1128-90-108 **Dmitriy Drusvyatskiy***, University of Washington, Department of Mathematics, Box 354350, Seattle, WA 98195. *Accelerated first-order methods beyond convexity.*

First-order methods with optimal convergence rates for smooth convex minimization have had a profound impact on computation. Two important downsides of such methods, often remarked in the literature, is a lack of geometric intuition and non-monotone behavior. I will begin by describing a new intuitive viewpoint on acceleration based on optimally averaging quadratic lower models of the function. Averaging only two quadratics at a time gives a new interpretation of the geometric descent method of Bubeck-Lee-Singh '15, while a longer sequence of quadratics yields limited memory extensions.

Without convexity, best-known complexity bounds worsen to those achieved by simple gradient descent. In the second part of the talk, I will present a "universal" accelerated method for non-convex optimization, which automatically accelerates in presence of convexity. The scheme extends and simplifies the universal catalyst of Lin-Mairal-Harchaoui '15 for convex minimization.

Joint work with M. Fazel (U. Washington), Z. Harchaoui (U. Washington), A.S. Lewis (Cornell), H. Lin (Inria), J. Mairal (Inria), C. Paquette (U. Washington), S.Roy (U. Washington). (Received February 17, 2017)