**Thesis:** A Survey Starting from First Principles: Out of Distribution Generalization Research Landscape in Deep Learning

**Abstract:** Out-of-Distribution generalization (OOD) is a challenging problem on the line of research about model generalization. The over-expressiveness of neural network layered the problem with additional combat against over-fitting in the deep learning field. Studies on the theoretical end and the empirical end have both contributed to push the frontier forwards, each embracing a set of vocabulary to describe the problem and a set of state-of-the-art solutions from different facets. This survey aims to bridge the two ends by grouping and differentiating similar terms in a structured manner by asking First Principle questions: “define the problem → understand the problem → solve the problem”. An extensive categorization of OOD scenarios will be presented, highlighting that not all OOD are equal. Main ideas of solution will be extracted, unwoven from the general-purpose algorithm toolkit and specific OOD scenarios.

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