

# Topics on Lattice Gauge Theories

Sunny Pradhan



# Contents

|  |           |
|--|-----------|
| <b>Introduction</b>  | <b>5</b>  |
| <b>1 Review of continuum gauge theory</b>                      | <b>7</b>  |
| 1.1 Yang-Mills theory . . . . .                                | 7         |
| 1.2 Euclidean field theory . . . . .                           | 7         |
| 1.3 Hamiltonian formulation . . . . .                          | 7         |
| <b>2 Introduction to lattice gauge theories</b>                | <b>9</b>  |
| 2.1 Kogut-Susskind Hamiltonian approach . . . . .              | 9         |
| 2.2 Quantum simulation . . . . .                               | 9         |
| 2.3 Finite-group approach . . . . .                            | 9         |
| <b>3 Dualities in lattice gauge theories</b>                   | <b>11</b> |
| 3.1 Bond-algebra approach to dualities . . . . .               | 11        |
| 3.2 Gauge-reducing dualities . . . . .                         | 11        |
| 3.3 Dualities of two-dimensional pure LGTS . . . . .           | 11        |
| 3.4 Dualities of ladder LGTs . . . . .                         | 11        |
| <b>4 Spin networks and finite group lattice gauge theories</b> | <b>13</b> |



# Introduction



## Chapter 1

# Review of continuum gauge theory

1.1 Yang-Mills theory

1.2 Euclidean field theory

1.3 Hamiltonian formulation





## Chapter 2

# Introduction to lattice gauge theories

2.1 Kogut-Susskind Hamiltonian approach

2.2 Quantum simulation

2.3 Finite-group approach



## Chapter 3

# Dualities in lattice gauge theories

3.1 Bond-algebra approach to dualities

3.2 Gauge-reducing dualities

3.3 Dualities of two-dimensional pure LGTS

3.4 Dualities of ladder LGTs



## Chapter 4

# Spin networks and finite group lattice gauge theories