Saddle Point Problems or Min-Max Problems

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Introduction:

Saddle point or min-max problems are more difficult problems than minimization problems. Meanwhile, min-max problems often arise in machine learning. The goal of this project is to understand the difference between min-max problems and minimization problems, and to learn methods for min-max problems.

This project is built upon an analysis of two papers: **A Variational Inequality Perspective on Generative Adversarial Networks** and **On the Convergence of Single-Cell Stochastic Extra-Gradient Methods**.

In order to comply with the requirement to have a single LaTeX file in the root directory of the project, this file will cover detailed analysis of both papers, though they will be contained in separate sections. Analysis of the problem in general and conclusion will follow the rest of the report in the final section of the .tex file.

1 A Variational Inequality Perspective on Generative Adversarial Networks:

1.1 Problem Statement:

1.2 Main Idea of the Approach:

1.3 Theory and Background:

1.3.1 Related Work:

1.3.2 Theoretical Framework:

1.3.3 Key Features:

1.3.4 Causes behind Good Performance:

1.3.5 Improvements over Older Methods:

1.4 Essence of Proof:

1.5 Experiments and Results:

2 On the Convergence of Single-Cell Stochastic Extra-Gradient Methods:

2.1 Problem Statement:

2.2 Main Idea of the Approach:

2.3 Theory and Background:

2.3.1 Related Work:

2.3.2 Theoretical Framework:

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2.3.4 Causes behind Good Performance:

2.3.5 Improvements over Older Methods:

2.4 Essence of Proof:

2.5 Experiments and Results:

3 Conclusion: