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Exponential map from tangent bundle

Geodesic flow is a flow on TM for a Riemannian manifold (M, g) then we have a smooth map

$$\exp(-) : \mathcal{E} \subseteq TM \rightarrow TM \overset{\pi}{\rightarrow} M$$

where

$$\begin{aligned} \mathcal{E}_p &:= \{V_p \in T_pM \mid \exists \gamma_v : [0, 1] \rightarrow M \text{ a geodesic starting at } V_p\} \\ \mathcal{E} &:= \bigcup_{p \in M} \mathcal{E}_p \\ \exp(V_p) &= \gamma_{V_p}(1) \end{aligned}$$

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