PhD course

Dipartimento di Matematica, Università di Roma Tor Vergata
a.y. 2019/2020 – Spring Semester, about 24 hours

Lecturer: Fabio Ciolli
Title: Operator Algebraic Models of Quantum Field Theory

Program

1. C^*-Algebras for physical Commutation Relations
   - 1.1 The CAR Algebra and Quasifree States
   - 1.2 The Fermi Fock Space
   - 1.3 The CCR Algebra and Quasifree States
   - 1.4 The Bose Fock Space
   - 1.5 Quasifree States on the Weyl Algebra
   - 1.6 Standard subspaces and nets of von Neumann Algebras in Fock Representations
   - 1.7 Special topics:
     - Weyl Algebras products
     - Non-regular representations: an elementary example
2. Quantum Field Theory
   - 2.1 Quantum Fields as operator-valued distributions
   - 2.2 Quasifree Bose Fields
   - 2.3 The Free Scalar Field (Klein-Gordon field)
   - 2.4 The Free Electromagnetic Field
   - 2.5 Special topics:
     - The Massless scalar free Field in 1+3 and 1+1-dimensions (Streater and Wilde model)
     - Universal C*-algebras of the e.m. Field and (local) topological charges
   - 2.6 Quasifree Fermi Fields
   - 2.7 The Free Neutrino Field
   - 2.8 The Free Dirac Field
3. Intro to further topics
   - QFT on S^1
   - Loop Groups models
   - QFT on curved spacetimes