# Semi-invariant pictures, c-vectors, maximal green sequences

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This talk will be about several topics, with main emphasis on the connections between these topics.
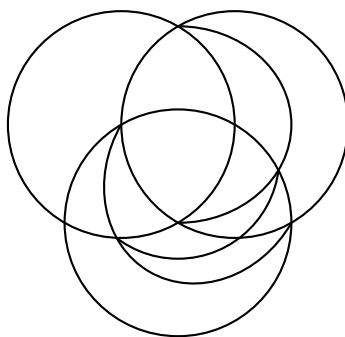
I will lightly (sometimes only with examples) introduce: quiver representations, their relation to root systems, Auslander-Reiten quivers, derived categories of the representation category, cluster category, cluster tilting objects; I will define semi-invariants, domains of semi-invariants, c-vectors from cluster theory, mutations, green mutations as mutations in the direction of non-negative c-vectors, sequences of green mutations (the last notions are related to some of the notions in BPS states in physics).

I will state two conjectures that we proved using semi-invariant pictures and indicate how the semi-invariant pictures were used.

Below is the semi-invariant picture for the following quiver of type $A_3$:

$$Q = (1 \leftarrow 2 \leftarrow 3).$$

Each part of the picture (vertex, line segment, triangle, circle, semi-circle) has several interpretations, and I will be adding the following information on the picture: roots of Lie algebra, indecomposable quiver representations, cluster objects, cluster tilting objects, domains of semi-invariants, c-vectors, mutations, green mutations, maximal green sequences.