Bachelor/Diploma/Master Thesis Topics in the Field of
Protection, Prevention and Self-Protection
Mechanisms of Databases and Cloud Storages

Each proposed topic will be customized by the kind of thesis. I want to encourage students to propose their own topics in above mentioned fields and related areas! I’m also interested in any environmental topic paired with databases and/or security.

Offered and supervised by Stefan Barthel (stefan.barthel@uba.de):

**Survey topics:**

1. *(ENG or GER)* State of the art of protecting and preserving mechanisms of DBMS that face the insider threat
   Currently existing DBMS do not face the danger that relies on current or former employee, contractor, or other business partner who has or had authorized access to an organization's network, system, or data. This danger is widely acknowledged as Insider Threat.
   *This survey should give an overview about existing dangers as well as mechanisms that face those challenges.*

2. *(ENG or GER)* State of the art of anomaly detection mechanisms of DBMS.
   Currently existing DBMS are not able to handle and to detect malicious behaviors of users who have authorized access to an organization's network, system, or data by abusing an existing user account. Even if there are no mechanisms implemented in the conventional DBMS, several researches already invented some detection mechanisms.
   *This survey should give an overview about existing mechanisms as well as mechanisms that face those challenges. Furthermore, a classification for those is demanded.*

3. *(ENG or GER)* Assign MVAL-approach for cloud storages and conceive an applicable concept.
   We invented a concept of how to detect malicious extractions of authorized insiders, called MVAL (see [www.mvalue.de](http://www.mvalue.de)). MVAL was primarily designed to prohibit unfaithful queries to relational databases. However, relational databases are not the only DBS being used and, in addition, cloud databases/ storages becoming more popular. For that reason, we are interested in a scientific evaluation of existing representatives as well as an applicable cloud concept for our MVAL mechanism.
   *This thesis should give an overview about existing mechanisms as well as an applicable cloud concept of MVAL.*

4. *(ENG or GER)* Assign MVAL-approach for object/ document oriented DBS (f.e., NoSQL, XML) and conceive an applicable concept.
   We invented a concept of how to detect malicious extractions of authorized insiders, called MVAL (see [www.mvalue.de](http://www.mvalue.de)). MVAL was primarily designed to prohibit unfaithful queries to relational databases. However, relational databases are only one kind of nowadays used DBS and object/ document oriented databases are also existent. For that reason, we are interested in scientific evaluation of existing representatives as well as an applicable object/ document oriented concept of MVAL.
   *This thesis should give an overview about existing mechanisms as well as an applicable object/ document concept of MVAL.*
5. **(ENG or GER)** Conceive and evaluate a concept of a valuation suggestion tool for a data-leakage preserving approach called MVAL.  
We invented a concept of how to detect malicious extractions of authorized insiders (see [www.mvalue.de](http://www.mvalue.de)). Furthermore, we set up a demonstrator and implemented the security mechanism **MVAL** into an existing DBMS. However, it came out that predicting certain valuations for arbitrary attributes is very ambiguous. Therefore, we are interested in a concept that recommends such valuations for existing relations.  
*The thesis should motivate the topic as well as give insights into the thoughts as well as a concept of such a tool.*

**Programming topics:**

1. **(ENG or GER)** Implementation and evaluation of a data-leakage preserving approach in a DBMS you can choose.  
We invented a concept of how to detect malicious extractions of authorized insiders. This concept shall be integrated in the existing database engine.  
The thesis should motivate the topic as well as give insights in how to implement the mentioned mechanism. Programming skills in a free to choose programming language are required.

2. **(ENG or GER)** Invention, implementation and evaluation of a visualization concept for our data-leakage preserving approach.  
We invented a concept of how to detect malicious extractions of authorized insiders. This concept shall be visualized in a way that it is accessible through the internet. The visualization should clearly describe how our approach works and has to have modifiable parameters.  
The thesis should motivate the topic as well as analyze how to implement and visualize best the mentioned mechanism. Programming skills in a free to choose web programming language (PHP, HTML, JAVA, etc.) are required.

3. **(ENG or GER)** Extending the data-leakage preserving approach by adding another suspicious measure.  
We invented a concept of how to detect malicious extractions of authorized insiders (see [www.mvalue.de](http://www.mvalue.de)) and implemented our security mechanism **MVAL** into a JAVA-based DBMS called HSQLDB. Our prototype shall be extended by an existing security measure (called M-Score) founded by Harel et al. ([http://doi.acm.org/10.1145/1866886.1866891](http://doi.acm.org/10.1145/1866886.1866891)) to be able to compare both mechanism.  
The thesis should motivate the topic as well as give insights in how to implement the mentioned measure. JAVA programming skills are required.

4. **(ENG or GER)** Extending the data-leakage preserving approach written in JAVA by adding another output capability.  
We invented a concept of how to detect malicious extractions of authorized insiders and implemented our security mechanism **MVAL** (see [www.mvalue.de](http://www.mvalue.de)) into a JAVA-based DBMS called HSQLDB. This concept shall be extended by adding a masking capability to our system. At the moment the output of query that is displayed to the user is anonymized by truncating.  
The thesis should motivate the topic as well as give insights in how to implement both mentioned mechanisms. JAVA programming skills are required.

5. **(ENG or GER)** Invention, implementation and evaluation of a valuation suggestion tool for a data-leakage preserving approach called MVAL.  
We invented a concept of how to detect malicious extractions of authorized insiders (see [www.mvalue.de](http://www.mvalue.de)). However, it came out that predicting certain valuations for arbitrary attributes is
very complex. Therefore, we are interested in a concept and a prototyp that is able to recommend such valuations for existing relations. This concept shall be visualized in a way that it is accessible through the internet and can score tables of interested users by uploading them. The thesis should motivate the topic as well as analyze how to implement and visualize best the mentioned mechanism. Programming skills in a free to choose web programming language (PHP, HTML, JAVA, etc.) are required.

6. **(ENG or GER) Implementation and evaluation of a valuation suggestion tool for a data-leakage preserving approach called MVAL.**

We invented a concept of how to detect malicious extractions of authorized insiders (see [www.mvalue.de](http://www.mvalue.de)) and implemented our security mechanism *MVAL* into a JAVA-based DBMS called HSQLDB. However, it came out that predicting certain valuations for arbitrary attributes is very ambiguous. Therefore, we are interested in a concept and an extension of our security mechanism implemented in JAVA that is able to recommend such valuations for existing relations in HSQLDB. The thesis should motivate the topic as well as give insights into the thoughts as well as implementation of such a analyzing and recommendation tool. JAVA programming skills are required.