

CSCI 403 - Database Management

Project 8 - Normalize

Instructions

For this project, you are given an unnormalized relation, and asked to normalize it (with respect to Boyce-Code Normal Form only). I will provide you with the attributes and a set of functional dependencies, which together form a cover of the possible functional dependencies (you may need to infer additional dependencies using the inference rules we learned). I will also provide you with a key for the initial relation; you will need to infer keys for any new relations you create from the functional dependencies.

Your job is to decompose the relation(s) until all relations are in BCNF. To document your work, for each decomposition you do, please note the following:

1. The starting relation (list of attributes)
2. The functional dependency which violates BCNF which you will use to decompose the relation
3. The two decomposition products (list of attributes)

At the end of your work, please list the set of final relations in BCNF, along with the functional dependencies for each final relation. This project is worth 50 points.

Details

The relation you need to decompose concerns composers and their compositions (sorry for the pun, I couldn't resist). The attributes for the relation are: {composer, era, dates (of the era), birthplace, continent, work, setting}. The choice of attributes is somewhat contrived, and also abbreviated for instructional purposes - try to imagine a much larger set of attributes for each "entity". If it helps make sense of things, some sample tuples from the unnormalized relation can be found in figure 1.

The only key for the unnormalized relation is: {composer, era, work}.

You are given the following functional dependencies:

- {composer} → {birthplace}
- {composer, work} → {setting}
- {era} → {dates}
- {birthplace} → {continent}

Extra Credit

You may notice (by looking at the sample data) that one relation in your final result above still has some remaining redundancy. For 5 points extra credit, identify the relation and the violating multi-valued dependency (MVD), and show the decomposition needed to bring it into fourth normal form (4NF).

composer	era	dates	birthplace	continent	work	setting
J.S. Bach	Baroque	c. 1600 - 1750	Germany	Europe	Fugue in G minor	organ
J.S. Bach	Baroque	c. 1600 - 1750	Germany	Europe	St Matthew Passion	choir and orchestra
J.S. Bach	Baroque	c. 1600 - 1750	Germany	Europe	Mass in F major	choir and orchestra
Henry Purcell	Baroque	c. 1600 - 1750	England	Europe	Dido and Aeneas	opera
Joseph Haydn	Classical	c. 1730 - 1820	Austria	Europe	Mass in F major	choir and orchestra
Ludwig van Beethoven	Classical	c. 1730 - 1820	Germany	Europe	Symphony No. 1	orchestra
Ludwig van Beethoven	Classical	c. 1730 - 1820	Germany	Europe	Symphony No. 2	orchestra
Ludwig van Beethoven	Romantic	c. 1780 - 1910	Germany	Europe	Symphony No. 1	orchestra
Ludwig van Beethoven	Romantic	c. 1780 - 1910	Germany	Europe	Symphony No. 2	orchestra
Frédéric Chopin	Romantic	c. 1780 - 1910	Poland	Europe	Three Polonaises	piano
Charles Ives	20th Century	c. 1880 - 2010	United States	North America	String Quartet No. 1	string quartet
Alberto Ginastera	20th Century	c. 1880 - 2010	Argentina	South America	Don Rodrigo	opera

Figure 1: Some tuples from the unnormalized relation