In this highly readable and well-motivated paper the author provides a unified and simplified approach to proving ergodicity and Bernoulliness. This technique applies to volume-preserving diffeomorphisms and flows on compact manifolds and to flows on contact manifolds.

The author introduces the notion of an infinitesimal Lyapunov function, which is used to give cone conditions similar to those of M. P. Wojtkowski [Ergodic Theory Dynam. Systems 5 (1985), no. 1, 145–161; MR0782793], J. Lewowicz [J. Differential Equations 38 (1980), no. 2, 192–209; MR0597800], and Markarian. Then Pesin’s theory is used to establish local ergodicity. Finally, the author shows that the infinitesimal Lyapunov functions can also be used to extend the stable and unstable leaves, accomplishing the goal of the Sina˘ı-Chernov program [Ya. G. Sina˘ı and N. I. Chernov, Uspekhi Mat. Nauk 42 (1987), no. 3(255), 153–174, 256; MR0896880] in a general setting.

In the case of a compact 3D manifold $M$, using the existence of a $C^\infty$ extension of a hyperbolic structure on $M \setminus K$ for some knot $K$, the author shows that $M$ has a $C^\infty$ Riemannian metric with Bernoulli geodesic flow.

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