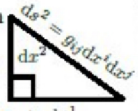
History of Information

Geometric Science of Information

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)

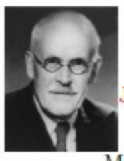


Élie Joseph Cartan
(1869-1951)
affine connections
differential forms ω

Blaise Pascal
(1623-1662)
Aleae Geometria
Probability
Thermodynamics (pressue Pa.)
Computer (Pascaline)

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

Sir Ronald A. Fisher
(1890-1962)
Mathematical statistics
Fisher information, MLE
$I(\theta) = E_{p_\theta}\left[(\nabla_\theta \log p_\theta)(\nabla_\theta \log p_\theta)^\top\right]$



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

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

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

Maurice R. Fréchet
(1878-1973)
Metric spaces
Fréchet barycenter
Fréchet CR bound
Legendre-Clairaut structure

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

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

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

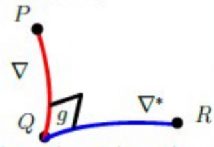
C. R. Rao
(1920-)
Fisher-Rao distance
Cramér-Rao lower bound
(1945)

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 B. Vinberg
(1937-2020)
characteristic functions
on homogeneous cones

Harald Cramér
(1893-1985)

Nikolai N. Chentsov
(1930-1992)
statistical invariance
geometrostatistics
Gen. Pythagoras theorem



$D(P:Q) + D(Q:R) = D(P:R)$

Bradley Efron
(1938-)
statistical curvature
E-connection
Lev M. Bregman
(1941-)
Bregman divergence
Bregman projections

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

Jean-Louis Koszul
(1921-2018)
Hirohiko Shima
Hessian Geometry
Symmetric Homogeneous Bounded Domains
Koszul forms, Fisher metric extension for
sharp convex cones
Lie Algebra Cohomology, Koszul Complex,
Koszul duality, Koszul connection
homogeneous bounded domains

Philip Dawid
(1946-)
decision theory
proper scoring rules

Steffen Lauritzen
(1947-)
statistical manifold
graphical models

Shun-ichi Amari
(1936-)
Information geometry
dualistic structure(M, g, ∇, ∇^*):
$Z_g(X,Y) = g(\nabla_Z X, Y) + g(X, \nabla^*_Z Y)$
dual $\pm\alpha$-connections
$(M, g_F, \nabla^{-\alpha}, \nabla^{\alpha})$

Jean-Marie Souriau
(1922-2012)
Lie Groups Thermodynamics
Souriau 2-form, Moment map
Fisher metric extension on
Homogeneous Symplectic Manifolds
Lie Groups Statistics, Entropy as Casimir Function
Fisher Metric as calorific capacity

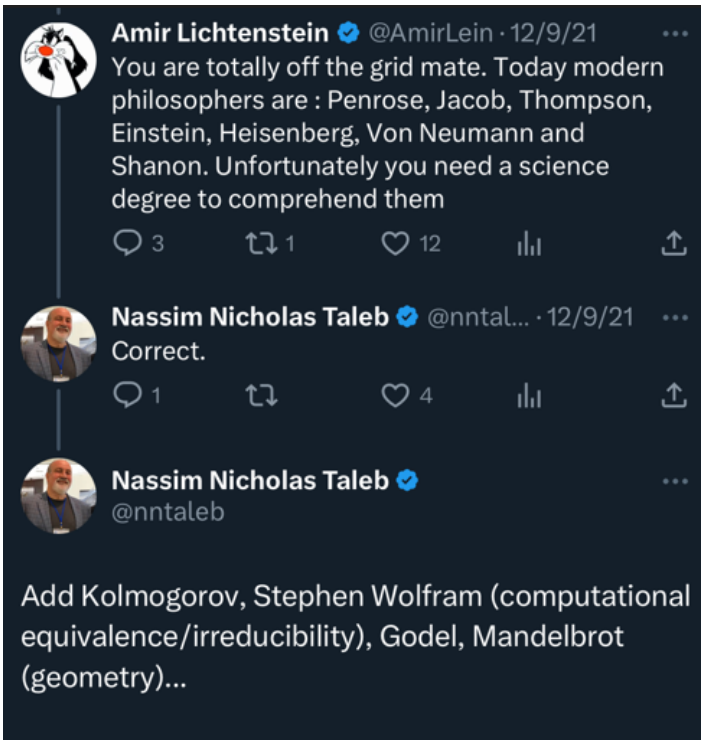
information theoretic lower bounds via fano's lemma

the wasserstein autoencoder paper

use of martingale inequalities to prove some contextual bandit stuff

History of statistics

Countrarywise, there is a yuuge branch of Phil. of Statistics:
[from Memory]
De Finetti
Jeffreys
Levi
Kyburg
Good
Nagel
Hacking
Salmon
Hintikka
Suppes
Smolburg
von Wright [Inductive Logic],
+ Reichenbach, Popper, Carnap, Von Mises (R.), Keynes, Fine, Peirce,
...even Laplace!


Amir Lichtenstein @AmirLein · 12/9/21
You are totally off the grid mate. Today modern philosophers are : Penrose, Jacob, Thompson, Einstein, Heisenberg, Von Neumann and Shanon. Unfortunately you need a science degree to comprehend them
3
1
12
Nassim Nicholas Taleb @nntal... · 12/9/21
Correct.
1
4
Nassim Nicholas Taleb
@nntaleb
Add Kolmogorov, Stephen Wolfram (computational equivalence/irreducibility), Godel, Mandelbrot (geometry)...