

# Project Proposal

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**Paper:** Linear Programming in the Semi-streaming Model with Application to the Maximum Matching Problem [Ahn, Guha]

## Motivation

This paper studies the Maximum Matching Problem in the Semi-Streaming Model. Maximum Matching is one of the most fundamental and extensively studied problems in Combinatorial Optimization and we believe the techniques that are used here can be thought of as a general framework for solving various related problems. This is the first thing that intrigues us about this paper. Secondly, one of us is already working on Semi-Streaming algorithms and the other intends to learn more about this model as it is one of the fundamental models that every Computer Scientist should be familiar with. So we want to utilize the opportunity to thoroughly understand this paper so that we have a much clearer understanding of the model and the techniques used.

## Agenda

The primary objective is of course to understand the techniques used very clearly. Eventually we would like to apply these techniques to solve other problems that we encounter in our research. Linear Programming is a widely used tool in Combinatorial Optimization and what this paper does on a high level is use Multiplicative Weight Update to solve LP relaxations in the Semi-Streaming setting. Thus, it is highly likely that we can use the techniques used in this paper to solve a broad class of problems, which can be expressed with “similar” LP’s. We can start with thinking about slightly modified versions of Matching, e.g. the Generalized Assignment Problem. To be more ambitious, we could think about the following questions: For which types of constraints would these techniques (or slight modifications thereof) generalize? In particular, would these techniques be applicable for Matroid constraints? Also, do these methods generalize for other types of objective functions? Moreover, this paper uses some techniques to reduce the space usage and the number of passes for their Semi-streaming algorithm. We plan to understand how much these techniques depend on the structure of the problem, or if it mainly depends on the Multiplicative Weight Update method.