VisMatchmaker: Cooperation of the User and the Computer in Centralized Matching Adjustment

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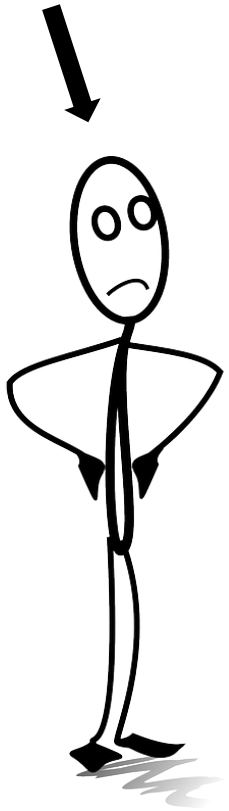
Mentor-Mentee Matching

A puzzled advisor
at Georgia Tech



Mentors	Mentees
Peter	David
Ken	Ben
Betty	Jack
Jane	Mary
John	May

Mentor-Mentee Matching

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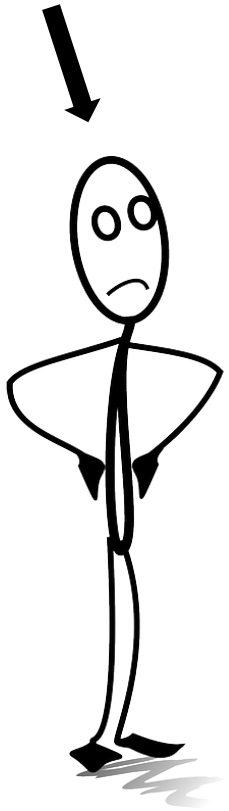

Mentees' Preference Lists

David	Ben
1. Jane	1. Ken
2. Betty	2. Jane
3. Peter	3. John
4. John	4. Betty

Jack	Mary	May
1. ...	1. ...	1. ...
2. ...	2. ...	2. ...
3. ...	3. ...	3. ...
4. ...	4. ...	4. ...

Mentor-Mentee Matching

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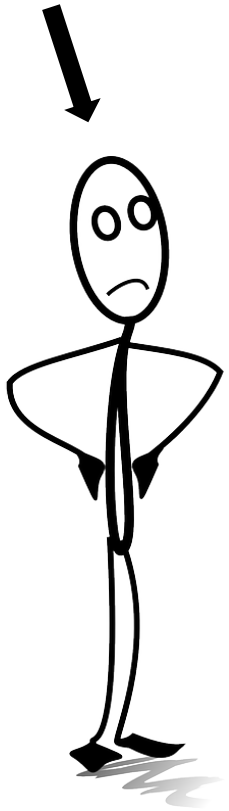

Mentors' Preference Lists

Peter	Ken
1. David	1. May
2. May	2. Mary
3. Jack	3. Jack
4. Ben	4. Ben

Betty	Jane	John
1. ...	1. ...	1. ...
2. ...	2. ...	2. ...
3. ...	3. ...	3. ...
4. ...	4. ...	4. ...

Mentor-Mentee Matching

Mentors' Preference Lists

Peter	Ken
1. David	1. May
2. May	2. Mary
3. Jack	3. Jack
4. Ben	4. Ben

Betty	Jane	John
1. ...	1. ...	1. ...
2. ...	2. ...	2. ...
3. ...	3. ...	3. ...
4. ...	4. ...	4. ...

Mentees' Preference Lists

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1. ...	1. ...	1. ...
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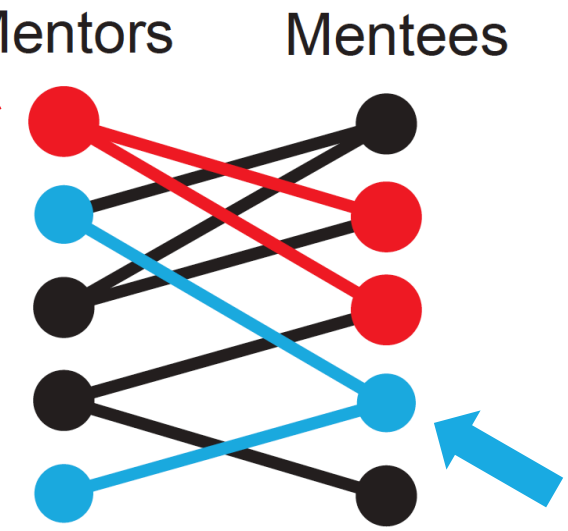
3. ...	3. ...	3. ...
4. ...	4. ...	4. ...

Mentor with two mentees

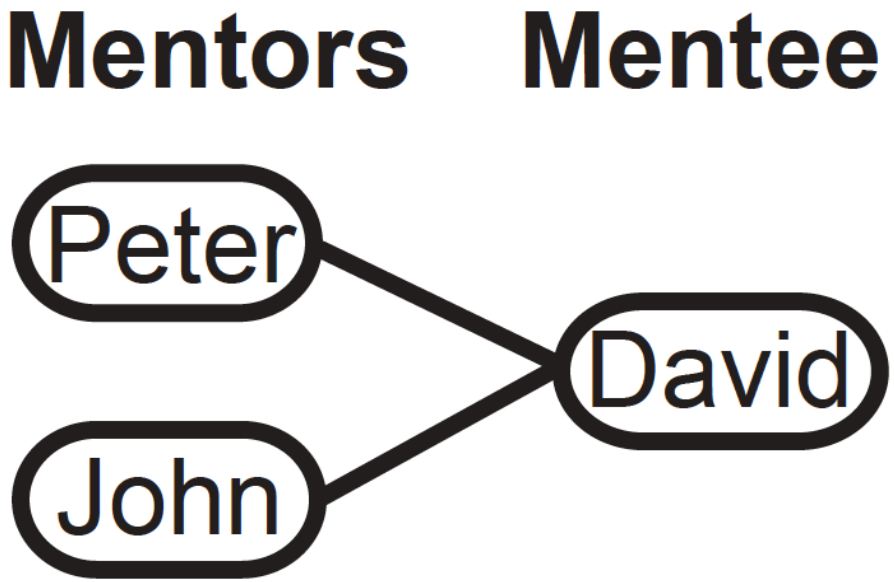
Algorithm



Mentee with two mentors

Matching

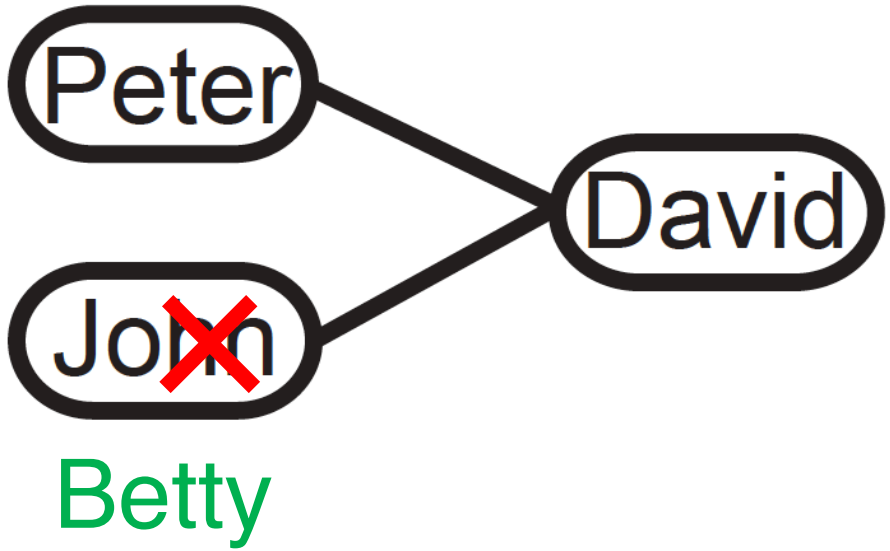
What if…



The Cascading Nightmare

David's Preference

1. Jane
2. Betty
3. Peter
4. John

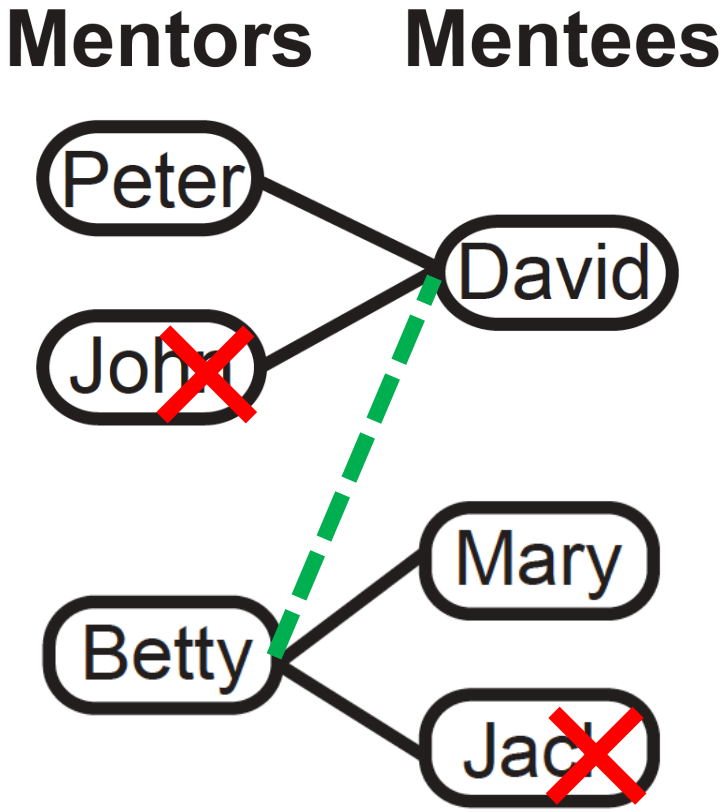


Possible to improve?

The Cascading Nightmare

David's Preference

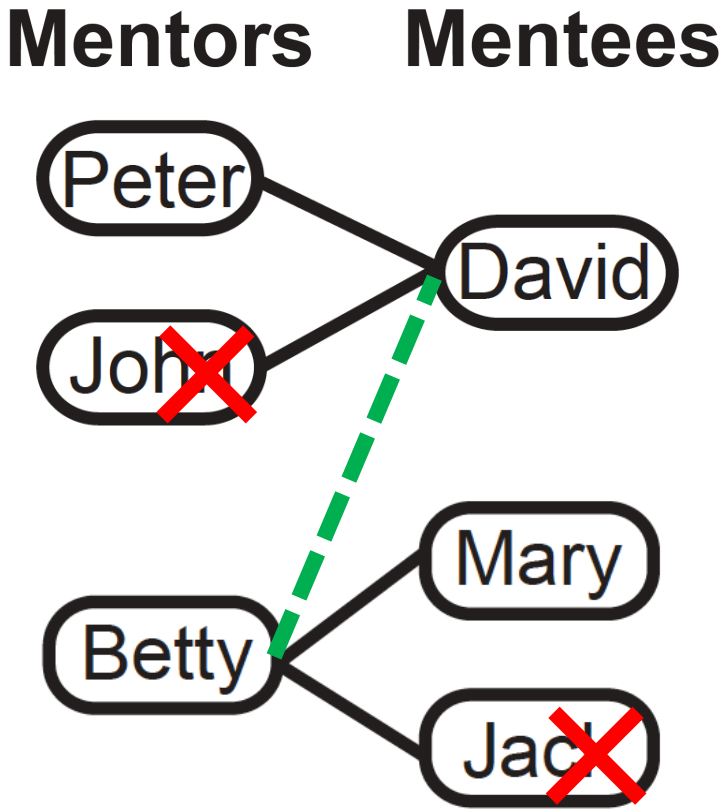
1. Jane
2. Betty
3. Peter
4. John



Betty can have at most two partners

The Cascading Nightmare

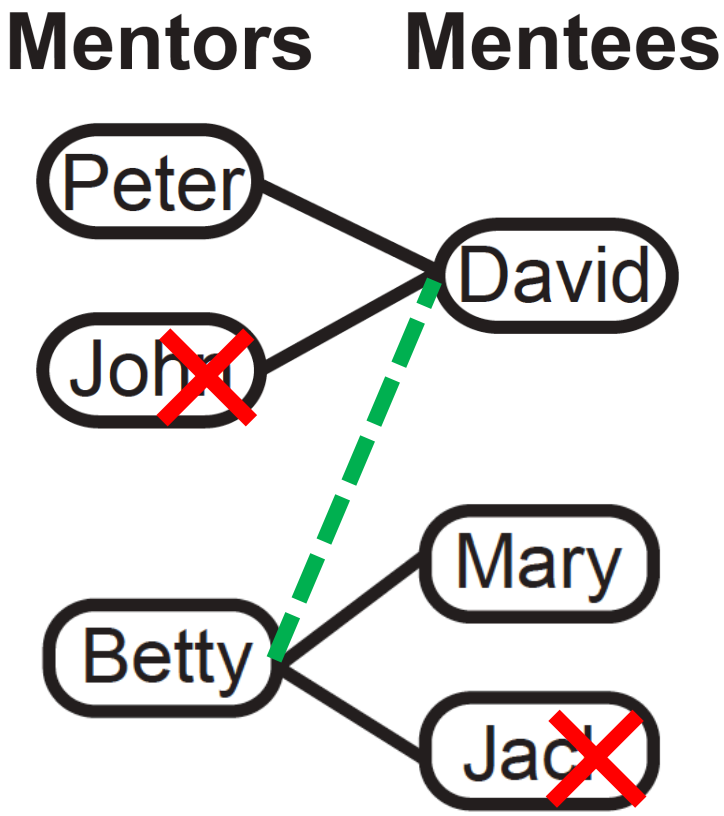
- Jack: one less mentor
- John: one less mentee
- Pair Jack with John?



Jack may not like John!

The Cascading Nightmare

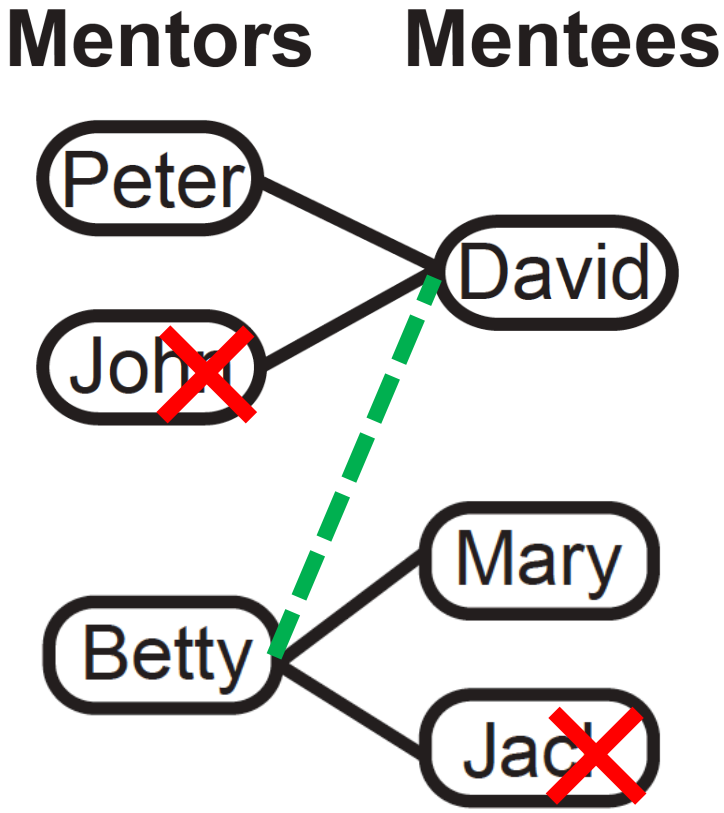
- Assign a different mentor to Jack and a different mentee to John?



The cascading nightmare continues!!

The Cascading Nightmare

- When you change a pairing, some people become unmatched
- Match them to the others, the pairing is changed again



The cascading effect can go on and on!!!

Have an algorithm-generated matching

Want to adjust it and explore matching alternatives

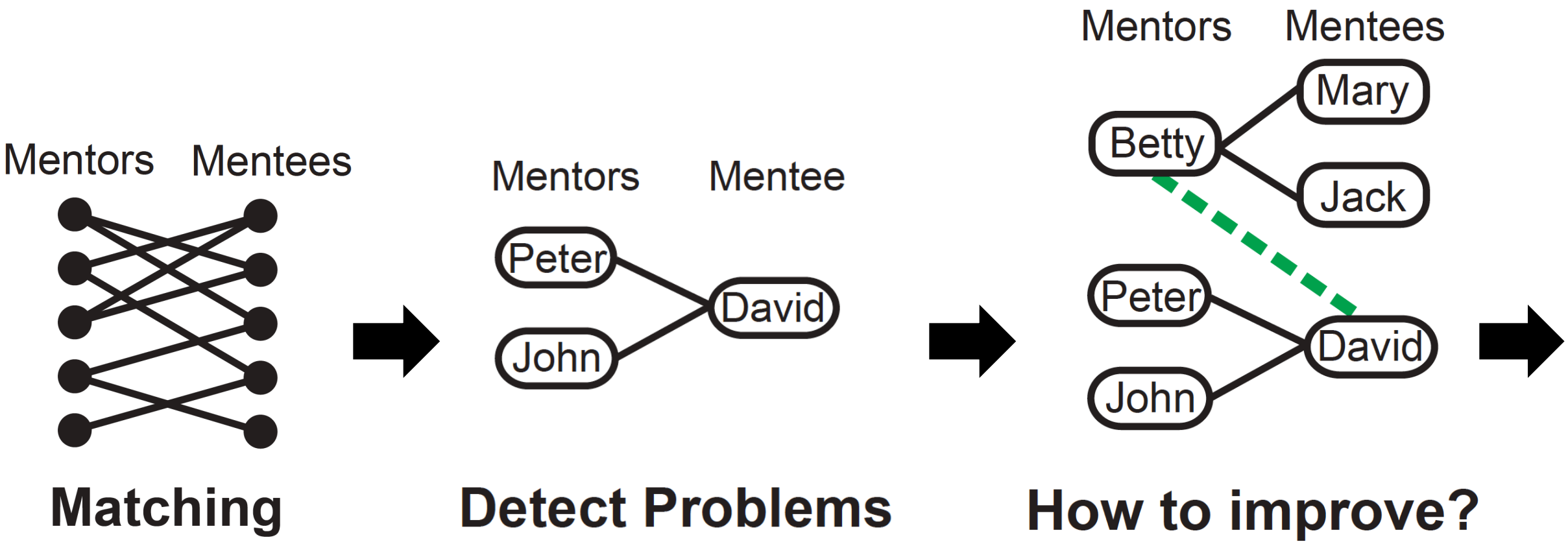
HARD to adjust it manually!!

Cooperation of user and computer

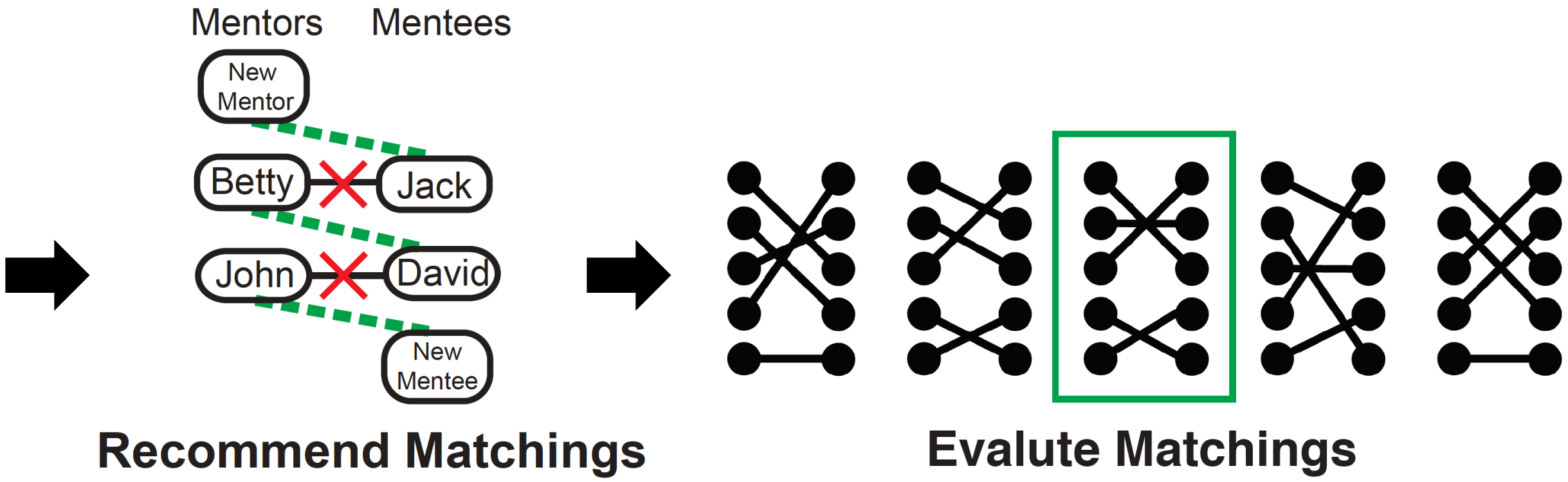
Users ⟶ **What** to adjust

System ⟶ **How** to adjust

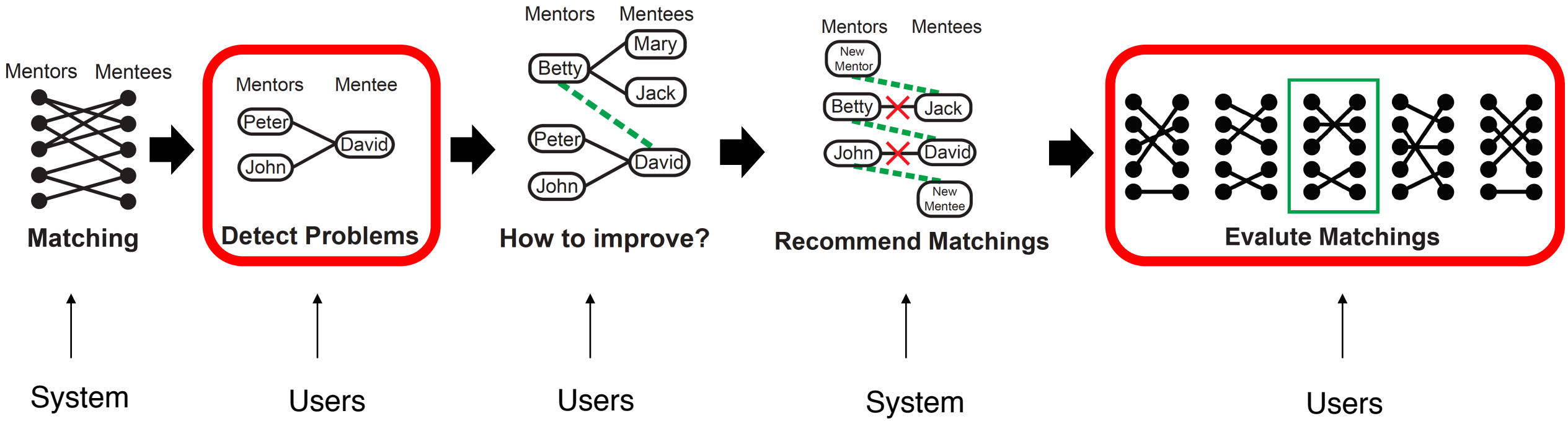
Cooperation of User and Computer



Cooperation of User and Computer



Cooperation of User and Computer

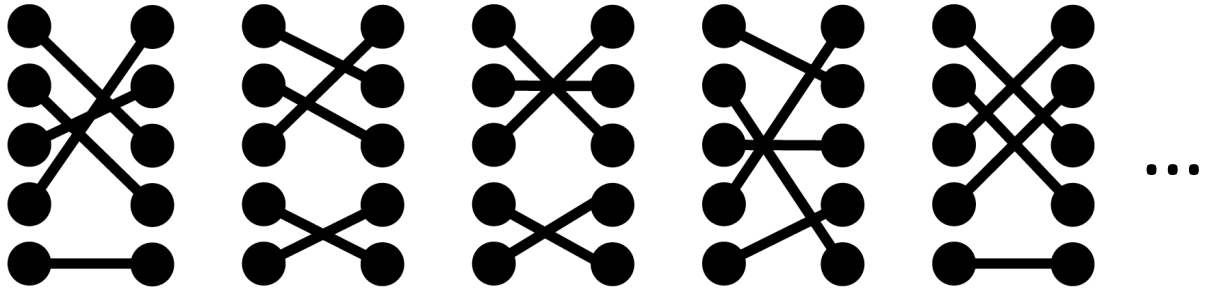


Problem Detection

Questions about allocation result	Questions about allocation mechanism
Who are those who get poor matches? **Improve their matches**	There is a popular person. Why pair A not B with him? **Try to pair the popular person with the others**

Matching Evaluation

Many matchings… How to compare them?



- Agent-level comparison
- Comparison between two matchings
- Comparison among multiple matchings

Matching Evaluation

Agent-level comparison

- Want to improve David's match
- Prefer matchings which give David a better match

Need to compare the quality of match of each person in multiple matchings

Matching Evaluation

Comparison between two matchings

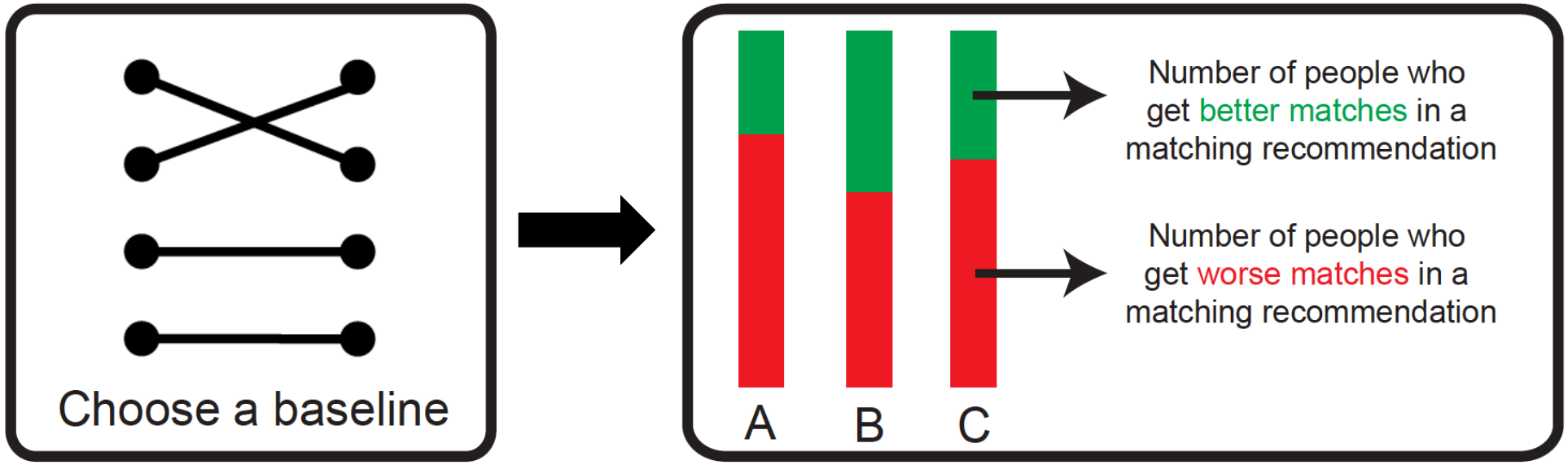
- Number of people who get better matches in matching 1 (in 2)
- Who are the people who get better matches in matching 1 (in 2)?
- By how much are their matches better?

May prefer matching 1 if…

- Most people get better matches in matching 1

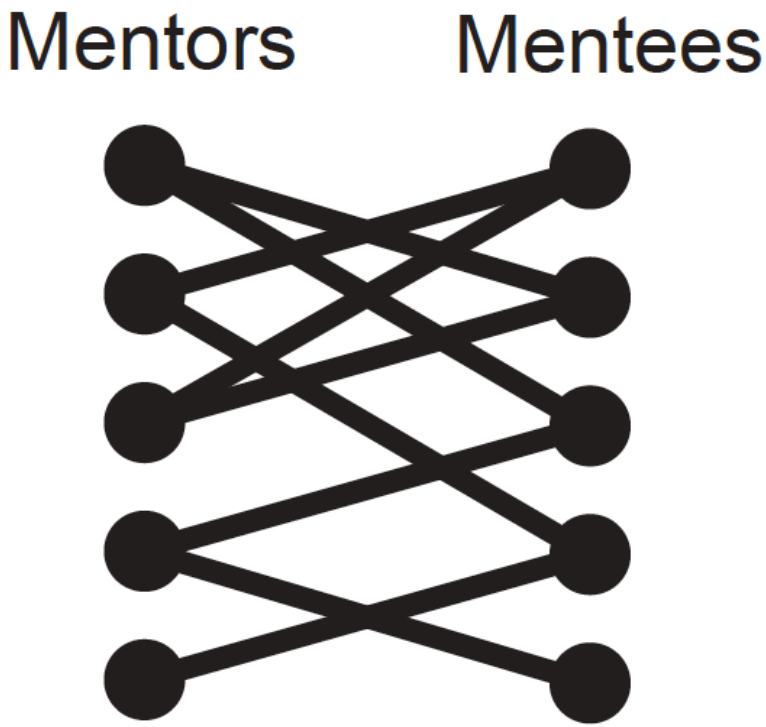
Matching Evaluation

Comparison among multiple matchings

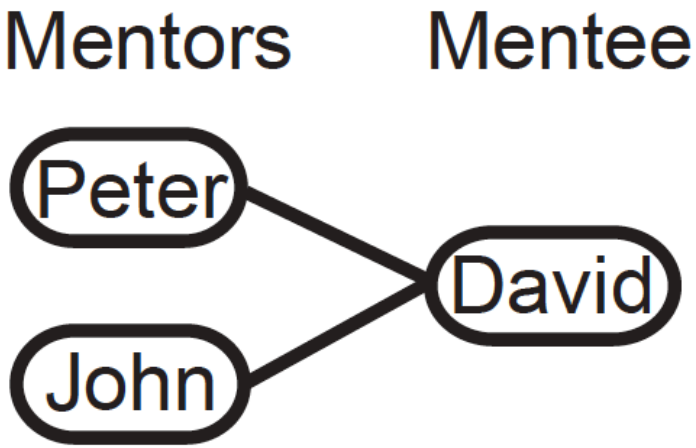


1. Choose original matching as a baseline
2. Compute the differences between the other matchings and the baseline
3. Compare differences across many matchings

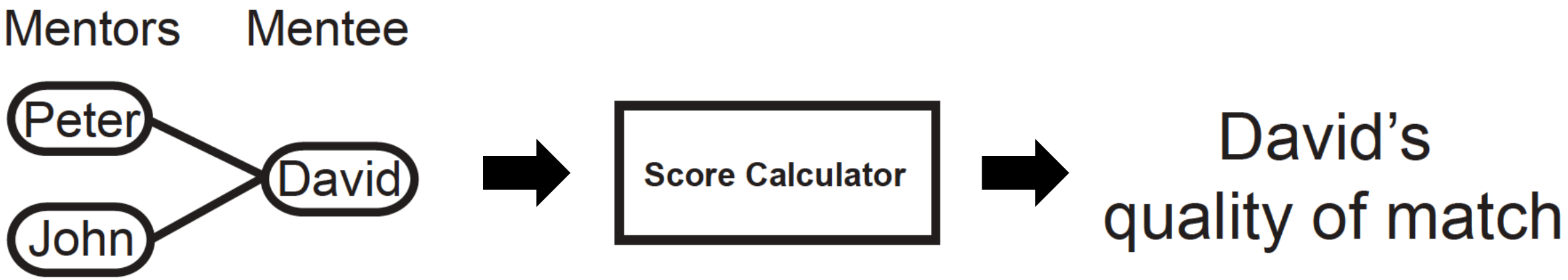
Number Lines



Algorithmic Result



Number Lines



Number Lines

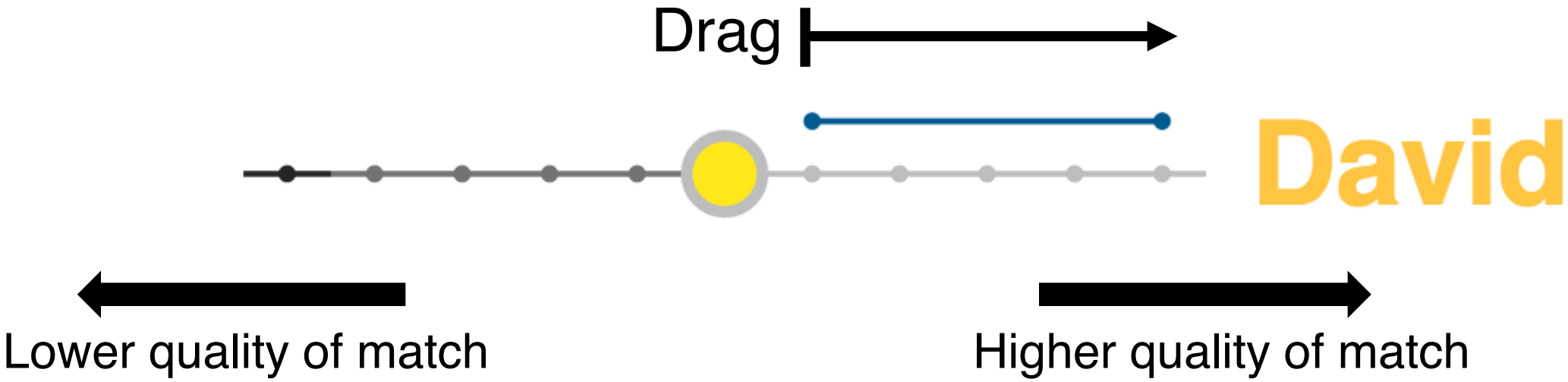
David's quality of match → Position on David's number line

Lower quality of match

Higher quality of match

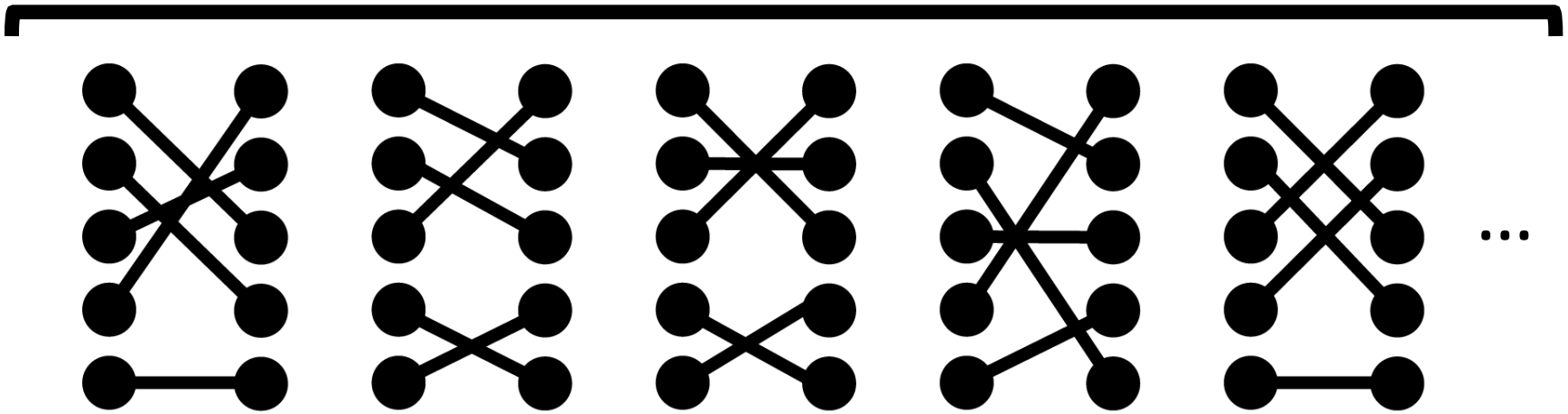
Number Lines

“Find matchings in which David’s quality of match falls within this range”



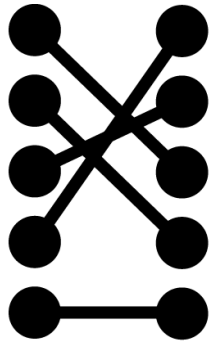
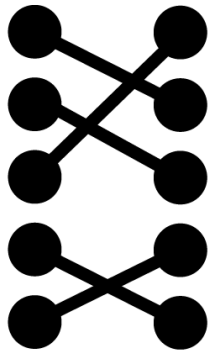
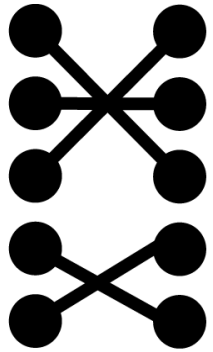
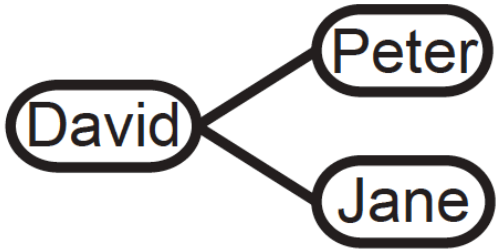
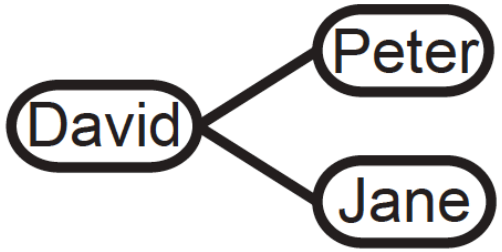
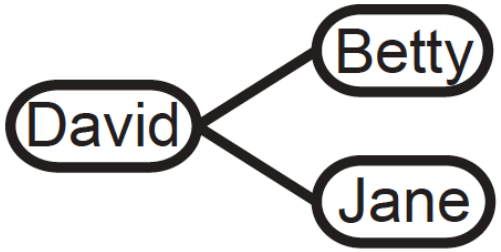
Number Lines

System finds 100 matchings

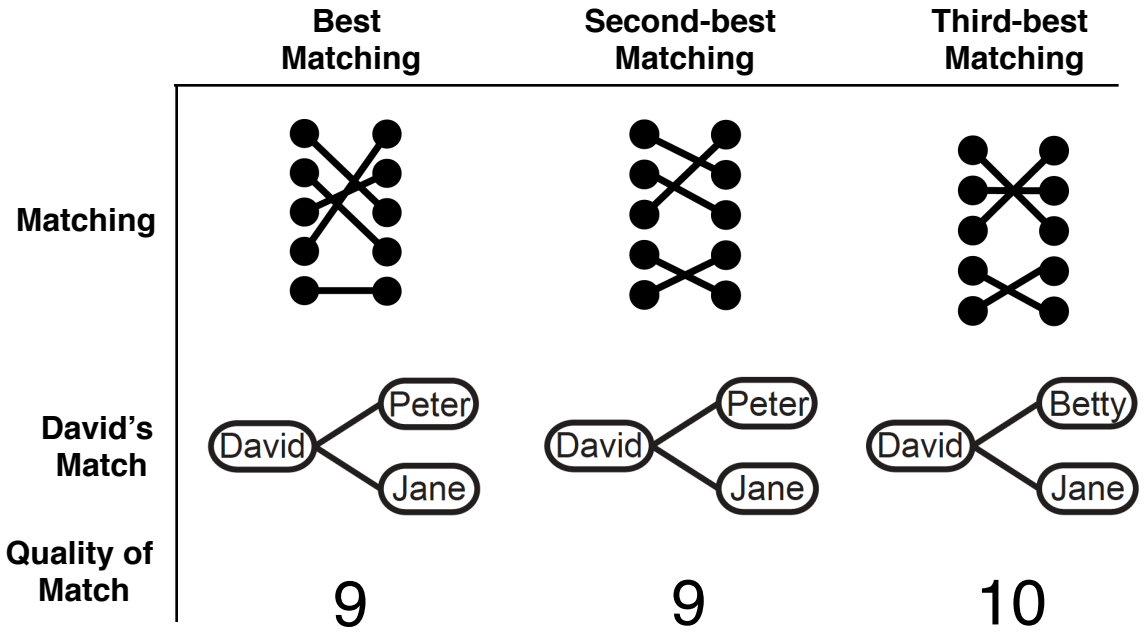


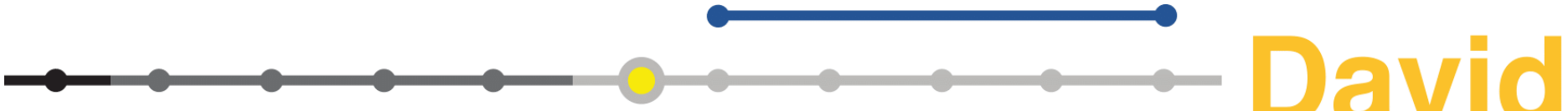
Ranked by a performance metric

Number Lines

	Best Matching	Second-best Matching	Third-best Matching
Matching			
David's Match			
Quality of Match	9	9	10

Number Lines





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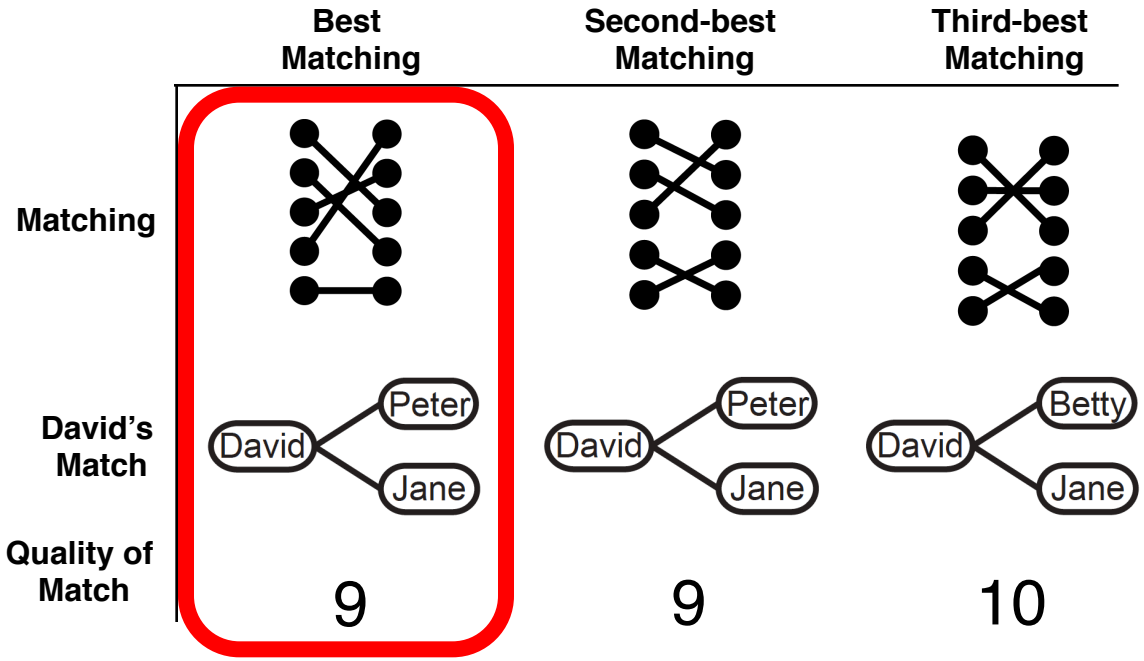

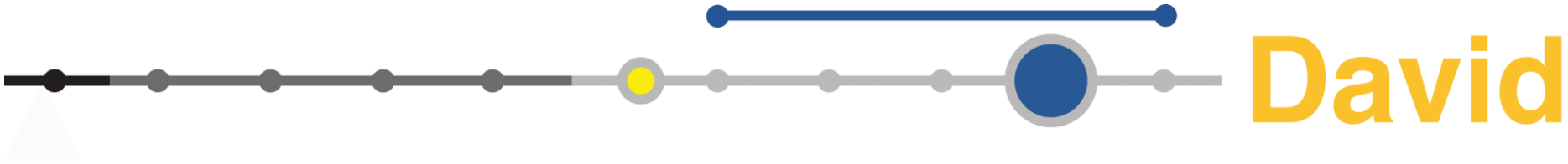

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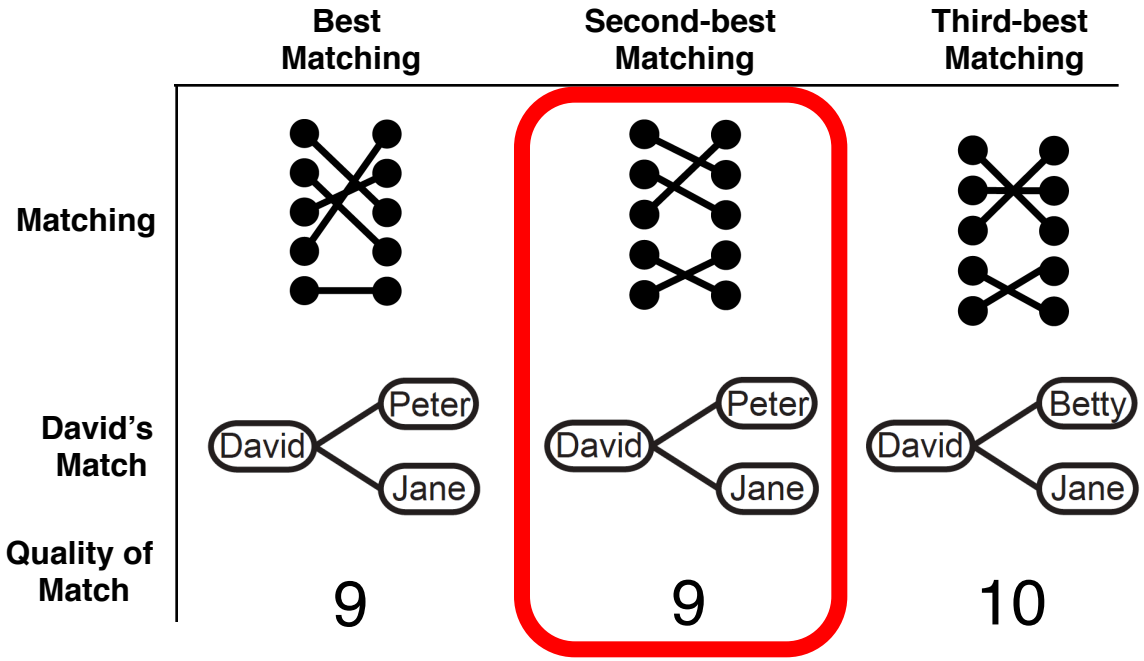

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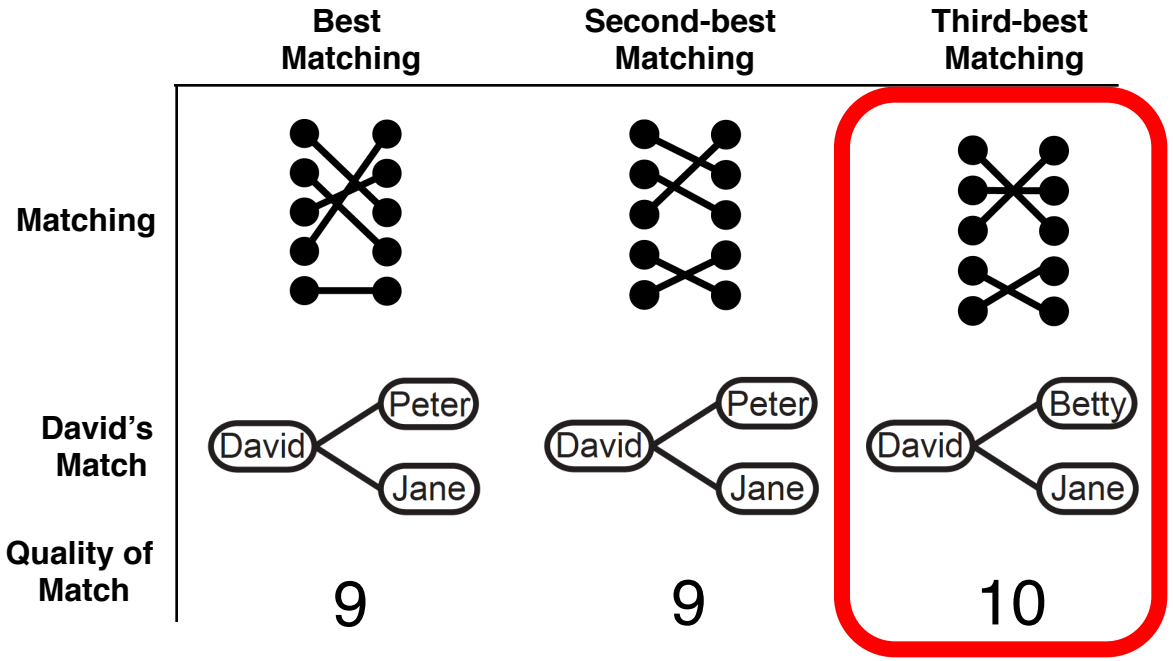

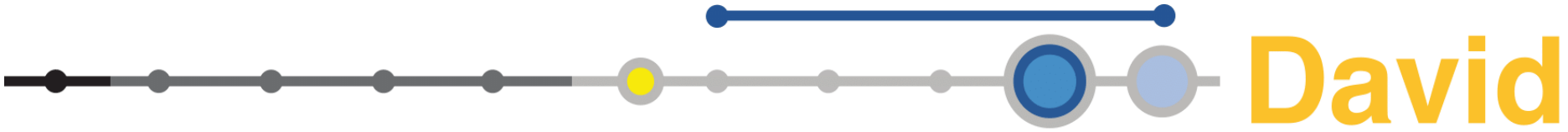

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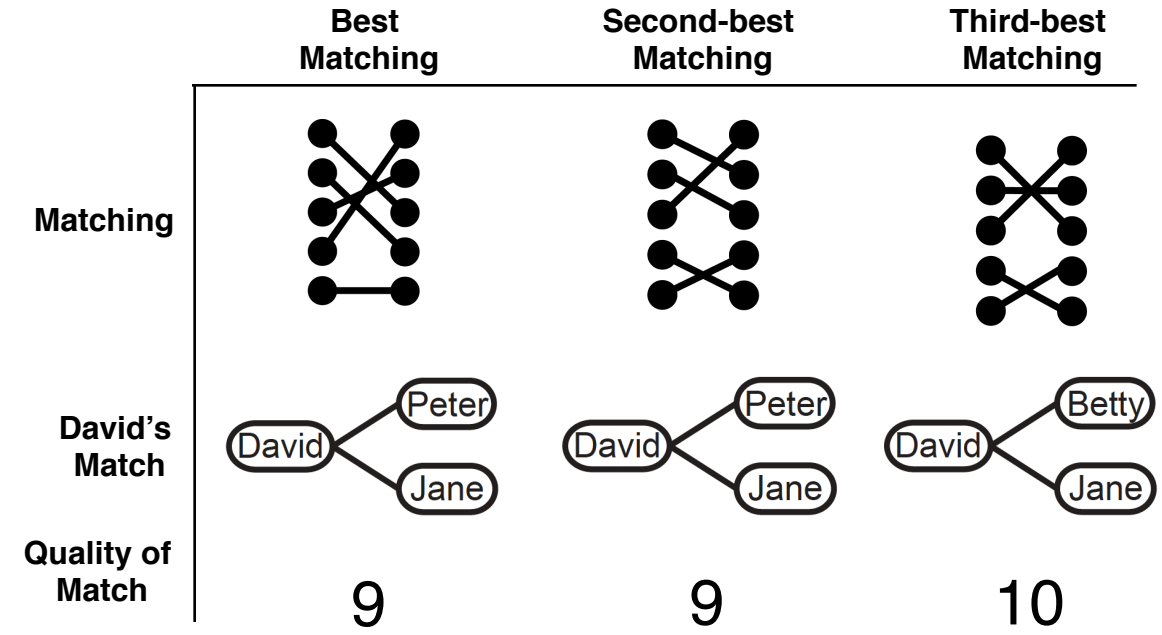

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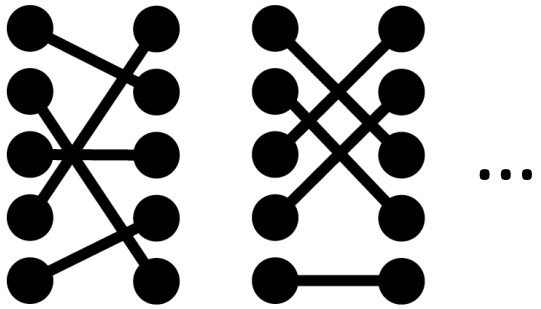
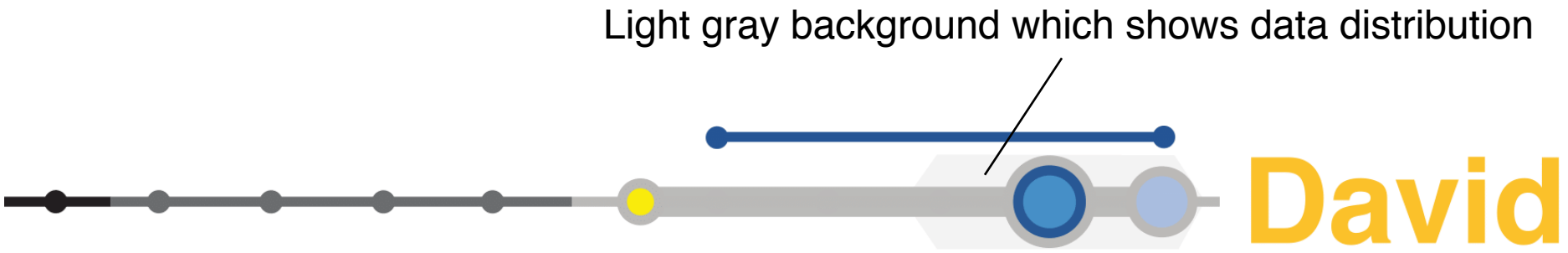
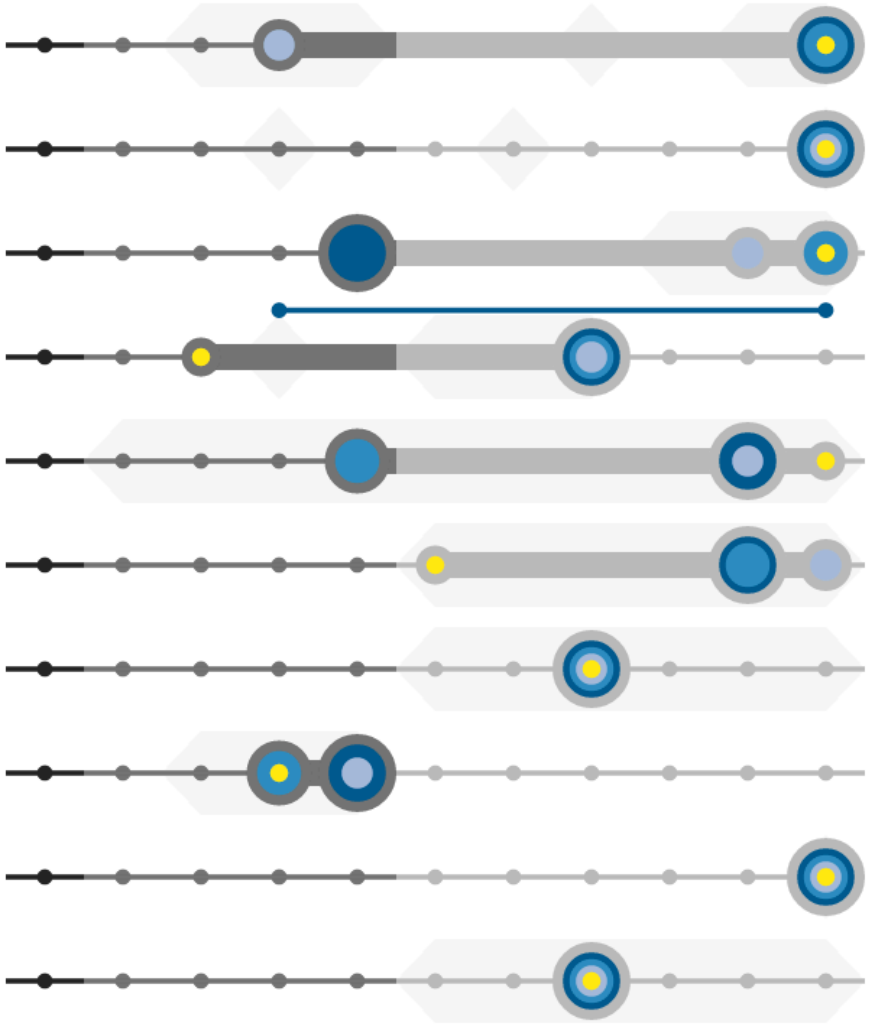


Matchings with lower rankings

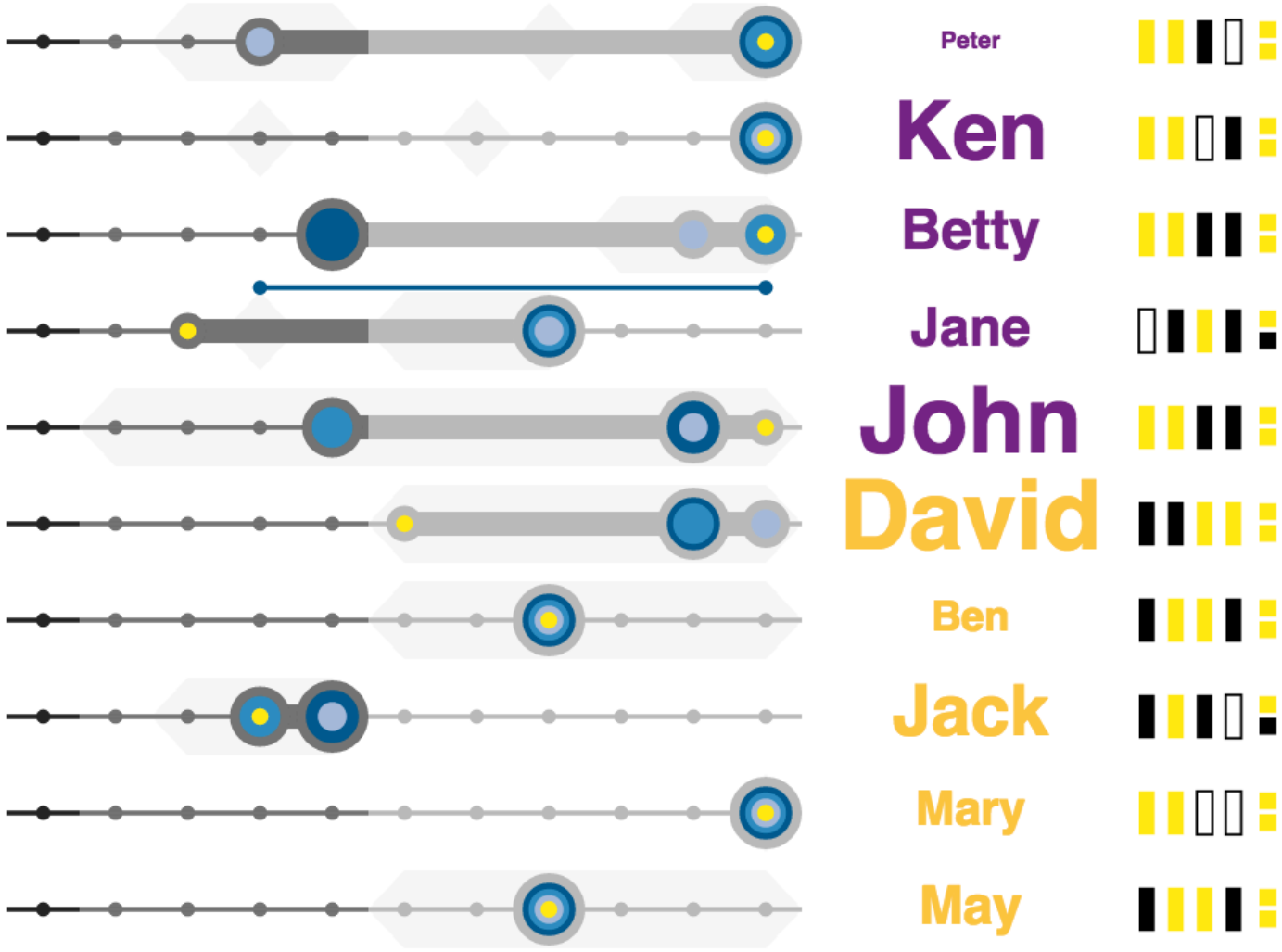


Visual Preference List



Peter
Ken
Betty
Jane
John
David
Ben
Jack
Mary
May

Visual Preference List



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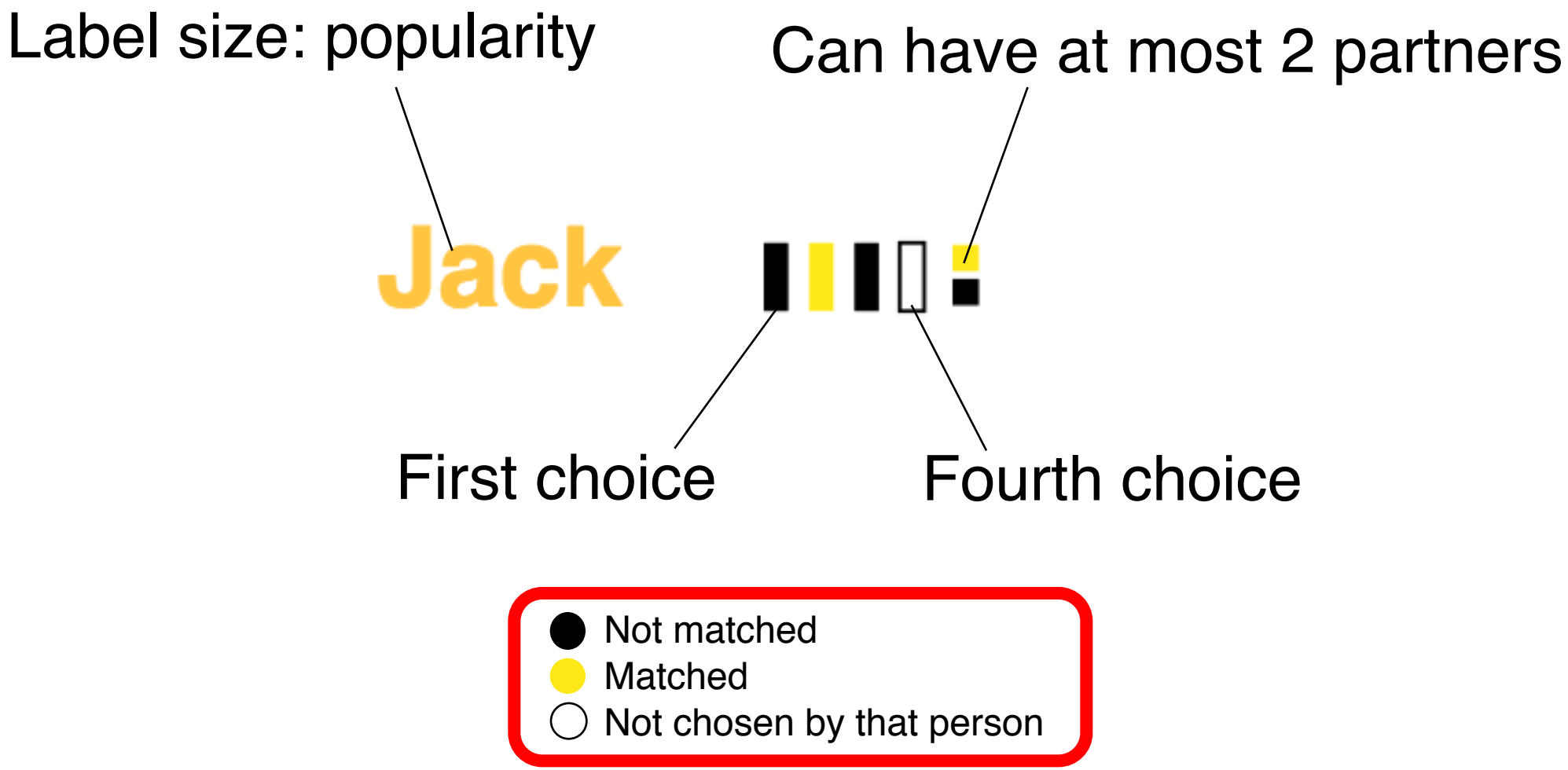
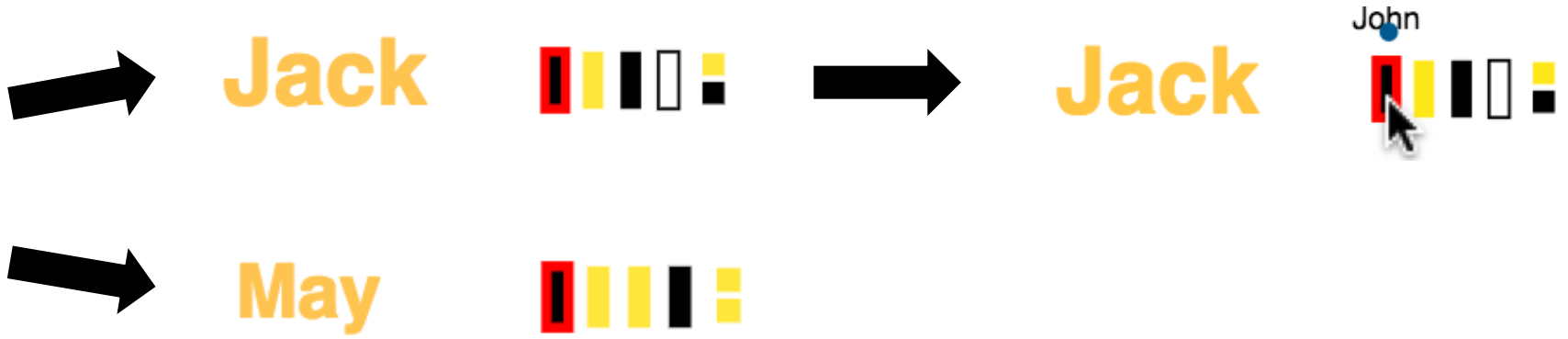


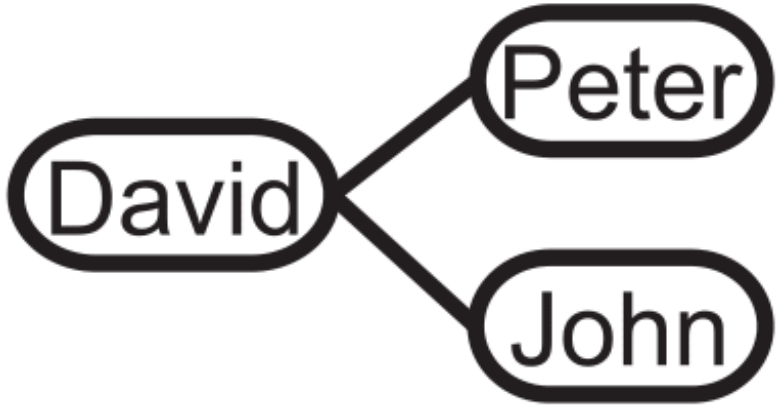
Visual Preference List

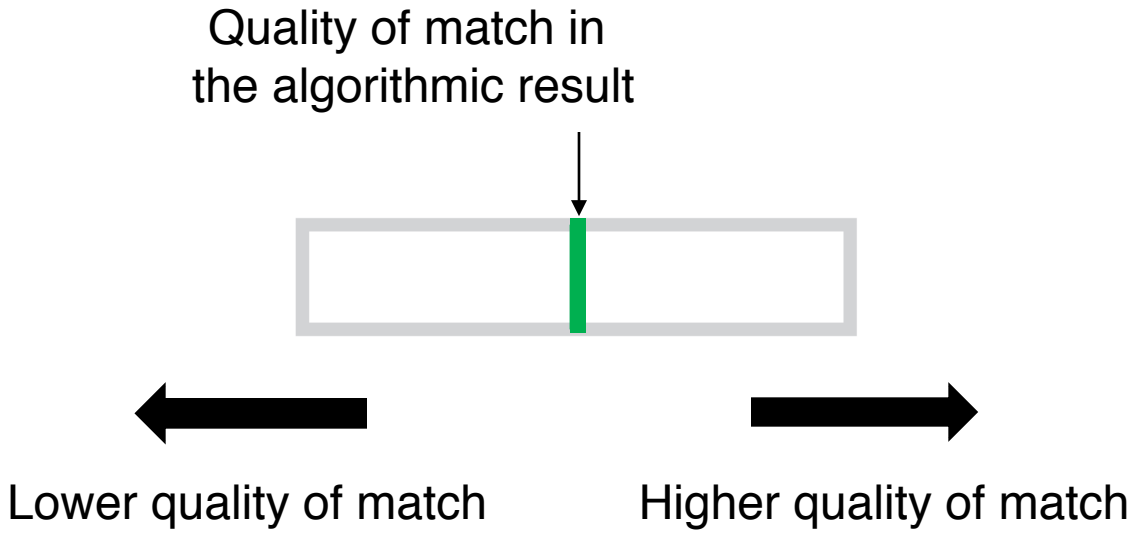
“John and Jack work well together. Match them together”



Stacked Graph

Consider the algorithmic result and the best matching recommendation

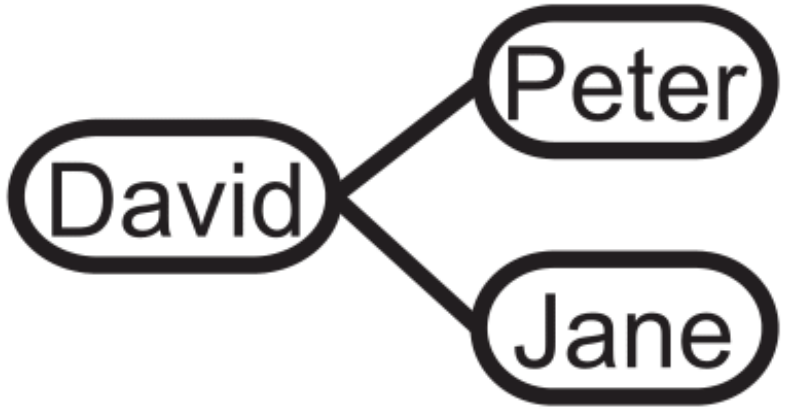


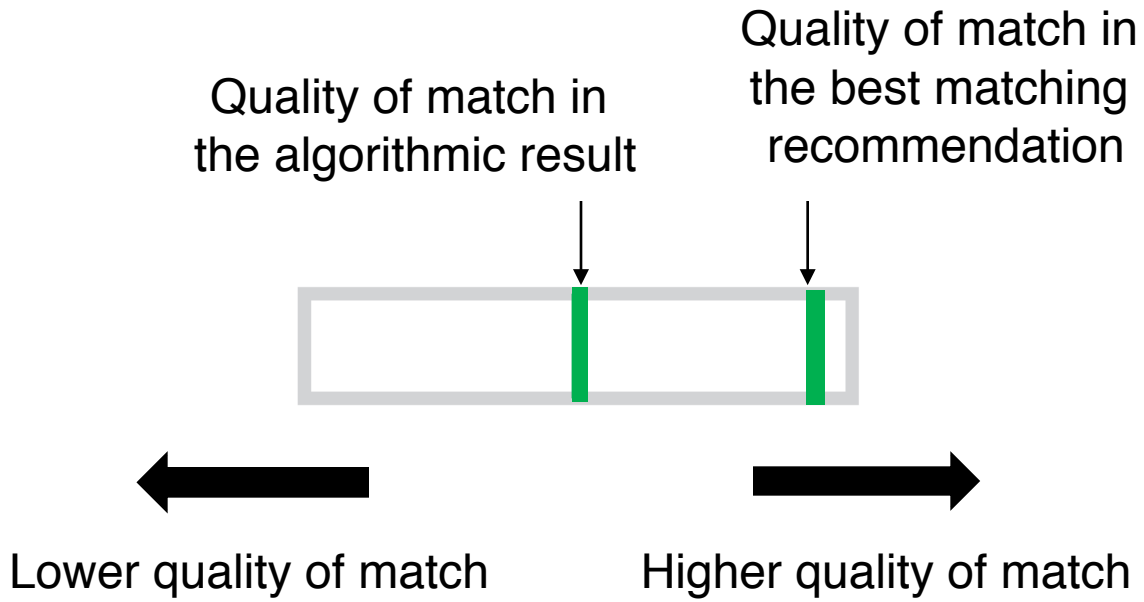


In the algorithmic result

Stacked Graph

Consider the algorithmic result and the best matching recommendation

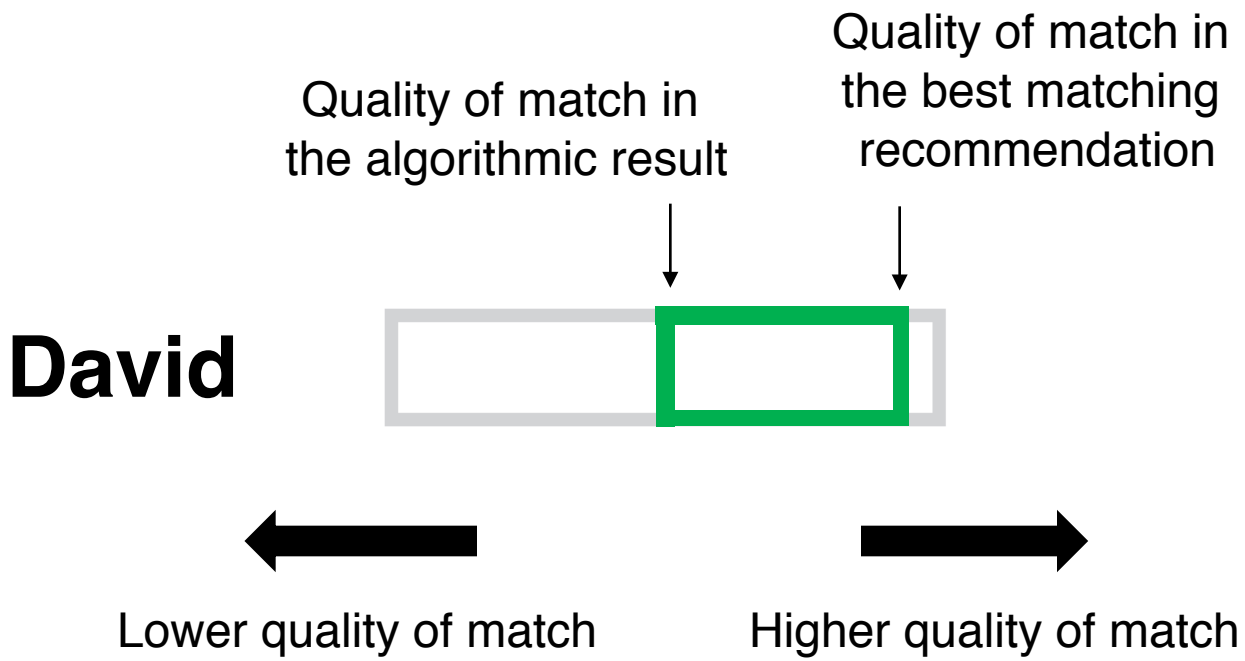




In the best matching recommendation

Stacked Graph

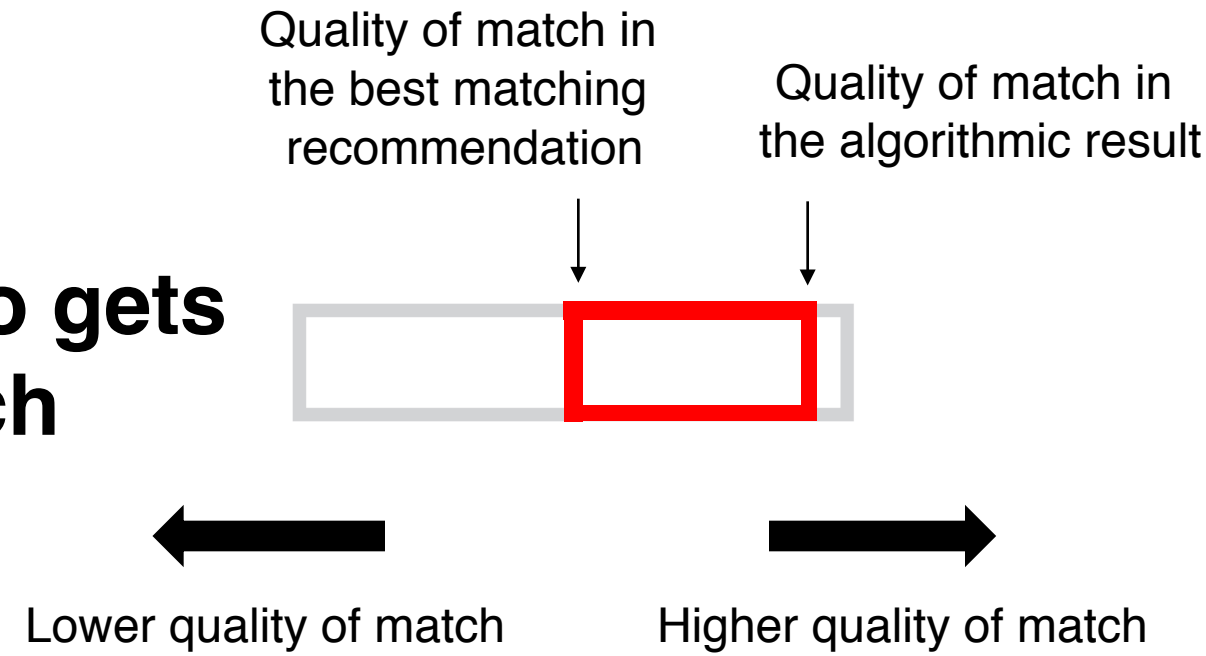
Consider the algorithmic result and the best matching recommendation



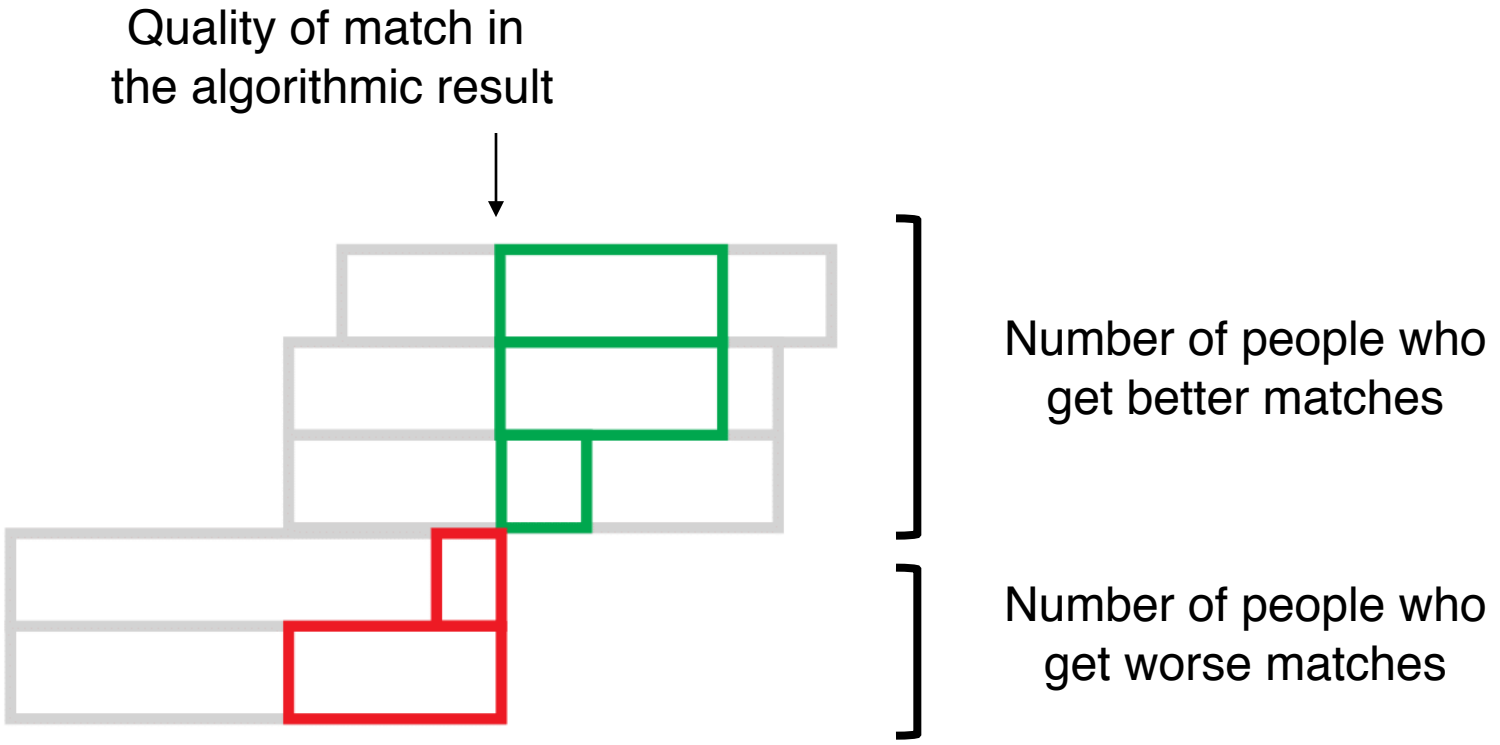
Stacked Graph

Consider the algorithmic result and the best matching recommendation

A person who gets a worse match



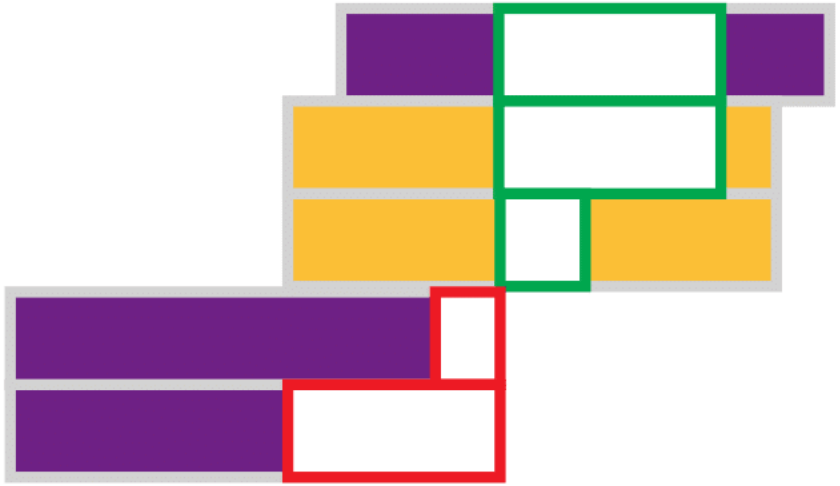
Stacked Graph



Stacked Graph

- Mentor
- Mentee

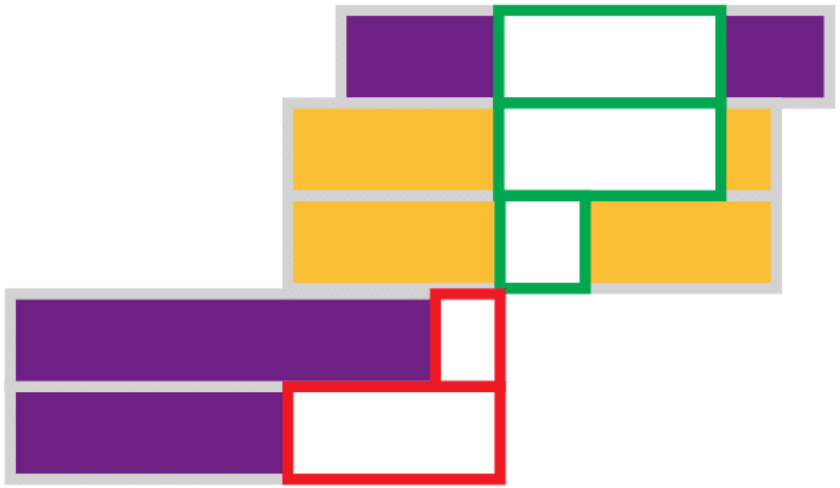
Quality of match in
the algorithmic result



Stacked Graph

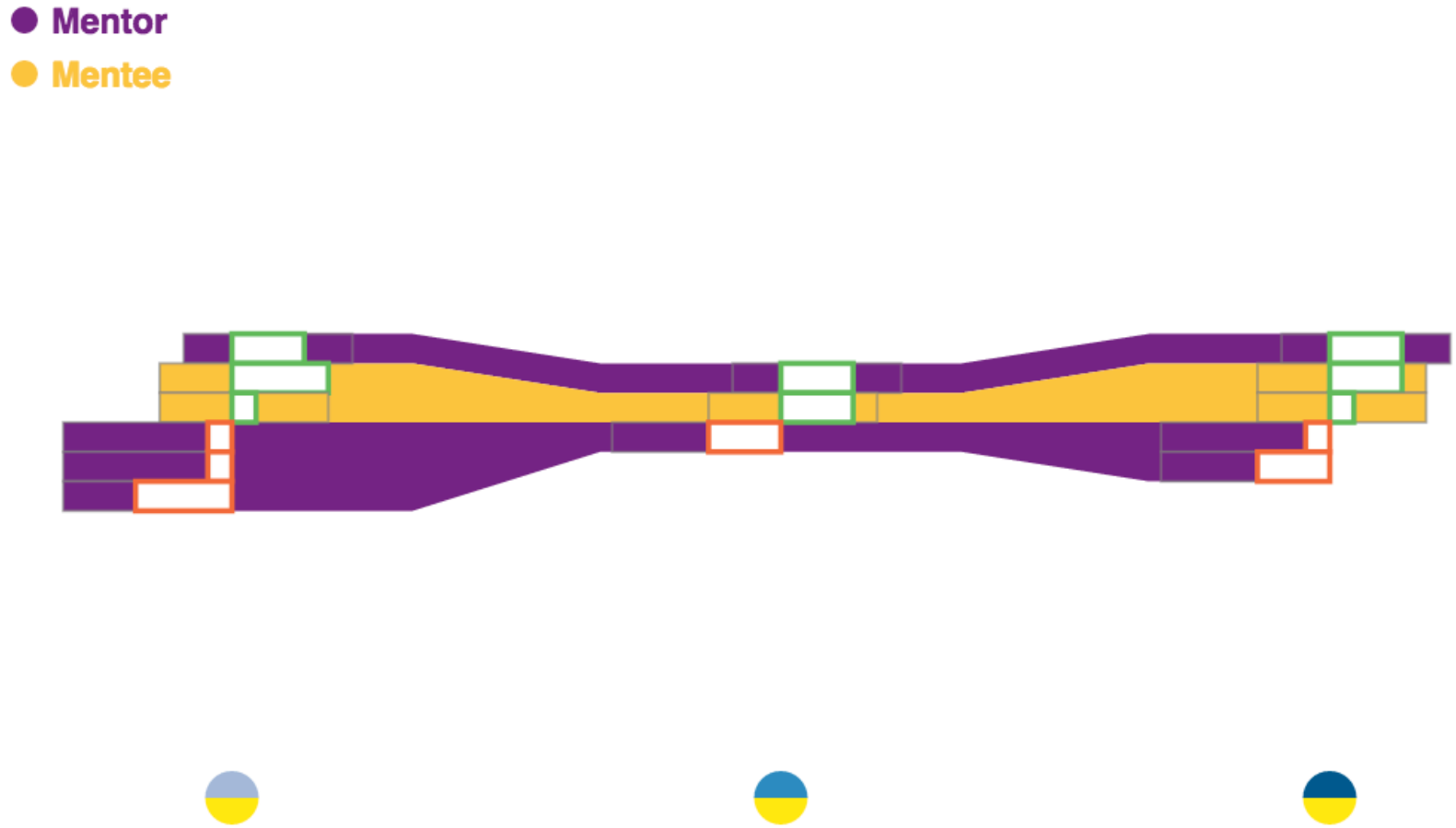
Mentor
Mentee

Quality of match in
the algorithmic result

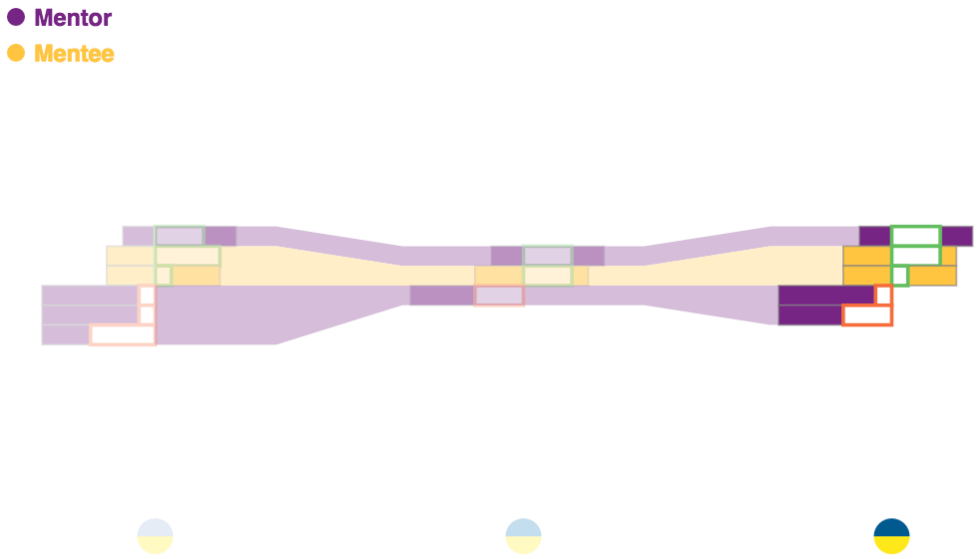


Comparing the algorithmic result and
the best matching recommendation

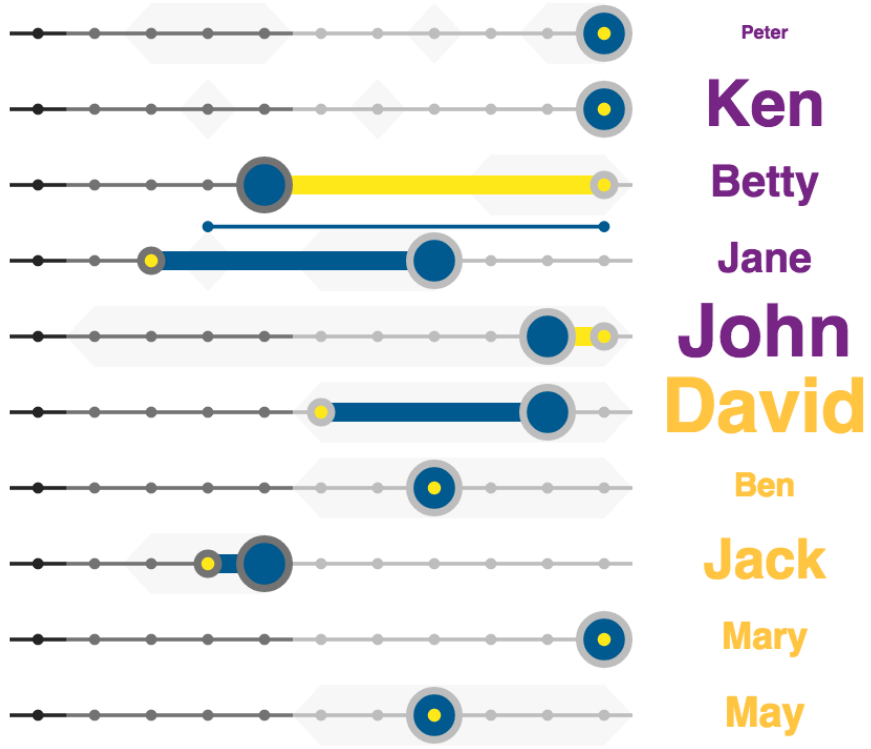
Stacked Graph



Stacked Graph

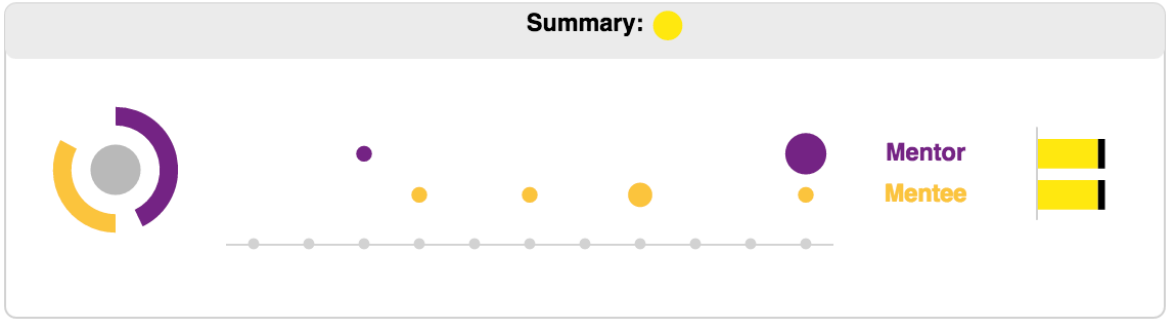


Hover
(detail on demand)

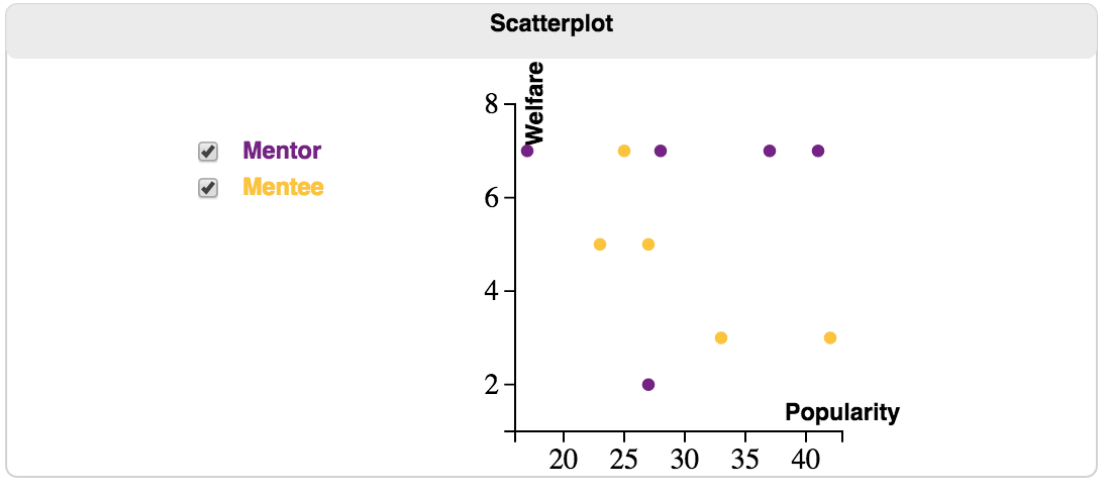


Other Views

Glyphs for summary statistics

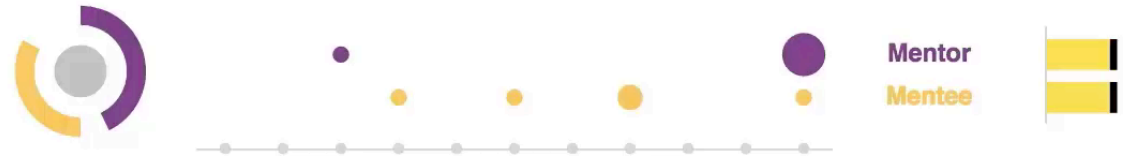


A scatterplot for filtering the number lines



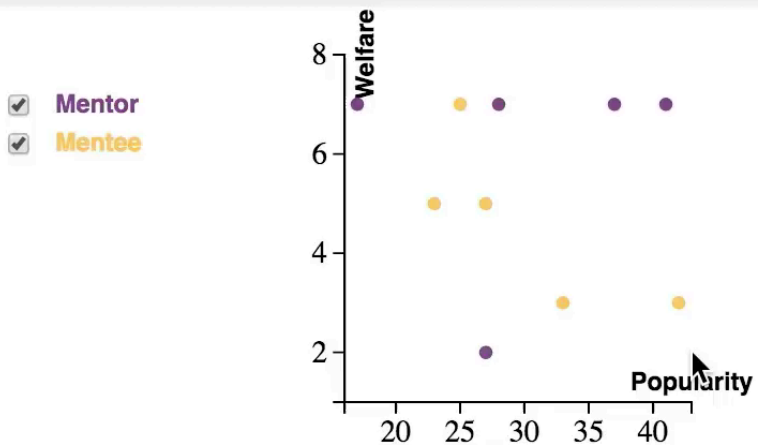
Stacked Graph View

Summary:



Number Line View

Scatterplot



Expert Interview

Better than spreadsheet for assignment

More confident in assignment

Learning curve may be steep

Conclusion and Future Work

- Developed a way for users and the system to co-create a matching
- Designed visualizations for matching comparison

- Steep learning curve
  Improve the usability of the system
- Slow and non-optimal matching recommendation algorithm
  More efficient algorithm to prune the huge matching search space

Thank You!

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