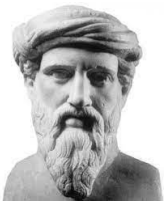
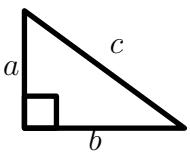
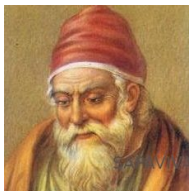
Genesis of Information Geometry



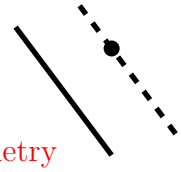
Pythagoras of Samos
(c. 570-495 BC)
Pythagoras' theorem



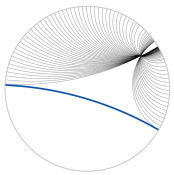
$c^2 = a^2 + b^2$



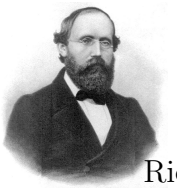
Euclid
(ca 365-300 BC)
Elements, math. proof
Playfair axiom, Euclidean geometry



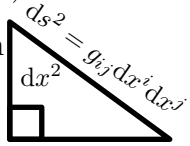
Nikolai Ivanovich Lobachevsky
(1792-1856)
Hyperbolic geometry
(∞-many lines passing through a point and // to another line)



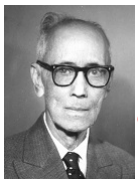
Christian Felix Klein
(1849-1925)
Projective geometry & symmetry grou
Erlangen program



Georg F. B. Riemann
(1826–1866)
metric tensor (1854)
$g = g_{ij} \mathrm{d}\theta_i \otimes \mathrm{d}\theta_j$
Riemannian manifold (M, g)

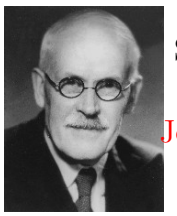


Élie Joseph Cartan
(1869-1951)
affine connections
differential forms ω



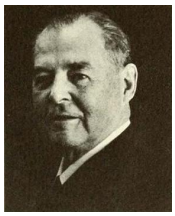
Rabindra Nath Sen
(1896-1974)
dual parallel transports
(ca 1945-1950)

Sir Ronald Aylmer Fisher
(1890-1962)
Mathematical statistics
Fisher information, MLE

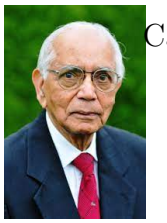


Sir Harold Jeffreys
(1891-1989)
Jeffreys prior $\propto \sqrt{|g|}$
J-divergence

Alexander Petrovich Norden
(1904-1993)
conjugate connections wrt g
Affinely connected spaces

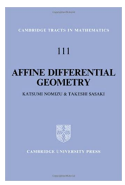


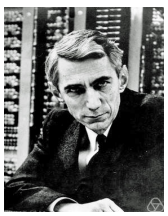
Harold Hotelling
(1895-1973)
Econometrician
Fisher metric
(1930)



Calyampudi Radhakrishna Rao
(1920-)
Fisher-Rao distance
Cramér-Rao lower bound
(1945)

Wilhelm Johann E. Blaschke
(1885-1962)
Affine differential geometry

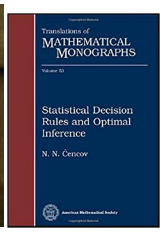




Claude Elwood Shannon
(1916-2001)
Information theory
Entropy:
$h(p) = -\int p \log p \mathrm{d}\mu$

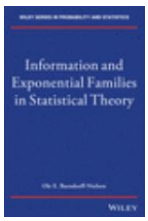
Solomon Kullback
(1907-1994)
Richard A. Leibler
(1914-2003)
KL divergence
$D_{\mathrm{KL}}[p:q] = \int p \log \frac{p}{q} \mathrm{d}\mu$

Ernest Borisovich Vinberg
(1937-2020)
characteristic functions
on Homogeneous cones



Nikolai Nikolaevich Chentsov
(1930-1992)
statistical invariance
geometrostatistics
Category theory, connections

Imre Csiszár
(1938-)
information projections
f-divergences
$I_f[p:q] = \int p f(\frac{q}{p}) \mathrm{d}\mu$



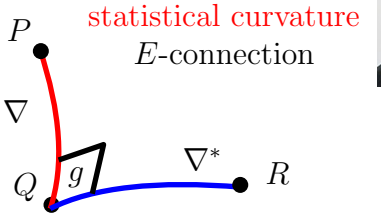
Ole E. Barndorff-Nielsen
(1935-)
Exponential families
observed information geometry

Bradley Efron
(1938-)
statistical curvature
E-connection

Jean-Louis Koszul
(1921-2018)
Hirohiko Shima
homogeneous bounded domains

Shun-ichi Amari
(1936-)
Information geometry
dual $\pm\alpha$-connections
$(M, g_F, \nabla^{-\alpha}, \nabla^{\alpha})$

Steffen Lauritzen
(1947-)
statistical manifold (M, g, C)



$D(P:Q) + D(Q:R) = D(P:R)$
Generalized Pythagoras' theorem
in dually flat space (M, g, ∇, ∇^*)

Information geometry
journal (2018-)