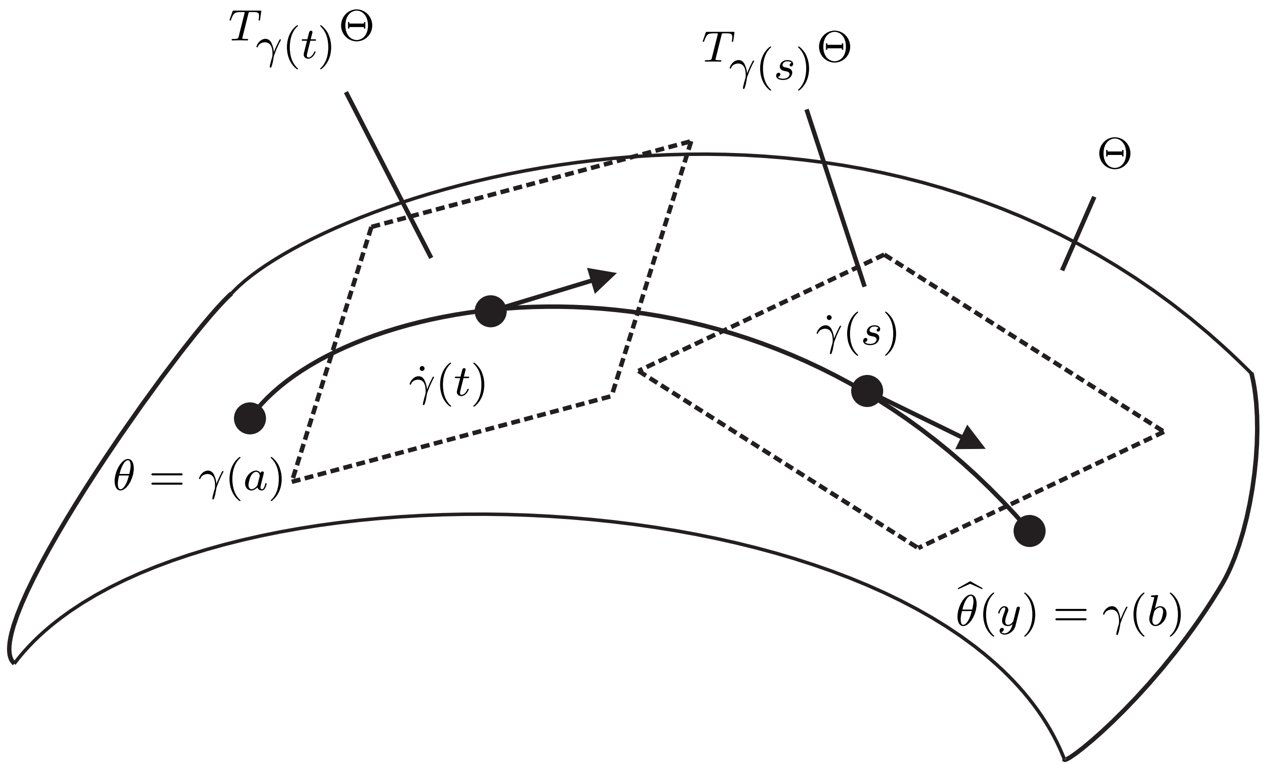
Riemannian-geometric concepts

☐ Length of a curve segment $\gamma : [a,b] \to \Theta$ is $L(\gamma) = \int_a^b |\dot\gamma(t)|\, dt$

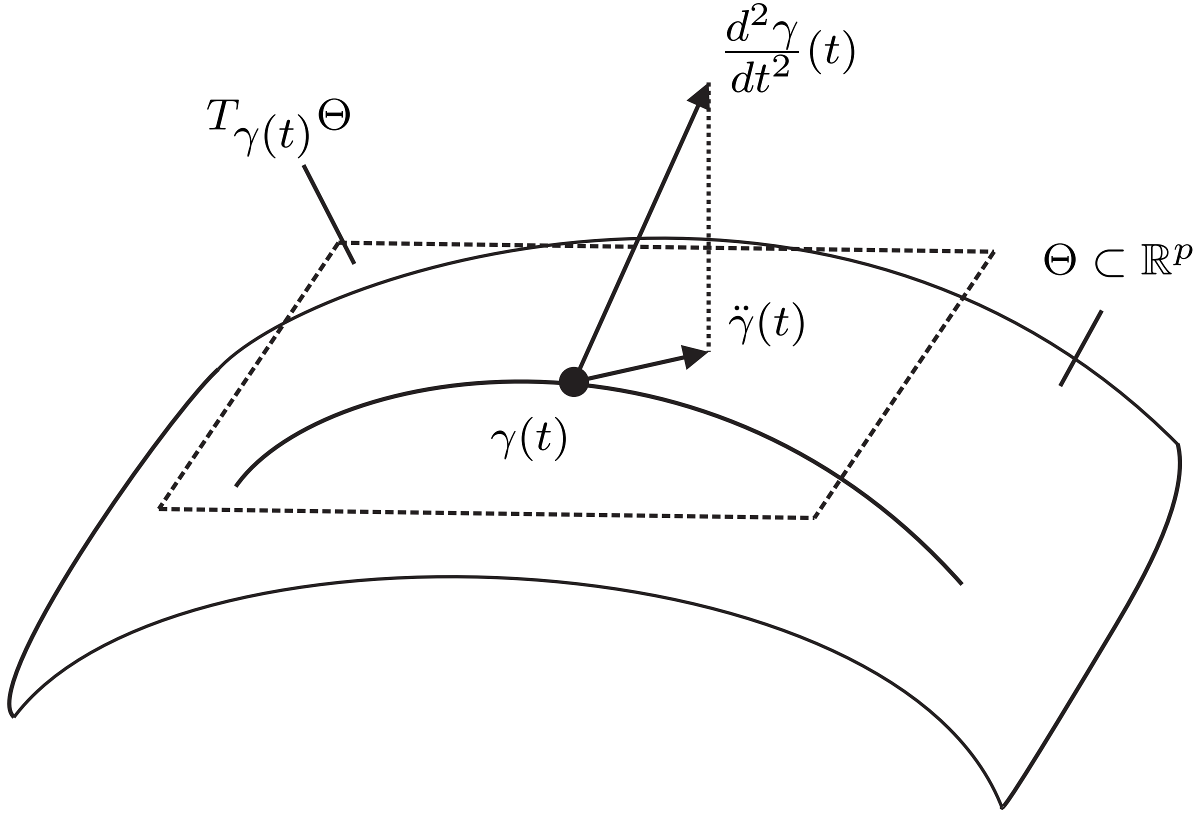


☐ Geodesic distance between θ and $\widehat\theta(y)$ in Θ:

$$d\left(\theta, \widehat\theta(y)\right) = \inf\left\{L(\gamma) : \gamma(a) = \theta,\, \gamma(b) = \widehat\theta(y)\right\}$$

Riemannian-geometric concepts

☐ The acceleration of a curve segment $\gamma : [a,b] \rightarrow \Theta$ is $\ddot{\gamma}(t) = \frac{D}{dt}\dot{\gamma}(t)$



☐ A curve segment γ is a geodesic iff $\ddot{\gamma} \equiv 0$ (its acceleration vanishes identically)

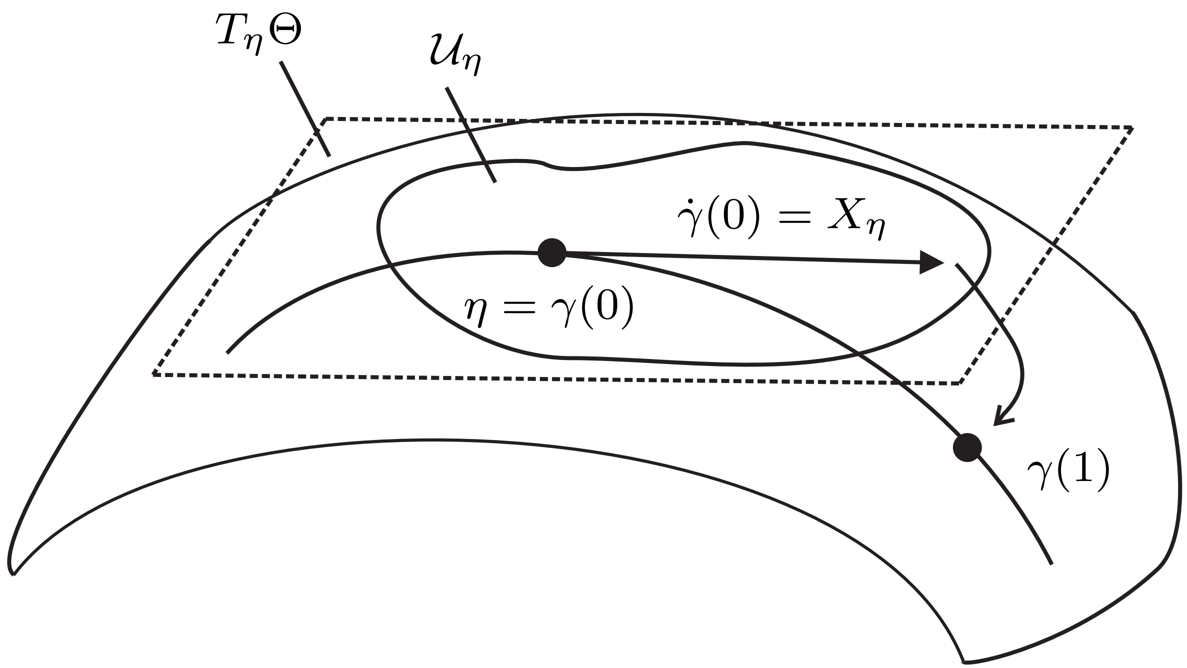
Riemannian-geometric concepts

☐ The exponential mapping

▷ $\exp_\eta : \mathcal{U}_\eta$ (open) $\subset T_\eta\Theta \to \Theta$

▷ Let γ denote a geodesic such that $\gamma(0) = \eta$ and $\dot{\gamma}(0) = X_\eta \in T_\eta\Theta$

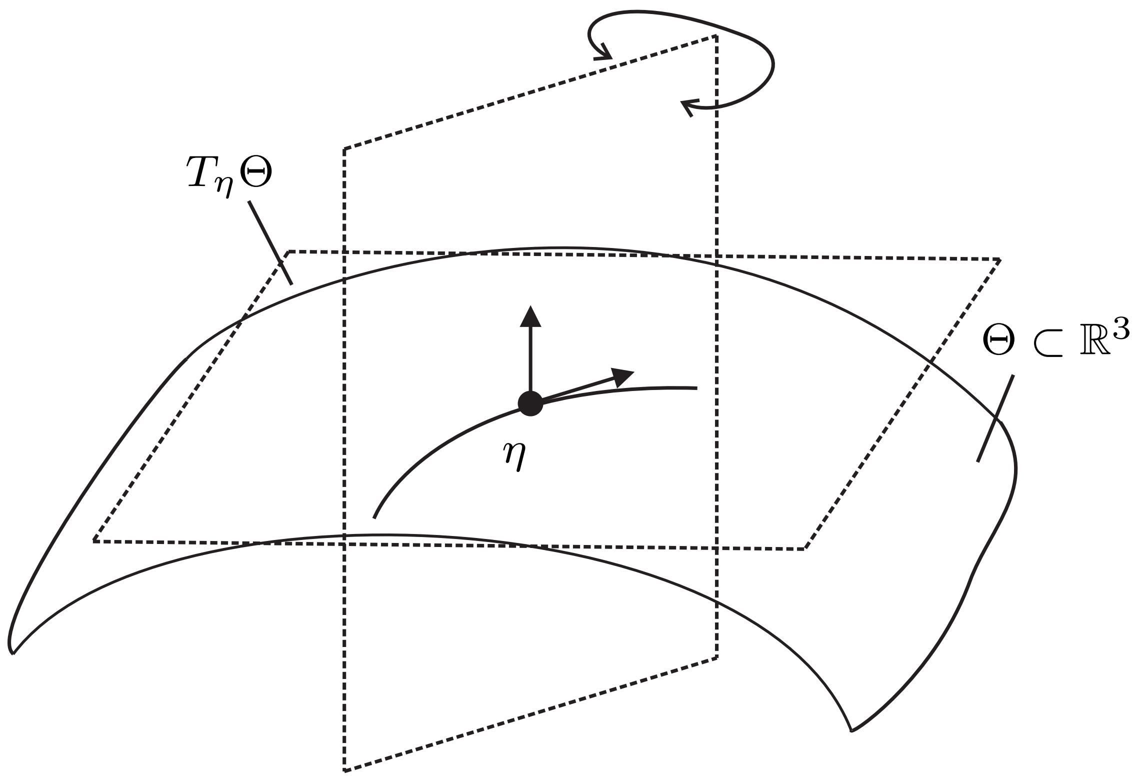
▷ $\exp_\eta(X_\eta) = \gamma(1)$



☐ Geodesic ball: $\mathsf{B}(\eta;\epsilon) = \exp_\eta(\{X_\eta : |X_\eta| < \epsilon\})$ (diffeomorphic image)

Riemannian-geometric concepts

☐ If γ is a unit-speed curve, then $\kappa = |\ddot{\gamma}(0)|$ is its curvature at $t = 0$



☐ Gaussian curvature (GC) of a surface $\Theta \subset \mathbb{R}^3$ at η: $\kappa_\eta = \pm\kappa_{\max} \cdot \kappa_{\min}$

☐ Sectional curvature of a 2D-plane $\Pi \subset T_\eta\Theta$: $C_\eta(\Pi) =$ GC of $\exp_\eta(\Pi)$