# Lecture 9

databases and sql

#### What is database?

- A database is a tool for collecting and organizing information.
- A database is an organized collection of data. It is the collection of schemes, tables, queries, reports, views and other objects. The data is typically organized to model aspects of reality in a way that supports processes requiring information, such as modelling the availability of rooms in hotels in a way that supports finding a hotel with vacancies.

## What information to store in database?

• Databases can store information about people, products, orders, or anything else.

Where it is used?

• any company has huge amounts of data, so they need to manipulate them easily

#### What we can use instead of database?

• Many databases start as a list in a word-processing program or spreadsheet. As the list grows bigger, redundancies and inconsistencies begin to appear in the data. The data becomes hard to understand in list form, and there are limited ways of searching or pulling subsets of data out for review.

### **Types of database**

There are two types of database storage:

- via file database
- via application database

#### File database

All data is saved in file and can be accessed through special libraries

As example:

- SQLite3 (connection library is already in python)
- the most used type of database, since it is stored in every IPhone and Android
- if you want to use sqlite3. check tutorial http://www.blog.pythonlibrary.org/2012/07/18/python-a-simple-step-by-step-sqlite-tutorial/

Advantages: easily can be moved from one computer to another

# **Application databases**

Server database is a program that manages data

And all queries, requests are performed by that program

Advantages: can be more faster than file database for big data

## Server database, examples

- Oracle. Mostly used commercial database
- MySQL (open-source) 2nd mostly used database
- MSSQL developed by Microsoft
- PostgreSQL (open-source database, 5th by popularity)

#### **Database structure**

Databases are designed to offer an organized mechanism for storing, managing and retrieving information.

Server stores many databases

- Database stores tables
- Tables are constructed by fields
- Table saves each data in a row

Fields have type. e.g. integer, string, date, datetime, boolean



Database is **MySDU** 

Tables are students, course, teachers

Fields are **name** (string/varchar), **surname** (string/varchar), **age** (integer)



- SQL structured query language
- SQL is special language to retrieve, update, delete data from database
- How does it work:
- we write SQL request in code that sends it to SQL server and then retrieve response

# SQL data retrieving: example



by specified field

## SQL insert, delete, update

INSERT INTO students (name, surname) values ('Berik','Sakenov')

DELETE FROM students WHERE name = 'Berik'

UPDATE students SET name='Serik' WHERE name='Berik'

# SQL aggregate functions

SELECT COUNT(\*) FROM users

SELECT MIN(age) FROM users

SELECT AVG(age) FROM users

SELECT DISTINCT(surname) FROM users



- Install XAMPP (you will be using it in next semester for Foundations of web) <u>http://www.apachefriends.org/en/xampp.html</u>
- enter in browser localhost/phpmyadmin

phone/poor connection:

https://www.w3schools.com/sql/trysql.asp?filename=trysql\_select\_columns\_

id	name	surname	group	faculty
1	Bill	Gates	EN1A03	Engineering
2	Jeff	Bezos	EN1A03	Engineering
3	Tim	Cook	EN1B03	Engineering
4	Steve	Jobs	MAN1A	Economy
5	Mike	Wazovski	LAW1B	Law

Saving all information in one table

### **Relational database**

- System of related tables
- Minimum redundancy
- Referential integrity
- Database keys

Relational databases store information in atomic tables

Custom er ID	CustomerName	Country
1	Samat Sarsembayev	Germany
2	Zhanat Davletov	Mexico
3	Ayan Ibrahimov	Mexico

OrderID	CustomerID	OrderDate
10308	2	1996-09-18
10309	1	1996-09-19
10310	77	1996-09-20