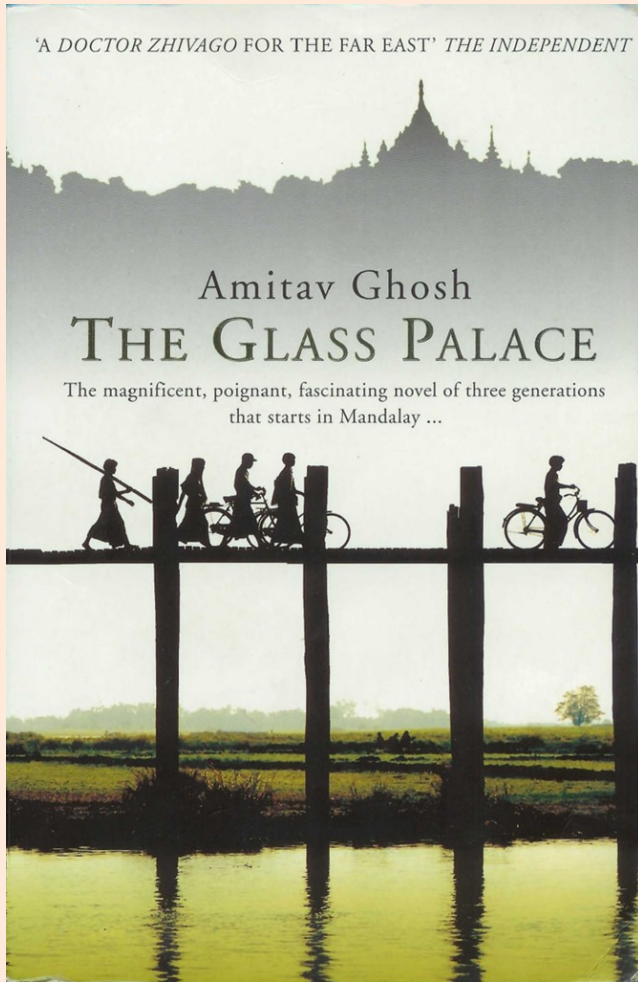# ICS 624 Spring 2011
Graph Data & RDF

Asst. Prof. Lipyeow Lim

Information & Computer Science Department

University of Hawaii at Manoa

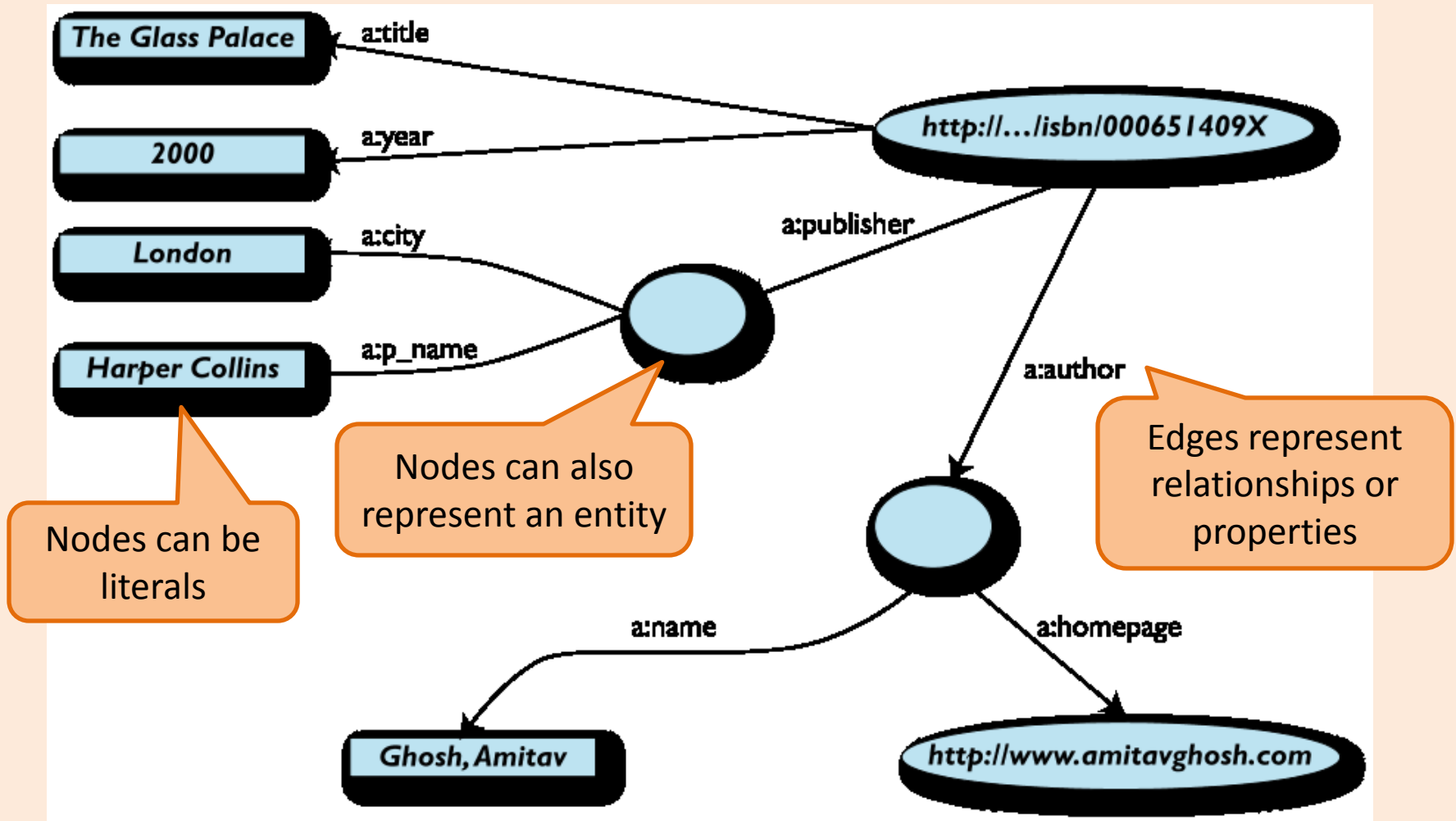# Resource Description Framework (RDF)

ID	Author	Title	Publisher	Year
Isbn0-00-651409-X	Id_xyz	The glass palace	Id_qpr	2000

ID	Name	Homepage
Id_xyz	Ghosh, Amitav	http://www.amitavghosh.com

ID	Publisher Name	City
Id_qpr	Ghosh, Amitav	London

RDF Graph Data Model

The Glass Palace — a:title

2000 — a:year

London — a:city

Harper Collins — a:p_name

http://.../isbn/000651409X

a:publisher

a:author

Nodes can be literals

Nodes can also represent an entity

Edges represent relationships or properties

a:name — Ghosh, Amitav

a:homepage — http://www.amitavghosh.com
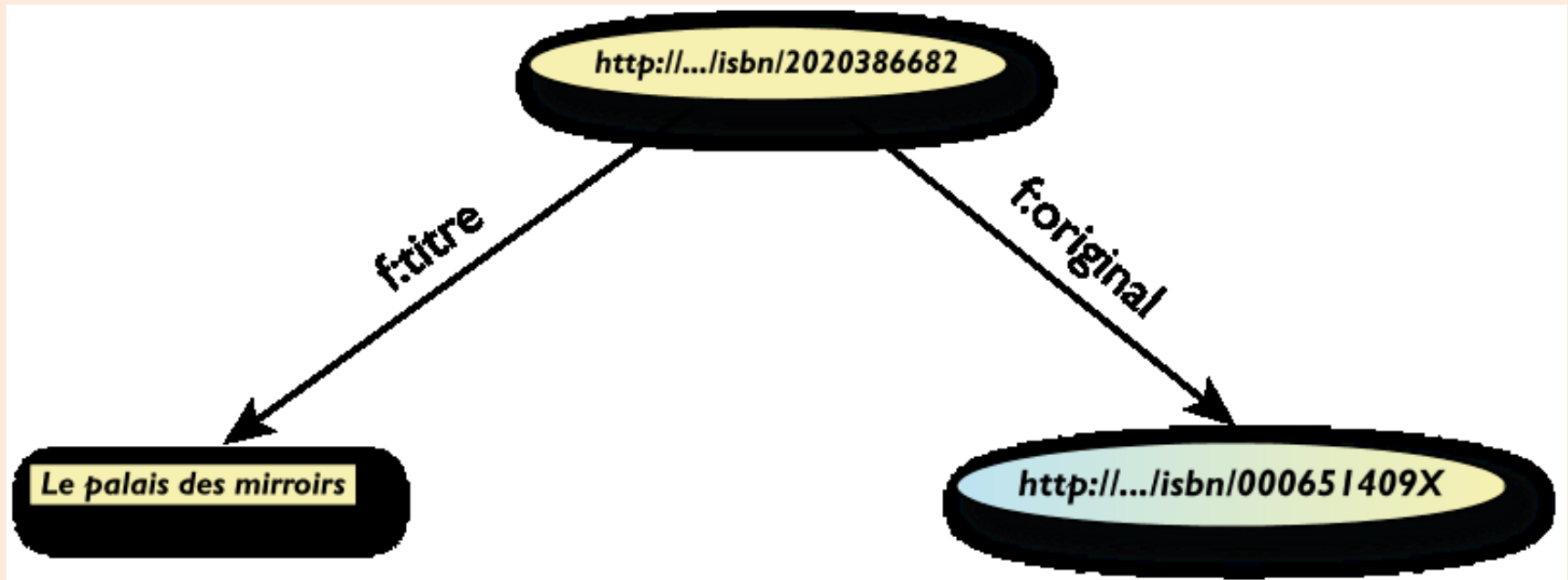
More formally

- An RDF graph consists of a set of RDF triples
- An RDF triple (s,p,o)
  - "s", "p" are URI-s, ie, resources on the Web;
  - "o" is a URI or a literal
  - "s", "p", and "o" stand for "subject", "property" (aka "predicate"), and "object"
  - here is the complete triple: (<http://...isbn...6682>, <http://..//original>, <http://...isbn...409X>)
- RDF is a general model for such triples
- RDF can be serialized to machine readable formats:
  - RDF/XML, Turtle, N3 etc

RDF/XML


```
<rdf:Description rdf:about="http://…/isbn/2020386682">
    <f:titre xml:lang="fr">Le palais des miroirs</f:titre>
    <f:original rdf:resource="http://…/isbn/000651409X"/>
</rdf:Description>
```
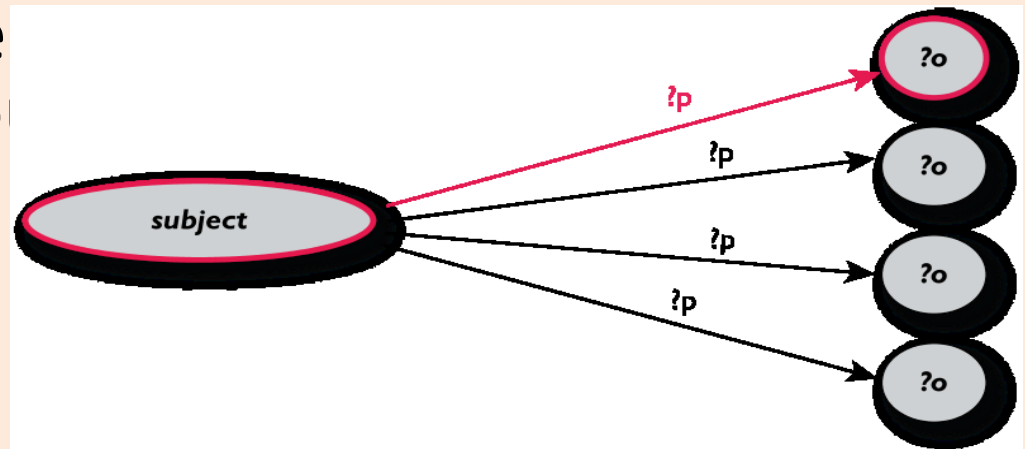
Querying RDF using SPARQL

- The fundamental idea: use graph patterns

- the pattern contains unbound symbols

- by binding the symbols, subgraphs of the RDF graph are selected
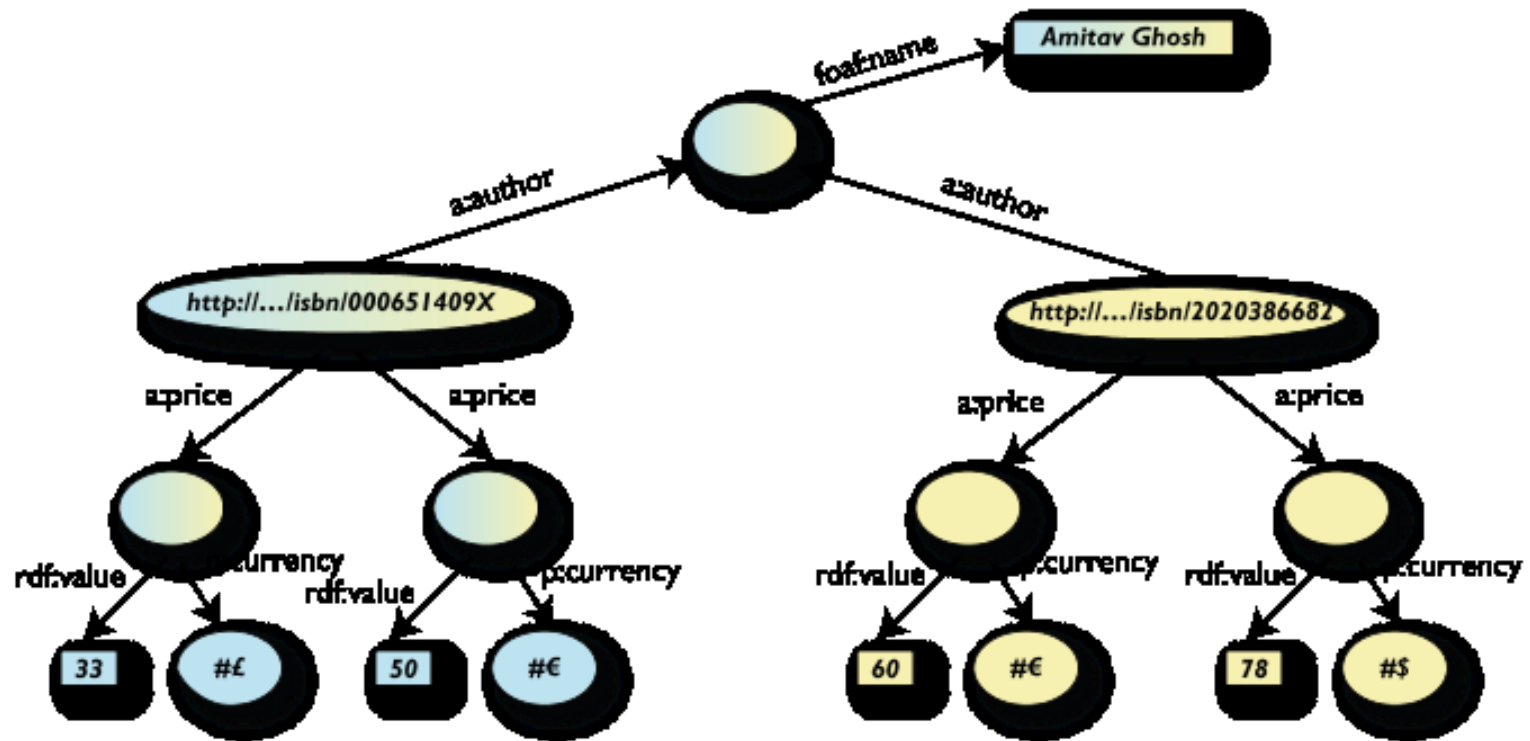
- if there is such a sele the query returns bo resources

SELECT ?p ?o
WHERE {subject ?p ?o}

Where-clause defines graph patterns. ?p and ?o denote "unbound" symbols

Example: SPARQL

SELECT ?isbn ?price ?currency   # note: not ?x!
WHERE {?isbn a:price ?x.
            ?x rdf:value ?price.
            ?x p:currency ?currency.}

Linking Open Data

- Goal: "expose" open datasets in RDF
  - Set RDF links among the data items from different datasets
  - Set up, if possible, query endpoints
- Example: DBpedia is a community effort to
  - extract structured ("infobox") information from Wikipedia
  - provide a query endpoint to the dataset
  - interlink the DBpedia dataset with other datasets on the Web

DBPedia

```
@prefix dbpedia
<http://dbpedia.org/resource/>.
@prefix dbterm
<http://dbpedia.org/property/>.

dbpedia:Amsterdam
  dbterm:officialName "Amsterdam" ;
  dbterm:longd "4" ;
  dbterm:longm "53" ;
  dbterm:longs "32" ;
  dbterm:leaderName dbpedia:Job_Cohen ;
  ...
  dbterm:areaTotalKm "219" ;
  ...
dbpedia:ABN_AMRO
  dbterm:location dbpedia:Amsterdam ;
  ...
```


Amsterdam

The Keizersgracht at dusk

Location of Amsterdam

Coordinates: 52°22'23"N 4°53'32"E

| Country | Netherlands |
| Province | North Holland |

Government	
- Type	Municipality
- Mayor	Job Cohen[1] (PvdA)
- Aldermen	Lodewijk Asscher
	Carolien Gehrels
	Tjeerd Herrema
	Maarten van Poelgeest
	Marijke Vos
- Secretary	Erik Gerritsen

Area [2][3]	
- City	219 km² (84.6 sq mi)
- Land	166 km² (64.1 sq mi)
- Water	53 km² (20.5 sq mi)
- Urban	1,003 km² (387.3 sq mi)
- Metro	1,815 km² (700.8 sq mi)

| Elevation [4] | 2 m (7 ft) |

Population (1 October 2008)[5][6]	
- City	755,269
- Density	4,459/km² (11,548.8/sq mi)
- Urban	1,364,422
- Metro	2,158,372
- Demonym	Amsterdammer

| Time zone | CET (UTC+1) |
| - Summer (DST) | CEST (UTC+2) |

| Postcodes | 1011 – 1109 |
| Area code(s) | 020 |

Website: www.amsterdam.nl

Linking the Data

```
<http://dbpedia.org/resource/Amsterdam>
    owl:sameAs <http://rdf.freebase.com/ns/...> ;
    owl:sameAs <http://sws.geonames.org/2759793> ;
    ...
```

```
<http://sws.geonames.org/2759793>
  owl:sameAs <http://dbpedia.org/resource/Amsterdam>
  wgs84_pos:lat "52.3666667" ;
  wgs84_pos:long "4.8833333";
  geo:inCountry <http://www.geonames.org/countries/#NL>
;
  ...
```