

# CONJUGATE CONNECTIONS AND DIFFERENTIAL EQUATIONS ON INFINITE DIMENSIONAL MANIFOLDS

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**ABSTRACT.** On a smooth manifold  $M$ , the vector bundle structures of the second order tangent bundle,  $T^2M$  bijectively correspond to linear connections. In this paper we classify such structures for those Fréchet manifolds which can be considered as projective limits of Banach manifolds. We investigate also the relation between ordinary differential equations on Fréchet spaces and the linear connections on their trivial bundle; the methodology extends to solve differential equations on those Fréchet manifolds which are obtained as projective limits of Banach manifolds. Such equations arise in theoretical physics.