Selected References on Hyperbolic Representation

Hyperbolic Geometry 2ed

This book provides a self-contained introduction to the geometry of the hyperbolic plane.

> James W. Anderson, *Hyperbolic Geometry 2ed*. in Springer Undergraduate Mathematics Series. London: Springer-Verlag, 2005. doi: 10.1007/1-84628-220-9.

Outer Circles: An Introduction to Hyperbolic 3-Manifolds

Outer Circles describes the basic mathematics needed for those answers as well as making clear the grand design of the subject of hyperbolic manifolds as a whole. The purpose of Outer Circles is to provide an account of the contemporary theory, accessible to those with minimal formal background in topology, hyperbolic geometry, and complex analysis.

[1]

> A Marden, Outer Circles, Cambridge University Press, Dec. 2009
> doi: 10.1017/CBO9780511618918, ISBN: 9780511618918

Analytic Hyperbolic Geometry

This is the first book on analytic hyperbolic geometry, fully analogous to analytic Euclidean geometry. Analytic hyperbolic geometry regulates relativistic mechanics just as analytic Euclidean geometry regulates classical mechanics. The book presents a novel gyrovector (hyperbolic vector) space approach to analytic hyperbolic geometry, fully analogous to the well-known vector space approach to Euclidean geometry.

> Abraham A. Unger *Analytic Hyperbolic Geometry*, 2005
> https://www.worldscientific.com/worldscibooks/10.1142/5914

Towards Scalable Hyperbolic Neural Networks using Taylor Series Approximations

Hyperbolic networks have shown prominent improvements over their Euclidean counterparts in .. hierarchical datasets ... However, their adoption in practice remains restricted due to (i) non-scalability on accelerated deep learning hardware, (ii) vanishing gradients due to the closure of hyperbolic space, and (iii) information loss due to frequent mapping between local tangent space and fully hyperbolic space. .. we propose the approximation of hyperbolic operators using Taylor series expansions, which allows us to reformulate the computationally expensive tangent and cosine hyperbolic functions into their polynomial equivariants which are more efficient.

> N. Choudhary and C. K. Reddy, “Towards Scalable Hyperbolic Neural Networks using Taylor Series Approximations.” arXiv, Jun. 07, 2022. doi: 10.48550/arXiv.2206.03610