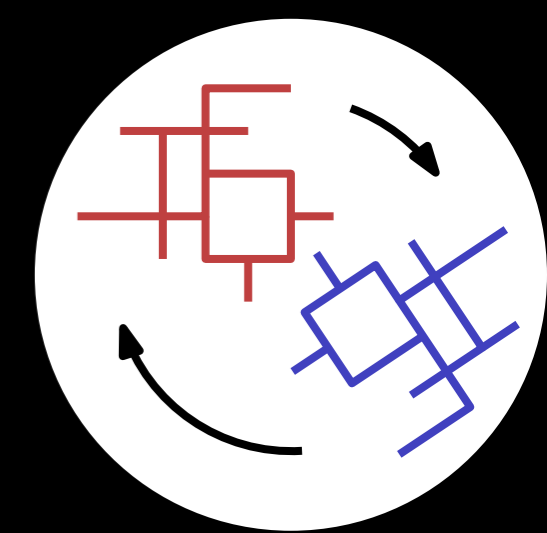
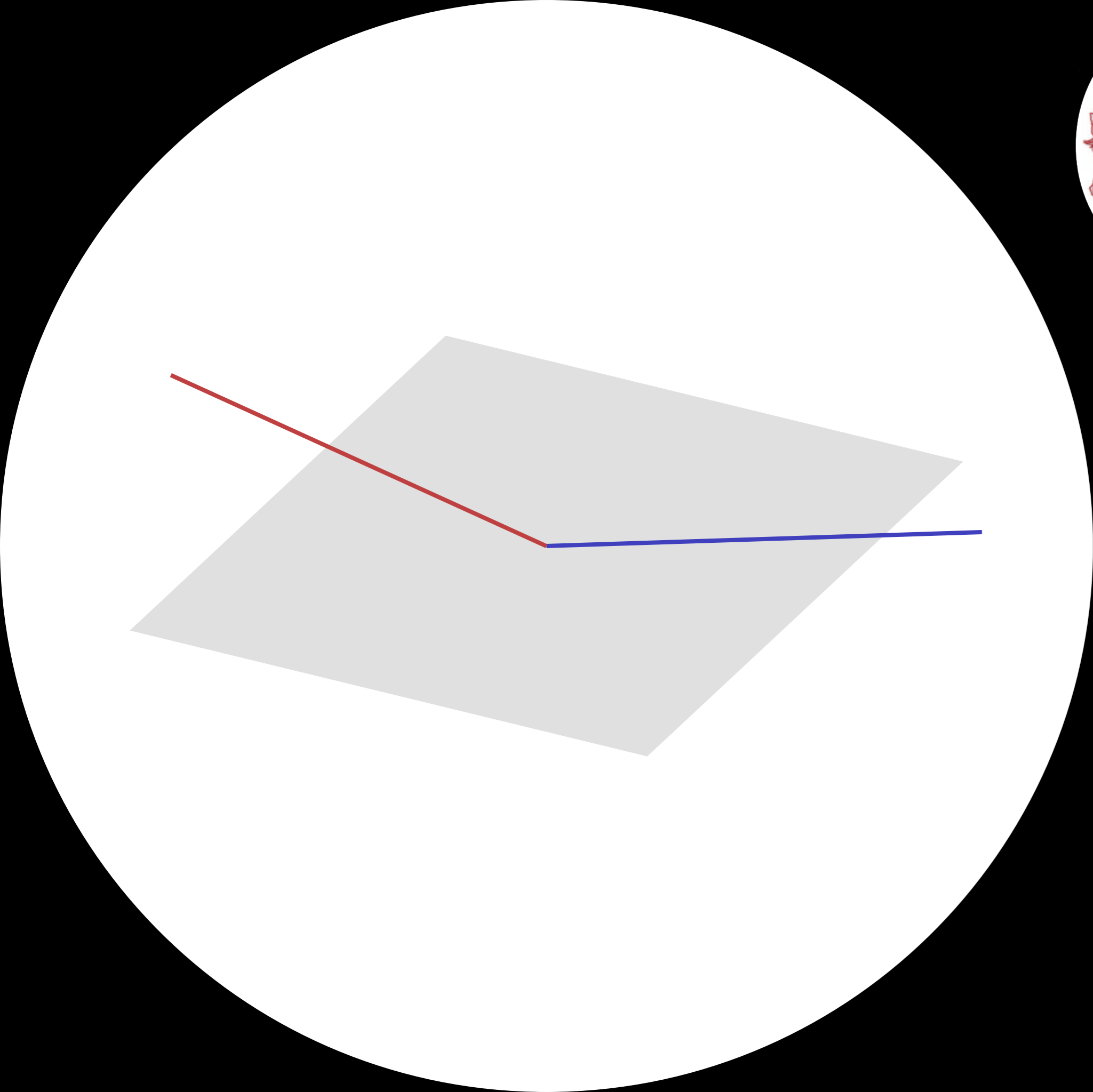


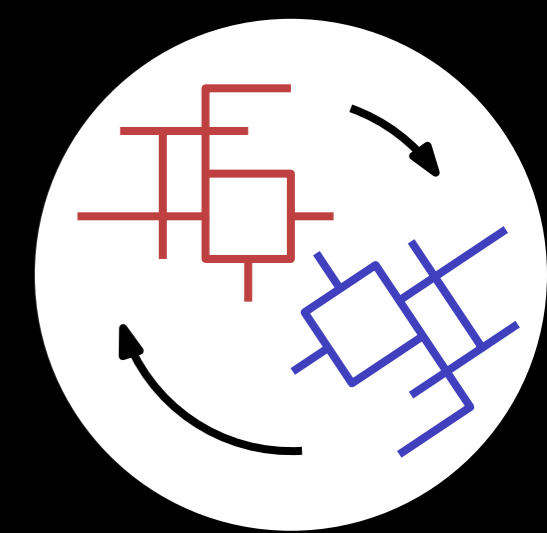
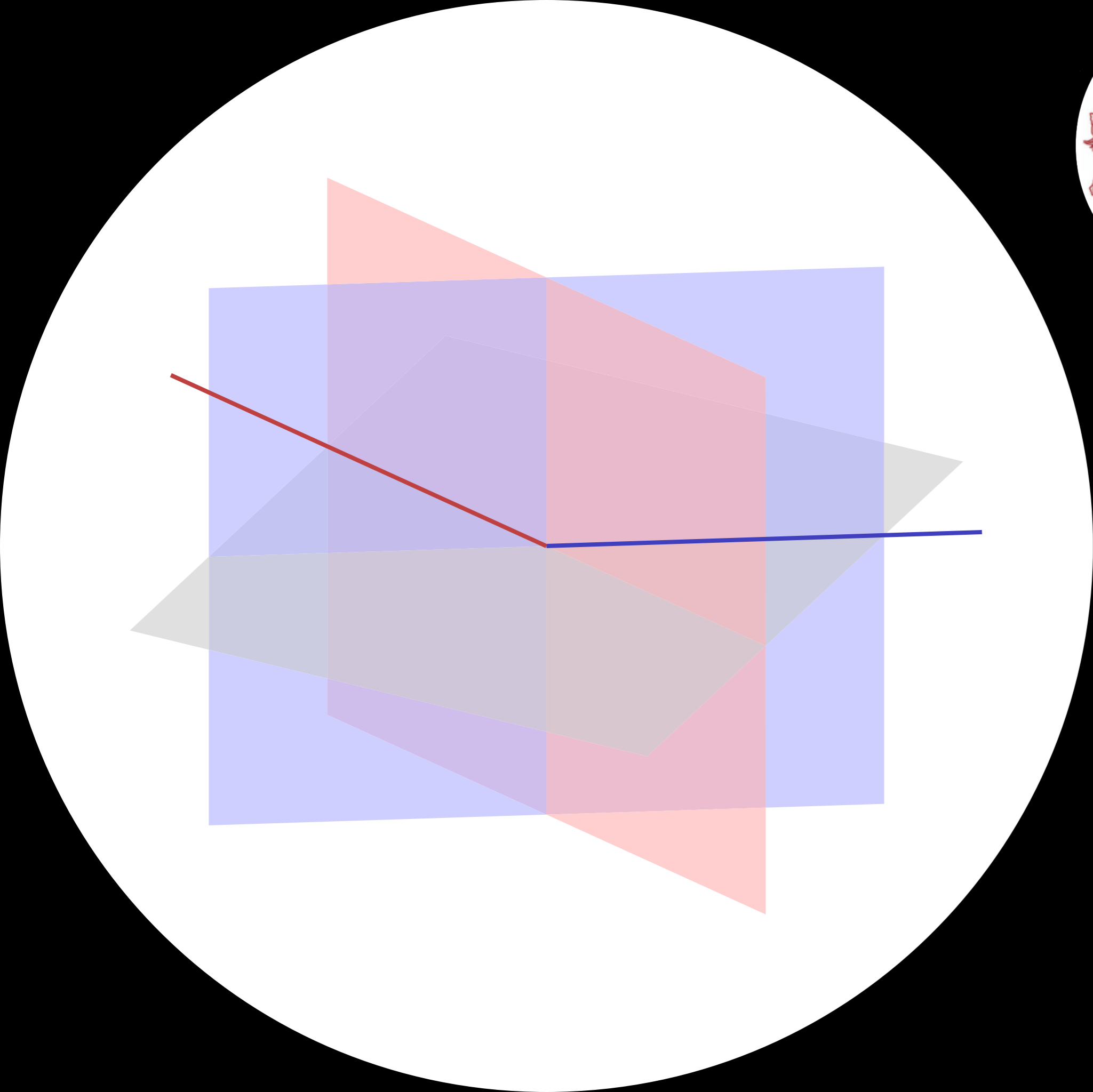


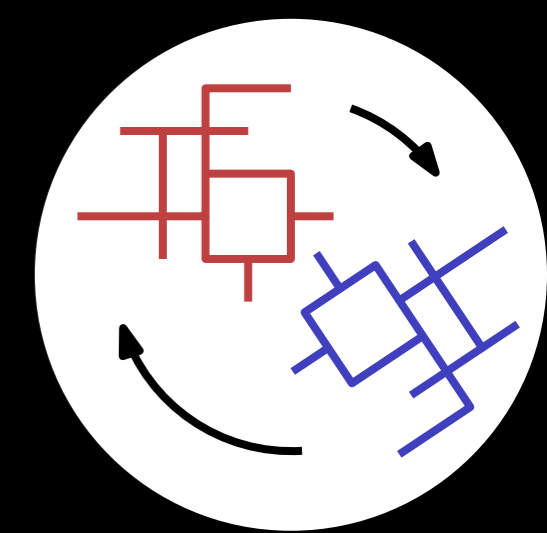
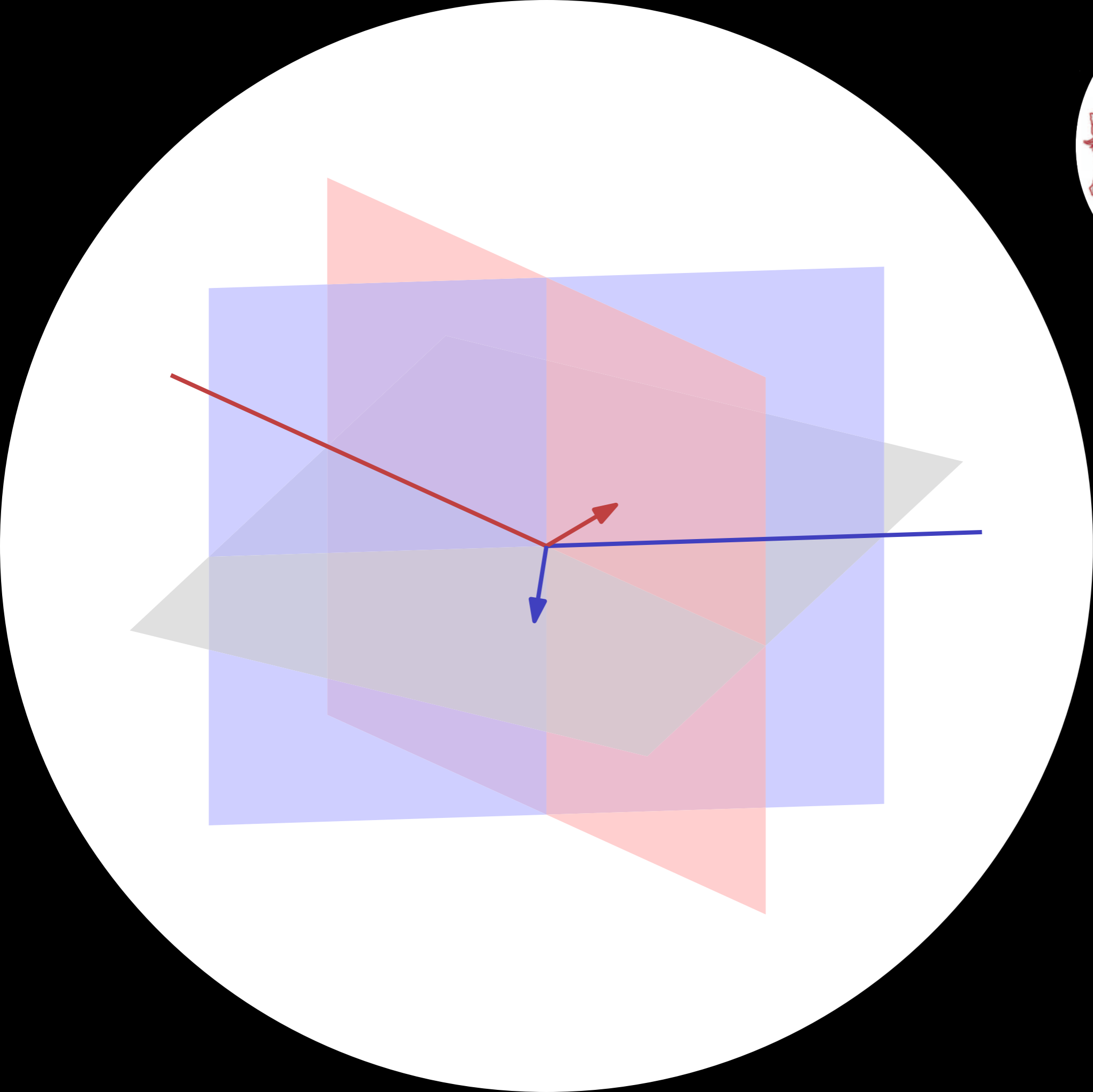


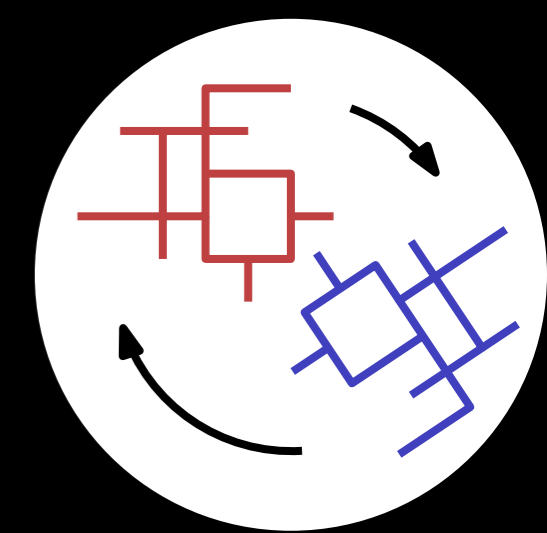
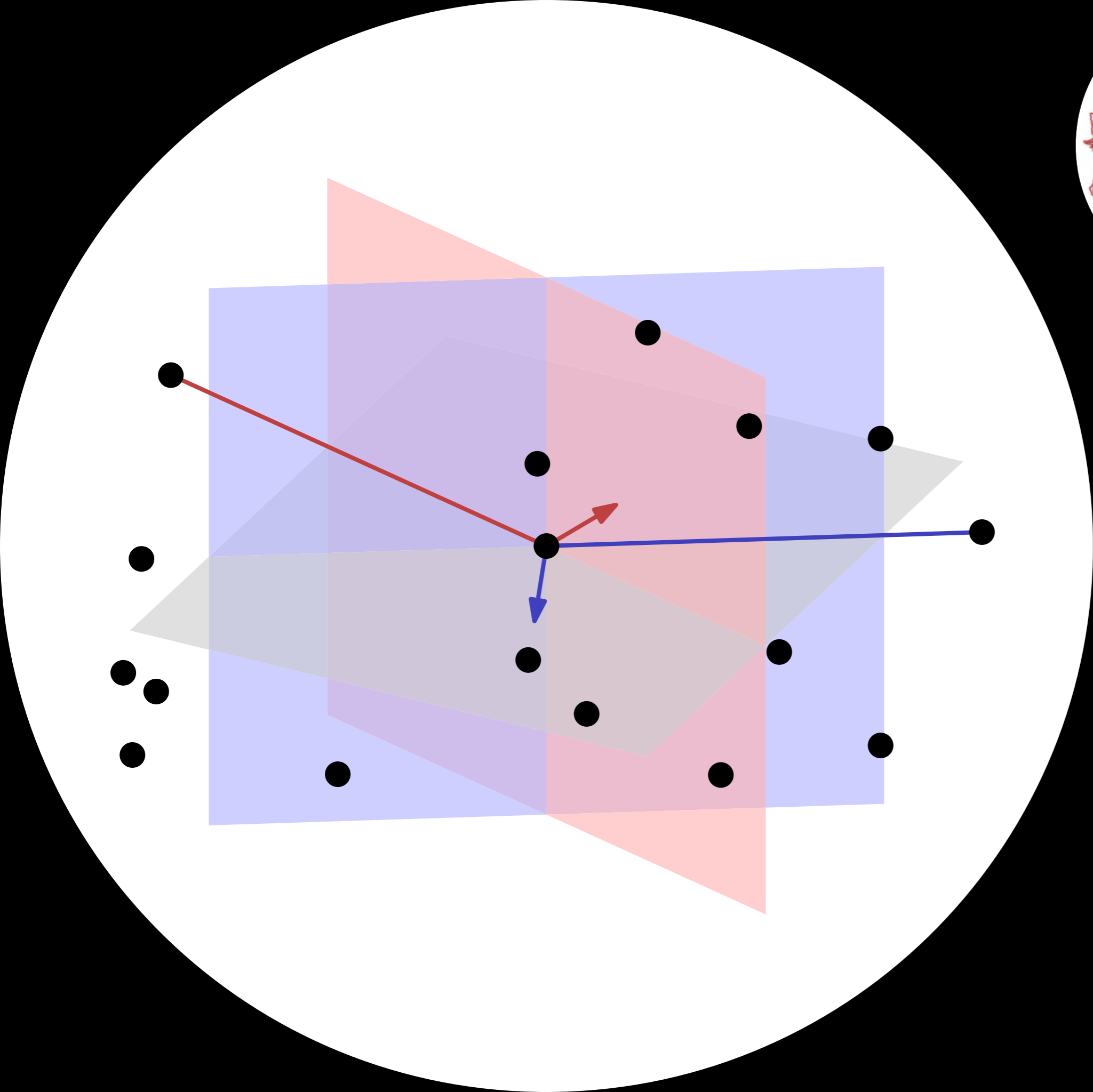


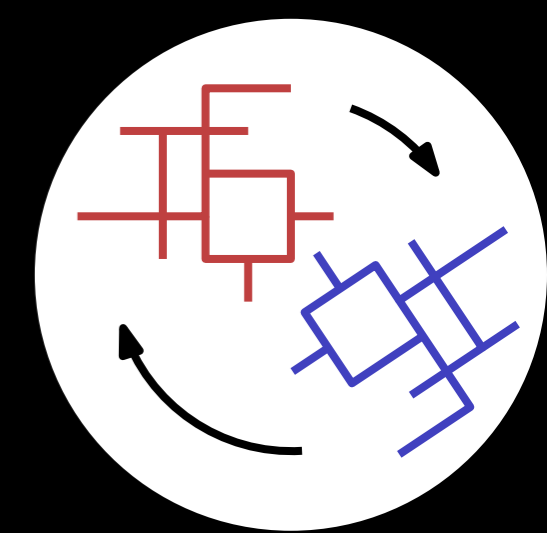
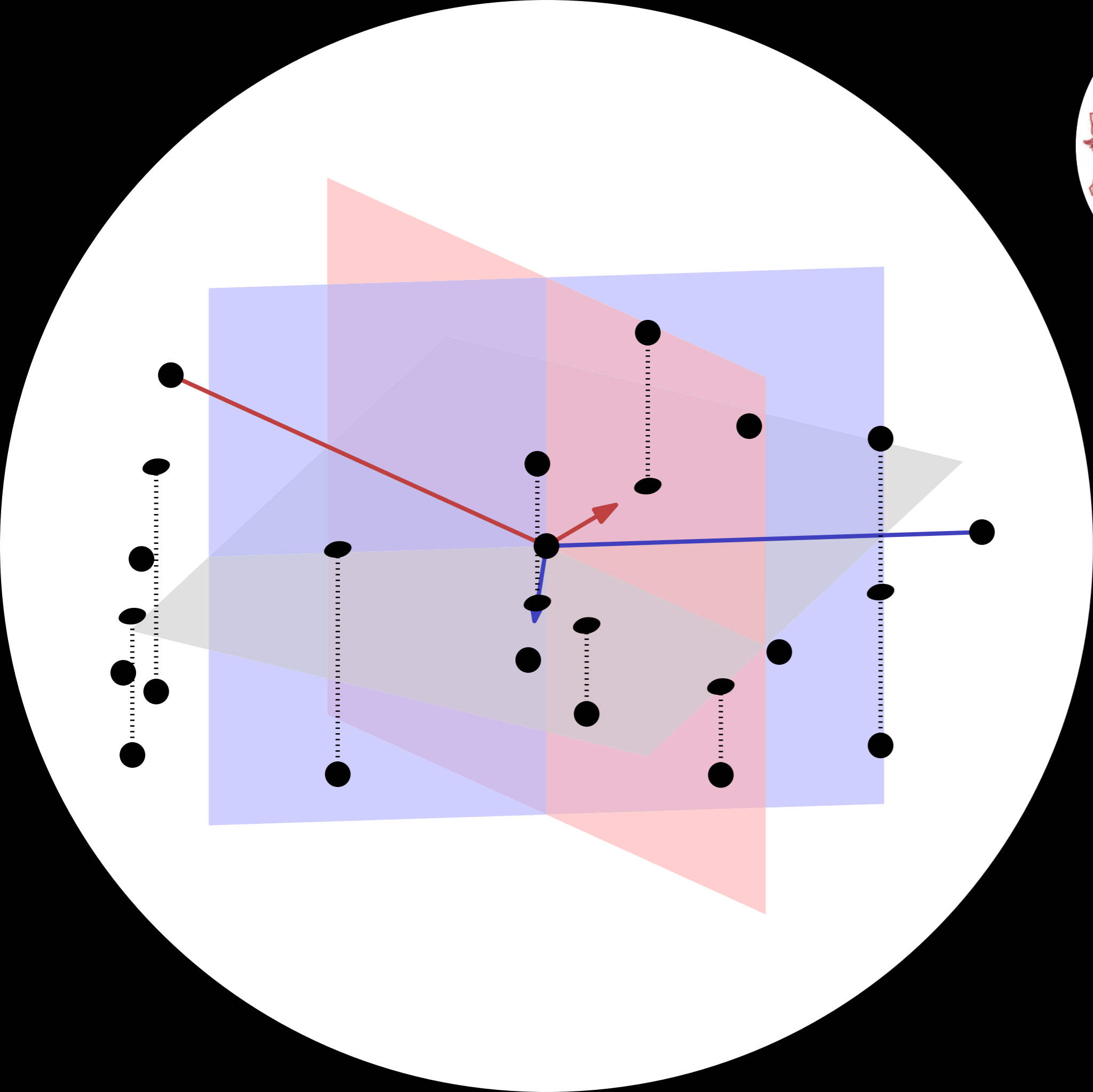


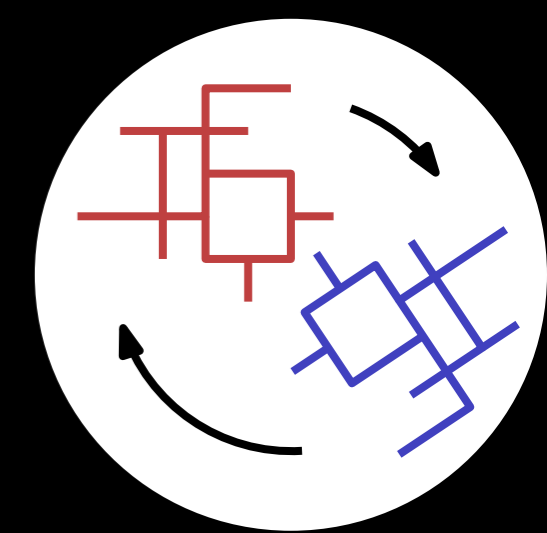
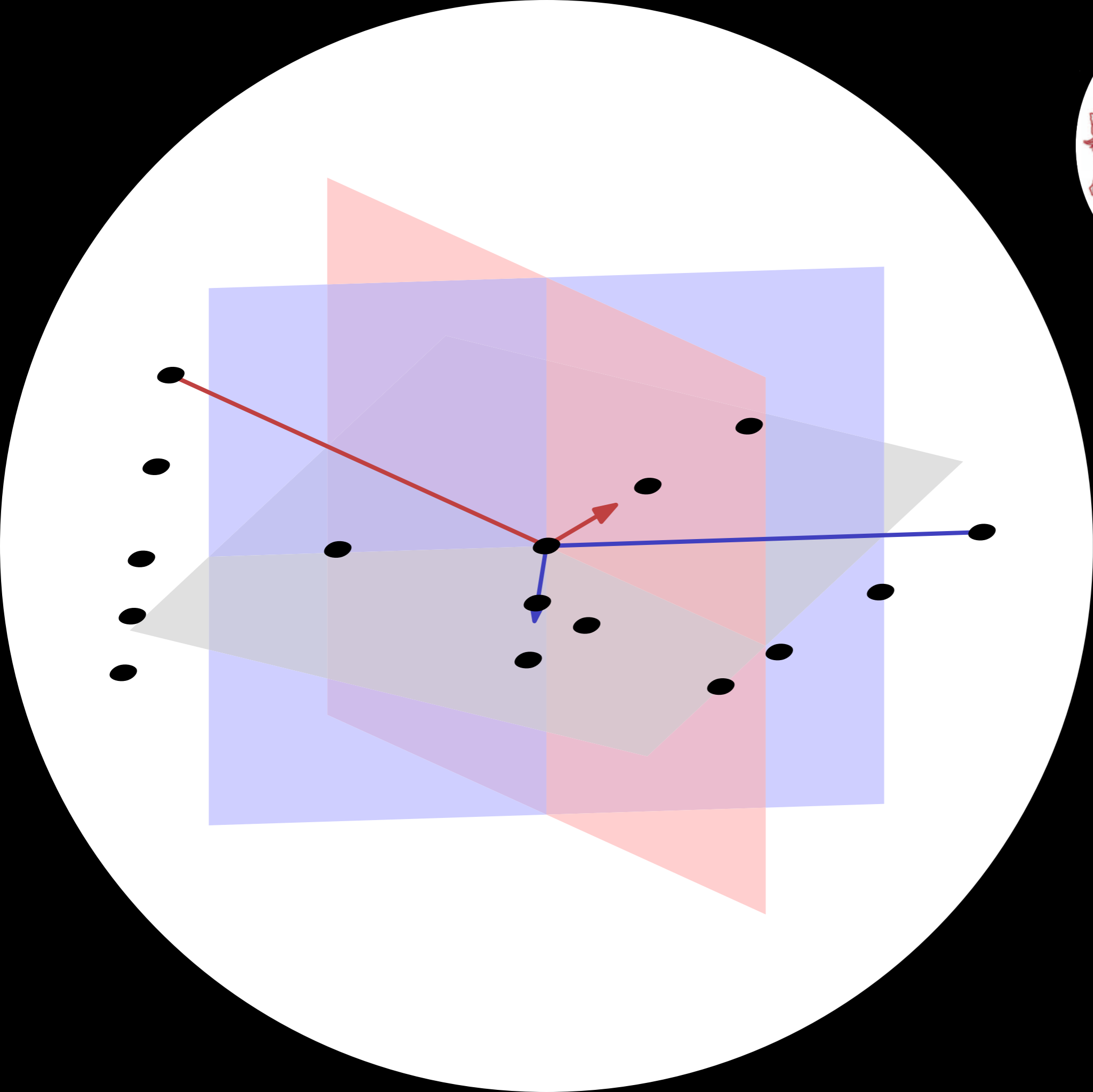


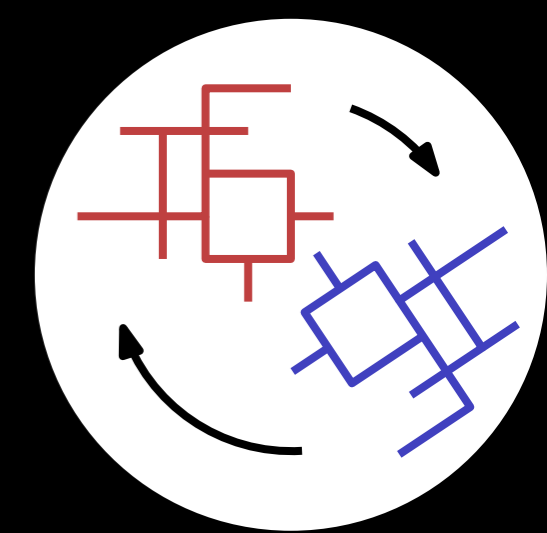
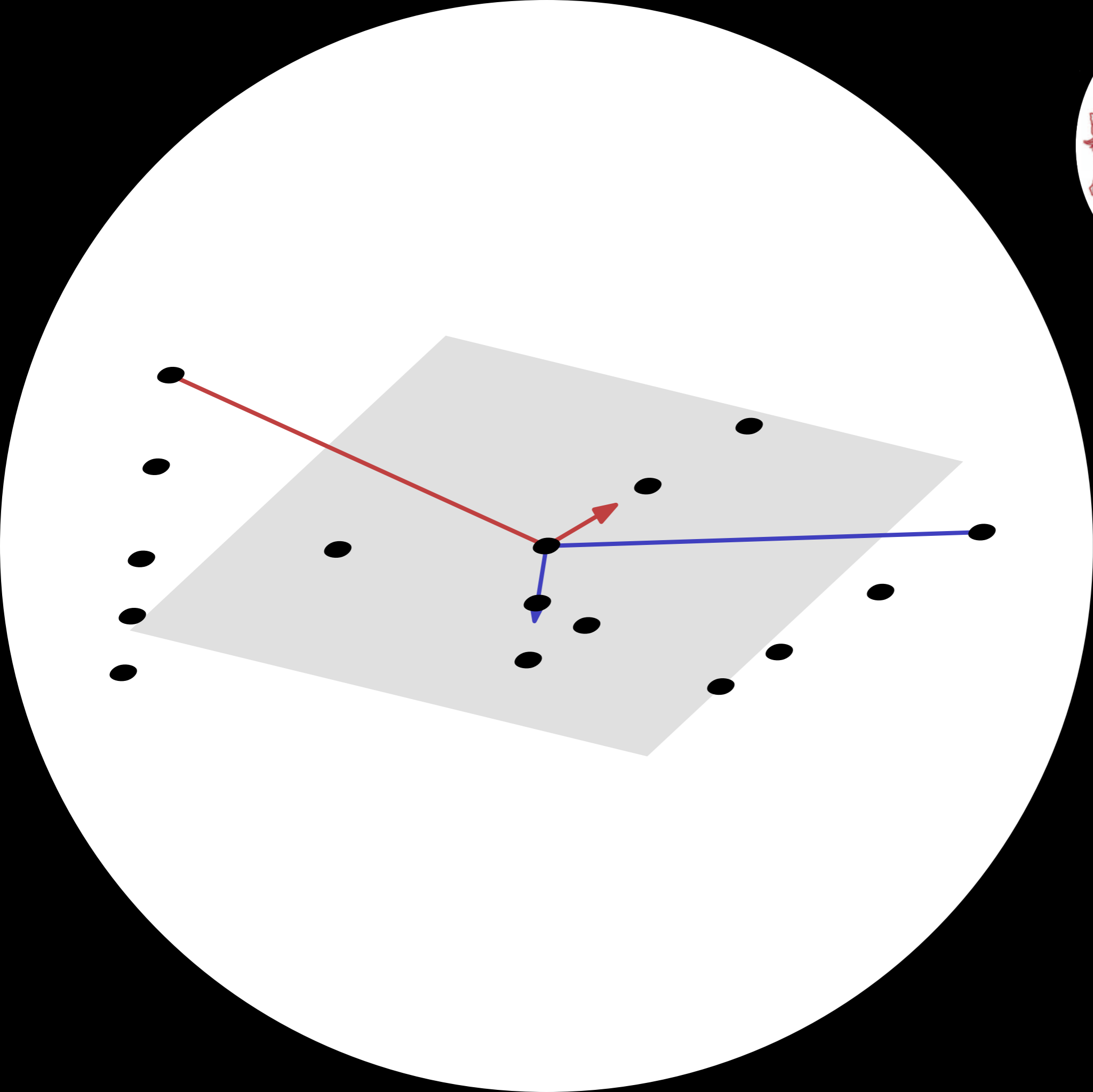


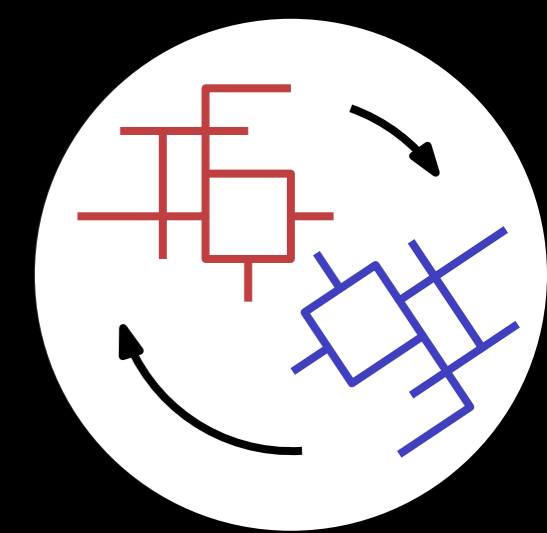
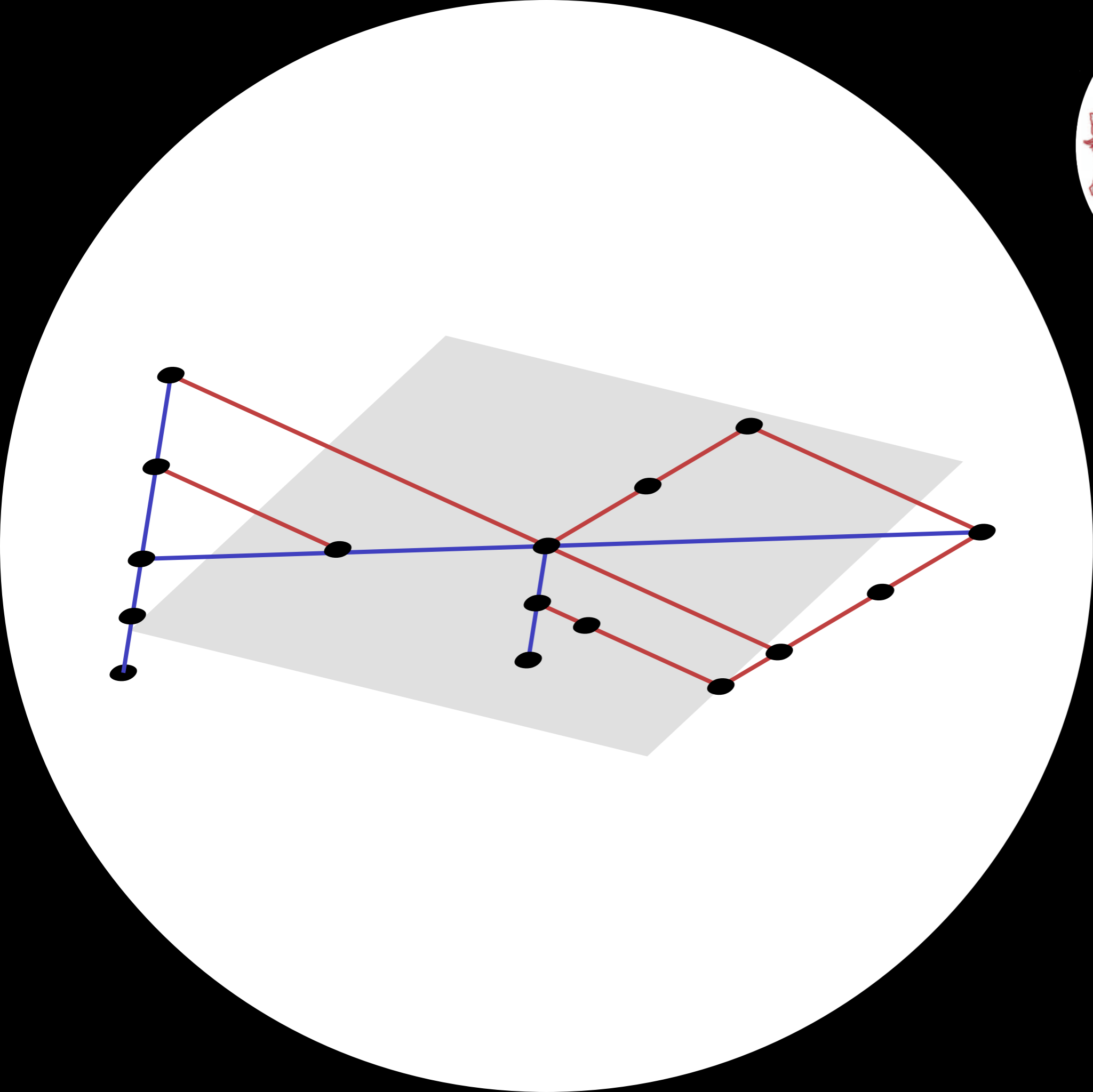


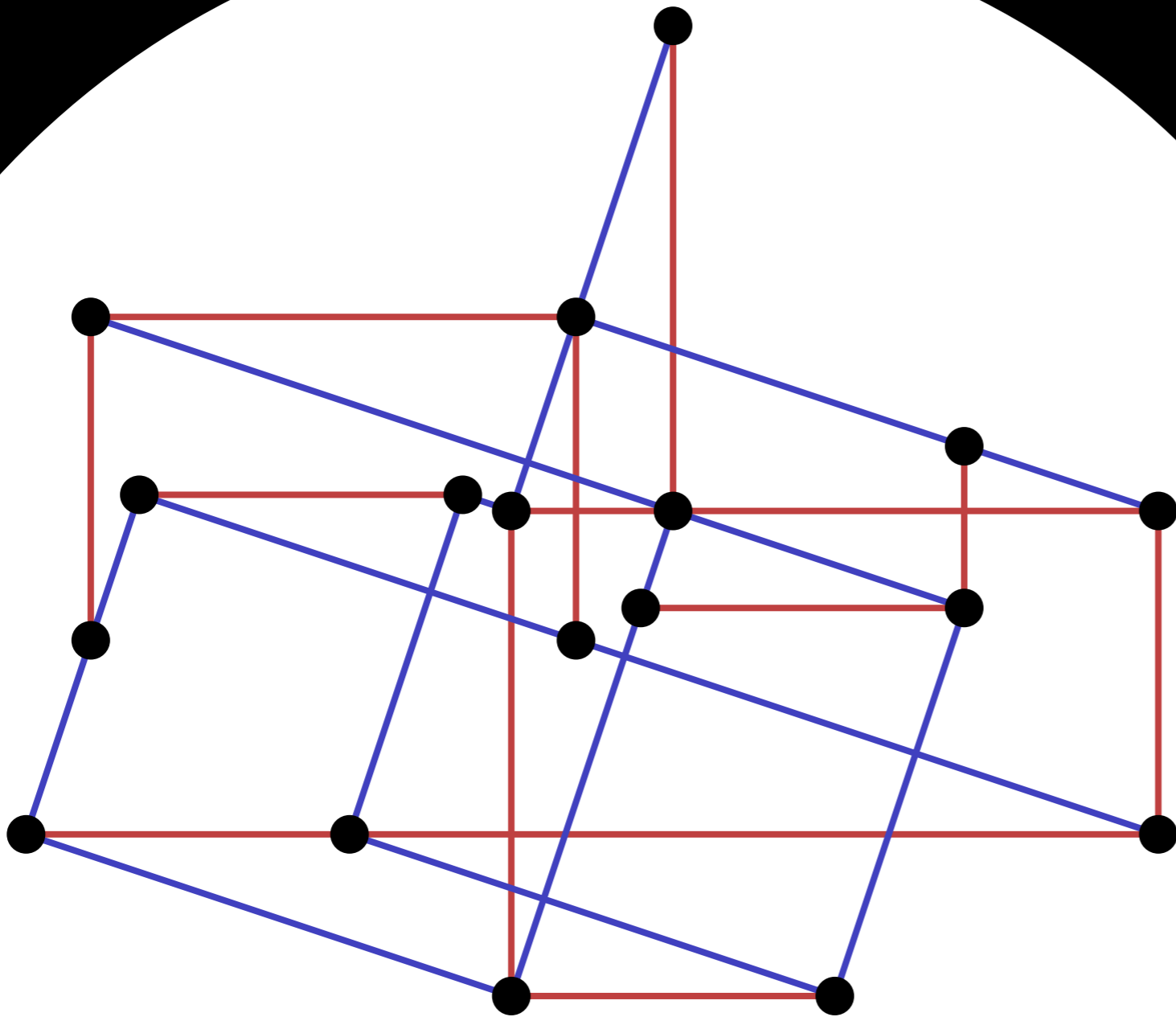




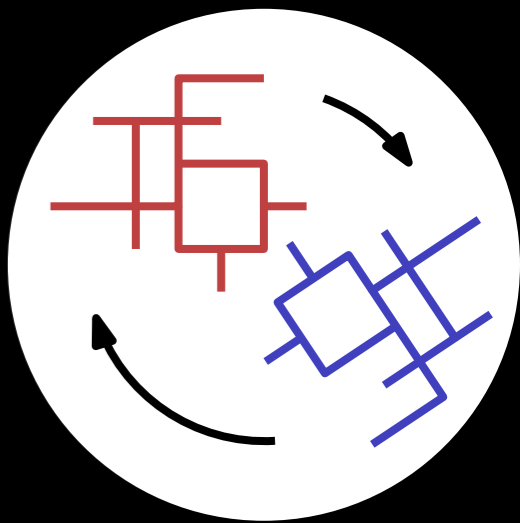




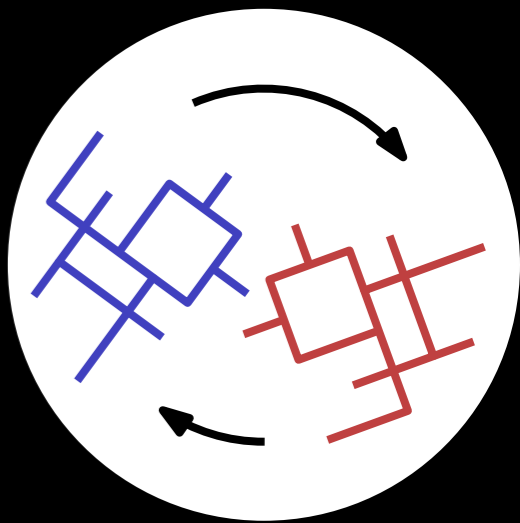
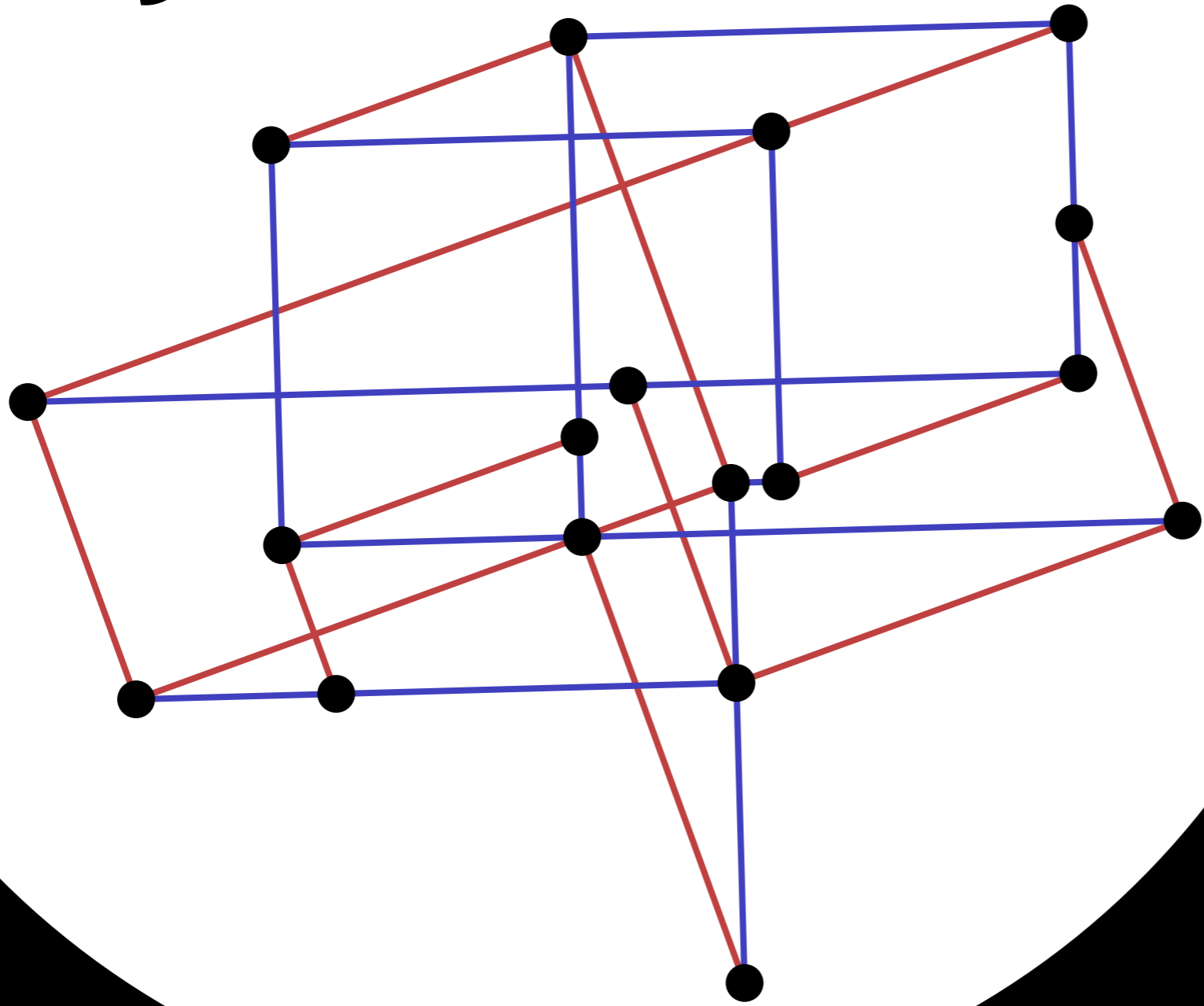


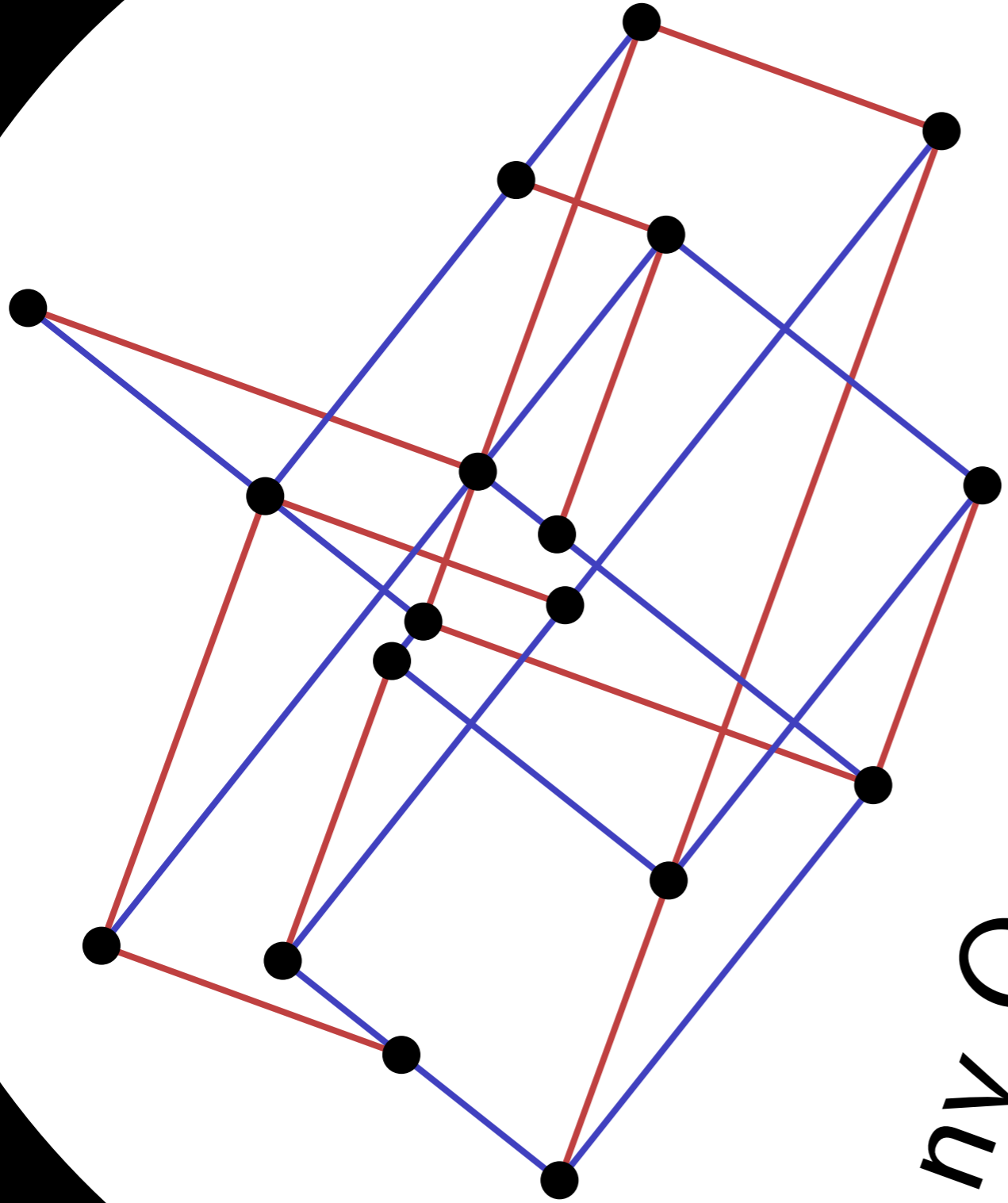


Any Questions... ?



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