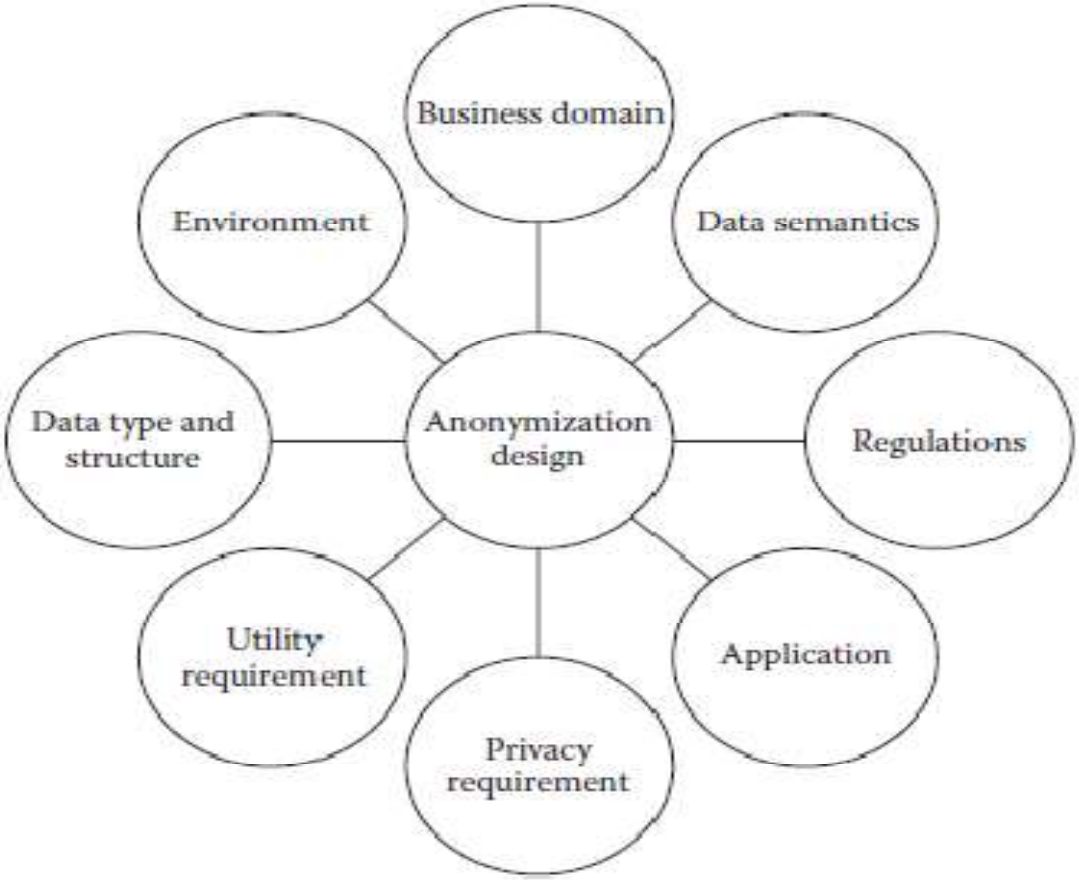
Anonymization design principles

Anonymization Design Principles

- Anonymization design is not straightforward
- achieving a balance between privacy and utility has many dependencies
- for a given requirement, many Factors that drive anonymization design

Anonymization Design Principles



Anonymization Design Principles

- When there is a need for data privacy, organizations generally use either a commercial or a home-grown product for anonymizing data.
- It is critical to ensure that an organization's data anonymization program is not limited by the features of the product.
- Many organizations fail to maintain a balance between privacy and utility.
- It is generally difficult to determine how much anonymization is required, which results in either loss of information or the anonymized data set becoming unusable.

Anonymization Design Principles

- Even with adoption of the best of breed data anonymization products, an organization's anonymization program may not be successful.
- In addition to this, the pressures of regulatory compliance force many organizations to be very defensive and adopt very high privacy standards that will render the data unusable for any research.
- If enough care is not taken, then the anonymized data could have very little utility

Anonymization Design Principles

- In this context, irrespective of which tool an organization uses, there is a need for a mechanism to monitor privacy versus utility for various privacy requirements.
- Unfortunately, quantifying privacy and utility is nontrivial. Therefore, it is critical to provide assurance of high quality of data anonymization during the initial phase of the anonymization life cycle.
- To support this, we felt it is necessary to define a set of design principles.
- These principles will provide the required guidelines for the data anonymizer to adopt the correct design for a given anonymization requirement.

Anonymization Design Principles

- Classifying principles into two broad types—scientific and normative.
- Scientific principles are laws of nature and form the fundamental truths that one can build upon. Normative principles act as a guide and need to be enforced.
- Similarly, a data anonymizer needs guidance, and the anonymization design principles should be enforced to ensure proper anonymization design.
- These principles are fundamental in nature and are applicable to all aspects of anonymization.
- They connect the high-level privacy and utility requirements to low-level implementation.

Data

Anonymization in multidimensional data

- **Multidimensional Data**
  - Multidimensional data also referred to as relational data are the most common format of data available today in many enterprises.
  - In a relational table, each row is a vector that represents an entity
  - The columns represent the attributes of the entity.
  - As relational data are the most common data format, a lot of attention has been paid to privacy preservation of relational data

Data

Anonymization in multidimensional data

- A row of data in a relational table is classified into explicit identifiers, quasi-identifiers, sensitive data, and nonsensitive data. Both perturbative and nonperturbative techniques could be used to protect the data.
- As a rule, EI are completely masked out, QI are anonymized, and SD are left in their original form.
- Depending on the sensitivity of data, appropriate data protection techniques can be applied.

Data

Anonymization in multidimensional data

- The fundamental differences between anonymizing multidimensional data and other data structures are as follows:
- In a multidimensional data table, each record or row is independent of others; therefore, anonymizing a few of the records will not affect other records.
- Anonymizing a tuple in a record will not affect other tuples in the record.

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Challenges in Privacy Preservation of Multidimensional Data

Challenges in Privacy Preservation of Multidimensional Data

The challenges in this kind of data preservation are as follows:

- Difficulty in identifying the boundary between QI and SD in the presence of background knowledge of the adversary
- High dimensionality of data poses a big challenge to privacy preservation Clusters in sensitive data set
- Difficulty in achieving realistic balance between privacy and utility