



# Database Concepts

BMI 773: Clinical Research Informatics

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# Database Concepts

- ▶ Transactional databases vs data warehouses
- ▶ The relational model
  - ▶ Tables, records, and columns
  - ▶ Schemas
  - ▶ Normal forms
  - ▶ Keys
- ▶ Learn how to design and execute SQL queries

# Transactional databases vs data warehouses



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## Table Relation Relvar

first_name	last_name	gender	birth_date
Lauren	Johnson	F	1982-03-12
Peter	Jurasik	M	1950-04-25
Richard	Biggs	M	1960-03-18
Lauren	Johnson	F	1974-06-01



Table  
Relation  
Relvar

Column  
Attribute  
Field

first\_name      last\_name      gender      birth\_date

Lauren	Johnson	F	1982-03-12
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Table  
Relation  
Relvar

Column  
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Field

	first_name	last_name	gender	birth_date
Row Tuple Record	Lauren	Johnson	F	1982-03-12
	Peter	Jurasik	M	1950-04-25
	Richard	Biggs	M	1960-03-18
	Lauren	Johnson	F	1974-06-01

# Why have more than one table?

First Name	Last Name	Birth Date
Lauren	Johnson	1982-03-12
Alice	Smith	1979-12-04
James	White	1964-09-01

- ▶ Consider a database of patients

# Why have more than one table?

First Name	Last Name	Birth Date	Drug	Prescription date
Lauren	Johnson	1982-03-12	Acetaminophen	2010-01-06
Alice	Smith	1979-12-04	Amoxicillin	1998-01-29
James	White	1964-09-01	Albuterol	1990-12-15

- ▶ Consider a database of patients and their prescriptions
- ▶ How can we track multiple prescriptions for a patient?

# Why have more than one table?

First Name	Last Name	Birth Date	Drug	Prescription date	Drug 2	Prescription date 2
Lauren	Johnson	1982-03-12	Acetaminophen	2010-01-06	—	—
Alice	Smith	1979-12-04	Amoxicillin	1998-01-29	Lisinopril	2019-05-26
James	White	1964-09-01	Albuterol	1990-12-15	—	—

- ▶ Consider a database of patients and their prescriptions
- ▶ How can we track multiple prescriptions for a patient?
  - ▶ Add columns?

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- ▶ Consider a database of patients and their prescriptions
- ▶ How can we track multiple prescriptions for a patient?
  - ▶ Add columns?
  - ▶ One row per prescription?

Patient ID	First Name	Last Name	Birth Date
1	Lauren	Johnson	1982-03-12
2	Alice	Smith	1979-12-04
3	James	White	1964-09-01

  

Patient ID	Drug	Prescription date
1	Acetaminophen	2010-01-06
2	Amoxicillin	1998-01-29
2	Lisinopril	2019-05-26
3	Albuterol	1990-12-15

# Schemas



Star schema Other schemas?

select/insert/delete (+where) merge group by summary functions