

Data Mining Tutorial

Session 2: APRIORI, Frequent Itemset Mining and Association Rules

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Recall:

- ▶ Frequent itemsets are *typical* patterns in the data
- ▶ Association rules *extend* a smaller FI to a larger FI
- ▶ Apriori is the most well-known algorithm for this and a *must-know* for data mining
- ▶ It is also often used in other applications than market basket analysis!
(It is just a really easy to understand use case)
- ▶ Details on Apriori are in the lecture slides

Database

1	B E G H
2	A B C E G H
3	A B C E F H
4	B C D E F G H L
5	A B E K H
6	B E F G H I K
7	A B D G H
8	A B D G
9	B D F G
10	C E F
11	A C E F H
12	A B E G

C1

A	
B	
C	
D	
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I	
J	
K	
L	


Database

→ 1	B E G H
2	A B C E G H
3	A B C E F H
4	B C D E F G H L
5	A B E K H
6	B E F G H I K
7	A B D G H
8	A B D G
9	B D F G
10	C E F
11	A C E F H
12	A B E G

C1

A	
B	1
C	
D	
E	1
F	
G	1
H	1
I	
J	
K	
L	

Database



1	B E G H
2	A B C E G H
3	A B C E F H
4	B C D E F G H L
5	A B E K H
6	B E F G H I K
7	A B D G H
8	A B D G
9	B D F G
10	C E F
11	A C E F H
12	A B E G

C1

A	1
B	2
C	1
D	
E	2
F	
G	2
H	2
I	
J	
K	
L	

Database

1	B E G H
2	A B C E G H
3	A B C E F H
4	B C D E F G H L
5	A B E K H
6	B E F G H I K
7	A B D G H
8	A B D G
9	B D F G
10	C E F
11	A C E F H
12	A B E G



C1

A	2
B	3
C	2
D	
E	3
F	1
G	2
H	3
I	
J	
K	
L	

Database



1	B E G H
2	A B C E G H
3	A B C E F H
4	B C D E F G H L
5	A B E K H
6	B E F G H I K
7	A B D G H
8	A B D G
9	B D F G
10	C E F
11	A C E F H
12	A B E G

C1

A	2
B	4
C	3
D	1
E	4
F	2
G	3
H	4
I	
J	
K	
L	1

Database

1	B E G H
2	A B C E G H
3	A B C E F H
4	B C D E F G H L
→ 5	A B E K H
6	B E F G H I K
7	A B D G H
8	A B D G
9	B D F G
10	C E F
11	A C E F H
12	A B E G

C1

A	3
B	5
C	3
D	1
E	5
F	2
G	3
H	5
I	
J	
K	1
L	1

Database

1	B E G H
2	A B C E G H
3	A B C E F H
4	B C D E F G H L
5	A B E K H
→ 6	B E F G H I K
7	A B D G H
8	A B D G
9	B D F G
10	C E F
11	A C E F H
12	A B E G

C1

A	3
B	6
C	3
D	1
E	6
F	3
G	4
H	6
I	1
J	
K	2
L	1

Database

1	B E G H
2	A B C E G H
3	A B C E F H
4	B C D E F G H L
5	A B E K H
6	B E F G H I K
7	A B D G H
8	A B D G
9	B D F G
10	C E F
11	A C E F H
12	A B E G

C1

A	4
B	7
C	3
D	2
E	6
F	3
G	5
H	7
I	1
J	
K	2
L	1

Database

1	B E G H
2	A B C E G H
3	A B C E F H
4	B C D E F G H L
5	A B E K H
6	B E F G H I K
7	A B D G H
8	A B D G
9	B D F G
10	C E F
11	A C E F H
12	A B E G

C1

A	5
B	8
C	3
D	3
E	6
F	3
G	6
H	7
I	1
J	
K	2
L	1



Database

1	B E G H
2	A B C E G H
3	A B C E F H
4	B C D E F G H L
5	A B E K H
6	B E F G H I K
7	A B D G H
8	A B D G
9	B D F G
10	C E F
11	A C E F H
12	A B E G



C1

A	5
B	9
C	3
D	4
E	6
F	4
G	7
H	7
I	1
J	
K	2
L	1

Database

1	B E G H
2	A B C E G H
3	A B C E F H
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5	A B E K H
6	B E F G H I K
7	A B D G H
8	A B D G
9	B D F G
10	C E F
11	A C E F H
12	A B E G

C1

A	5
B	9
C	4
D	4
E	7
F	5
G	7
H	7
I	1
J	
K	2
L	1

Database

1	B E G H
2	A B C E G H
3	A B C E F H
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6	B E F G H I K
7	A B D G H
8	A B D G
9	B D F G
10	C E F
11	A C E F H
12	A B E G

C1

A	6
B	9
C	5
D	4
E	8
F	6
G	7
H	8
I	1
J	
K	2
L	1

Database

1	B E G H
2	A B C E G H
3	A B C E F H
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8	A B D G
9	B D F G
10	C E F
11	A C E F H
12	A B E G

C1

A	7
B	10
C	5
D	4
E	9
F	6
G	8
H	8
I	1
J	
K	2
L	1

Database

1	B E G H
2	A B C E G H
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6	B E F G H I K
7	A B D G H
8	A B D G
9	B D F G
10	C E F
11	A C E F H
12	A B E G

L1

A	7
B	10
C	5
D	4
E	9
F	6
G	8
H	8
I	4
J	0
K	2
L	4

Minsupport 30% \Leftrightarrow Support $\geq 4/12$

Database

1	B E G H
2	A B C E G H
3	A B C E F H
4	B C D E F G H L
5	A B E K H
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9	B D F G
10	C E F
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12	A B E G

L1

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C2

AB		CE	
AC		CF	
AD		CG	
AE		CH	
AF		DE	
AG		DF	
AH		DG	
BC		DH	
BD		EF	
BE		EG	
BF		EH	
BG		FG	
BH		FH	
CD		GH	

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L1

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C2

AB		CE	
AC		CF	
AD		CG	
AE		CH	
AF		DE	
AG		DF	
AH		DG	
BC		DH	
BD		EF	
BE	1	EG	1
BF		EH	1
BG	1	FG	
BH	1	FH	
CD		GH	1

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L1

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C2

AB	1	CE	1
AC	1	CF	
AD		CG	1
AE	1	CH	1
AF		DE	
AG	1	DF	
AH	1	DG	
BC	1	DH	
BD		EF	
BE	2	EG	2
BF		EH	2
BG	2	FG	
BH	2	FH	
CD		GH	2

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12	A B E G

L1

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C2

AB	2	CE	2
AC	2	CF	1
AD		CG	1
AE	2	CH	2
AF	1	DE	
AG	1	DF	
AH	2	DG	
BC	2	DH	
BD		EF	1
BE	3	EG	2
BF	1	EH	3
BG	2	FG	
BH	3	FH	1
CD		GH	2

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L1

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C2

AB	2	CE	3
AC	2	CF	2
AD		CG	2
AE	2	CH	3
AF	1	DE	1
AG	1	DF	1
AH	2	DG	1
BC	3	DH	1
BD	1	EF	2
BE	4	EG	3
BF	2	EH	4
BG	3	FG	1
BH	4	FH	2
CD	1	GH	3

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L1

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C2

AB	3	CE	3
AC	2	CF	2
AD		CG	2
AE	3	CH	3
AF	1	DE	1
AG	1	DF	1
AH	3	DG	1
BC	3	DH	1
BD	1	EF	2
BE	5	EG	3
BF	2	EH	5
BG	3	FG	1
BH	5	FH	2
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L1

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C2

AB	3	CE	3
AC	2	CF	2
AD		CG	2
AE	3	CH	3
AF	1	DE	1
AG	1	DF	1
AH	3	DG	1
BC	3	DH	1
BD	1	EF	3
BE	6	EG	4
BF	3	EH	6
BG	4	FG	2
BH	6	FH	3
CD	1	GH	4

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12	A B E G



L1

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C2

AB	4	CE	3
AC	2	CF	2
AD	1	CG	2
AE	3	CH	3
AF	1	DE	1
AG	2	DF	1
AH	4	DG	2
BC	3	DH	2
BD	2	EF	3
BE	6	EG	4
BF	3	EH	6
BG	5	FG	2
BH	7	FH	3
CD	1	GH	5

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11	A C E F H
12	A B E G



L1

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C2

AB	5	CE	3
AC	2	CF	2
AD	2	CG	2
AE	3	CH	3
AF	1	DE	1
AG	3	DF	1
AH	4	DG	3
BC	3	DH	2
BD	3	EF	3
BE	6	EG	4
BF	3	EH	6
BG	6	FG	2
BH	7	FH	3
CD	1	GH	5

Database

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8	A B D G
9	B D F G
10	C E F
11	A C E F H
12	A B E G



L1

A
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F
G
H

C2

AB	5	CE	3
AC	2	CF	2
AD	2	CG	2
AE	3	CH	3
AF	1	DE	1
AG	3	DF	2
AH	4	DG	4
BC	3	DH	2
BD	4	EF	3
BE	6	EG	4
BF	4	EH	6
BG	7	FG	3
BH	7	FH	3
CD	1	GH	5

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8	A B D G
9	B D F G
10	C E F
11	A C E F H
12	A B E G



L1

A
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G
H

C2

AB	5	CE	4
AC	2	CF	3
AD	2	CG	2
AE	3	CH	3
AF	1	DE	1
AG	3	DF	2
AH	4	DG	4
BC	3	DH	2
BD	4	EF	4
BE	6	EG	4
BF	4	EH	6
BG	7	FG	3
BH	7	FH	3
CD	1	GH	5

Database

1	B E G H
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8	A B D G
9	B D F G
10	C E F
11	A C E F H
12	A B E G



L1

A
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D
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G
H

C2

AB	5	CE	5
AC	3	CF	4
AD	2	CG	2
AE	4	CH	4
AF	2	DE	1
AG	3	DF	2
AH	5	DG	4
BC	3	DH	2
BD	4	EF	5
BE	6	EG	4
BF	4	EH	7
BG	7	FG	3
BH	7	FH	4
CD	1	GH	5

Database

1	B E G H
2	A B C E G H
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6	B E F G H I K
7	A B D G H
8	A B D G
9	B D F G
10	C E F
11	A C E F H
12	A B E G



L1

A
B
C
D
E
F
G
H

C2

AB	6	CE	5
AC	3	CF	4
AD	2	CG	2
AE	5	CH	4
AF	2	DE	1
AG	4	DF	2
AH	5	DG	4
BC	3	DH	2
BD	4	EF	5
BE	7	EG	5
BF	4	EH	7
BG	8	FG	3
BH	7	FH	4
CD	1	GH	5

Database

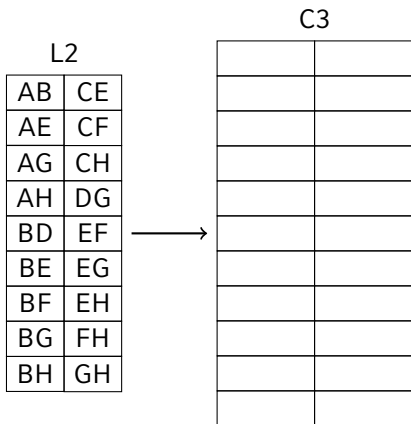
1	B E G H
2	A B C E G H
3	A B C E F H
4	B C D E F G H L
5	A B E K H
6	B E F G H I K
7	A B D G H
8	A B D G
9	B D F G
10	C E F
11	A C E F H
12	A B E G

L1

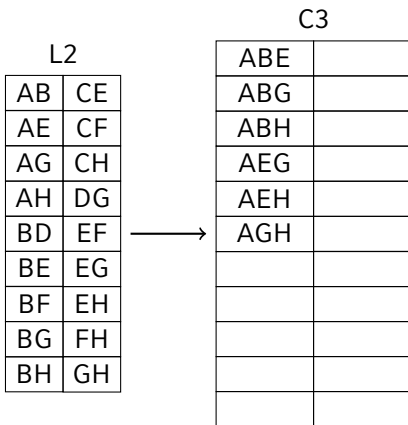
A
B
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L2

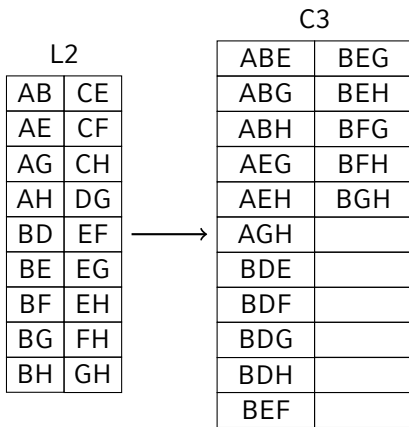
AB	6	CE	5
AC	3	CF	4
AD	2	CG	2
AE	5	CH	4
AF	2	DE	1
AG	4	DF	2
AH	5	DG	4
BC	3	DH	2
BD	4	EF	5
BE	7	EG	5
BF	4	EH	7
BG	8	FG	3
BH	7	FH	4
CD	1	GH	5



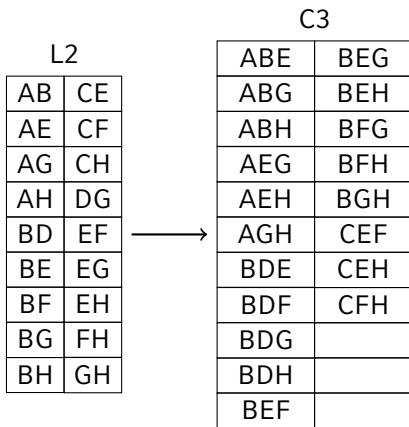
This construction is the most important step in Apriori!
You will see this in many “Apriori-style” algorithms!



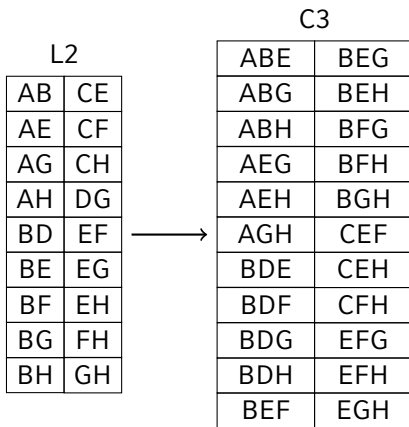
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L2		→	C3	
AB	CE		ABE	BEG
AE	CF		ABG	BEH
AG	CH		ABH	BFG
AH	DG		AEG	BFH
BD	EF		AEH	BGH
BE	EG		AGH	CEF
BF	EH		BDE	CEH
BG	FH		BDF	CFH
BH	GH		BDG	EFG
			BDH	EFH
			BEF	EGH

This construction is the most important step in Apriori!
You will see this in many “Apriori-style” algorithms!

Database

1	B E G H
2	A B C E G H
3	A B C E F H
4	B C D E F G H L
5	A B E K H
6	B E F G H I K
7	A B D G H
8	A B D G
9	B D F G
10	C E F
11	A C E F H
12	A B E G

C3

ABE		BEH	
ABG		BFH	
ABH		BGH	
AEG		CEF	
AEH		CEH	
AGH		CFH	
BDG		EFH	
BEF		EGH	
BEG			

Database

→ 1	B E G H
2	A B C E G H
3	A B C E F H
4	B C D E F G H L
5	A B E K H
6	B E F G H I K
7	A B D G H
8	A B D G
9	B D F G
10	C E F
11	A C E F H
12	A B E G

C3

ABE		BEH	1
ABG		BFH	
ABH		BGH	1
AEG		CEF	
AEH		CEH	
AGH		CFH	
BDG		EFH	
BEF		EGH	1
BEG	1		

Database

1	B E G H
→ 2	A B C E G H
3	A B C E F H
4	B C D E F G H L
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6	B E F G H I K
7	A B D G H
8	A B D G
9	B D F G
10	C E F
11	A C E F H
12	A B E G

C3

ABE	1	BEH	2
ABG	1	BFH	
ABH	1	BGH	2
AEG	1	CEF	
AEH	1	CEH	1
AGH	1	CFH	
BDG		EFH	
BEF		EGH	2
BEG	2		

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7	A B D G H
8	A B D G
9	B D F G
10	C E F
11	A C E F H
12	A B E G

C3

ABE	2	BEH	3
ABG	1	BFH	1
ABH	2	BGH	2
AEG	1	CEF	1
AEH	2	CEH	2
AGH	1	CFH	1
BDG		EFH	1
BEF	1	EGH	2
BEG	2		

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1	B E G H
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9	B D F G
10	C E F
11	A C E F H
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C3

ABE	2	BEH	4
ABG	1	BFH	2
ABH	2	BGH	3
AEG	1	CEF	2
AEH	2	CEH	3
AGH	1	CFH	2
BDG	1	EFH	2
BEF	2	EGH	3
BEG	3		

Database

1	B E G H
2	A B C E G H
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4	B C D E F G H L
→ 5	A B E K H
6	B E F G H I K
7	A B D G H
8	A B D G
9	B D F G
10	C E F
11	A C E F H
12	A B E G

C3

ABE	3	BEH	5
ABG	1	BFH	2
ABH	3	BGH	3
AEG	1	CEF	2
AEH	3	CEH	3
AGH	1	CFH	2
BDG	1	EFH	2
BEF	2	EGH	3
BEG	3		

Database

1	B E G H
2	A B C E G H
3	A B C E F H
4	B C D E F G H L
5	A B E K H
6	B E F G H I K
7	A B D G H
8	A B D G
9	B D F G
10	C E F
11	A C E F H
12	A B E G



C3

ABE	3	BEH	6
ABG	1	BFH	3
ABH	3	BGH	4
AEG	1	CEF	2
AEH	3	CEH	3
AGH	1	CFH	2
BDG	1	EFH	3
BEF	3	EGH	4
BEG	4		

Database

1	B E G H
2	A B C E G H
3	A B C E F H
4	B C D E F G H L
5	A B E K H
6	B E F G H I K
→ 7	A B D G H
8	A B D G
9	B D F G
10	C E F
11	A C E F H
12	A B E G

C3

ABE	3	BEH	6
ABG	2	BFH	3
ABH	4	BGH	5
AEG	1	CEF	2
AEH	3	CEH	3
AGH	2	CFH	2
BDG	2	EFH	3
BEF	3	EGH	4
BEG	4		

Database

1	B E G H
2	A B C E G H
3	A B C E F H
4	B C D E F G H L
5	A B E K H
6	B E F G H I K
7	A B D G H
8	A B D G
9	B D F G
10	C E F
11	A C E F H
12	A B E G



C3

ABE	3	BEH	6
ABG	3	BFH	3
ABH	4	BGH	5
AEG	1	CEF	2
AEH	3	CEH	3
AGH	2	CFH	2
BDG	3	EFH	3
BEF	3	EGH	4
BEG	4		

Database

1	B E G H
2	A B C E G H
3	A B C E F H
4	B C D E F G H L
5	A B E K H
6	B E F G H I K
7	A B D G H
8	A B D G
9	B D F G
10	C E F
11	A C E F H
12	A B E G



C3

ABE	3	BEH	6
ABG	3	BFH	3
ABH	4	BGH	5
AEG	1	CEF	2
AEH	3	CEH	3
AGH	2	CFH	2
BDG	4	EFH	3
BEF	3	EGH	4
BEG	4		

Database

1	B E G H
2	A B C E G H
3	A B C E F H
4	B C D E F G H L
5	A B E K H
6	B E F G H I K
7	A B D G H
8	A B D G
9	B D F G
→ 10	C E F
11	A C E F H
12	A B E G

C3

ABE	3	BEH	6
ABG	3	BFH	3
ABH	4	BGH	5
AEG	1	CEF	3
AEH	3	CEH	3
AGH	2	CFH	2
BDG	4	EFH	3
BEF	3	EGH	4
BEG	4		

Database

1	B E G H
2	A B C E G H
3	A B C E F H
4	B C D E F G H L
5	A B E K H
6	B E F G H I K
7	A B D G H
8	A B D G
9	B D F G
10	C E F
11	A C E F H
12	A B E G



C3

ABE	3	BEH	6
ABG	3	BFH	3
ABH	4	BGH	5
AEG	1	CEF	4
AEH	4	CEH	4
AGH	2	CFH	3
BDG	4	EFH	4
BEF	3	EGH	4
BEG	4		

Database

1	B E G H
2	A B C E G H
3	A B C E F H
4	B C D E F G H L
5	A B E K H
6	B E F G H I K
7	A B D G H
8	A B D G
9	B D F G
10	C E F
11	A C E F H
12	A B E G



C3

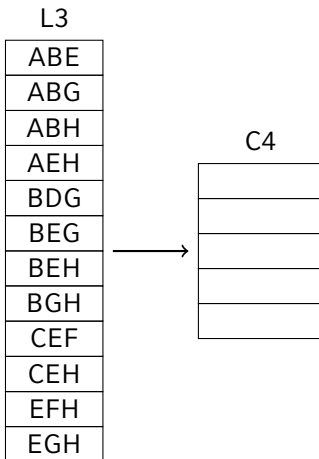
ABE	4	BEH	6
ABG	4	BFH	3
ABH	4	BGH	5
AEG	2	CEF	4
AEH	4	CEH	4
AGH	2	CFH	3
BDG	4	EFH	4
BEF	3	EGH	4
BEG	5		

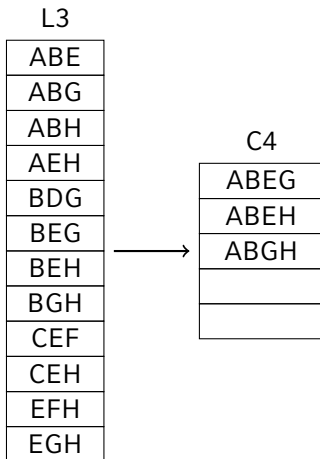
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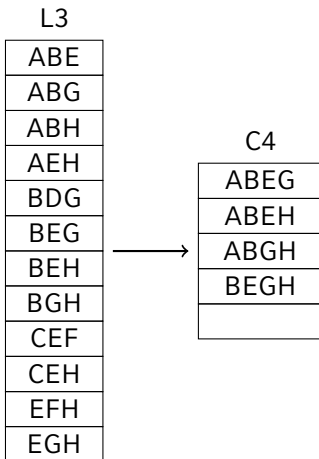
1	B E G H
2	A B C E G H
3	A B C E F H
4	B C D E F G H L
5	A B E K H
6	B E F G H I K
7	A B D G H
8	A B D G
9	B D F G
10	C E F
11	A C E F H
12	A B E G

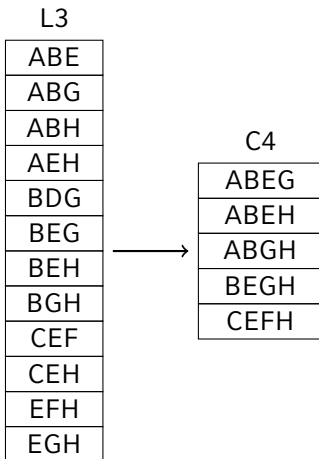
L3

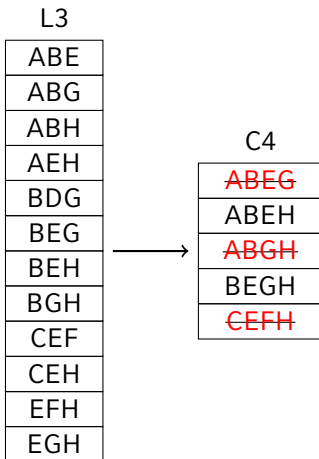
ABE	4	BEH	6
ABG	4	BFH	3
ABH	4	BGH	5
AEG	2	CEF	4
AEH	4	CEH	4
AGH	2	CFH	3
BDG	4	EFH	4
BEF	3	EGH	4
BEG	5		











AEG, AGH and CFH not *frequent*!

Database

1	B E G H
2	A B C E G H
3	A B C E F H
4	B C D E F G H L
5	A B E K H
6	B E F G H I K
7	A B D G H
8	A B D G
9	B D F G
10	C E F
11	A C E F H
12	A B E G

C4

ABEH	
BEGH	

Database

→ 1	B E G H
2	A B C E G H
3	A B C E F H
4	B C D E F G H L
5	A B E K H
6	B E F G H I K
7	A B D G H
8	A B D G
9	B D F G
10	C E F
11	A C E F H
12	A B E G

C4

ABEH	
BEGH	1

Database

1	B E G H
2	A B C E G H
3	A B C E F H
4	B C D E F G H L
5	A B E K H
6	B E F G H I K
7	A B D G H
8	A B D G
9	B D F G
10	C E F
11	A C E F H
12	A B E G



C4

ABEH	1
BEGH	2

Database

1	B E G H
2	A B C E G H
3	A B C E F H
4	B C D E F G H L
5	A B E K H
6	B E F G H I K
7	A B D G H
8	A B D G
9	B D F G
10	C E F
11	A C E F H
12	A B E G

C4

ABEH	2
BEGH	2

Database

1	B E G H
2	A B C E G H
3	A B C E F H
4	B C D E F G H L
5	A B E K H
6	B E F G H I K
7	A B D G H
8	A B D G
9	B D F G
10	C E F
11	A C E F H
12	A B E G

C4

ABEH	2
BEGH	3

Database

1	B E G H
2	A B C E G H
3	A B C E F H
4	B C D E F G H L
→ 5	A B E K H
6	B E F G H I K
7	A B D G H
8	A B D G
9	B D F G
10	C E F
11	A C E F H
12	A B E G

C4

ABEH	3
BEGH	3

Database

1	B E G H
2	A B C E G H
3	A B C E F H
4	B C D E F G H L
5	A B E K H
→ 6	B E F G H I K
7	A B D G H
8	A B D G
9	B D F G
10	C E F
11	A C E F H
12	A B E G

C4

ABEH	3
BEGH	4

Database

1	B E G H
2	A B C E G H
3	A B C E F H
4	B C D E F G H L
5	A B E K H
6	B E F G H I K
→ 7	A B D G H
→ 8	A B D G
→ 9	B D F G
→ 10	C E F
→ 11	A C E F H
→ 12	A B E G

C4

ABEH	3
BEGH	4

Database

1	B E G H
2	A B C E G H
3	A B C E F H
4	B C D E F G H L
5	A B E K H
6	B E F G H I K
7	A B D G H
8	A B D G
9	B D F G
10	C E F
11	A C E F H
12	A B E G

L4

ABEH	3
BEGH	4

Only one frequent 4-Itemset remaining.

Association rules for BEGH, confidence $\geq 60\%$, support 4:

Body	Head	Support	Confidence	Rule
BEGH	\emptyset	4	1.000	
BEG	H	5	$4/5 = \mathbf{0.800}$	BEG \Rightarrow H
BE	GH	7	$4/7 \approx 0.571$	-
BG	EH	8	$4/8 = 0.500$	-
EG	BH	5	$4/5 = \mathbf{0.800}$	EG \Rightarrow BH
E	BGH	9	$4/9 \approx 0.444$	-
G	BEH	8	$4/8 = 0.500$	-
BEH	G	6	$4/6 \approx \mathbf{0.667}$	BEH \Rightarrow G
BH	EG	7	$4/7 \approx 0.571$	-
EH	BG	7	$4/7 \approx 0.571$	-
BGH	E	5	$4/5 = \mathbf{0.800}$	BGH \Rightarrow E
GH	BE	5	$4/5 = \mathbf{0.800}$	GH \Rightarrow BE
H	BEG	8	$4/8 = 0.500$	-
EGH	B	4	$4/4 = \mathbf{1.000}$	EGH \Rightarrow B

L1

A	7
B	10
C	5
D	4
E	9
F	6
G	8
H	8

L2

AB	6
AE	5
AG	4
AH	5
BD	4
BE	7
BF	4
BG	8
BH	7
CE	5
CF	4
CH	4
DG	4
EF	5
EG	5
EH	7
FH	4
GH	5

L3

ABE	4
ABG	4
ABH	4
AEH	4
BDG	4
BEG	5
BEH	6
BGH	5
CEF	4
CEH	4
EFH	4
EGH	4

L4

BEGH	4
------	---

MFI and CFI
CFI only

L1

A	7
B	10
C	5
D	4
E	9
F	6
G	8
H	8

L2

AB	6
AE	5
AG	4
AH	5
BD	4
BE	7
BF	4
BG	8
BH	7
CE	5
CF	4
CH	4
DG	4
EF	5
EG	5
EH	7
FH	4
GH	5

L3

ABE	4
ABG	4
ABH	4
AEH	4
BDG	4
BEG	5
BEH	6
BGH	5
CEF	4
CEH	4
EFH	4
EGH	4

L4

BEGH	4
------	---

MFI and CFI
CFI only

Apriori Homework – MFI and CFI

L1

A	7
B	10
C	5
D	4
E	9
F	6
G	8
H	8

L2

AB	6
AE	5
AG	4
AH	5
BD	4
BE	7
BF	4
BG	8
BH	7
CE	5
CF	4
CH	4
DG	4
EF	5
EG	5
EH	7
FH	4
GH	5

L3

ABE	4
ABG	4
ABH	4
AEH	4
BDG	4
BEG	5
BEH	6
BGH	5
CEF	4
CEH	4
EFH	4
EGH	4

L4

BEGH	4
------	---

MFI and CFI
CFI only

L1

A	7
B	10
C	5
D	4
E	9
F	6
G	8
H	8

L2

AB	6
AE	5
AG	4
AH	5
BD	4
BE	7
BF	4
BG	8
BH	7
CE	5
CF	4
CH	4
DG	4
EF	5
EG	5
EH	7
FH	4
GH	5

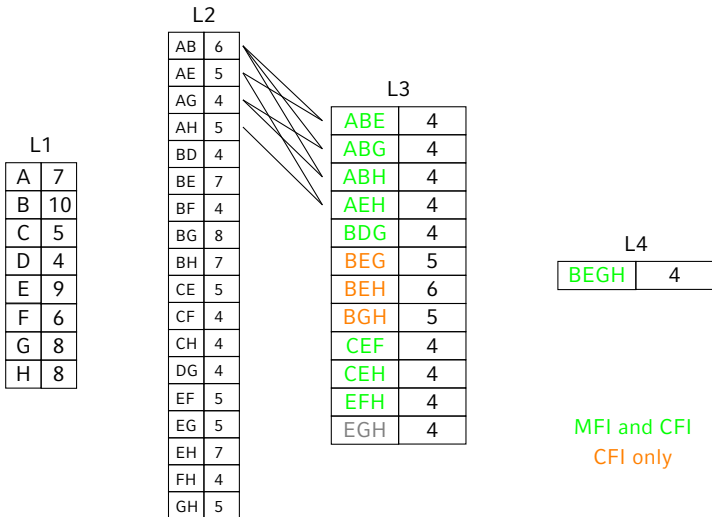
L3

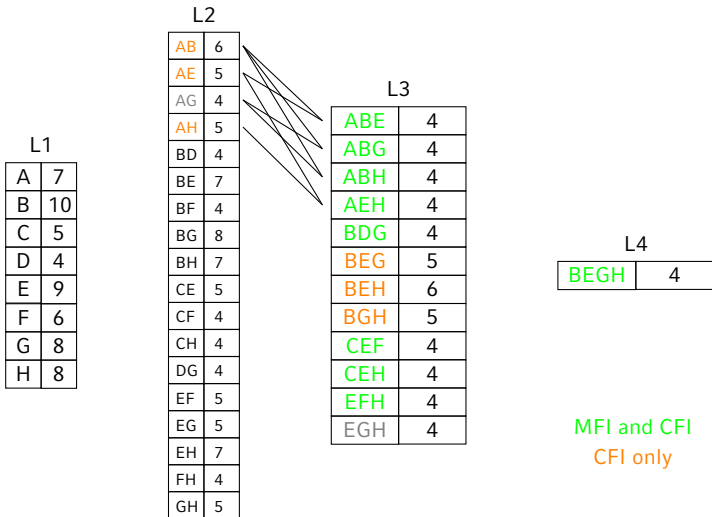
ABE	4
ABG	4
ABH	4
AEH	4
BDG	4
BEG	5
BEH	6
BGH	5
CEF	4
CEH	4
EFH	4
EGH	4

L4

BEGH	4
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MFI and CFI
CFI only





Apriori Homework – MFI and CFI

Apriori

C1 and L1

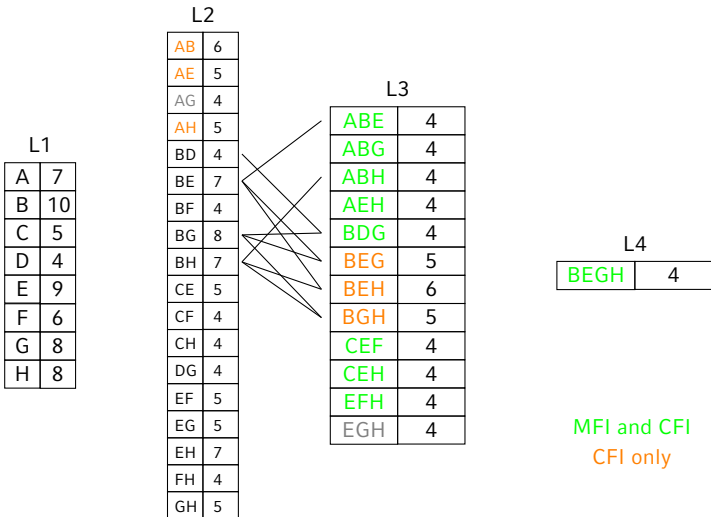
C2 and L2

C3 and L3

C4 and L4

Association Rules

MFI and CFI



L1

A	7
B	10
C	5
D	4
E	9
F	6
G	8
H	8

L2

AB	6
AE	5
AG	4
AH	5
BD	4
BE	7
BF	4
BG	8
BH	7
CE	5
CF	4
CH	4
DG	4
EF	5
EG	5
EH	7
FH	4
GH	5

L3

ABE	4
ABG	4
ABH	4
AEH	4
BDG	4
BEG	5
BEH	6
BGH	5
CEF	4
CEH	4
EFH	4
EGH	4

L4

BEGH	4
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MFI and CFI
CFI only

Apriori Homework – MFI and CFI

Data Mining
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E. Ntoutsis

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C1 and L1

C2 and L2

C3 and L3

C4 and L4

Association Rules

MFI and CFI

L1

A	7
B	10
C	5
D	4
E	9
F	6
G	8
H	8

L2

AB	6
AE	5
AG	4
AH	5
BD	4
BE	7
BF	4
BG	8
BH	7
CE	5
CF	4
CH	4
DG	4
EF	5
EG	5
EH	7
FH	4
GH	5

L3

ABE	4
ABG	4
ABH	4
AEH	4
BDG	4
BEG	5
BEH	6
BGH	5
CEF	4
CEH	4
EFH	4
EGH	4

L4

BEGH	4
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MFI and CFI
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C1 and L1

C2 and L2

C3 and L3

C4 and L4

Association Rules

MFI and CFI

L1

A	7
B	10
C	5
D	4
E	9
F	6
G	8
H	8

L2

AB	6
AE	5
AG	4
AH	5
BD	4
BE	7
BF	4
BG	8
BH	7
CE	5
CF	4
CH	4
DG	4
EF	5
EG	5
EH	7
FH	4
GH	5

L3

ABE	4
ABG	4
ABH	4
AEH	4
BDG	4
BEG	5
BEH	6
BGH	5
CEF	4
CEH	4
EFH	4
EGH	4

L4

BEGH	4
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MFI and CFI
CFI only

L1

A	7
B	10
C	5
D	4
E	9
F	6
G	8
H	8

L2

AB	6
AE	5
AG	4
AH	5
BD	4
BE	7
BF	4
BG	8
BH	7
CE	5
CF	4
CH	4
DG	4
EF	5
EG	5
EH	7
FH	4
GH	5

L3

ABE	4
ABG	4
ABH	4
AEH	4
BDG	4
BEG	5
BEH	6
BGH	5
CEF	4
CEH	4
EFH	4
EGH	4

L4

BEGH	4
------	---

MFI and CFI
CFI only

L1

A	7
B	10
C	5
D	4
E	9
F	6
G	8
H	8

L2

AB	6
AE	5
AG	4
AH	5
BD	4
BE	7
BF	4
BG	8
BH	7
CE	5
CF	4
CH	4
DG	4
EF	5
EG	5
EH	7
FH	4
GH	5

L3

ABE	4
ABG	4
ABH	4
AEH	4
BDG	4
BEG	5
BEH	6
BGH	5
CEF	4
CEH	4
EFH	4
EGH	4

L4

BEGH	4
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MFI and CFI
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C1 and L1

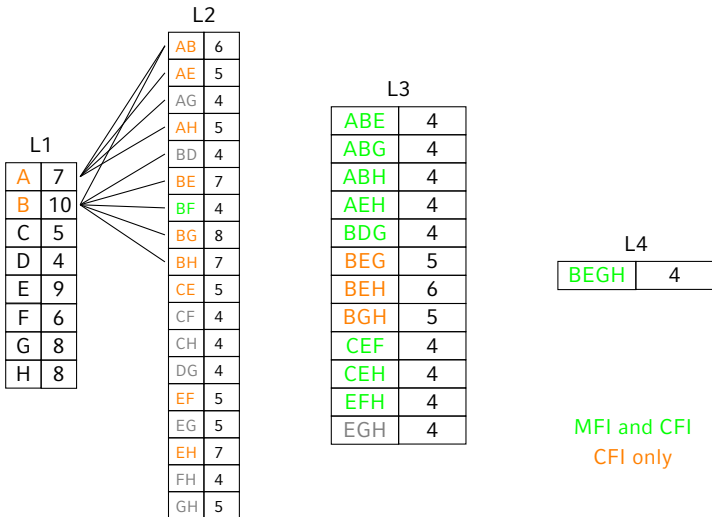
C2 and L2

C3 and L3

C4 and L4

Association Rules

MFI and CFI



MFI and CFI
CFI only

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C1 and L1

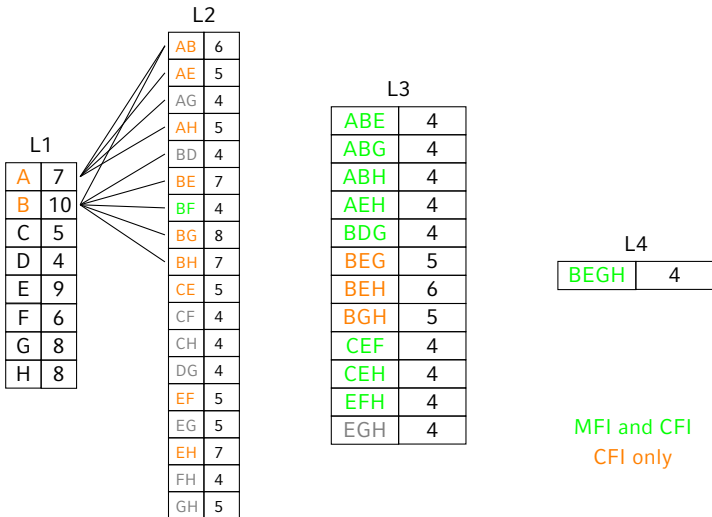
C2 and L2

C3 and L3

C4 and L4

Association Rules

MFI and CFI



MFI and CFI
CFI only

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Apriori

C1 and L1

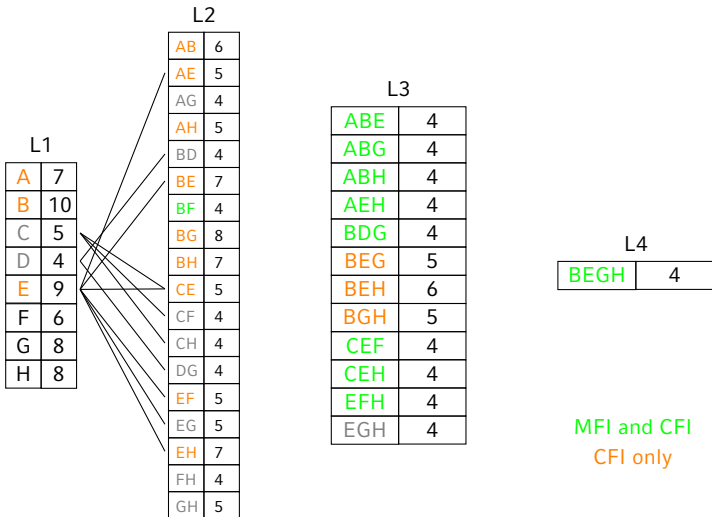
C2 and L2

C3 and L3

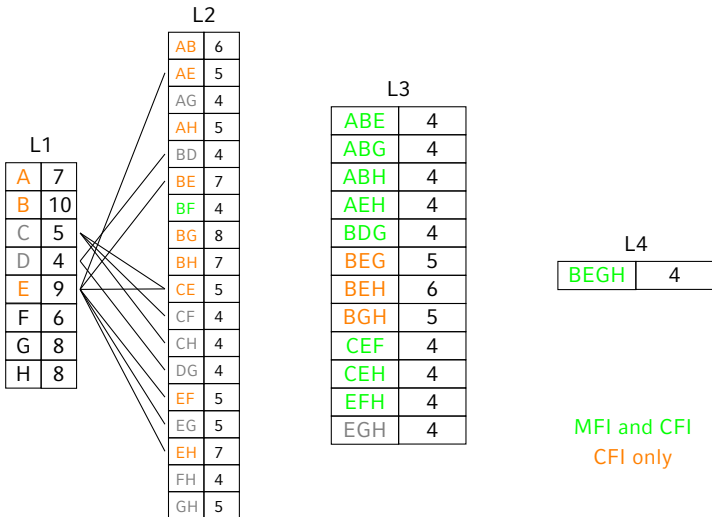
C4 and L4

Association Rules

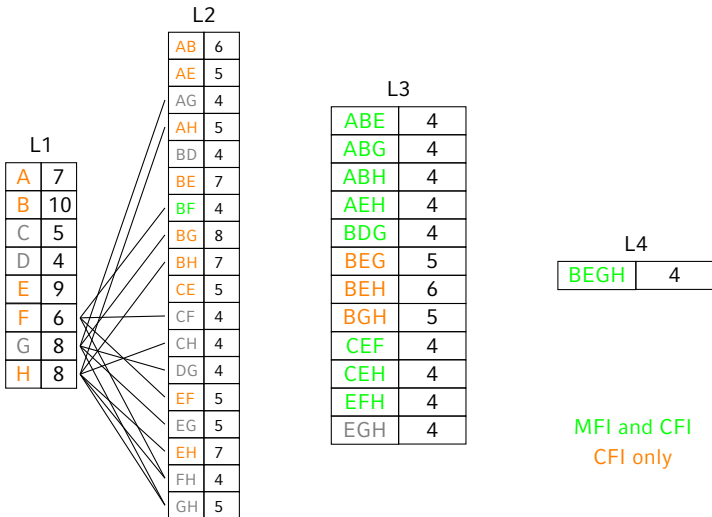
MFI and CFI



Apriori Homework – MFI and CFI

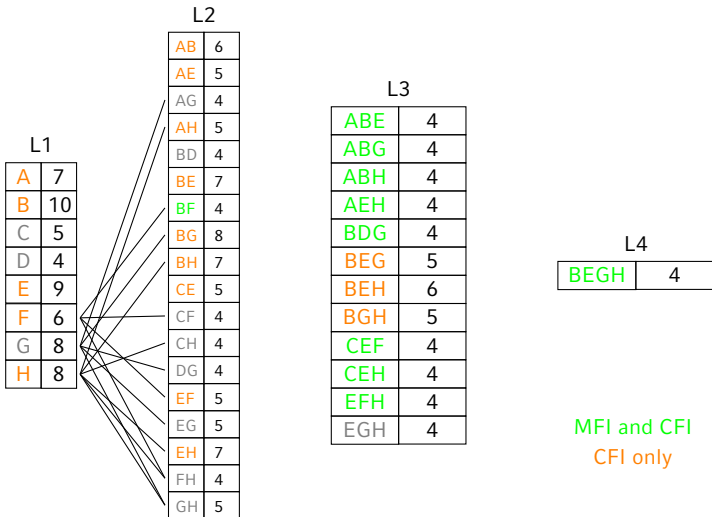


Apriori Homework – MFI and CFI



MFI and CFI
CFI only

Apriori Homework – MFI and CFI



MFI and CFI
CFI only

Apriori Homework – MFI and CFI

Apriori

C1 and L1

C2 and L2

C3 and L3

C4 and L4

Association Rules

MFI and CFI

