**University of British Columbia, Vancouver**
Department of Computer Science

# CPSC 304 Project Cover Page

Milestone #: 2

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Group Number: 115

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By typing our names and student numbers in the above table, we certify that the work in the attached assignment was performed solely by those whose names and student IDs are included above. (In the case of Project Milestone 0, the main purpose of this page is for you to let us know your e-mail address, and then let us assign you to a TA for your project supervisor.)

In addition, we indicate that we are fully aware of the rules and consequences of plagiarism, as set forth by the Department of Computer Science and the University of British Columbia

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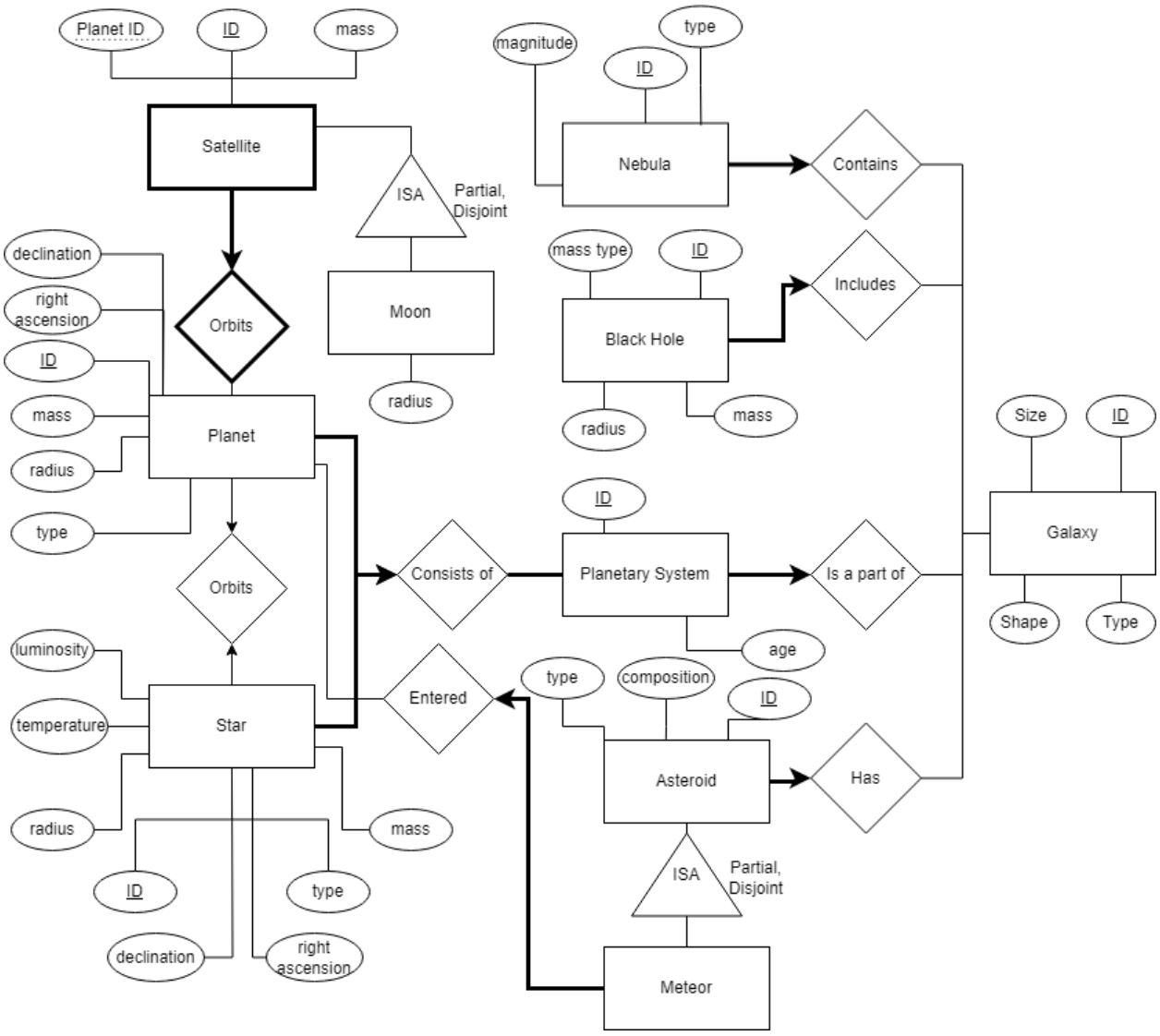
## Project Summary:

A database of data on stars, planets, planetary systems, and astronomical entities. This includes a collection of classifications.

## Updated ER Diagram:



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Changes from previous ER Diagram:

- Fixed order for all incorrect ISAs (for A is a B, B should be at the top vertex of the triangle)
- Added foreign key to Satellite to signify that it is a weak entity
- Removed “name” from Galaxy
- Split “coordinate” to two separate attributes (declination and right ascension)
- Changed multiple “has” relationship to unique names
- Added “disjoint” to all ISA relationships
- Removed luminosity from nebulas
- Changed star system to planetary system

## Schema from ER Diagram:

Galaxy(ID: char[64], Size: integer, Shape char[64], Type: char[64])

BlackHole(ID: char[64], MassType: char[64], Radius: integer, Mass: integer, **GalaxyId: char[64]**)

PlanetarySystem(ID: char[64], Type: char[64], Age: integer, **GalaxyId: char[64]**)

Asteroid(ID: char[64], Composition: char[64], Type: char[64], **GalaxyId: char[64]**)

Meteor(**ID: char[64]**, **PlanetEnteredID: char[64]**)

Nebula(ID: char[64], Type: char[64], Magnitude: integer, **GalaxyId: char[64]**)

Satellite(ID: char[64], **PlanetId: char[64,** Mass: integer)

Moon(**ID: char[64]**, Radius: integer)

Planet(ID: char[64], Declination: integer, Right Ascension: integer, Mass: integer, Radius: integer, Type: char[64], **planetarySystemId: char[64]**)

Star(ID: char[64], Declination: integer, Right Ascension: integer, Type: char[64], Mass: integer, Radius: integer, Temperature: integer, Luminosity: integer, **planetarySystemId: char[64]**)

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## Functional Dependencies:

Star():

- Temperature -> Type

BlackHole():

- Mass -> MassType

Asteroid():

- Composition -> Type
- Type -> Composition

Galaxy():

- Type -> Shape
- Shape -> Type

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## Normalization:

Star(ID: char[64], Declination: integer, Right Ascension: integer, Type: char[64], Mass: integer, Radius: integer, Temperature: integer, Luminosity: integer, **planetarySystemId: char[64]**)

- Temperature -> Type
- $Temperature^{+}$ = {Temperature, Type}
- Decompose:
    - Star(ID: char[64], Declination: integer, Right Ascension: integer, Mass: integer, Radius: integer, **Temperature: integer**, Luminosity: integer, **planetarySystemId: char[64]**)
    - StarTemperature(Temperature: integer, Type: char[64])

BlackHole(ID: char[64], MassType: char[64], Radius: integer, Mass: integer, **GalaxyId: char[64]**)

- Mass -> MassType
- $Mass^{+}$ = {Mass, MassType}
- Decompose:
    - BlackHole(ID: char[64], Radius: integer, **Mass: integer**, **GalaxyId: char[64]**)
    - BlackHoleMass (MassType: char[64], Mass: integer)

Asteroid(ID: char[64], Composition: char[64], Type: char[64], **GalaxyId: char[64]**)

- Composition -> Type
- $Composition^{+}$ = {Composition, Type}
- Decompose:
    - Asteroid(ID: char[64], **Composition: char[64]**, **GalaxyId: char[64]**)
    - AsteroidComposition(Composition: char[64], Type: char[64])

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Galaxy(ID: char[64], Size: integer, Shape char[64], Type: char[64])

- Type -> Shape
- $Type^+$ = {Type, Shape}
- Decompose:
    - Galaxy(ID: char[64], Size: integer, **Type: char[64]**)
    - GalaxyType(Shape char[64], Type: char[64])

PlanetarySystem(ID: char[64], Type: char[64], Age: integer, **GalaxyId: char[64]**)

Meteor(**ID: char[64]**, **PlanetEnteredID: char[64]**)

Nebula(ID: char[64], Type: char[64], Magnitude: integer, **GalaxyId: char[64]**)

Satellite(ID: char[64], **PlanetId: char[64]**, Mass: integer)

Moon(**ID: char[64]**, Radius: integer)

Planet(ID: char[64], Declination: integer, Right Ascension: integer, Mass: integer, Radius: integer, Type: char[64], **planetarySystemId: char[64]**)

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**SQL DDL Statements and INSERT statements :**

Star(ID: char[64], Declination: integer, Right Ascension: integer, Mass: integer, Radius: integer, **Temperature: integer**, Luminosity: integer, **planetarySystemId: char[64]**)

```
CREATE TABLE Star

(id VARCHAR,

declination INTEGER,

right ascension INTEGER,

mass INTEGER,

PRIMARY KEY (id),

FOREIGN KEY (temperature) REFERENCES StarTemperature,

FOREIGN KEY (planetarySystemID) REFERENCES PlanetarySystem);
```

StarTemperature(Temperature: integer, Type: char[64])

```
CREATE TABLE StarTemperature

(temperature INTEGER,

type VARCHAR,

PRIMARY KEY (temperature));
```

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BlackHole(ID: char[64], Radius: integer, **Mass: integer**, **GalaxyId: char[64]**)

```
CREATE TABLE BlackHole
(id VARCHAR,
radius INTEGER,
mass INTEGER,
galaxyID VARCHAR,
PRIMARY KEY (id),
FOREIGN KEY (mass) REFERENCES BlackHoleMass,
FOREIGN KEY (galaxyID) REFERENCES Galaxy);
```

BlackHoleMass (MassType: char[64], Mass: integer)

```
CREATE TABLE BlackHoleMass
(massType VARCHAR,
mass INTEGER
PRIMARY KEY(mass));
```

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Asteroid(ID: char[64], **Composition: char[64]**, **GalaxyId: char[64]**)

```
CREATE TABLE Asteroid
(id VARCHAR,
composition VARCHAR,
galaxyID VARCHAR,
PRIMARY KEY (id),
FOREIGN KEY (composition) REFERENCES AsteroidComposition,
FOREIGN KEY (galaxyID) REFERENCES Galaxy);
```

AsteroidComposition(Composition: char[64], Type: char[64])

```
CREATE TABLE AsteroidComposition
(composition VARCHAR,
type VARCHAR,
PRIMARY KEY (composition));
```

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Galaxy(ID: char[64], Size: integer, **Type: char[64]**)

```
CREATE TABLE Galaxy

(id VARCHAR,

size INTEGER,

type: VARCHAR,

PRIMARY KEY(id)

FOREIGN KEY(type) REFERENCES GalaxyType);
```

GalaxyType(Shape char[64], Type: char[64])

```
CREATE TABLE GalaxyType

(shape VARCHAR,

type VARCHAR

PRIMARY KEY(type));
```

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PlanetarySystem(ID: char[64], Type: char[64], Age: integer, **GalaxyId: char[64]**)

```
CREATE TABLE PlanetarySystem
(id VARCHAR,
type VARCHAR,
age INTEGER,
galaxyID VARCHAR,
PRIMARY KEY (id),
FOREIGN KEY (galaxyID) REFERENCES Galaxy);
```

Meteor(**ID: char[64]**, **PlanetEnteredID: char[64]**)

```
CREATE TABLE Meteor
(id VARCHAR,
planetEnteredID VARCHAR,
PRIMARY KEY (id),
FOREIGN KEY (id) REFERENCES Asteroid,
FOREIGN KEY (planetEnteredID) REFERENCES Planet);
```

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Nebula(ID: char[64], Type: char[64], Magnitude: integer, **GalaxyId: char[64]**)

```
CREATE TABLE Nebula
(id VARCHAR,
type VARCHAR,
magnitude INTEGER,
galaxyID VARCHAR,
PRIMARY KEY (id),
FOREIGN KEY (galaxyID) REFERENCES Galaxy);
```

Satellite(ID: char[64], **PlanetId: char[64]**, Mass: integer)

```
CREATE TABLE Satellite
(id VARCHAR,
planetId INTEGER,
mass INTEGER,
PRIMARY KEY(id, planetId),
FOREIGN KEY (planetId) REFERENCES Planet);
```

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Moon(**ID: char[64]**, Radius: integer)

```
CREATE TABLE Moon
(id VARCHAR,
radius INTEGER,
PRIMARY KEY(id),
FOREIGN KEY (id) REFERENCES Satellite);
```

Planet(ID: char[64], Declination: integer, Right Ascension: integer, Mass: integer, Radius: integer, Type: char[64], **planetarySystemId: char[64]**)

```
CREATE TABLE Planet
(id VARCHAR,
declination INTEGER,
right Ascension INTEGER,
mass INTEGER,
radius INTEGER,
type INTEGER,
planetarySystemId VARCHAR,
PRIMARY KEY(id),
FOREIGN KEY (planetarySystemId) REFERENCES PlanetarySystem);
```

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## Populate each table :

```
INSERT INTO Galaxy VALUES (“Milky Way”, 87400, “Spiral”)

INSERT INTO Galaxy VALUES (“Andromeda”, 220000, “Spiral”)

INSERT INTO Galaxy VALUES (“Sombrero”, 60000, “Peculiar”)

INSERT INTO Galaxy VALUES (“Whirlpool”, 50000, “Spiral”)

INSERT INTO Galaxy VALUES (“Triangulum”, 60000, “Spiral”)

INSERT INTO GalaxyType VALUES (“Spiral”, “Spiral”)

INSERT INTO GalaxyType VALUES (“Spiral”, “Spiral”)

INSERT INTO GalaxyType VALUES (“Elliptical”, “Peculiar”)

INSERT INTO GalaxyType VALUES (“Spiral”, “Spiral”)

INSERT INTO GalaxyType VALUES (“Spiral”, “Spiral”)

INSERT INTO BlackHole VALUES (“Sagittarius A*”, 31.6, 4154000, “Milky Way”)

INSERT INTO BlackHole VALUES (“Cygnus X-1”, 21, 21.2, “Milky Way”)

INSERT INTO BlackHole VALUES (“HLX-1”, 0.14374012,90000, “ESO 243-49”)

INSERT INTO BlackHole VALUES (“M87*”, 8.15932*10^11, 2400000000000, “Virgo A”)

INSERT INTO BlackHole VALUES (“SS 433”, 19.4, 26.3, “Milky Way”)

INSERT INTO BlackHoleMass VALUES (“Supermassive”, 4154000)

INSERT INTO BlackHoleMass VALUES (“Stellar”, 21.2)

INSERT INTO BlackHoleMass VALUES (“Intermediate”, 90000)

INSERT INTO BlackHoleMass VALUES (“Supermassive”, 2400000000000)

INSERT INTO BlackHoleMass VALUES (“Stellar”, 26.3)

INSERT INTO PlanetarySystem VALUES (“Solar System”, 4.571, “Milky Way”)

INSERT INTO PlanetarySystem VALUES (“Kepler 22”, 7, “Milky Way”)
```

```
INSERT INTO PlanetarySystem VALUES (“Proxima Centauri”, 4.85, “Milky Way”)

INSERT INTO PlanetarySystem VALUES (“Lalande 21185”, 7.5, “Milky Way”)

INSERT INTO PlanetarySystem VALUES (“TRAPPIST-1”, 7.6, “Milky Way”)

INSERT INTO Star VALUE (“Sun”, 9.8394, 13.569444, 1, 1, 5772, 1, “Solar
System”)

INSERT INTO Star VALUE (“Kepler 22”, 47.8844301, 19.281164, 0.857, 0.869,
5596, 0.79, “Kepler 22”)

INSERT INTO Star VALUE (“Proxima Centauri”, -62.6794897, 14.495261, 0.1221,
0.1542, 2992, 0.001567, “Proxima Centauri”)

INSERT INTO Star VALUE (“Lalande 21185”, 35.96988, 11.055609, 0.389, 0.392,
3547, 0.0195, “Lalande 21185”)

INSERT INTO Star VALUE (“TRAPPIST-1”, -5.0414, 23.108158, 0.0898, 0.1192,
2566, 0.000553, “TRAPPIST-1”)

INSERT INTO StarTemperature VALUE (5772, “G-Type”)

INSERT INTO StarTemperature VALUE (5596, “G-Type”)

INSERT INTO StarTemperature VALUE (2992, “M-Type”)

INSERT INTO StarTemperature VALUE (3547, “M-Type”)

INSERT INTO StarTemperature VALUE (2566, “M-Type”)

INSERT INTO Planet VALUE (“Earth”, 0, 0, 1, 6378.137, “Terrestrial”, “Solar
System”)

INSERT INTO Planet VALUE (“Saturn”, 40.589, 2.7058333 , 95.16, 58232, “Gas
Giant”, “Solar System”)

INSERT INTO Planet VALUE (“Uranus”, 257.311, 17.154167, 14.535, 25,362, “Ice
Giant”, “Solar System”)

INSERT INTO Planet VALUE (“Jupiter”, 268.057, 17.870556, 317.83985, 69,911,
“Gas Giant”, “Solar System”)

INSERT INTO Planet VALUE (“Kepler 22B”, -47.8845, 19.281167, 2.1, 6378.137,
“Terrestrial”, “Kepler 22”)

INSERT INTO Satellite(“Moon”, “Earth”, 0.012294)
```

```
INSERT INTO Satellite(“Ganymede”, “Jupiter”, 0.025 )

INSERT INTO Satellite(“Titan”, “Saturn”, 0.0225 )

INSERT INTO Satellite(“Miranda”, “Uranus”, 0.0000107163)

INSERT INTO Satellite(“Europa”, “Jupiter”, 0.008)

INSERT INTO Moon(“Moon”, 1737.4)

INSERT INTO Moon(“Ganymede”, 2634.1)

INSERT INTO Moon(“Titan”, 2574.73)

INSERT INTO Moon(“Miranda”, 235.8)

INSERT INTO Moon(“Europa”, 1560.8)

INSERT INTO Nebula(“Helix Nebula”, “Bright Planetary”, 7.6, “Milky Way”)

INSERT INTO Nebula(“Ring Nebula”, “Planetary”, 8.8, “Milky Way”)

INSERT INTO Nebula(“M2-09”, “Planetary”, 14.7, “Milky Way”)

INSERT INTO Nebula(“Cat's Eye Nebula”, “Planetary”, 9.8, “Milky Way”)

INSERT INTO Nebula(“Dumbbell Nebula”, “Planetary”, 7.5, “Milky Way”)

INSERT INTO Asteroid(“Aarhus”, “Chondrite”, “Milky Way”)

INSERT INTO Asteroid(“Vermillion”, “Pallasite”, “Milky Way”)

INSERT INTO Asteroid(“Qidong”, “O Chondrite”, “Milky Way”)

INSERT INTO Asteroid(“Yamato 000593”, “Achondrite”, “Milky Way”)

INSERT INTO Asteroid(“Hoba”, “Iron”, “Milky Way”)

INSERT INTO AsteroidComposition(“Chondrite”, “H Chondrite”)

INSERT INTO AsteroidComposition(“Pallasite”, “P pallasite grouplet”)

INSERT INTO AsteroidComposition(“O Chondrite”, “Ordinary Chondrite”)

INSERT INTO AsteroidComposition(“Achondrite”, “Martian Meteorite”)
```

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```
INSERT INTO AsteroidComposition(“Iron”, “Iron”)

INSERT INTO Meteor(“Aarhus”, “Earth”)

INSERT INTO Meteor(“Vermillion”, “Earth”)

INSERT INTO Meteor(“Qidong”, “Earth”)

INSERT INTO Meteor(“Yamato 000593”, “Earth”)

INSERT INTO Meteor(“Hoba”, “Earth”)
```