What is Relational Algebra

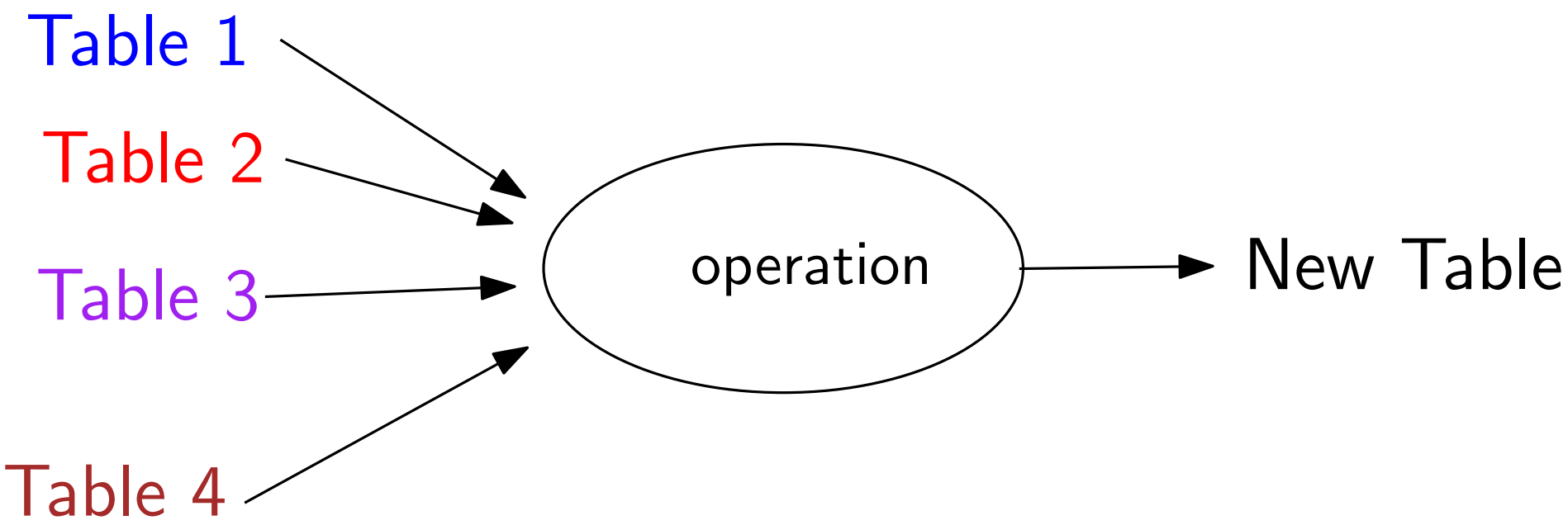


Table $\equiv$ Set of tuples

Why do we use Relational Algebra?

The operation we will see:

Basic operators

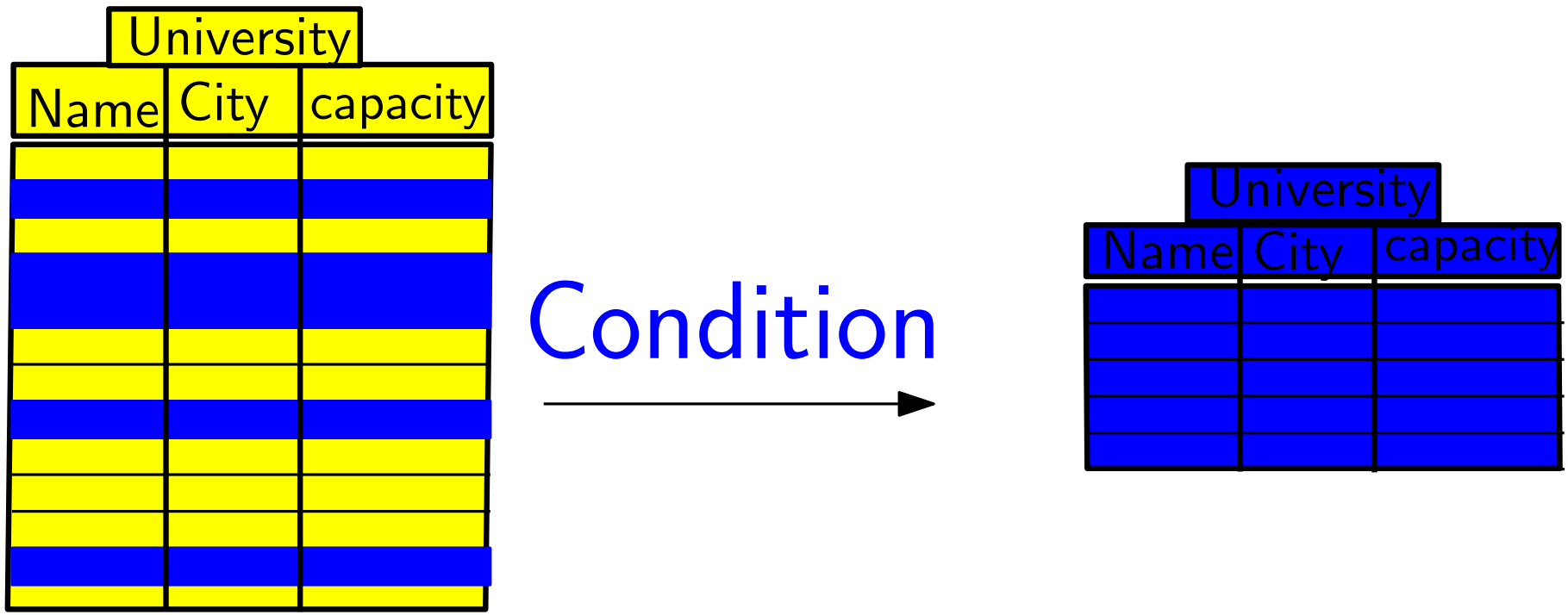
1. Select σ
2. Projection Π
3. Product $\times$
4. Set operations (Union, difference)
5. Rename ρ

Additional operators

1. Natural Join $\bowtie$
2. Theta Join $\bowtie_\theta$

Relational Algebra

First operator: Select $\sigma_{Condition}Table$



Relational Algebra

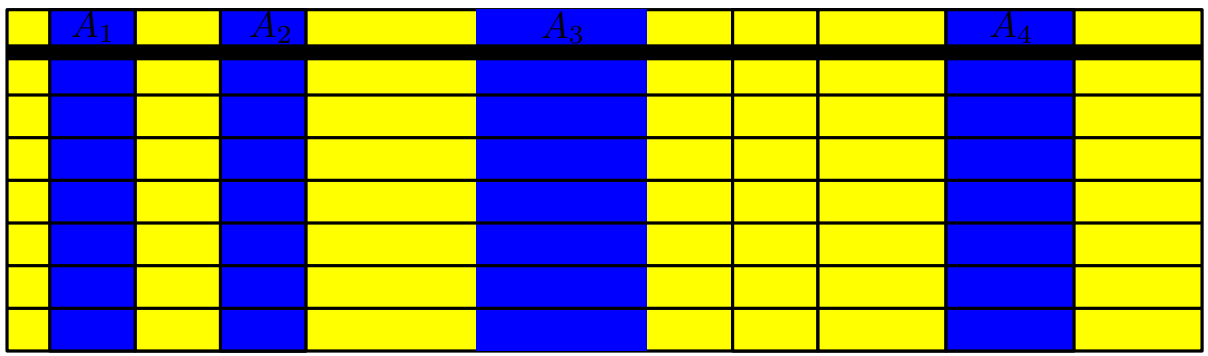
First operator: Select $\sigma_{Condition}Table$

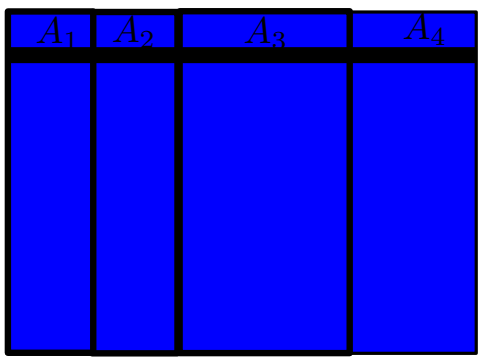
Applied to one table to give rows (tubles)

1. Find the movies tuples before 1980
2. Find rating tuples with 5 stars

Relational Algebra

Second operator: Projection $\Pi_{A_1 \ldots A_k}$ Table





Relational Algebra

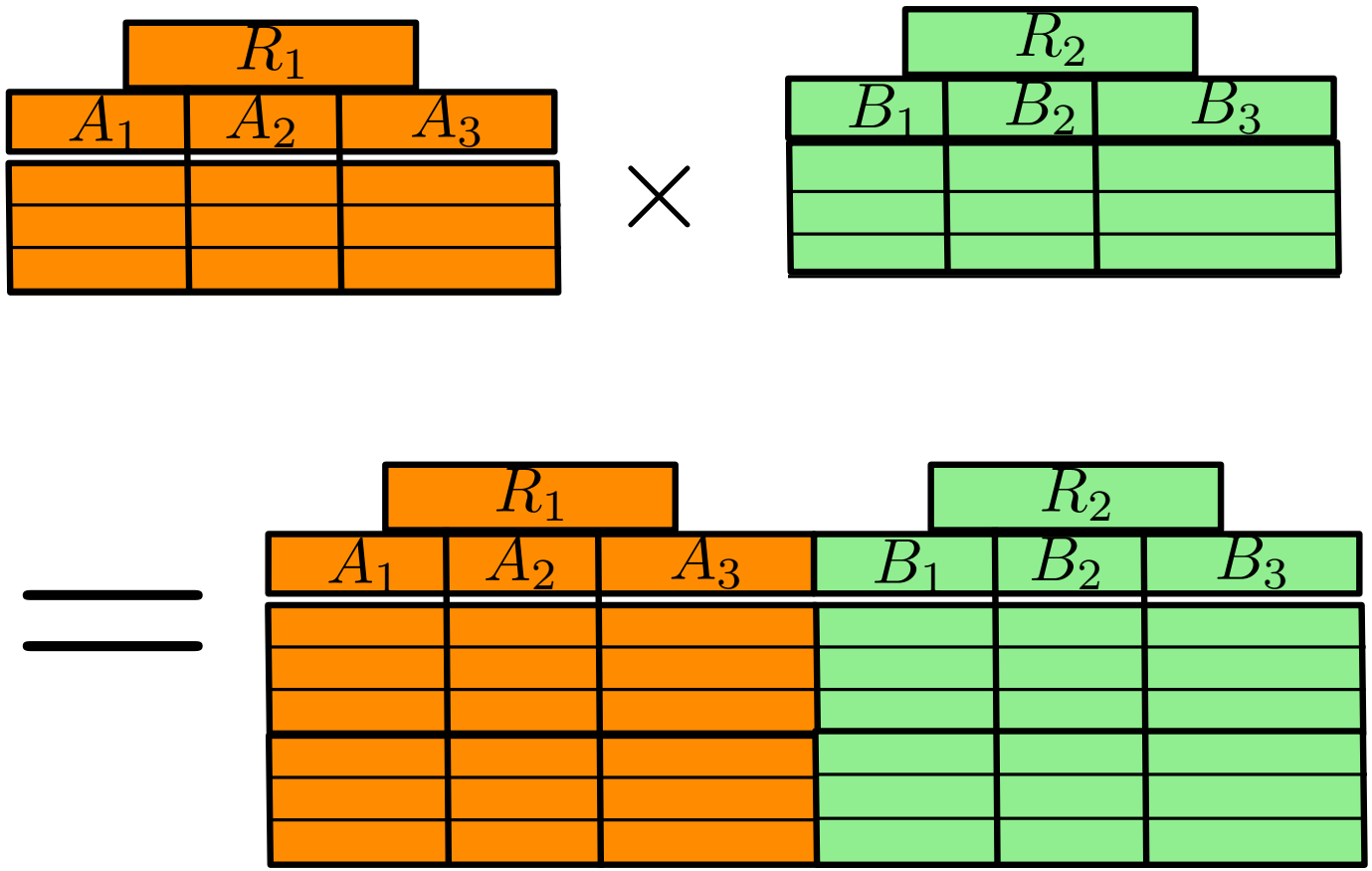
Second operator: Projection $\Pi_{A_1 \ldots A_k}$ Table

Applied to one table to give columns (tubles)

1. Find the movies names before 1980
2. Find movies IDs with 5 stars with the date of rating

Relational Algebra

3rd operator: Product $\times$



Relational Algebra

3rd operator: Product $Table_1 \times Table_2$

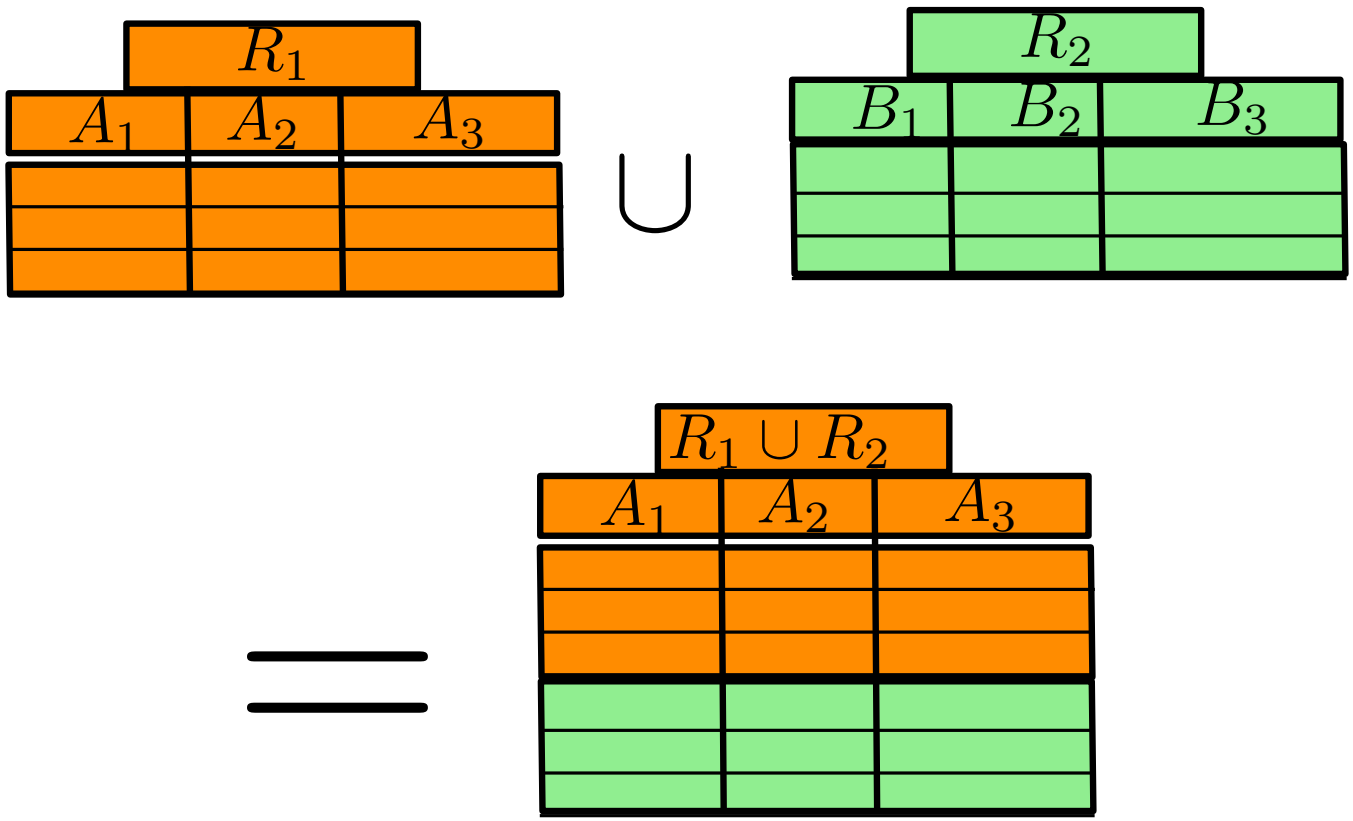
Applied to one table to give columns (tubles)

1. Find all years that have a movie that received a rating of 4 or 5
2. Find the titles of all movies not reviewed by Chris Jackson.

Relational Algebra

4rd operator: Union $\cup$

Condition: $\#columns R_1 = \#columns R_2$



Relational Algebra

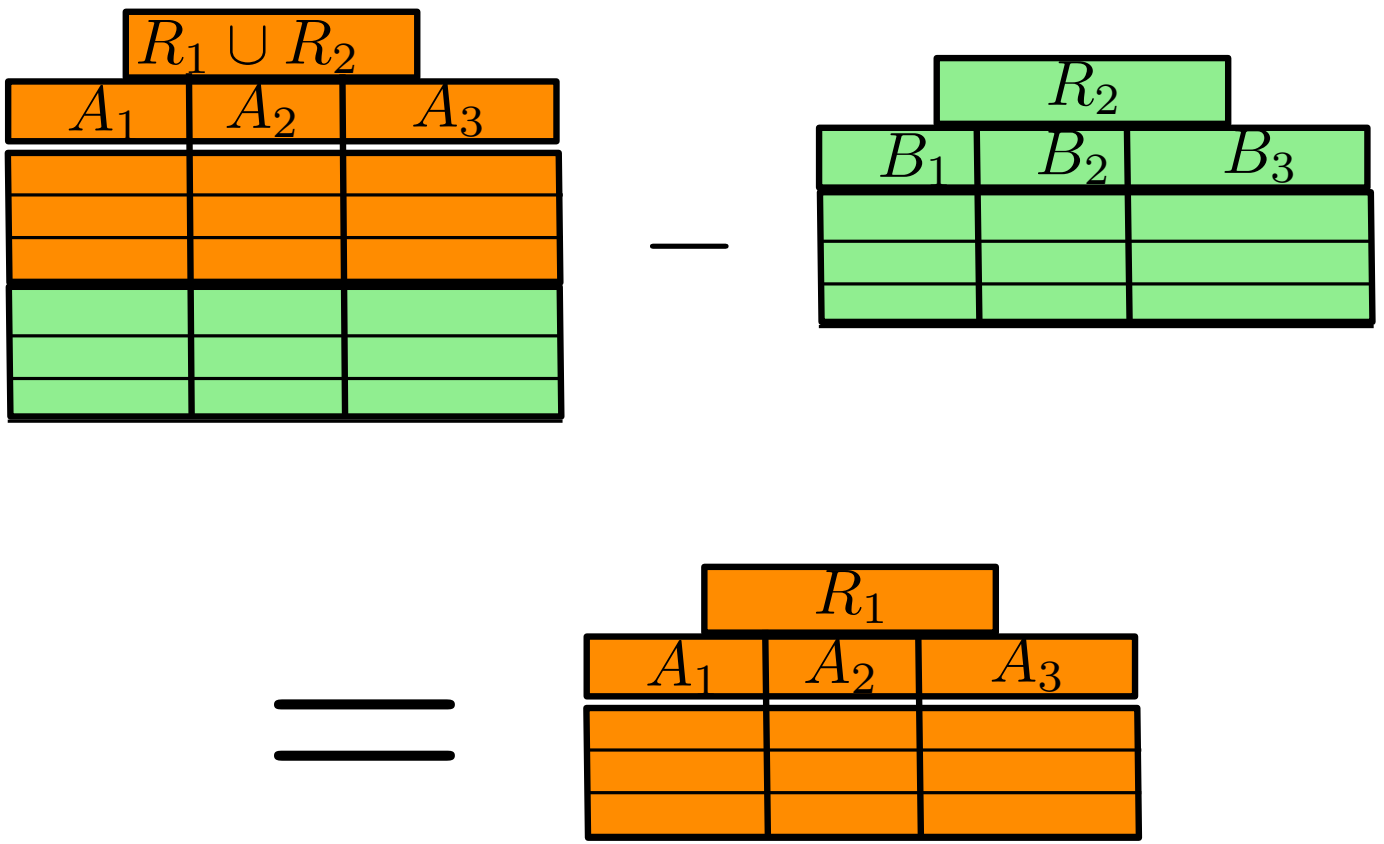
4th operator: Union $Table_1 \cup Table_2$

1. Find the list of directors union reviewers.
2. Find the list of rIDs union mIDs

Relational Algebra

5th operator: Difference $-$

Condition: $\#columns R_1 = \#columns R_2$



Relational Algebra

5th operator: Difference $Table_1 - Table_2$

1. Find the list movies not rated by Sarah Martinez

Relational Algebra

Natural join $\bowtie$

1. A list shcu that, for each rating, the name of reviewers with the names of the movie and the number of stars.

Relational Algebra

Theta join $\bowtie_\theta$

1. List of rIDs and mIDs that have at least two different ratings

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Designing Database

UML Data Modeling

How to represent data for application

1. Relational model (tables)
2. XML
3. Graphes
   (a) Entity-Relationship Model (E/R)
   (b) Unified Modeling Language (UML)

Unified Modeling Language (UML)

1. Classes
2. Associations
3. Association Classes
4. Subclasses
5. Composition & Aggregation

Classes

Name, attributes, methods

Unified Modeling Language (UML)

1. Classes
2. Associations
3. Association Classes
4. Subclasses
5. Composition & Aggregation

Associations

Relationships between objects of two classes

Multiplicity of Associations

Each object of class C_1 is related to at least m and at most n objects of class C_2

Unified Modeling Language (UML)

1. Classes
2. Associations
3. Association Classes
4. Subclasses
5. Composition & Aggregation

UML Data Modeling: Association Classes

Relationships between objects of two classes, with attributes on relationships