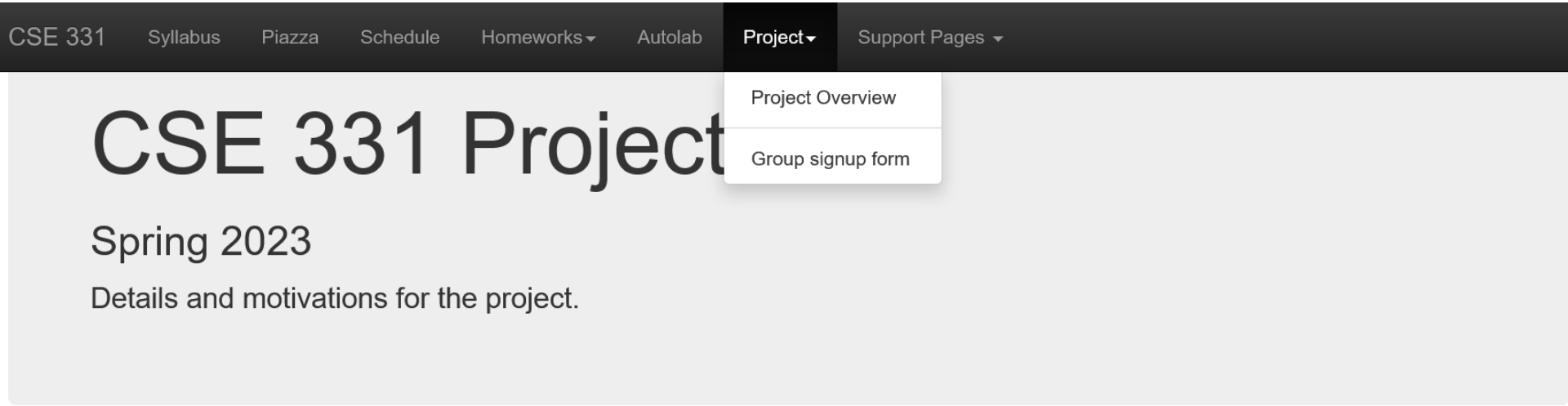
Lecture 6

CSE 331

Register your project groups

Deadline: Friday, March 3, 11:59pm



Motivation

CSE 331 is primarily concerned with the technical aspects of algorithms: how to design them and then how to analyze their correctness and runtime. However, algorithms are pervasive in our world and are common place in many aspects of society. The main aim of the project is to have you explore in some depth some of the social implications of algorithms.

Just to give some examples for such implications:

Your UB email: XXX@buffalo.edu

Your UBIT ID is XXX

NOT XXX @buffalo.edu
NOT your person number

HW 1 gets released Today

Week 2 Mon, Feb 6	Perfect Matchings F22 F21 S21 S20 x²	[KT, Sec 1.1] (**HW 0 in**) Week 2 recitation notes
Wed, Feb 8	Algorithms for stable matching problem F22 F21 S21 S20 x²	[KT, Sec 1.1]
Fri, Feb 10	Gale Shapley algorithm F22 F21 S21 S20 x²	[KT, Sec 1.1] (**HW 1 out**) *Reading Assignment:* Pigeonhole principle *Reading Assignment:* Asymptotic notation care package

Reading Assignments

Week 2 Mon, Feb 6	Perfect Matchings F22 F21 S21 S20 x²	[KT, Sec 1.1] (**HW 0 in**) Week 2 recitation notes
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Stable Marriage problem

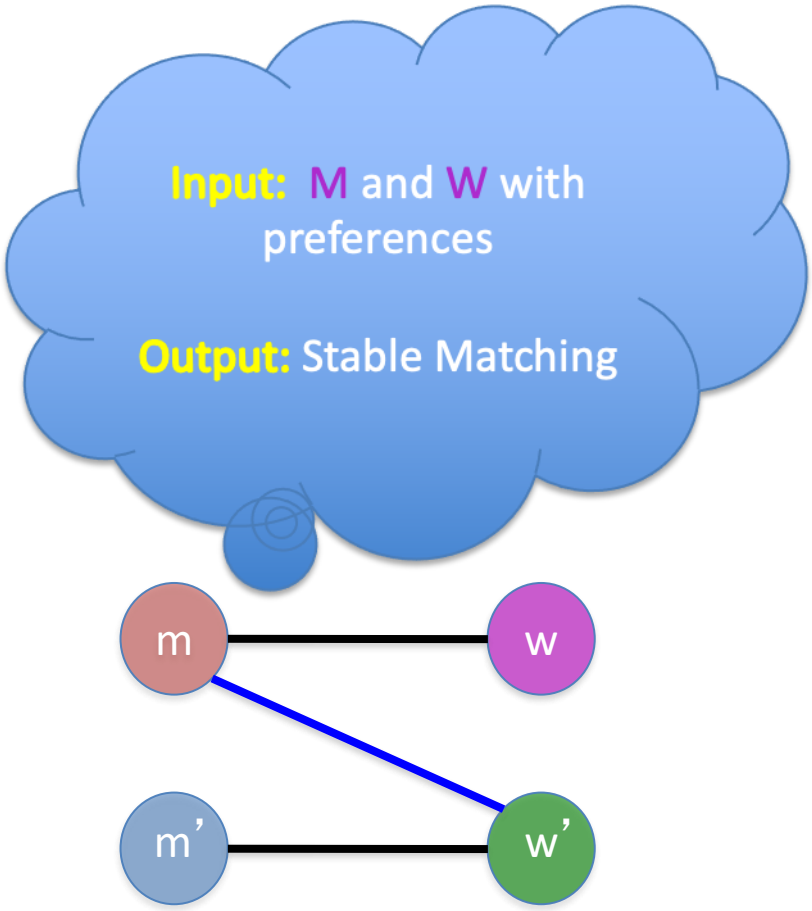
Set of men M and women W

Preferences (ranking of potential spouses)

Matching (no polyandry/gamy in M X W)

Perfect Matching (everyone gets married)

Instablity



Stable matching = perfect matching + no instablity

Two Questions

Does a stable marriage always exist?

If one exists, how quickly can we compute one?

The naïve algorithm

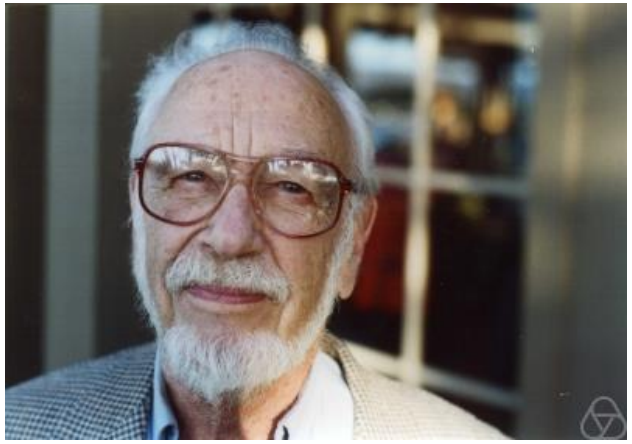
Go through all possible perfect matchings S

If S is a stable matching

then Stop

Else move to the next perfect matching

Gale-Shapley Algorithm



David Gale

Lloyd Shapley

$O(n^2)$ algorithm

Rest of today's agenda

GS algorithm

Run of GS algorithm on an instance

Prove correctness of the GS algorithm

Gale-Shapley Algorithm

Intially all men and women are free

While there exists a free woman who can propose

Let w be such a woman and m be the best man she has not proposed to

w proposes to m

If m is free

(m,w) get engaged

Else (m,w') are engaged

If m prefers w' to w

w remains free

Else

(m,w) get engaged and w' is free

Output the engaged pairs as the final output

Rest of today's agenda

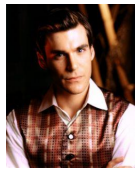
GS algorithm

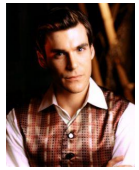
Run of GS algorithm on an instance

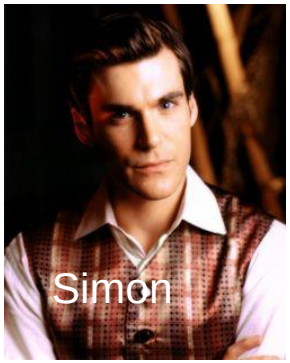
Prove correctness of the GS algorithm

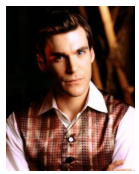
Back to working on paper…

Preferences









GS algorithm: Firefly Edition