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Altri autori (Persone)	Borgia, Bruno Di Domenico, Antonio
Altri autori (Enti)	Istituto Nazionale di Fisica Nucleare : Laboratori Nazionali <Frascati> Istituto Nazionale di Fisica Nucleare : Sezione di Roma
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Nota di contenuto	PART 1: Tribute to Jean-Marie Souriau seminal works: G. de Saxcé and C.-M. Marle, Structure des Systèmes Dynamiques -- Jean-Marie Souriau’s book 50th birthday -- F. Barbaresco, Jean-Marie Souriau’s Symplectic Model of Statistical Physics : Seminal papers on Lie Groups Thermodynamics - Quod Erat Demonstrandum -- PART 2: Lie Group Geometry & Diffeological Model of Statistical Physics and Information Geometry: F. Barbaresco - Souriau-Casimir Lie Groups Thermodynamics & Machine Learning -- K. Tojo and T. Yoshino, An exponential family on the upper half plane and its conjugate prior -- E. Chevallier and N. Guigui, Wrapped statistical models on manifolds: motivations, the case SE(n), and generalization to symmetric spaces -- G. de Saxcé, Galilean Thermodynamics of Continua -- H. Vân Lê and A. Tuzhilin, Nonparametric estimations and the diffeological Fisher metric

-- PART 3: Advanced Geometrical Models of Statistical Manifolds in Information Geometry: J.-P. Francoise, Information Geometry and Integrable Hamiltonian Systems -- M. N. Boyom, Relevant Differential topology in statistical manifolds -- G. Pistone, A lecture about the use of Orlicz Spaces in Information Geometry -- F. Nielsen and G. Hadjeres, Quasiconvex Jensen divergences and quasiconvex Bregman divergences -- PART 4: Geometric Structures of Mechanics, Thermodynamics & Inference for Learning: F. Gay-Balmaz and H. Yoshimura, Dirac Structures and Variational Formulation of Thermodynamics for Open Systems -- A. A. Simoes, D. Martín de Diego, M. L. Valcázar and Manuel de León, The geometry of some thermodynamic systems -- F. Chinesta, E. Cueto, M. Grmela, B. Mioya, M. Pavelka and M. Sipka, Learning Physics from Data: a Thermodynamic Interpretation -- Z. Terze, V. Pandža, M. Andri and D. Zlatar, Computational dynamics of reduced coupled multibody-fluid system in Lie group setting -- F. Masi, I. Stefanou, P. Vannucci and V. Maffi-Berthier, Material modeling via Thermodynamics-based Artificial Neural Networks -- K. Grosvenor, Information Geometry and Quantum Fields -- PART 5: Hamiltonian Monte Carlo, HMC Sampling and Learning on Manifolds: A. Barp, The Geometric Integration of Measure-Preserving Flows for Sampling and Hamiltonian Monte Carlo -- A. Fradi, I. Adouani and C. Samir, Bayesian inference on local distributions of functions and multidimensional curves with spherical HMC sampling -- S. Huntsman, Sampling and Statistical Physics via Symmetry -- T. Gerald, H. Zaatiti and H. Hajri, A Practical hands-on for learning Graph Data Communities on Manifolds.

Sommario/riassunto

Machine learning and artificial intelligence increasingly use methodological tools rooted in statistical physics. Conversely, limitations and pitfalls encountered in AI question the very foundations of statistical physics. This interplay between AI and statistical physics has been attested since the birth of AI, and principles underpinning statistical physics can shed new light on the conceptual basis of AI. During the last fifty years, statistical physics has been investigated through new geometric structures allowing covariant formalization of the thermodynamics. Inference methods in machine learning have begun to adapt these new geometric structures to process data in more abstract representation spaces. This volume collects selected contributions on the interplay of statistical physics and artificial intelligence. The aim is to provide a constructive dialogue around a common foundation to allow the establishment of new principles and laws governing these two disciplines in a unified manner. The contributions were presented at the workshop on the Joint Structures and Common Foundation of Statistical Physics, Information Geometry and Inference for Learning which was held in Les Houches in July 2020. The various theoretical approaches are discussed in the context of potential applications in cognitive systems, machine learning, signal processing.