Physically Consistent Models

- 3 DESIGN OF DATA SCIENCE MODELS
  - 3.1 Theory-guided Specification of Response
    - choice of model family，link function and probability distribution functions [42]
  - 3.2 Theory-guided Design of Model Architecture
    - modular sub-problems [43]
    - specifying node connections [44-46]
- 4 LEARNING OF DATA SCIENCE MODELS
  - 4.1 Theory-guided Initialization
    - pretraining strategies [47-49]
  - 4.2 Theory-guided Probabilistic Models
    - graph estimation techniques,graph Lasso [50]
    - introduce priors in the model space [26,27][51]
  - 4.3 Theory-guided Constrained Optimization
    - linear equality or inequality conditions [25][52-54][57]
    - partial differential equations (PDE) [55,56][58,[59]
  - 4.4 Theory-guided Regularization
    - variants of Lasso, e.g. group Lasso [28][31][60-66]
    - multitask learning formulations [59][67]
- 5 REFINEMENT OF DATA SCIENCE OUTPUTS
  - 5.1 Using Explicit Domain Knowledge
  - 5.2 Using Implicit Domain Knowledge
- 6 LEARNING HYBRID MODELS OF THEORY AND DATA SCIENCE
- 7 AUGMENTING THEORY-BASED MODELS USING DATA SCIENCE
  - 7.1 Data Assimilation in Theory-based Models
  - 7.2 Calibrating Theory-based Models using Data