



UZH, Dept. of Informatics, Binzmühlestr. 14, CH-8050 Zürich

Dominique Hässig

**Prof. Dr. Michael Böhlen**  
Professor  
Phone +41 44 635 43 33  
Fax +41 44 635 68 09  
[boehlen@ifi.uzh.ch](mailto:boehlen@ifi.uzh.ch)

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**Bachelor's Thesis in Informatics  
Database Technology**

**Topic: Development of Adaptive Heatmaps for Interactive Feed Explorations**

The Swiss Feed Database (<http://vm-164.s3it.uzh.ch/>) models the concentration of nutrients in feed samples collected across Switzerland. It is used by Swiss farmers and research institutions, and is actively being developed by UZH in collaboration with Agroscope in Posieux. The goal of this Bachelor's thesis is the development and deployment of a system that can be run, used, maintained and further developed by Agroscope. The Bachelor thesis is to be completed in collaboration with Agroscope.

• **T1: Getting started**

The Swiss Feed Database uses PostgreSQL, Node.js, GoogleMaps, Nginx, and AngularJS as its main software components. The source code is accessible in an Ifl gitlab repository at [git@gitlab.ifl.uzh.ch:boehlen/feedbasehaessig.git](https://gitlab.ifl.uzh.ch/boehlen/feedbasehaessig.git). Download the latest version and get started by implementing the following features:

- Database migration and evolution: implement and test in collaboration with Agroscope the possibility to run and switch between multiple instances of the Swiss Feed Database.
- Data import from Excel files: implement and test in collaboration with Agroscope the data import from Excel files [3].
- Migration from AngularJS to Angular: Migrate the application from AngularJS to Angular [5].

• **T2: Heatmaps**

Heatmaps are used to aggregate and display summary information. In the Swiss Feed Database they are used to visualize sample and nutrient density, respectively. A criti-



cal parameter of heatmaps is the radius that controls the influence radius of database points. Use Google's heatmap layer to implement adaptive heatmaps that correctly display sample and nutrient density at all zoom levels. Apply your solution to the example queries in the appendix and evaluate it in collaboration with Agroscope. The system must transparently switch from displaying statistical summary information to displaying individual measurements to ensure an interactive behavior with maximal information content.

- **T3: Scalability** Evaluation of the scalability of the implemented solutions. Implement heatmaps visualizations that scale to arbitrarily many observations.

Literature:

- [1] Google heatmaps <https://developers.google.com/maps/documentation/javascript/heatmaplayer>
- [2] Valentin Weiss, The Swiss Feed Database—Development of a Dynamic Web Application, BSc thesis, Ifl, UZH, 2018.
- [3] Nathalie Torrent, Data Curation in the Swiss Feed Database, MSc Basic Module, Ifl, UZH, 2019.
- [4] Scott, D.W. (1992). Multivariate Density Estimation: Theory, Practice, and Visualization. John Wiley & Sons, New York.
- [5] Upgrading from AngularJS to Angular <https://angular.io/guide/upgrade>

Supervisor: Michael Böhlen

- Michael Böhlen

Starting date: 17.2.2020

Ending date: 17.6.2020

Department of Informatics, University of Zurich

Prof. Dr. Michael Böhlen

## Appendix:

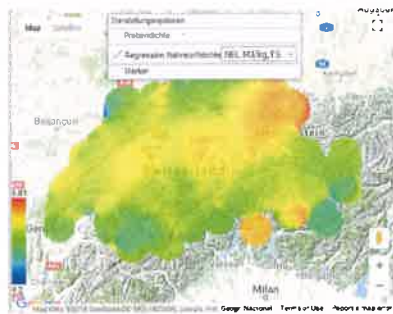


Figure 1: Query 68) regional NEL content in hay

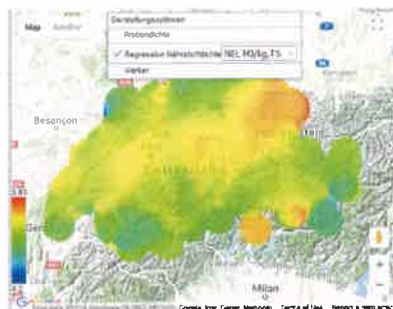
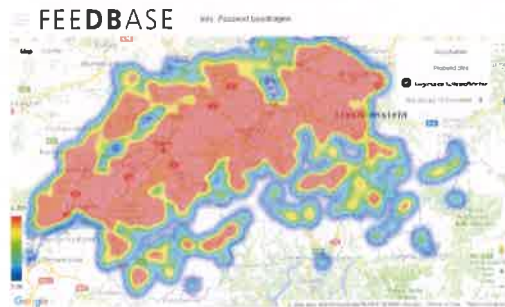


Figure 2: Query 68) regional NEL content in hay

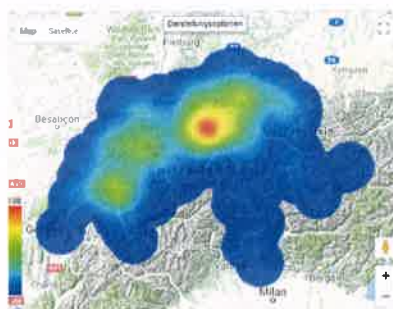
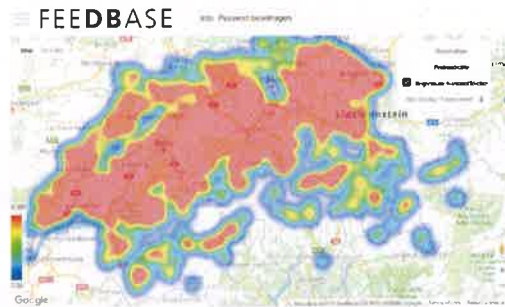


Figure 3: Query 70) Alfalfa hay survey

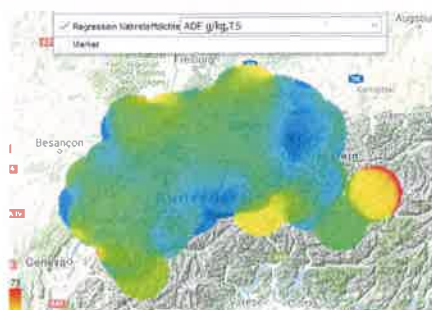


Figure 4: Query 65) Grass silage survey (regression nutrient density)

