

Deferred Acceptance Algorithm for Julia

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Abstract: Deferred Acceptance (DA) algorithm proposed by Gale and Shapley in 1962 has profound influence on matching markets. Here, I present Julia application for DA algorithm and its extensions accompanied with an example. Using this application the users only have to input the two sides to be matched and ranking information to achieve the desirable matching result.

Characterization of DA Algorithm

"Matching is one of the most important functions of markets. Who gets which jobs, which school places, who marries whom, these help shape lives and careers." - Alvin E. Roth

Deferred Acceptance algorithm clears the two-sided (proposing and receiving side) matching market (serving as a market place) based on preferences (not based on prices). The resulting match is

- ▶ Stable: no pair (or coalition) can form another matching that is preferred by both sides
- ▶ (Proposing Side) Optimal: there is no strictly better stable matching
- ▶ Strategy-proof: players will not receive better matching by lying their preferences

The DA algorithm CAN be used for:

- ▶ Creating matches for (online) dating each day
- ▶ Labor (job) markets: team/project assignments, clients & server assignment
- ▶ Education markets: school/course assignments
- ▶ and many more...!

The DA algorithm CAN NOT (yet) be used for

- ▶ When matching opportunities arrive over time

daa.jl*

Inputs:

- ▶ Proposing side: A, B, and C; Receiving side: X and Y
- ▶ Preferences:
 - ▶ A prefers X to Y
 - ▶ B prefers X to Y
 - ▶ C prefers Y to X
 - ▶ X prefers A the most and indifferent across B and C
 - ▶ Y is indifferent across all choices A, B, and C
- ▶ Capacity: X can be matched upto 1 and Y 2.

Code: `daa(ps=[A,B,C],rs=[X,Y],cap=[1,2],pspref=[[X,Y],[X,Y],[Y,X]],rspref=[[A],[]])`

Results: `[[A,X],[B,Y],[C,Y]]`

Extensions:

- ▶ For the proposing side: can indicate preference intensity shares, which sums up to 1 for all ranked choices
- ▶ For the receiving side: can rank the characteristics rather than each individual (helpful in case of large market)

*Documentation/Example can be found in a software section of my website (<https://sites.google.com/view/mrho>)

References

- ▶ Roth, Alvin E. "Deferred Acceptance Algorithms: History, Theory, Practice, and Open Questions," International Journal of Game Theory, Special Issue in Honor of David Gale on his 85th birthday, 36, March, 2008, 537-569.
- ▶ Rho, M. "Implementation of the Deferred Acceptance Algorithm in School Choice Application," Carnegie Mellon University, Thesis, 2019.