RESEARCH RELATED TO CLUSTER ALGEBRAS

DANIEL LABARDINI-FRAGOSO

My main research interest in relation with cluster algebras lies in the connection of these objects with the representation theory of algebras. More specifically, I am very interested in Derksen-Weyman-Zelevinsky's approach to cluster algebras using quivers with potentials (QPs).

My recent research has to do with finding potentials for the tagged triangulations of surfaces with non-empty boundary (by results of Fomin-Shapiro-Thurston, such tagged triangulations *are* clusters in the corresponding cluster algebras). In recent joint work, G. Cerulli Irelli and I have defined, for each tagged triangulation τ of a surface with marked points and non-empty boundary, a Jacobi-finite non-degenerate potential $S(\tau)$ on the signed-adjacency quiver $Q(\tau)$. We have shown that flips of tagged triangulations are compatible with QP-mutations, at least at the level of Jacobian algebras, and that every two tagged triangulations are related by a sequence of flips along which we have compatibility with QP-mutations (up to right-equivalence, not only at the level of Jacobian algebras). Furthermore, we have proved that the inclusion of the path algebra $R\langle Q(\tau)\rangle$ into the complete path algebra $R\langle\langle Q(\tau)\rangle\rangle$ induces an isomorphism between $R\langle Q(\tau)\rangle/J_0(S(\tau))$ and the Jacobian algebra $\mathcal{P}(Q(\tau),S(\tau))$, where $J_0(S(\tau))$ is the two-sided ideal of $R\langle Q(\tau)\rangle$ generated by the cyclic derivatives of $S(\tau)$. This has allowed us to apply Derksen-Weyman-Zelevinsky's homological interpretation of the *E-invariant* to obtain information about the cluster monomials of the cluster algebra associated to the surface.

Below you can find a list of papers directly related to my research.

References

[1] G. Cerulli Irelli and D. Labardini-Fragoso. *Quivers with potentials associated to triangulated surfaces, Part III: Tagged triangulations and cluster monomials.* arXiv:1108.1774

[2] H. Derksen, J. Weyman, A. Zelevinsky. *Quivers with potentials and their representations I: Mutations.* Selecta Mathematica, New Series. 14 (2008), 59-119. http://arxiv.org/abs/0704.0649

[3] H. Derksen, J. Weyman, A. Zelevinsky. *Quivers with potentials and their representations II: Applications to cluster algebras.* Journal of the American Mathematical Society 23 (2010), No. 3, 749-790. http://arxiv.org/abs/0904.0676

[4] S. Fomin, M. Shapiro, D. Thurston. *Cluster algebras and triangulated surfaces, part I: Cluster complexes.* Acta Mathematica 201 (2008), 83-146. http://arxiv.org/abs/math/0608367

[5] S. Fomin, A. Zelevinsky. *Cluster algebras I: Foundations.* Journal of the American Mathematical Society. **15** (2002), 497-529. http://arxiv.org/abs/math/0104151

[6] S. Fomin, A. Zelevinsky. *Cluster algebras II: Finite type classification.* Inventiones Mathematicae. **154** (2003), 63-121. http://arxiv.org/abs/math/0208229

[7] S. Fomin and A. Zelevinsky. *Cluster algebras IV: Coefficients.* Compositio Mathematica 143 (2007), 112-164. arXiv:math/0602259

[8] D. Labardini Fragoso. *Quivers with potentials associated to triangulated surfaces.* Proc. London Math. Soc. Volume 98 Part 3 (May 2009), 797-839. http://arxiv.org/abs/0803.1328

[9] D. Labardini Fragoso. *Quivers with potentials associated to triangulated surfaces, Part II: Arc representations.* http://arxiv.org/abs/0909.4100

[10] D. Labardini Fragoso. *Quivers with potentials associated with triangulations of Riemann surfaces.* Ph.D. Thesis. Northeastern University. 2010.

Mathematisches Institut, Universität Bonn, Germany 53115
E-mail address: labardini@math.uni-bonn.de