DB Project

Database Systems

Spring 2013

Database project – YAGO

WIKIPEDIA
The Free Encyclopedia

WordNet
A lexical database for English

GeoNames

Yet **A**nother **G**reat **O**ntology

yago
select knowledge

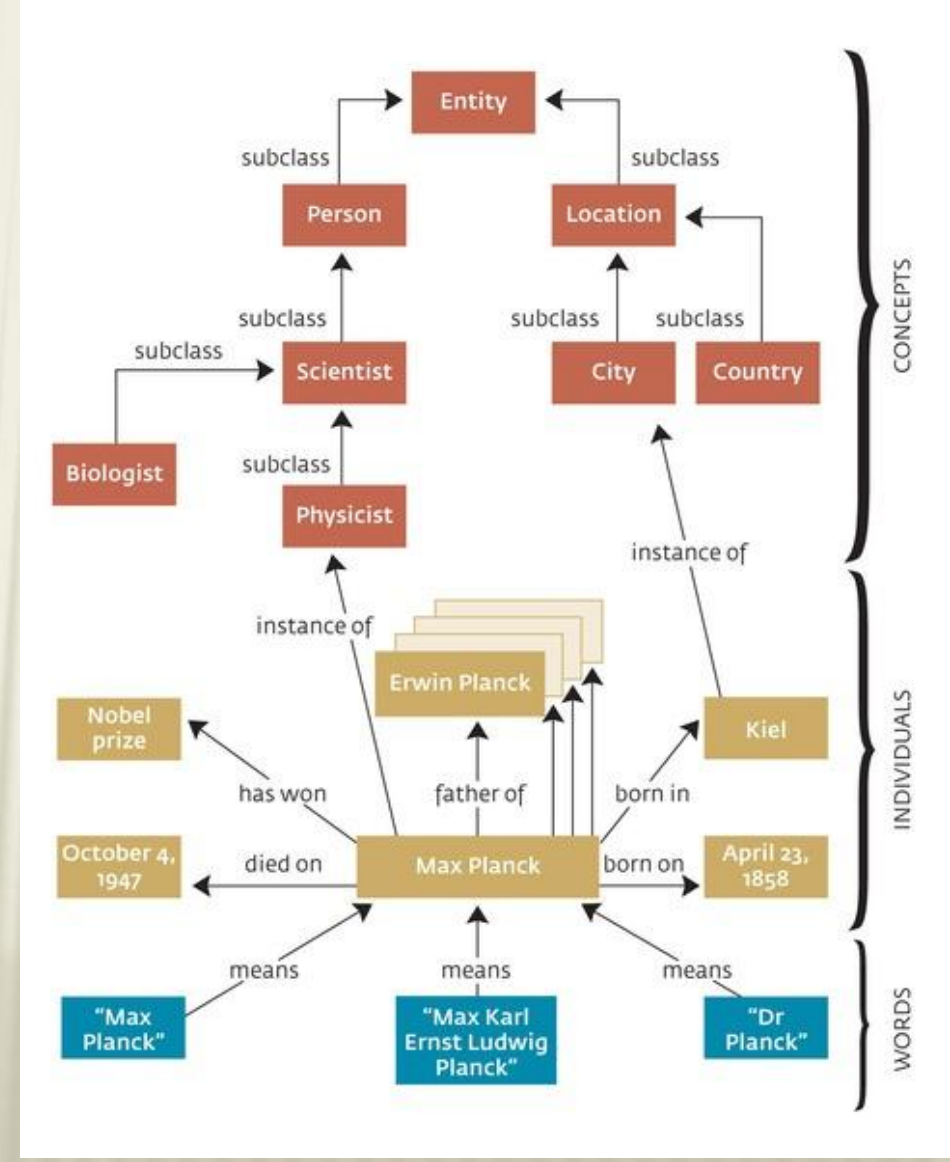
About YAGO*

- A huge semantic knowledge base
  - knowledge base – a special kind of DB for knowledge management (e.g., facts)
  - Semantic – related to the Semantic Web where presentation is assigned a meaning http://www.youtube.com/watch?v=TJfrNo3Z-DU&feature=player_embedded

* Fabian M. Suchanek, Gjergji Kasneci and Gerhard Weikum, **YAGO - A Core of Semantic Knowledge**, *WWW '07*

YAGO is an Ontology

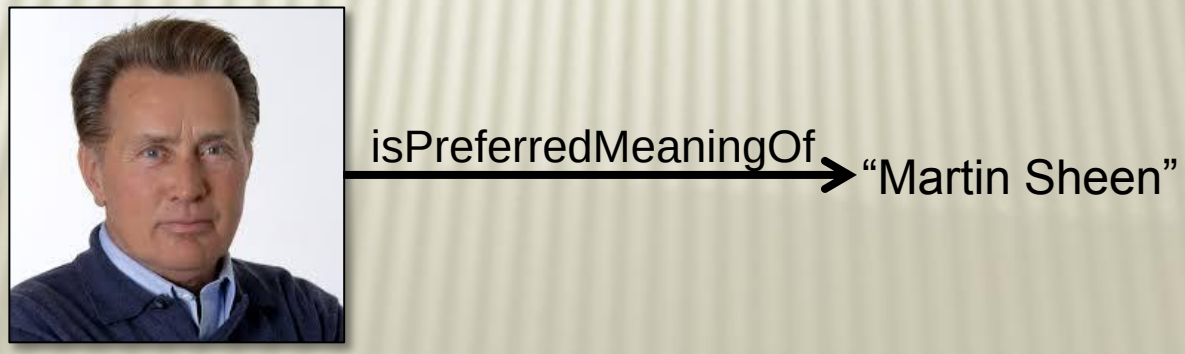
- A Taxonomy of concept classes
- At the bottom – instances, facts about instances
  - This is typically the interesting part



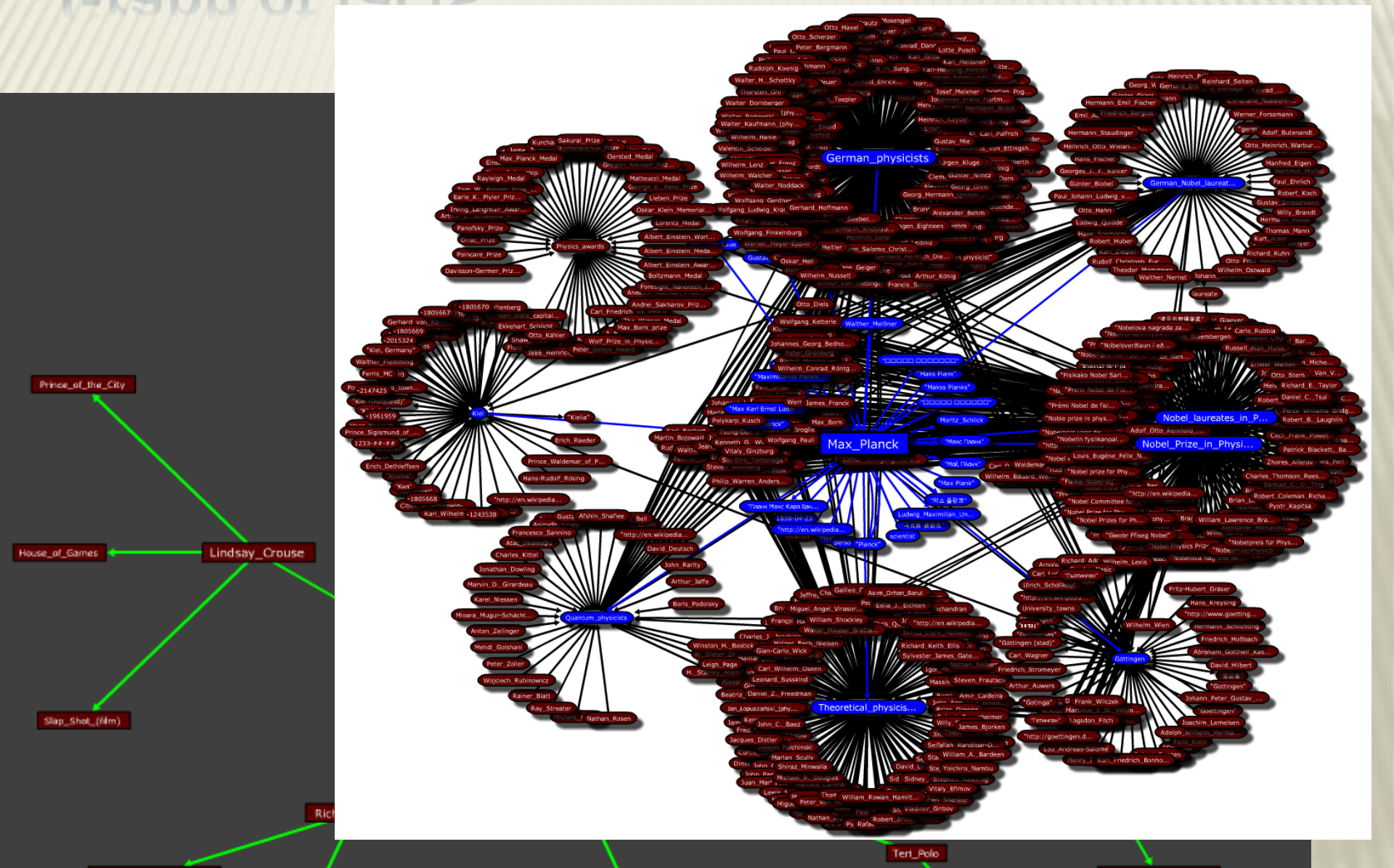
A fact

- A particular relationship that holds between two instances

- Or, an instance and a literal (string)



Graph of facts



More about YAGO

- More than 10 million entities
- More than 120 million facts
- High (but not perfect!) accuracy
- Connections with other ontologies (DBPedia, SUMO, Freebase…)
- Over 11 research papers (Max Planck team) with over 1k citations

Detailed Evaluation Results of YAGO2s

Relation	Evaluations	Correct	Ratio (%)	Wilson Center (%)	Wilson Width (%)	# of facts in YAGO
<actedIn>	39	39	100	95.52	4.48	120508
<created>	55	54	98.18	95.04	4.64	260997
<dealsWith>	43	43	100	95.9	4.1	882
<diedIn>	35	35	100	95.05	4.95	45019
<diedOnDate>	37	37	100	95.3	4.7	361890
<directed>	58	57	98.28	95.28	4.42	39685
<edited>	35	35	100	95.05	4.95	5678
<exports>	88	88	100	97.91	2.09	577
<graduatedFrom>	39	39	100	95.52	4.48	26280
<happenedIn>	36	36	100	95.18	4.82	166496
<happenedOnDate>	43	43	100	95.9	4.1	182572
<hasAcademicAdvisor>	44	44	100	95.99	4.01	2895
<hasArea>	42	42	100	95.81	4.19	129909
<hasBudget>	44	44	100	95.99	4.01	715
<hasCapital>	63	61	96.83	94.13	4.99	1821
<hasChild>	64	62	96.88	94.22	4.92	14998
<hasCurrency>	36	36	100	95.18	4.82	504

Database Project - Goals

- Project goal: to tackle and resolve real-life DB related development issues

- Including
  - DB design
  - Query writing
  - DB programming
  - Application design

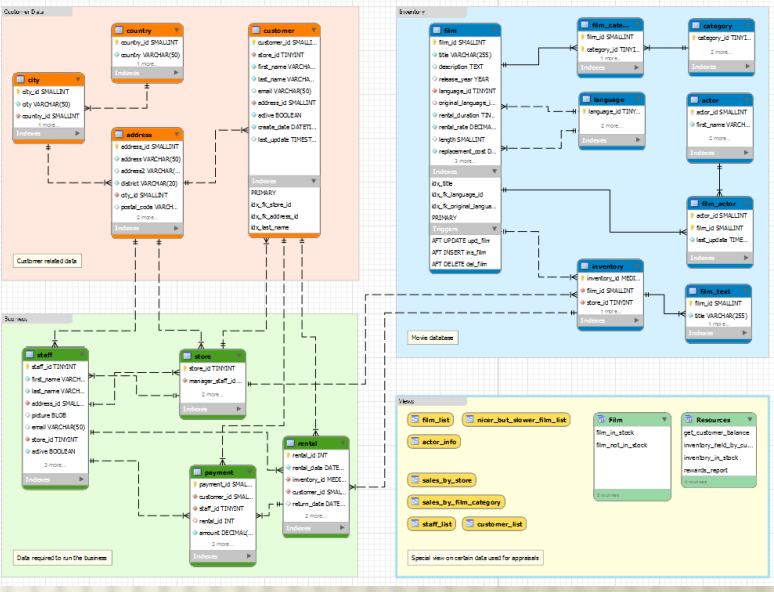
Database Project - Requirements

1. Think of an application
   + Useful and creative!
2. Design a DB schema
   + According to available data
   + And the application usage
   + And principles of DB design
3. Load *and flatten* data from YAGO
4. Update the Database
5. Write an application (with UI)
   + Usable and fault tolerant
   + Accessing the data via efficient queries/updates
   + According to principles of coding
6. Support manual updates and updates from YAGO

1. Think of an application

- Could be anything! As far as your imagination goes
  - YOU should want to use it…
  - **Tip:** first inspect the available data
  - **Tip:** must-have and nice-to-have features
  - The application can be interesting even if the UI is simple

2. Design a DB Schema

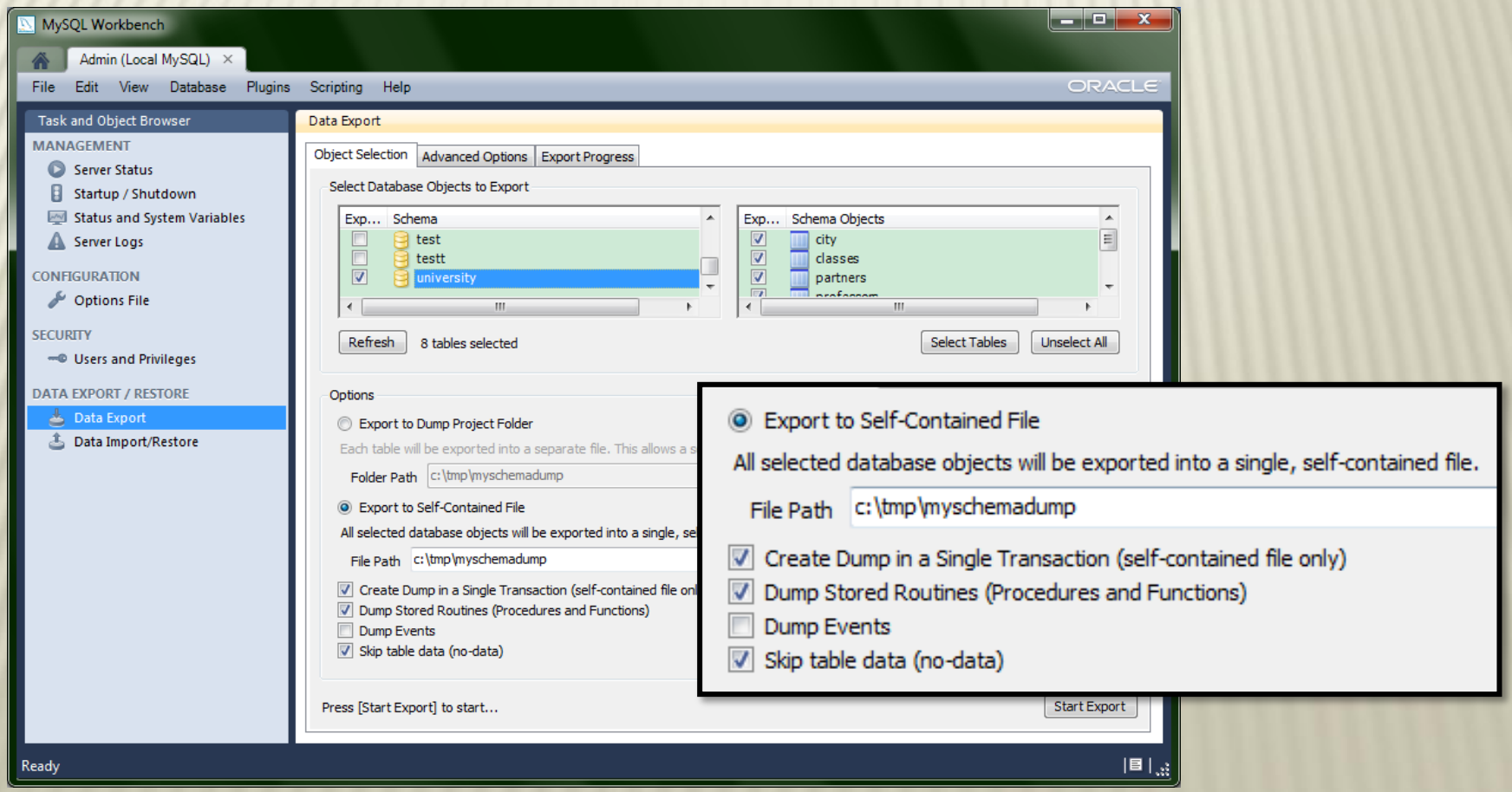


- Tables, indexes, keys and foreign keys
- Avoid redundant information
- Allow efficient queries
- The script for generating the schema should be submitted with the project

- More about design in the following lectures

2. Creating the SQL Script

- http://dev.mysql.com/doc/workbench/en/wb-manage-server-export-to-disk.html

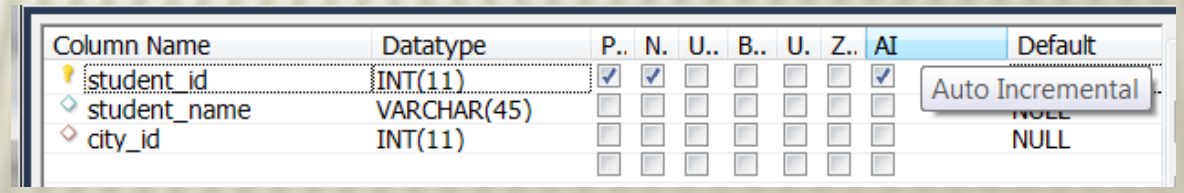


3. Load data from YAGO

- The entire database of YAGO is freely available online
- Extract relevant parts (entities, facts)
- Insert into *flat tables*
  - A few facts may be used for one record
  - E.g., the actor record for Martin Sheen will include his first and last name, birth date, residence, etc.
  - (But not the films he did… why?)
- We discuss this in detail next

4. Update the DB

- The data should be written to the DB
  - Before submission you will update your schema in the school MySQL server
- Including relevant IDs
  - Actor_id, film_id,… (Must be integers in MySQL!)
  - Auto-incremental or based on YAGO ids



5. Write an application

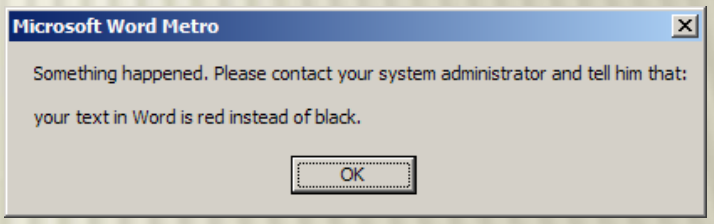
- In java, using JDBC
- Desktop application
- SWT for GUI (other open-source packages such as Swing, Qt Jambi…)
- Any other open-source packages, *except hibernate and similar packages*
- According to DB programming principles
- **Important:** separate the code of the UI, the core logic and the DB

5. Write an application (cont.)

- Using the DB data
- Efficient queries / updates
  - Important for user experience
  - Use indexes!
- Interesting queries / updates
  - Search for specific data
  - According to your application

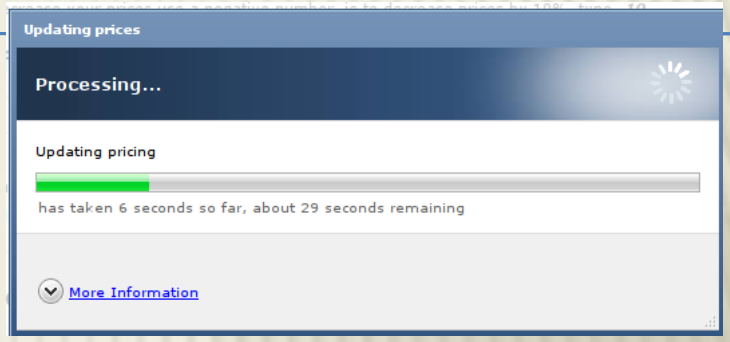
5. Write an application (cont.)

- Should be usable and easy to understand
- Should be fault tolerant
  - Every exception should be caught, and a user-friendly message should be displayed

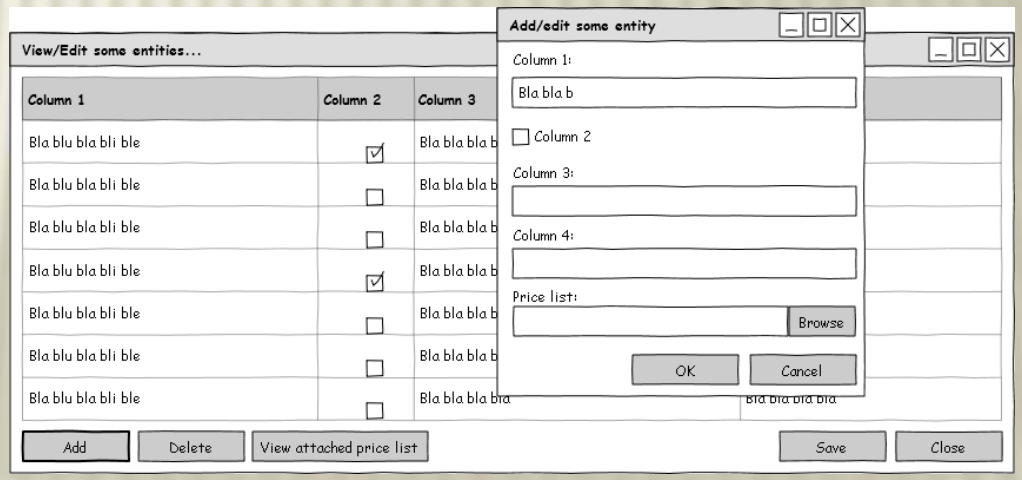


- Test your application
  - Install on different environments
  - Portable:
    - Copy-paste, create DB schema, edit configuration and… play!

6. Support updates



- A must-have feature!
- "Import" from YAGO
  - Via the UI
  - To support, e.g., a new YAGO version
  - What happens to the "old" data?
  - Administrator privileges?
- Manual updates
  - Add, edit and delete data originally taken from YAGO
  - Add, edit and delete user-provided data



In the course Website

- Project details
- Project examination form and grade guide

http://courses.cs.tau.ac.il/databases/databases201213b/assignments/

What to focus on

- Database structure
- Data – you choose what to take from YAGO
- Query efficiency
- Editing capabilities
- Usability and fault tolerance

YAGO data – HowTo

- YAGO downloads page - http://www.mpi-inf.mpg.de/yago-naga/yago/downloads.html

TAXONOMY	**yagoSchema** The domains, ranges and confidence values of the relations	Preview	Download TTL	Download TSV
	yagoTypes All rdf:type facts of YAGO	Preview	Download TTL	Download TSV
	yagoTaxonomy The entire YAGO taxonomy. These are all rdfs:subClassOf facts derived from Wikipedia and from WordNet.	Preview	Download TTL	Download TSV
	yagoTransitiveType Transitive closure of all rdf:type/rdfs:subClassOf facts	Preview	Download TTL	Download TSV
SIMPLETAX	**yagoSimpleTaxonomy** A simplified rdfs:subClassOf taxonomy. This taxonomy contains just WordNet leaves, the main YAGO branches, and owl:Thing. Use with yagoSimpleTypes.	Preview	Download TTL	Download TSV
	yagoSimpleTypes A simplified rdf:type system. This theme contains all instances, and links them with rdf:type facts to the leaf level of WordNet. Use with yagoSimpleTaxonomy.	Preview	Download TTL	Download TSV
CORE	**yagoFacts** All facts of YAGO that hold between instances	Preview	Download TTL	Download TSV
	yagoLabels All facts of YAGO that contain labels (rdfs:label, skos:prefLabel, isPreferredMeaningOf, hasGivenName, hasFamilyName, hasGloss)	Preview	Download TTL	Download TSV
	yagoLiteralFacts All facts of YAGO that contain literals (except labels)	Preview	Download TTL	Download TSV
GEONAMES	**yagoGeonamesClassIds** IDs from GeoNames classes	Preview	Download TTL	Download TSV
	yagoGeonamesClasses Classes from GeoNames	Preview	Download TTL	Download TSV
	yagoGeonamesEntityIds IDs from GeoNames entities	Preview	Download TTL	Download TSV
META	**yagoStatistics** Statistics about YAGO and YAGO themes	Preview	Download TTL	Download TSV

YAGO data – HowTo (cont.)

- Data comes in TSV format – text with tab-separated fields (also TTL)

Format: yago-id entity relation entity

<id_zik11d_88c_ehg9uq>	<A>	rdf:type	<wikicategory_Vowel_letters>
<id_zik11d_88c_w3c6wm>	<A>	rdf:type	<wikicategory_ISO_basic_Latin_letters>
<id_1bsrlah_88c_1s6g79w>	<Alabama>	rdf:type	<wikicategory_States_of_the_United_States>
<id_3ienox_88c_4retae>	<Achilles>	rdf:type	<wikicategory_People_of_the_Trojan_War>
<id_3ienox_88c_1rk49a2>	<Achilles>	rdf:type	<wikicategory_Pederastic_heroes_and_deities>
<id_3ienox_88c_s57m6o>	<Achilles>	rdf:type	<wikicategory_Kings_of_the_Myrmidons>

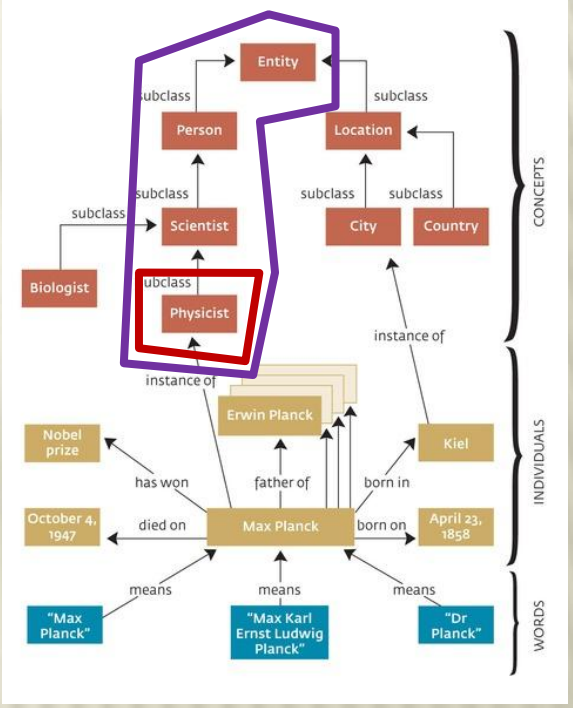
- YAGO entities and relations are marked by < > (e.g., <Achilles>)
- Others are taken from rdf, rdfs, owl, skos… (e.g., rdf:type)
- Literals are marked by " "
  - Strings with optional locale, e.g., "Big tent"@eng
  - Others with datatype, e.g., "1977-08-16"^^xsd:date, "70"^<m>
- See also: http://www.mpi-inf.mpg.de/yago-naga/yago/faq.html

YAGO data – HowTo (cont.)

- You can also download just the portions of YAGO2s that you need. Each portion is called a theme. There are 8 groups of themes:
  - TAXONOMY: All types of entitites, and the class structure of YAGO2s. Moreover, it has formal definitions of YAGO relations.
  - SIMPLETAX: An alternative, simpler taxonomy of YAGO.
  - CORE: Core facts of YAGO2s, such as the facts between entities, the facts containing literals,i.e., numbers, dates, strings, etc.
  - GEONAMES: Geographical entities, classes taken from GeoNames.
  - META: Temporally and spatially scoped facts together with statistics and extraction sources about the facts.
  - MULTILINGUAL: The multilingual names for entities.
  - LINK: The connection of YAGO2s to Wordnet, DBPedia, etc.
  - OTHER: Miscellaneous features of YAGO2s, such as Wikipedia in-outlinks, GeoNames data etc.

YAGO data – Taxonomy

- yagoTypes – facts with relation rdf:type - contains the lowest-level classes for each entity
- yagoTransitiveType – also contains the higher-level classes



<id_zik11d_88c_ehg9uq>	<A>	rdf:type	<wikicategory_Vowel_letters>
<id_zik11d_88c_w3c6wm>	<A>	rdf:type	<wikicategory_ISO_basic_Latin_letters>
<id_1bsrlah_88c_1s6g79w>	<Alabama>	rdf:type	<wikicategory_States_of_the_United_States>
<id_3ienox_88c_4retae>	<Achilles>	rdf:type	<wikicategory_People_of_the_Trojan_War>
<id_3ienox_88c_1rk49a2>	<Achilles>	rdf:type	<wikicategory_Pederastic_heroes_and_deities>
<id_3ienox_88c_s57m6o>	<Achilles>	rdf:type	<wikicategory_Kings_of_the_Myrmidons>

YAGO data - Core

- yagoFacts – facts between instances
  - A complete list of relations – in Taxomony, yagoSchema

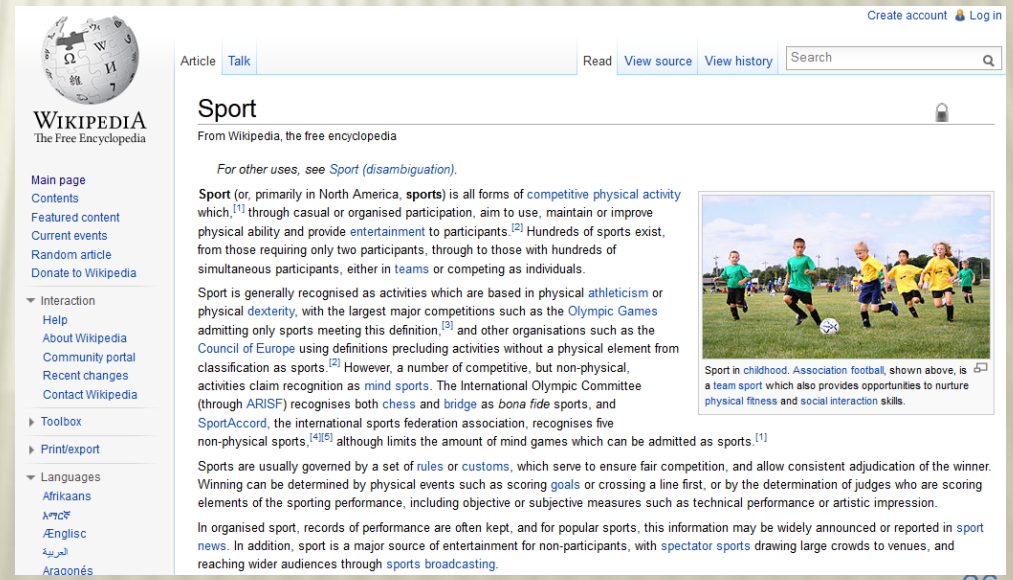
  <Martin_Sheen> <hasChild> <Charlie_Sheen>
- YagoLabels – names of entities.
  - There may be many labels! use skos:prefLabel

  <Martin_Sheen> skos:prefLabel "Martin Sheen"@eng
- yagoLiteralFacts –other facts with literals
  - Often properties of the entity

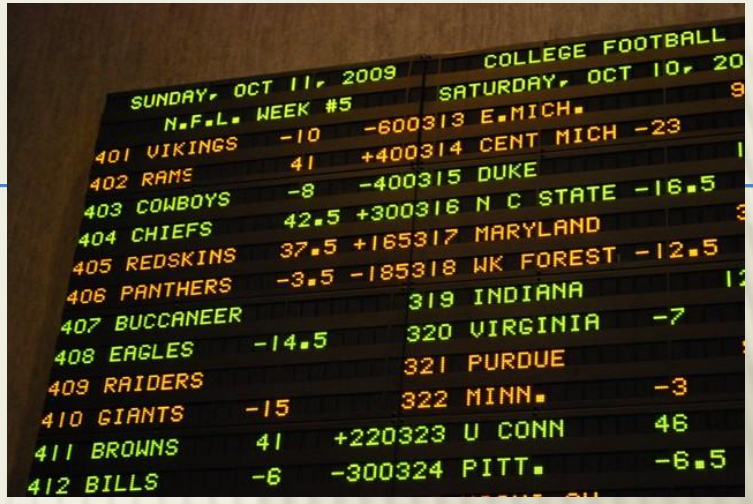
  <Martin_Sheen> <wasBornOnDate> "1940-08-03"^^xsd:date

Example

- Assume we work with the sports domain
- Create an online application that contains details on teams and players
- Users/automatic algorithms will guess game scores, awards, etc.



Example



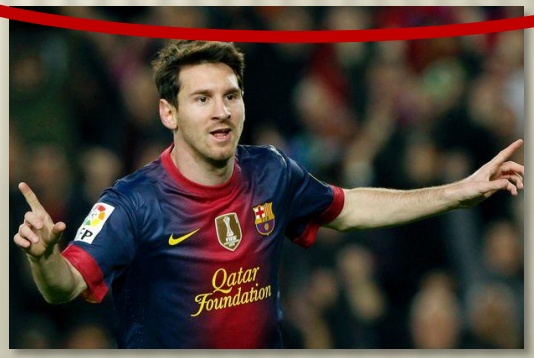
- Editing capabilities for YAGO data: add/remove/edit all players, teams, games…
- Data of your own: odds, bets…
- Your tables:
  - Players, Teams, Users, Bets
  - Linking tables: Player_team, User_bets

YAGO data – putting it together

- We want to create records in the table
  `Player(ID, name, birth date, height)`
- First, we look in yagoTransitiveType for entities that represent players
  - We find, e.g.,

<Lionel_Messi>	rdf:type	<wordnet_player_110439851>

Fixed application parameter



YAGO data – putting it together

- Next, we create the properties
  - ID – e.g., automatically generated (must make sure we do not have Messi in our DB yet!)
  - Name – from yagoLabels

<Lionel_Messi>	skos:prefLabel	"Lionel Messi"@eng

  - Birthdate and height – from yagoLiteralFacts

<Lionel_Messi>	<hasHeight>	"1.69"^^<m>
<Lionel_Messi>	<wasBornOnDate>	"1987-06-24"^^xsd:date

YAGO data – Flattening process

1. Read the relevant TSV files
2. Save only the relevant data in memory or in a temporary table
3. Join together relevant pieces of data
4. Insert into the (final) schema tables

YAGO data – challenges

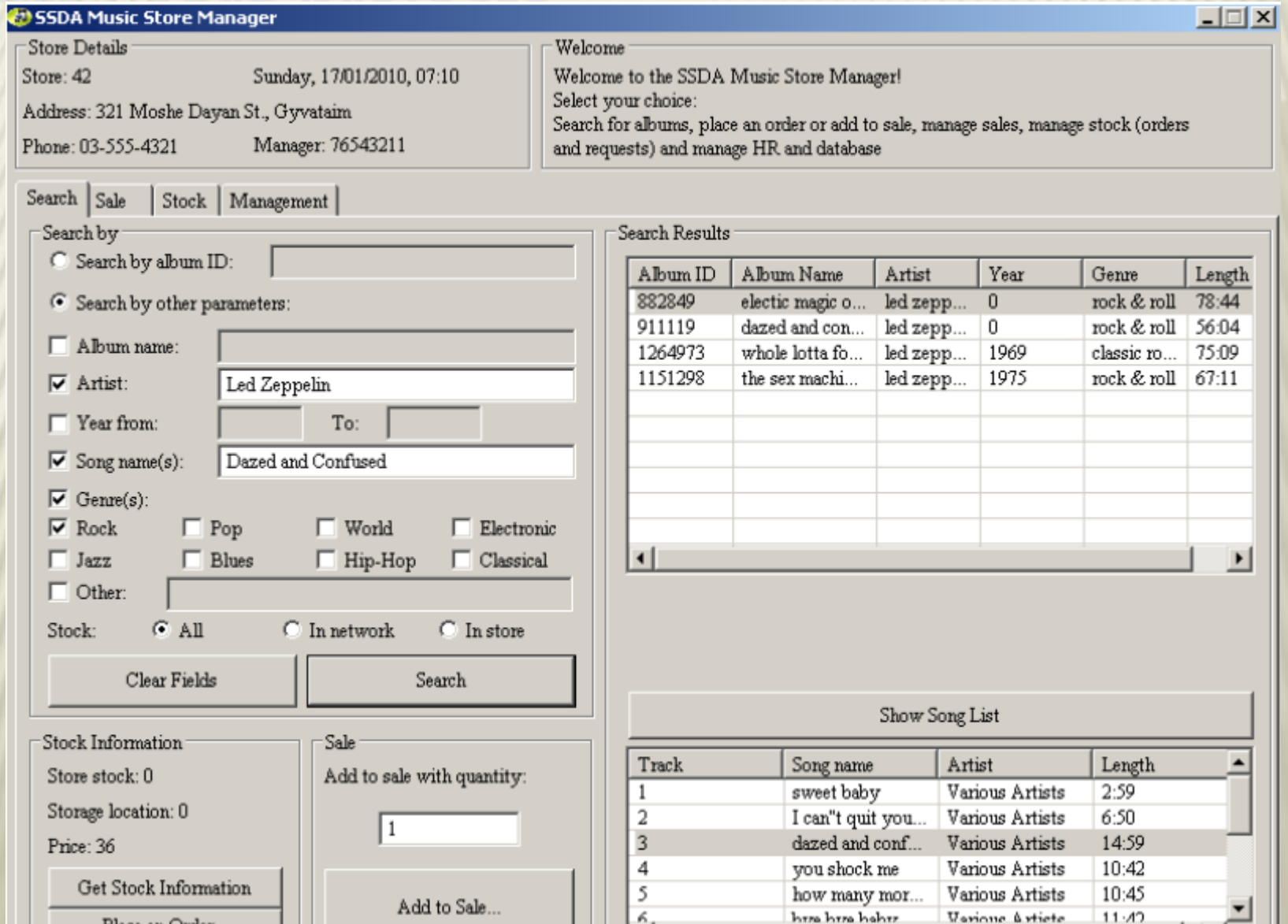
- What do we do when a value is missing?
- What do we do when the data in invalid?
- What do we do when there is more than one value?

<Lionel_Messi>	<playsFor>	<FC_Barcelona_B>
<Lionel_Messi>	<playsFor>	<FC_Barcelona_C>
<Lionel_Messi>	<playsFor>	<Newell's_Old_Boys>
<Lionel_Messi>	<playsFor>	<Argentina_national_football_team>
<Lionel_Messi>	<playsFor>	<FC_Barcelona>

Relaxations

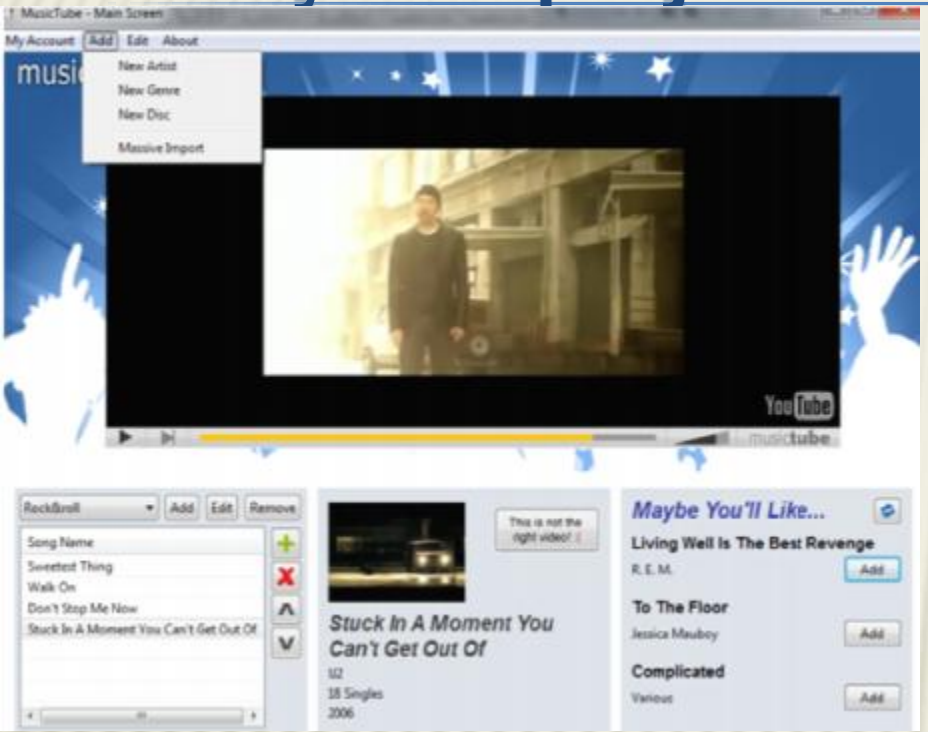
- You do not have to fix errors in YAGO's data (but you can allow the application users to do so)
- You can choose an arbitrary value if there are many (where this makes sense! playsFor can be many-to-one, actedIn cannot)
- You can use an additional data source to complete missing data (must be freely available)

Past years projects



Past years projects

Past years projects



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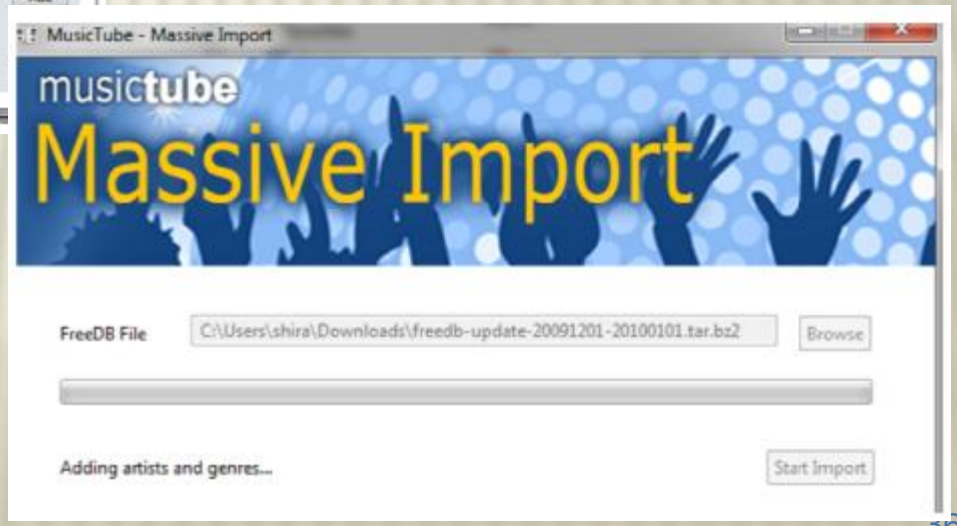
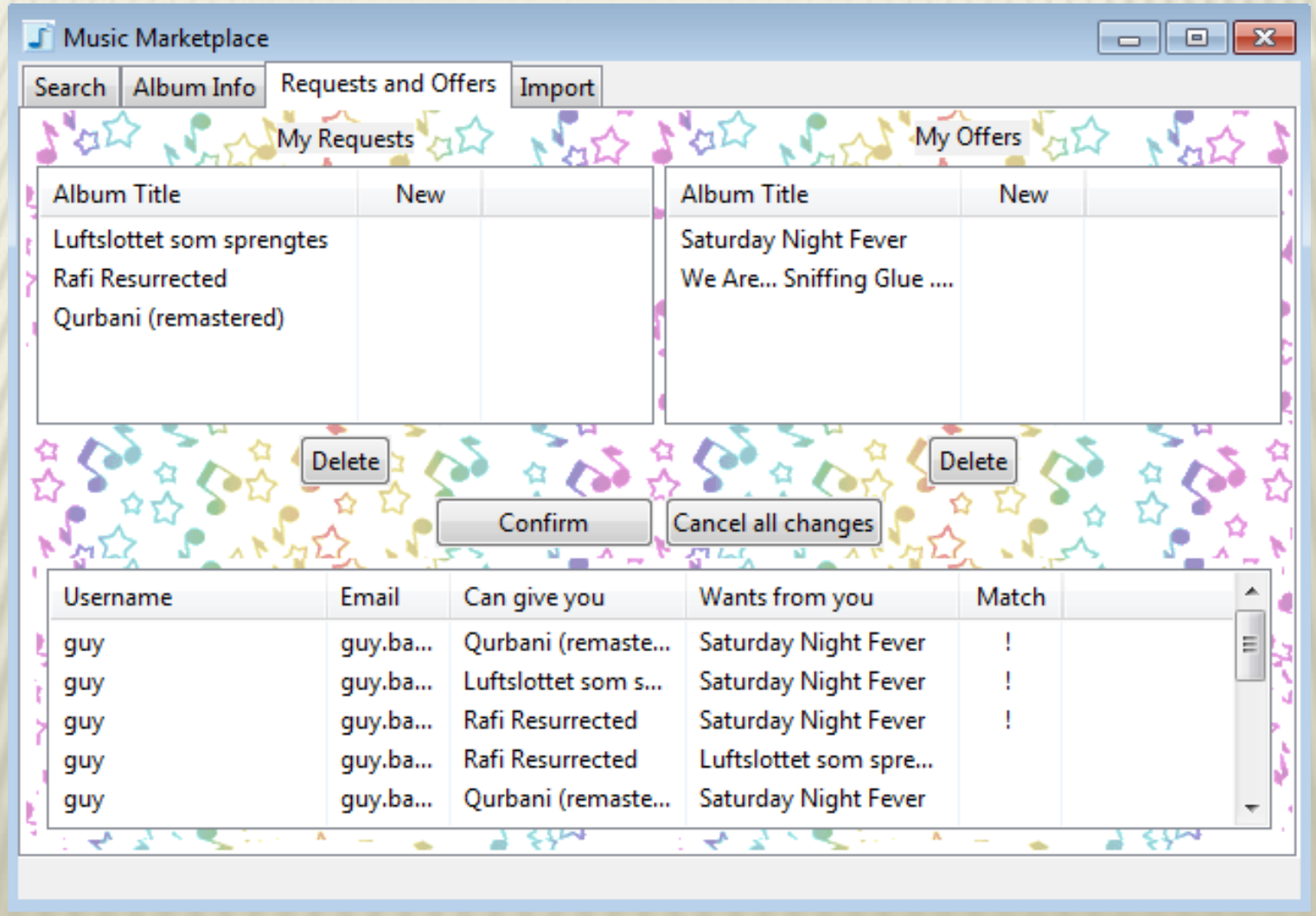


Past years projects



Tips

- First: - understand the data format.
  - understand what you want to do.
  - find relevant data and relations.
- Be flexible: work with what you have!
- Database key should always be an INTEGER.
- Don’t forget to support manual edit of the data (add/update/remove) – e.g., artists/categories/values…
- Configuration – for DB connection, OS, etc.

Database Project - Bureaucracy

- Hard work, but a practical experience.
- Work in groups of 4
- Submission database is MySQL in TAU
- Java, SWT (or Swing/AWT)
- Thinking out of the box will be rewarded

Database Project - Requirements

- (at least) 150K records table
  - But could be much more!
- Also see the course website for full instructions http://courses.cs.tau.ac.il/databases/databases201213b/assignments/

Time schedule

- **April 9th** – Project distribution
- **April 18th** – Last date for submitting the team member names
- **May 21st** – "Project days"
  - I will meet with each group
  - You need to prepare: DB design, preferably have data in the school DB, work plan – what is left to do, who does what and when, optional – presentation or demonstration
- **June 18th** – Project due!
  - Aim to submit a week before, to avoid network crushes, mysterious illnesses…

DB Project

בהצלחה!