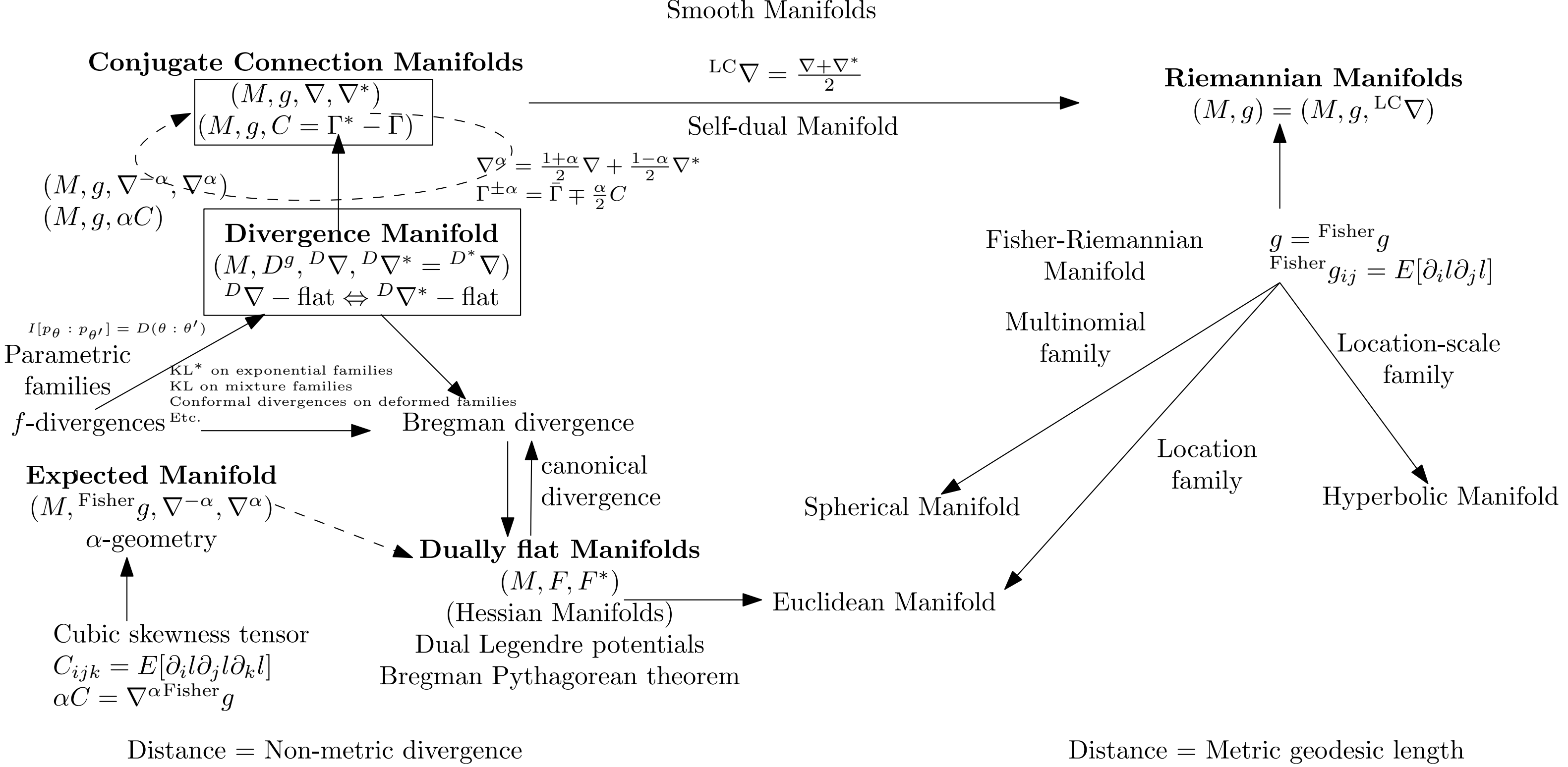
Smooth Manifolds
Conjugate Connection Manifolds
(M, g, ∇, ∇^*)
$(M, g, C = \Gamma^* - \bar{\Gamma})$
$^{\mathrm{LC}}\nabla = \frac{\nabla + \nabla^*}{2}$
Self-dual Manifold
Riemannian Manifolds
$(M, g) = (M, g, {}^{\mathrm{LC}}\nabla)$
$\nabla^\alpha = \frac{1+\alpha}{2}\nabla + \frac{1-\alpha}{2}\nabla^*$
$\Gamma^{\pm\alpha} = \bar{\Gamma} \mp \frac{\alpha}{2} C$
$(M, g, \nabla^{-\alpha}, \nabla^\alpha)$
$(M, g, \alpha C)$
Divergence Manifold
$(M, D^g, {}^D\nabla, {}^D\nabla^* = {}^{D^*}\nabla)$
${}^D\nabla - \text{flat} \Leftrightarrow {}^D\nabla^* - \text{flat}$
Fisher-Riemannian Manifold
$g = {}^{\mathrm{Fisher}}g$
${}^{\mathrm{Fisher}}g_{ij} = E[\partial_i l \partial_j l]$
$I[p_\theta : p_{\theta'}] = D(\theta : \theta')$
Parametric families
f-divergences
KL^* on exponential families
KL on mixture families
Conformal divergences on deformed families
Etc.
Bregman divergence
Multinomial family
Location-scale family
Location family
canonical divergence
Expected Manifold
$(M, {}^{\mathrm{Fisher}}g, \nabla^{-\alpha}, \nabla^\alpha)$
α-geometry
Spherical Manifold
Hyperbolic Manifold
Dually flat Manifolds
(M, F, F^*)
(Hessian Manifolds)
Dual Legendre potentials
Bregman Pythagorean theorem
Euclidean Manifold
Cubic skewness tensor
$C_{ijk} = E[\partial_i l \partial_j l \partial_k l]$
$\alpha C = \nabla^\alpha {}^{\mathrm{Fisher}}g$
Distance = Non-metric divergence
Distance = Metric geodesic length