Conformal Field Theory

Rubik Poghossian
Yerevan Physics Institute

56 hours: 22 Lectures (44 hours) and 6x2 hours of practical training

Lecture 1. Introduction: CFT applications in particle physics, critical statistical systems and string theory
Lecture 2. Conformal symmetry in various dimensions
Lecture 3. Infinitesimal conformal transformations in d>2 dimensions; algebra of conformal transformations
Lecture 4. Global conformal transformations through exponentiation
Lecture 5. Conformal transformations in two dimensions, De Vitt algebra
Lecture 6. Central extension, Virasoro algebra
Lecture 7. Energy momentum tensor in 2d CFT
Lecture 8. Representations of Virasoro algebra
Lecture 9. Local fields and Operator Product Expansion (OPE)
Lecture 10. Primary and secondary fields
Lecture 11. Correlation functions; calculation of 2 and three-point functions
Lecture 12. 4-point functions; conformal blocks
Lecture 13. Degenerate representations and degenerate fields; null vectors
Lecture 14. Ward identities; differential equations for correlation function including degenerate fields
Lecture 15. 4-point function including a second level degenerated field, explicit solution in terms of hypergeometric functions
Lecture 16. Free Bosons anf Fermions as simplest CFT models
Lecture 16. Virasoro minimal models; Ising and tri-critical Ising model
Lecture 17. Liouville theory; structure constants and correlation functions
Lecture 18. Super-symmetry; super-symmetric minimal models
Lecture 19. Current algebra; Wess-Zumino-Novikov-Witten models
Lecture 20. Goddard-Kent-Olive construction
Lecture 21. Basics of string/superstring theory
Lecture 22. Alday-Gaiotto-Tachikawa conjecture- duality between 2d CFT and four dimensional N=2 supersymmetric Yang-Mills theory