Normalization

> Functional Dependency

- How different attributes relate in a table
- Primary Key & Candidate Key = Primary Attibute
- Attibutes that aren't primary key or candidate key = Non-Primary Attributes

> Three Types of Dependenceis

1. Full Dependencies: Depends on all Prime Attributes Fully
2. Partial Dependenceis: Depends on some Prime Attibutes
3. Transitive Dependencies: Depends on an attributes that depends on a Prime Attribute

> Normalization

1. First Normal Form
    - Each table cell should contain a single value
    - Each record needs to be unique
2. Second Normal Form
    - Meets all of 1NF
    - No Partial Dependencies
3. Third Normal Form
    - Meets 1NF and 2NF
    - No Transitive Dependencies

Pet ID	Pet Name	Pet Type	Pet Age	Owner Name	Owner ID	Visit Date	Procedure
246	Rover	Dog	12	Sam Cook	1	Jan 13/2002	01-Rabies vaccination
						Mar 27/2002	10-Examine and Treat Wound
						Apr 02/2002	05-Heart Worm Test
298	Spot	Dog	2	Terry Kim	2	Jan 21/2002	08-Tetanus Vaccination
						Mar 10/2002	05-Heart Worm Test
341	Morris	Cat	4	Sam Cook	1	Jan 23/2001	01-Radies Vaccination
						Jan 13/2002	01-Radies Vaccination
519	Tweedy	Bird	2	Terry Kim	2	Apr 30/2002	20-Annual Check Up
						Apr 30/2002	12-Eye Wash

1NF

Pet ID	Pet Name	Pet Type	Pet Age	Owner Name	Owner ID	Visit Date	Procedure ID	Procedure Name
246	Rover	Dog	12	Sam Cook	1	Jan 13/2002	01	Rabies vaccination
						Mar 27/2002	10	Examine and Treat Wound
						Apr 02/2002	05	Heart Worm Test
298	Spot	Dog	2	Terry Kim	2	Jan 21/2002	08	Tetanus Vaccination
						Mar 10/2002	05	Heart Worm Test
341	Morris	Cat	4	Sam Cook	1	Jan 23/2001	01	Radies Vaccination
						Jan 13/2002	01	Radies Vaccination
519	Tweedy	Bird	2	Terry Kim	2	Apr 30/2002	20	Annual Check Up
						Apr 30/2002	12	Eye Wash

2NF

Pet ID	Pet Name	Pet Type	Pet Age	Owner Name	Owner ID
246	Rover	Dog	12	Sam Cook	1
298	Spot	Dog	2	Terry Kim	2
341	Morris	Cat	4	Sam Cook	1
519	Tweedy	Bird	2	Terry Kim	2

Procedure ID	
01	Rabies vaccination
10	Examine and Treat Wound
05	Heart Worm Test
08	Tetanus Vaccination
20	Annual Check Up

Pet ID	Visit Date	Procedure ID
246	Jan 13/2002	01
246	Mar 27/2002	10
246	Apr 02/2002	05
298	Jan 21/2002	08
298	Mar 10/2002	05
341	Jan 23/2001	01
341	Jan 13/2002	01
519	Apr 30/2002	20
519	Apr 30/2002	12

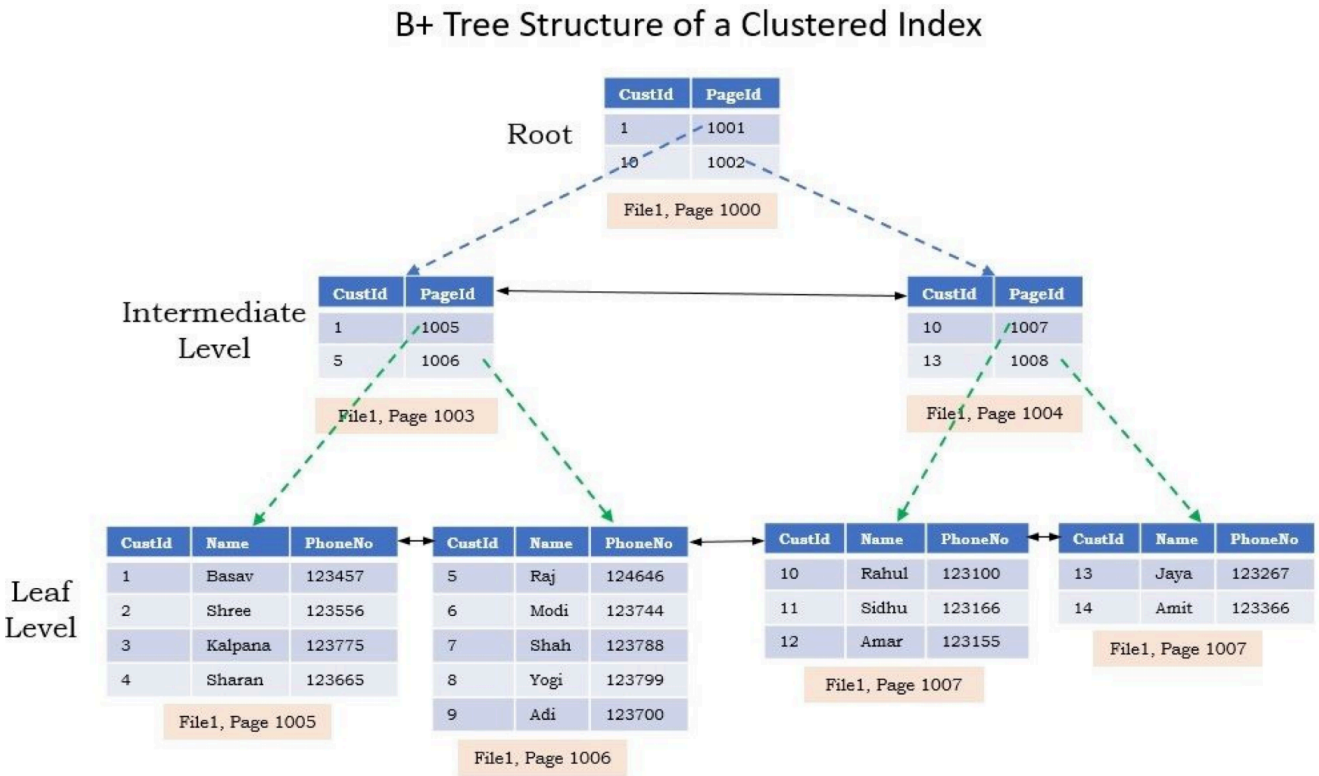
> 3NF

Pet ID	Pet Name	Pet Type	Pet Age	Owner ID
246	Rover	Dog	12	1
298	Spot	Dog	2	2
341	Morris	Cat	4	1
519	Tweedy	Bird	2	2

Owner ID	Owner Name
1	Sam Cook
2	Terry Kim

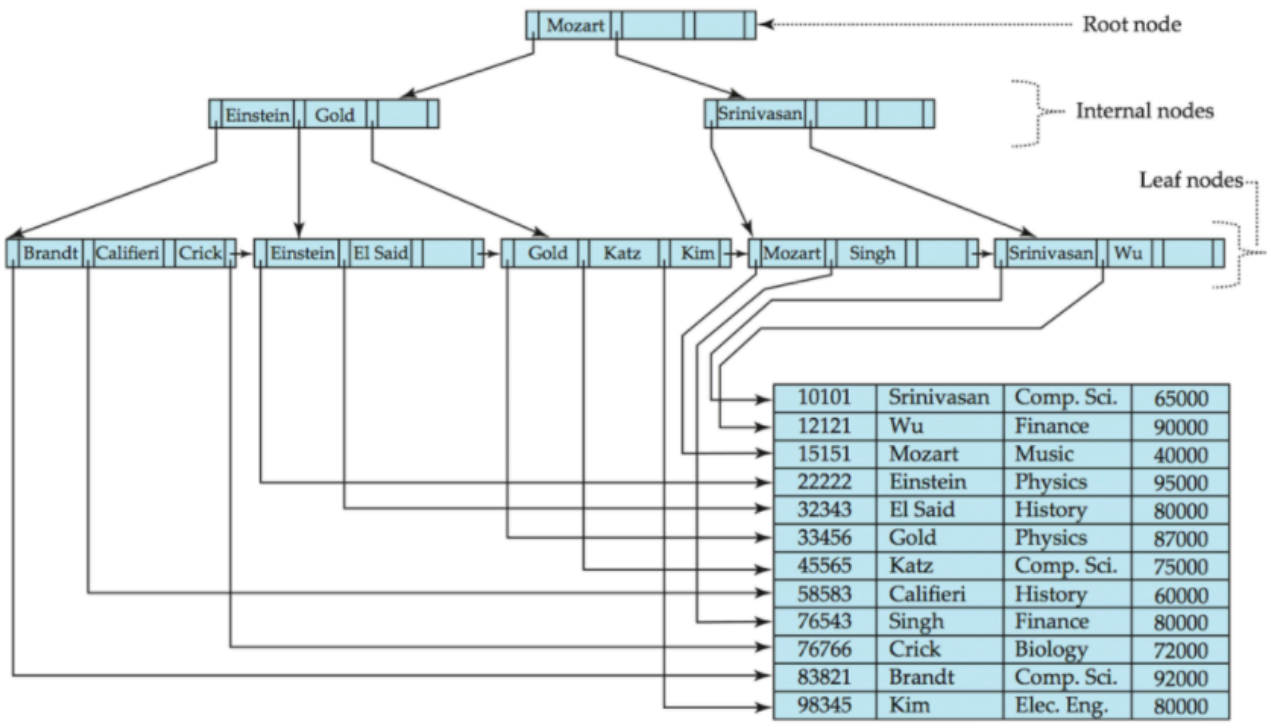
Index

> Clustered Index



- Insert
  - https://www.cs.usfca.edu/~galles/visualization/BPlusTree.html

> Non-Clustered Index



DB Design

> Hospital

We would like to design a database to maintain information about hospital staff, including doctors and nurses, and patients at the hospital. The information we need includes:

b. Staff, including their names, addresses and social-security numbers.
c. Patients, including their names, addresses, and the name of their insurance company.
d. Patients are each assigned to a room.
e. The staffs that are nurses are assigned to zero or more rooms. Each room has at least one nurse assigned.
f. The staffs that are doctors are assigned to zero or more patients. Patients may or may not have a doctor assigned, and they may have more than one doctor.
g. Patients in the same ward may have different doctors but will always have the same nurse(s).

Patients: pid | name | address | insurance company | ward_id(not null)

Nurse: nid | name | address | ssn

Ward: wid

Nurse_Ward: id | wid | nid

Doctor: did | name | address | ssn

Doctor_Patient: id | did | pid

> One to Many: Which side?

Person Address

Address: aid pid

SQL

```
select * from Products where pname like '%o%'
select * from Products where pname like '%o__'
```

```
select * from Products order by price limit 1,3
```