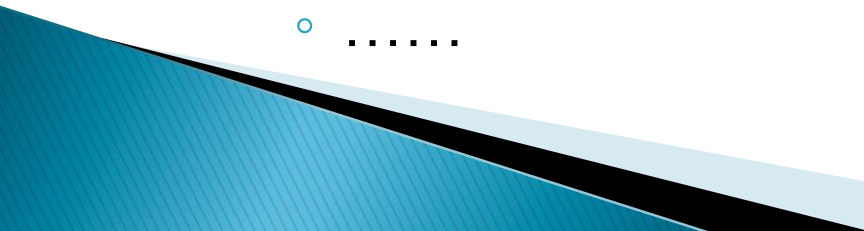


Efficiently Assign Student Groups Using GroupEng

Thomas Dimiduk, Harvard University
Kathryn Dimiduk, Cornell University

Group Composition Affects Retention and Learning

- ▶ ABET encourages teamwork
 - ▶ Education research recommends assigning groups rather than self-selecting
 - ▶ Multiple research based selection criteria
 - Don't isolate women
 - Don't isolate minorities
 - Mixed ability groups
 - Interdisciplinary groups
 -
- 

Assigning Groups by Hand is Hard

By Hand

- ▶ Partially meet a few criteria
- ▶ Sort and Filter in Excel
- ▶ Good group selection takes hours
- ▶ Faculty don't have the time

Automate with GroupEng

By Hand

- ▶ Partially meet a few criteria
- ▶ Sort and Filter in Excel
- ▶ Good group selection takes hours
- ▶ Faculty are too busy

With GroupEng

- ▶ Prioritized meeting of many criteria
- ▶ Run GroupEng
- ▶ Group selection takes a few minutes
- ▶ Free and open source

Peoples have goals and criteria

Computers need rules and operations

**Grouping criteria become
operators and attributes**

GroupEng Uses Four Operators

Balance

Examples

GPA's

Test 1 scores

Pre-test scores

Cluster

Examples

Women

Minorities

Vision impaired + note taker

Distribute

Examples

Major

Year

Skills

Aggregate

Examples

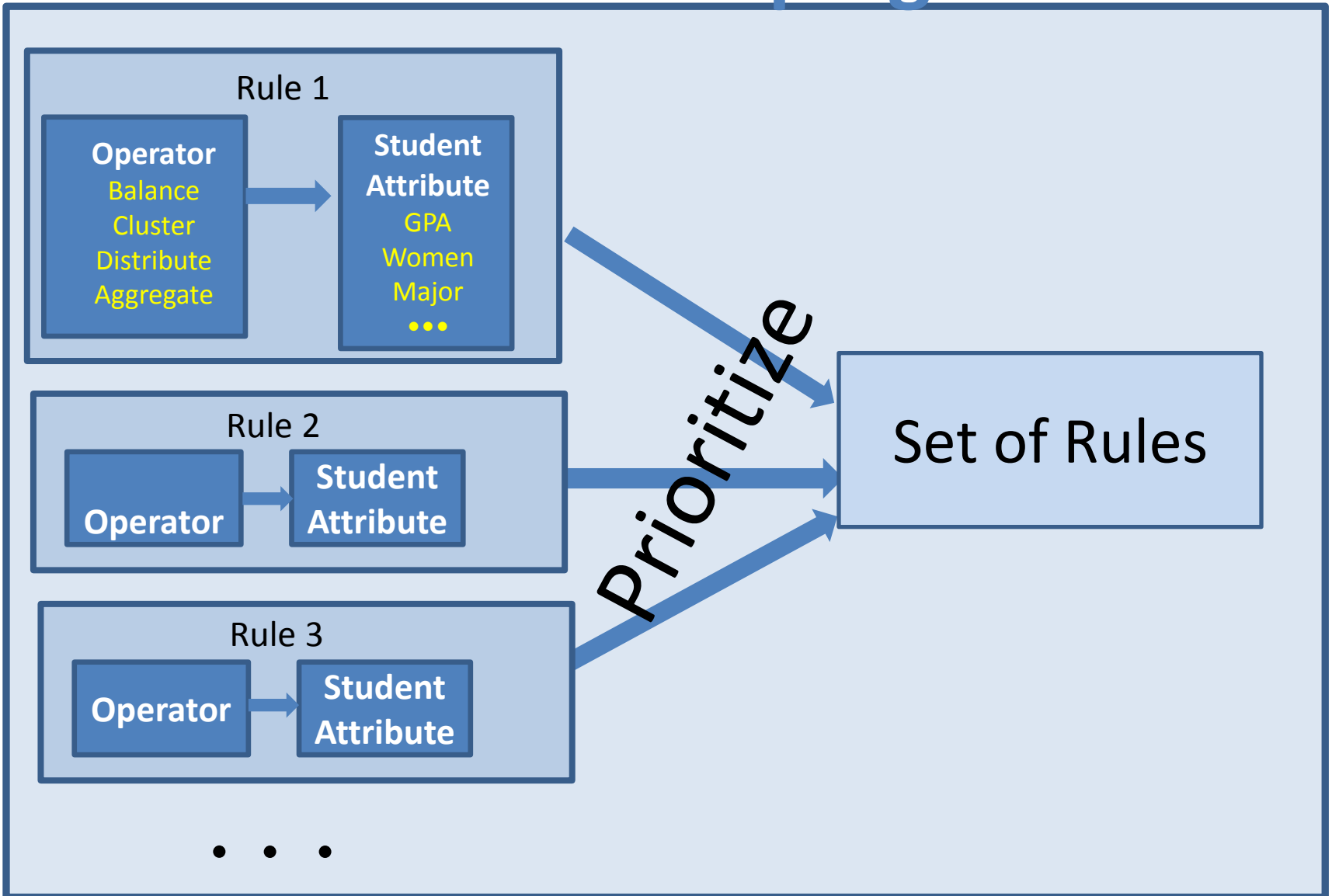
Project choice

Recitation section

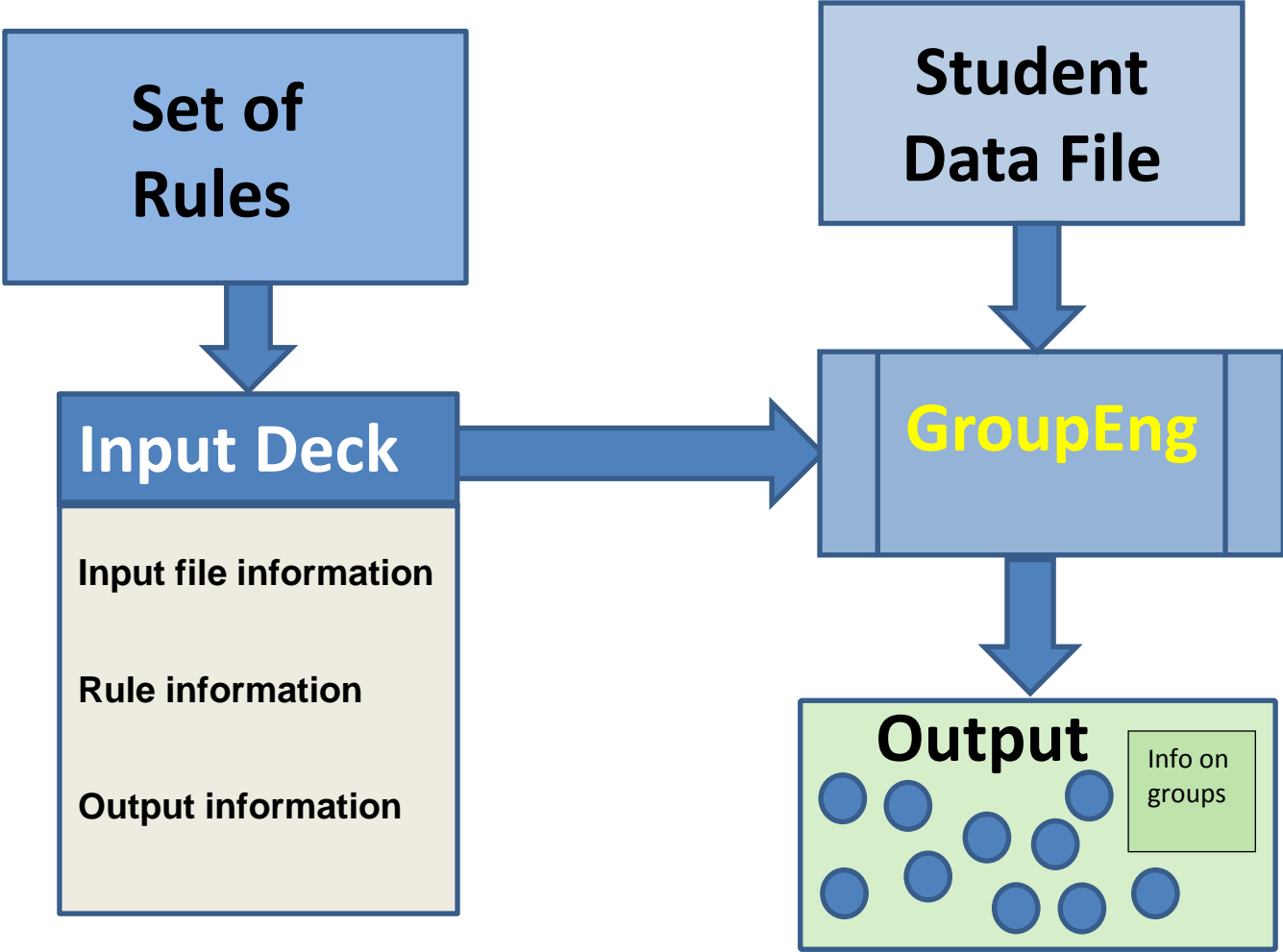
Grad or Undergrad

Major

Define a Set of Grouping Rules



GroupEng Program



Input Deck

classlist : me324.csv
identifier : Name
strength : GPA
group_size : 3
uneven_size : low

Input file
information

rules:
- type : cluster
flag : Gender
value : F
- type : balance
tol : 0.2

Rule information

output :
- type : full_report
outfile: me324grp.csv
- type : group_blocks
outfile : post_me.txt

Output
information

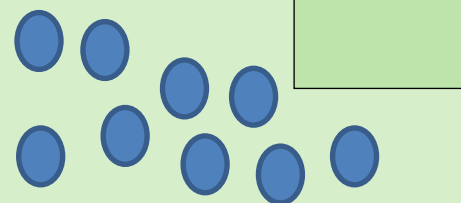
Set of
Rules

Student
Data File

GroupEng

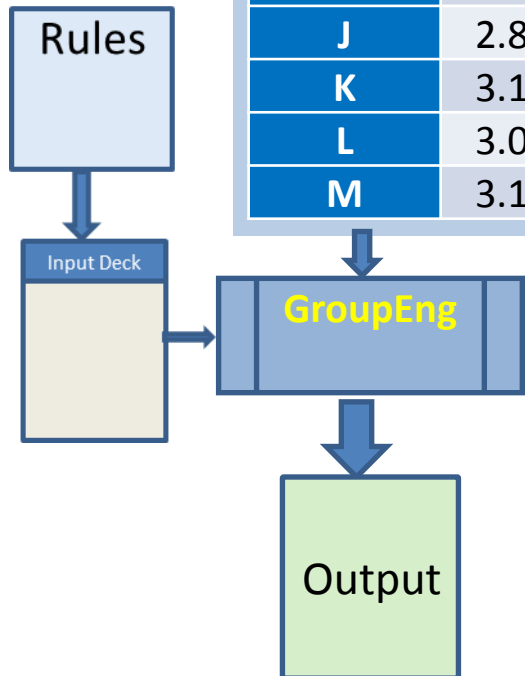
Output

Info



Student Data File

Name	GPA	Gender	Ethnicity	Major	prereq	skill1	skill2	skill3
A	2.02	M	-	EE	-	y	y	y
B	2.93	F	-	EE	Y	y	y	y
C	3.21	M	-	ME	-	-	y	-
D	3.19	M	B	EE	-	y	y	y
E	4.27	F	-	CS	-	y	y	y
F	3.16	F	-	CS	-	-	-	-
G	1.92	F	-	ME	-	y	y	y
H	2.85	F	H	ME	-	y	y	y
I	3.47	F	H	EE	y	y	y	-
J	2.89	F	-	ME	y	-	y	-
K	3.12	F	-	ME	y	-	y	y
L	3.02	F	-	CS	y	y	y	-
M	3.12	F	H	CE	y	y	y	y



GroupEng Algorithm

Rules

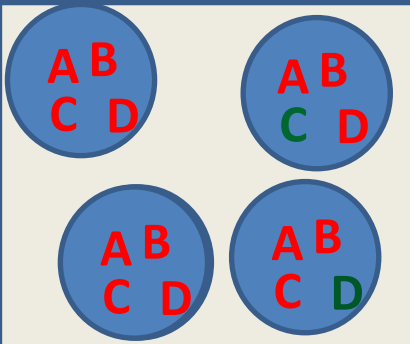
Student Data File

Input Deck

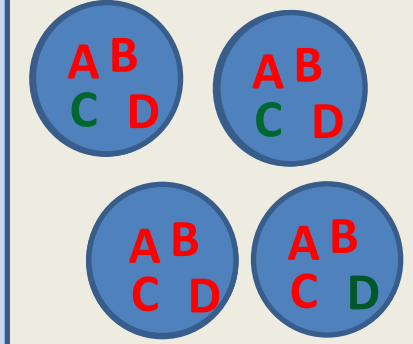
Broken rules in red

Met Rules in green

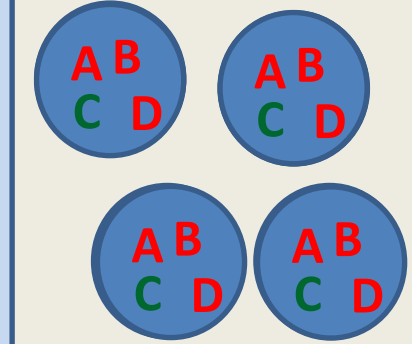
Step 1



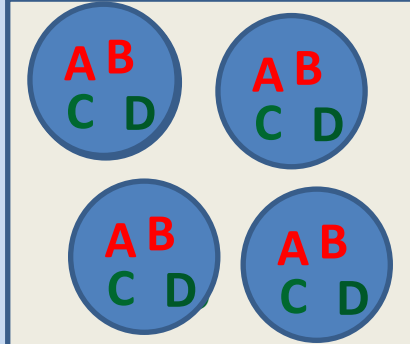
Step 1.1



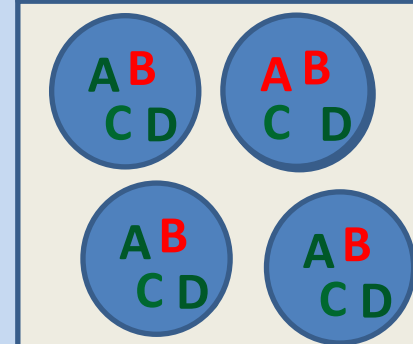
Step 2



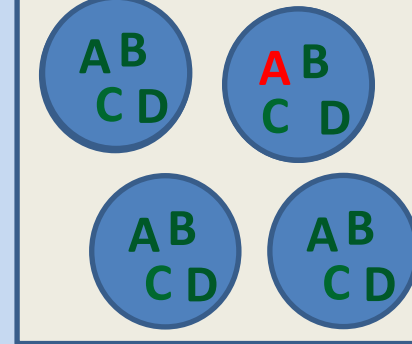
Step 3



Step 4

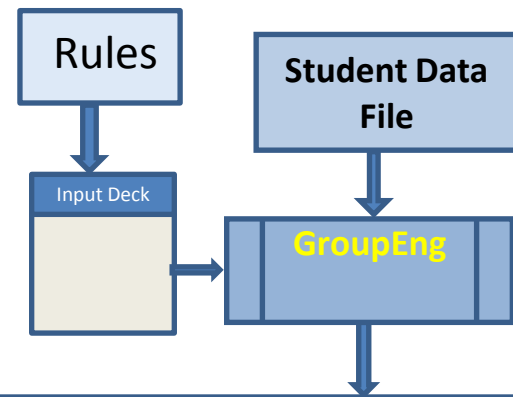


End

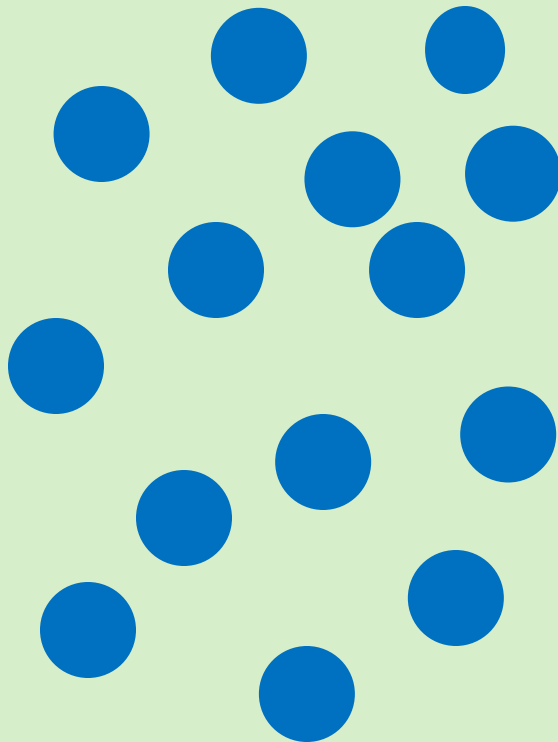


Output

Output



Student groups output



Each group

- Members
- Average strength
- Total strength
- Any broken rules

Overall set of groups

- Average strength
- Standard deviation
- Minimum
- Maximum
- # of that groups break each rule

GroupEng In Action

```
Ran GroupEng on: mae2210_rules_a.yaml
```

```
Made 29 groups
```

```
0 groups failed rule : <Distribute : cField ['CivilEngr', 'EngrPhys', 'SciEthSys', 'MechEngr', 'Unaff', 'Env']>
```

```
0 groups failed rule : <Distribute : cAge []>
```

```
0 groups failed rule : <Cluster : Gender ['F']>
```

```
0 groups failed rule : <Cluster : Race ['Black', 'Hispanic', 'Multicultural']>
```

```
0 groups failed rule : <Balance 3.211625 0.111532071672>
```

```
GPA Statistics
```

```
-----
```

```
Class Mean: 3.21
```

```
Class Std Dev: 0.56
```

```
Std Dev of Group Means: 0.06
```

```
Group Means: 3.11, 3.12, 3.12, 3.12, 3.13, 3.14, 3.15, 3.17, 3.19, 3.19, 3.20, 3.20, 3.21, 3.21, 3.21, 3.23, 3.23, 3.23, 3.25, 3.26, 3.26, 3.27, 3.27, 3.27, 3.27, 3.27, 3.27, 3.28, 3.30, 3.32
```


```
Rule Failures By Group
```

```
-----
```

```
Group 1:
```

```
Group 2:
```

```
--More-- (70%)
```

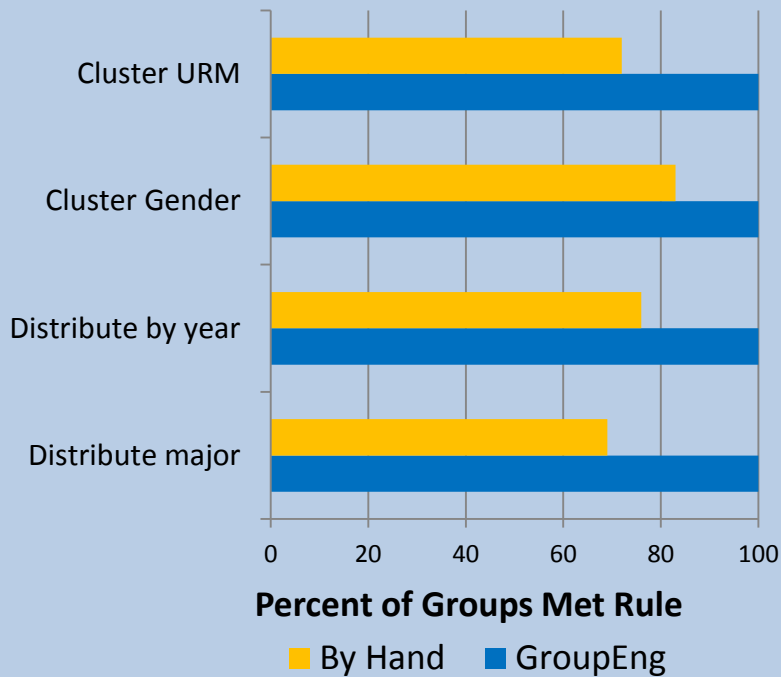


Group	Name	GPA	Gender	Ethnicity	Skill 1	Skill 2	Project choice
1	B	2.4	M	w	-	y	A
	Z	4.0	F	w	y	-	A
	G	3.3	F	w	-	-	A
2	C	3.8	F	B	y	-	B
	L	3.5	F	B	-	y	B
	J	2.9	F	A	y	y	B

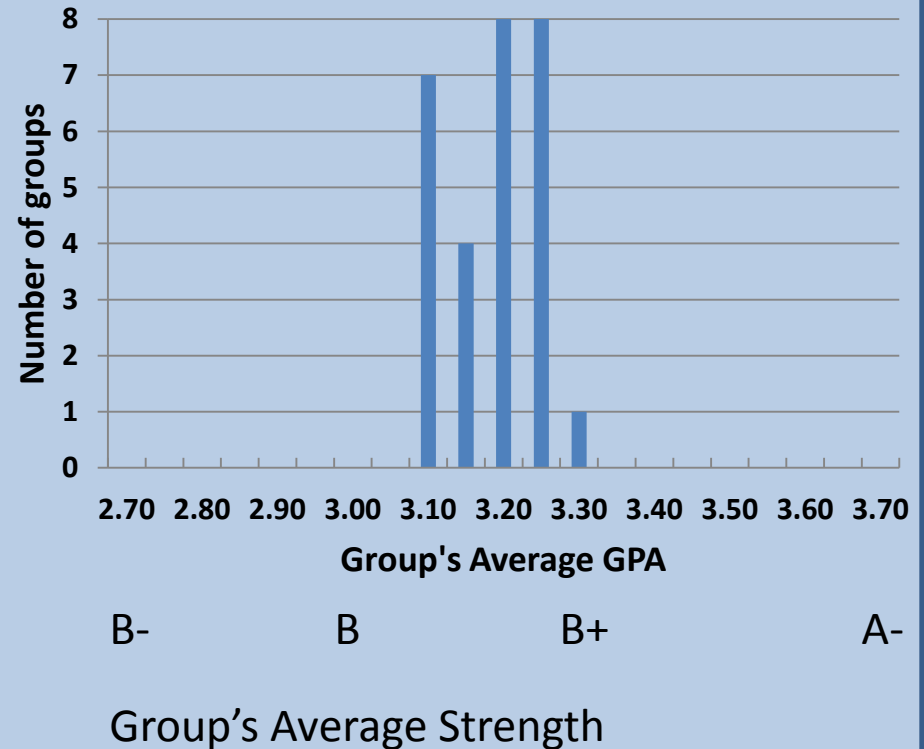
...

Sample GroupEng Results

Meeting Rules

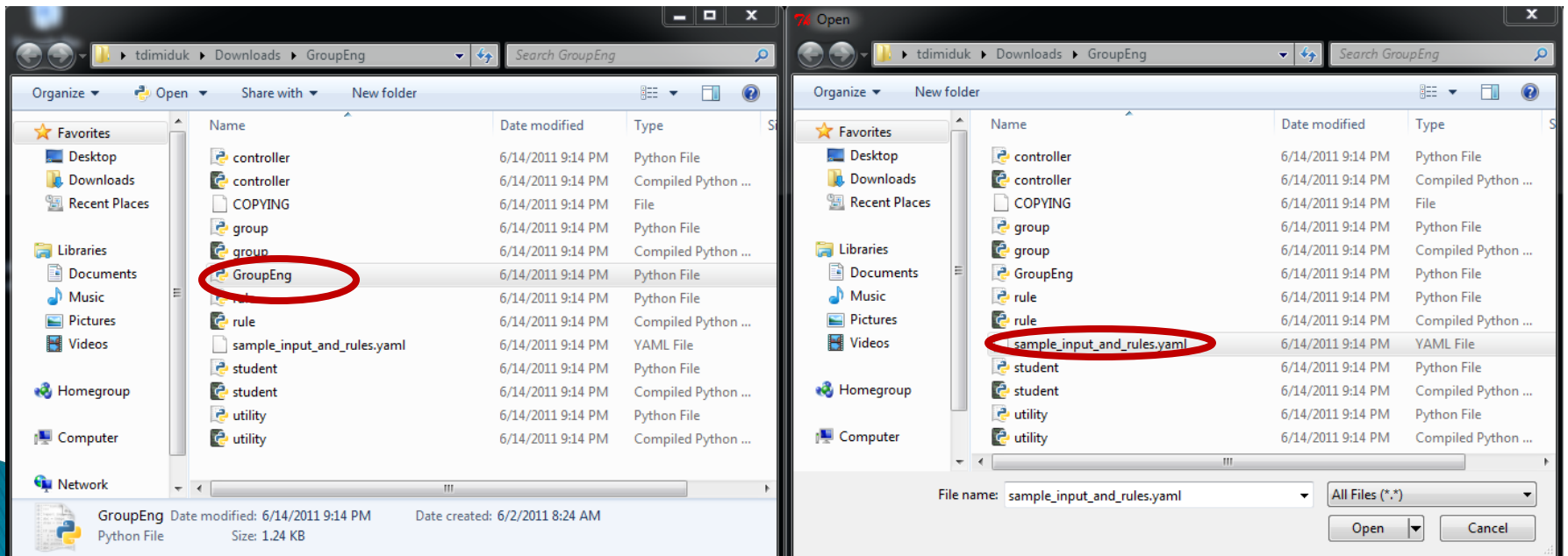


Histogram of Group Strengths



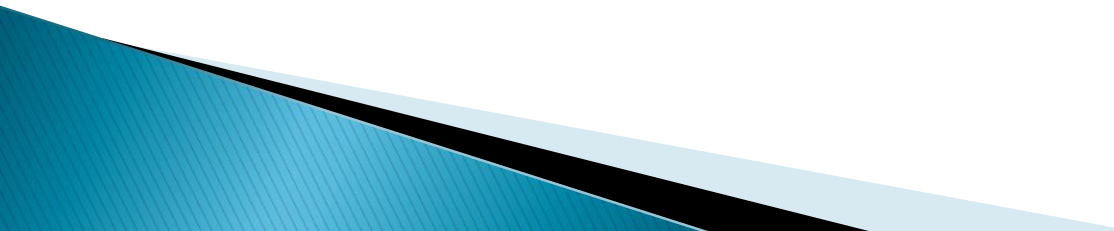
Open-Source Python Code

► www.GroupEng.org

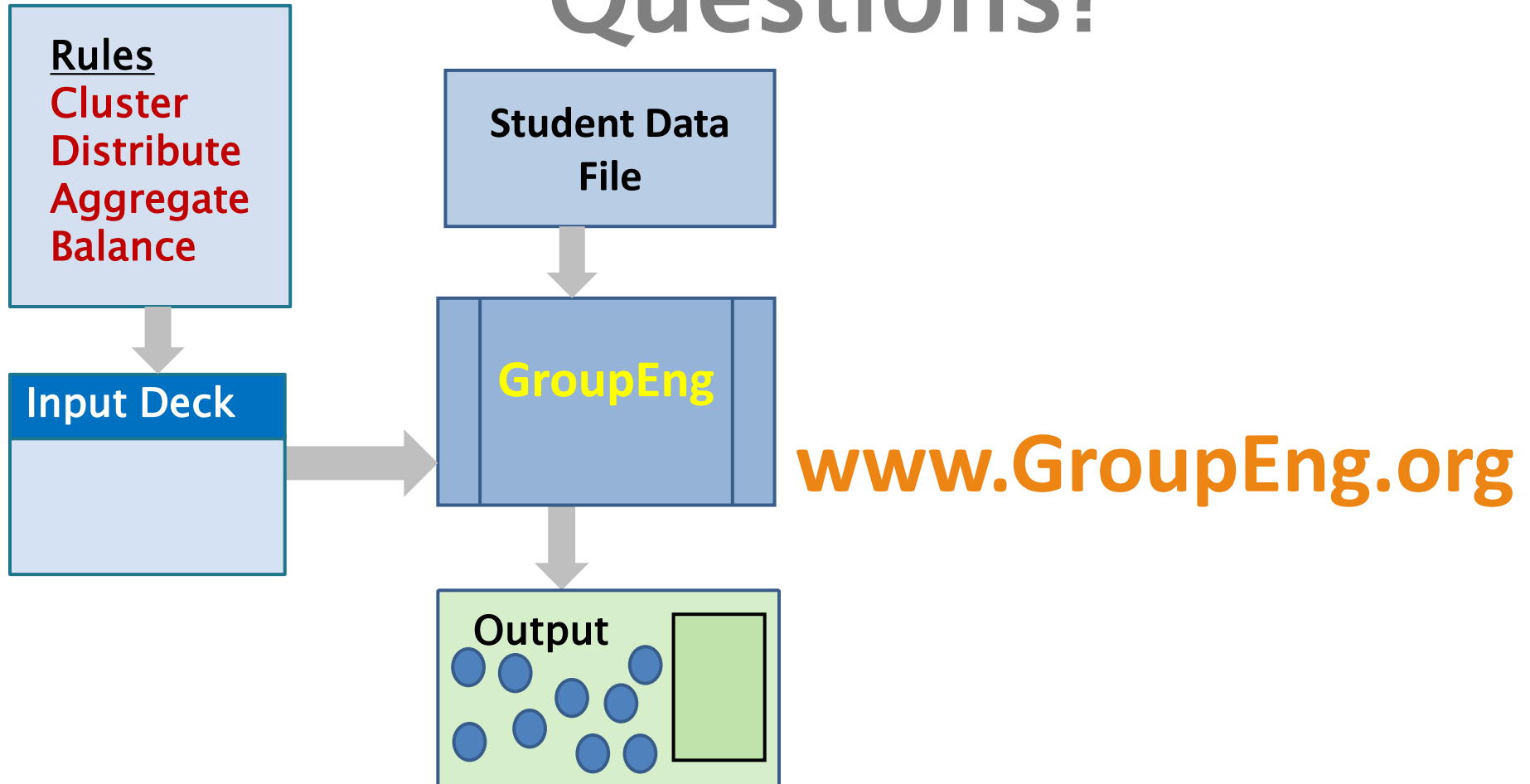


Acknowledgements

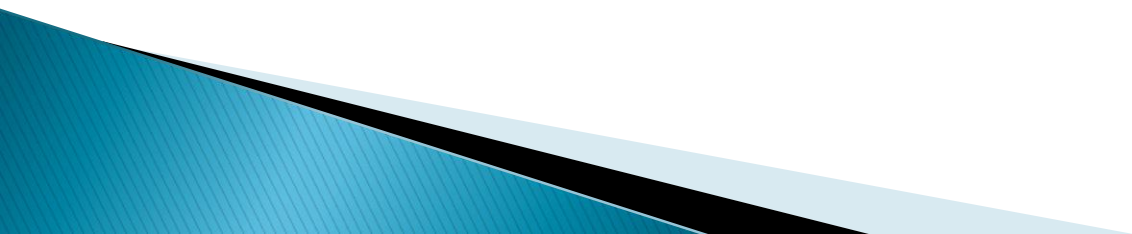
- ▶ NSF Graduate Fellowship
 - ▶ Harvard Van Vleck travel grant
 - ▶ Cornell Engineering Teaching Excellence Institute

 - ▶ Jeffrey Dimiduk, Statistics Consultant
 - ▶ Jamie Joyner, Assoc. Director, Cornell Engineering Diversity Program Office
 - ▶ DiOnetta Jones, Cornell → MIT
- 

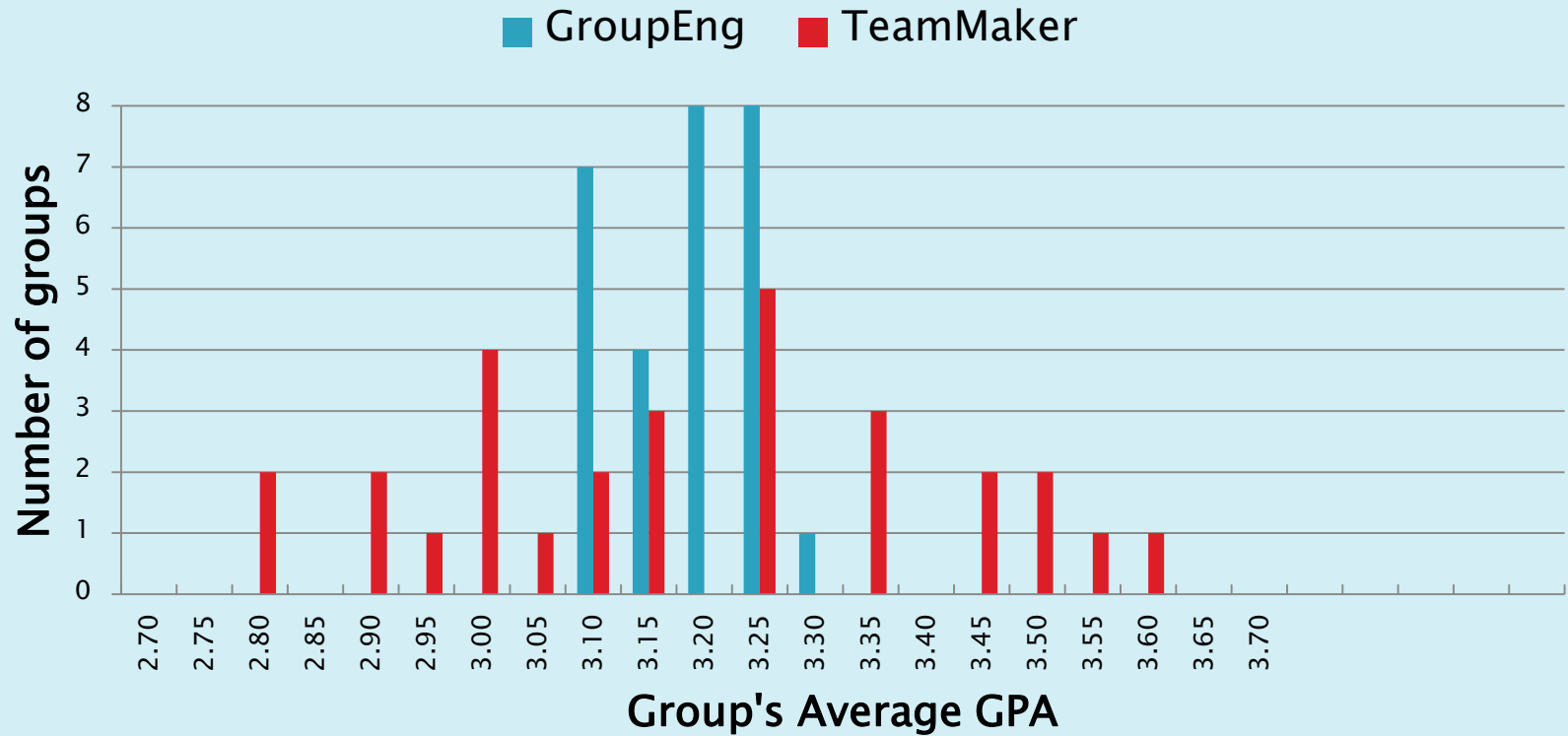
Questions?



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Histogram of Group Strengths



B-

B

B+

A-