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Jeanne Clelland* (jeanne.clelland@colorado.edu), Dept. of Mathematics, 395 UCB, University of Colorado, Boulder, CO 80309-0395, and **Edward Estrada, Molly May, Jonah Miller, Sean Peneyra** and **Michael Schmidt**. *A Tale of Two Arc Lengths*.

In Euclidean geometry, all metric notions (arc length for curves, the first fundamental form for surfaces, etc.) are derived from the Euclidean inner product on tangent vectors, and this inner product is preserved by the symmetry group of Euclidean space (translations, rotations, and reflections).

In equiaffine geometry there is no invariant notion of inner product on tangent vectors that is preserved by the full symmetry group of affine space. Nevertheless, it is possible to define an invariant notion of arc length for "nondegenerate" curves, and an invariant first fundamental form for "nondegenerate" surfaces in affine space. This leads to two possible notions of arc length for a curve contained in a surface, and these two arc length functions do not necessarily agree! In this talk we will explain all this, derive necessary and sufficient conditions under which the two arc length functions DO agree, and illustrate with lots of examples. (This is joint work with a group of independent study students.) (Received September 04, 2012)