# Pavao Mardesic, Iterated integrals and Melnikov functions

We present the results of a recent joint work with Dmitry Novikov, Laura Ortiz-Bobadilla and Jessie Pontigo-Herrera.

We consider small polynomial deformations of integrable systems of the form $dF = 0$, $F \in \mathbb{C}[x, y]$ and the first nonzero term $M_\mu$ of the displacement function $\Delta(t, \epsilon) = \sum_{i=\mu} M_i(t)\epsilon^i$ along a cycle $\gamma(t) \in F^{-1}(t)$. It is known that $M_\mu$ is an iterated integral of length at most $\mu$. The bound $\mu$ depends on the deformation of $dF$.

We give a *universal bound* for the length of the iterated integral expressing the first nonzero term $M_\mu$ depending only on the geometry of the unperturbed system $dF = 0$. Our result generalizes the result of Gavrilov and Iliev providing a sufficient condition for $M_\mu$ to be given by an abelian integral i.e. by an iterated integral of length 1. We conjecture that our bound is optimal.