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Independent project (degree project), 15 credits, for the degree of

Bachelor of Computer Science  
Spring Semester 2023  
Faculty of Natural Sciences

**Using Machine Learning with chemical analysis to improve the quality in the brewing process**

Subheading if used  
(style Subheading)

**Sandra Kaljula and Mark Harvey**

**Author (style Abstract Headline)**

Sandra Kaljula and Mark Harvey

**Title**

Using Machine Learning with chemical analysis to improve the quality in the brewing process

**Supervisor**

Fredrik Frisk

**Examiner**

Kamilla Klonowska

**Abstract (maximum 250 words)**

Abstract text.

**Keywords (5–8 words)**

chemical analysis, beer quality, sensor, audio classification, image processing, beer brewing, machine learning, computing

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# Problem Definition

Beer

**See apendix C.**

# Motivation

We want to optimize the beer

# Research Questions

The following research questions will be addressed in this thesis:

* How is taste affected by the changes in the brewing process?
* How can Machine Learning help with the quality of the brewing process?
* How can beer brewing techniques be improved for higher quality beer?
* How can image and audio classification help with the parameters?
* How are the fermentation process and the final product affected by using commercial and wild yeast strains in terms of growth and metabolism, brewing parameters, and quality characteristics?
* What can ML do to discover relationships between yeast properties, chemistry, brewing parameters, and sensory?
* How to predict the flavorings (aromas + taste) with the help of chemical analysis?
* How to predict the quality the tasters will rate the beer?

# Methodology

Variables:

Aromas, Yeast, Temperature,

# Expected Results

# Time Plan

**See apendix A.**

# References

**See apendix B.**

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# Appendix A

|  |  |  |  |
| --- | --- | --- | --- |
| **Week** | **To do** | **Done** | **Comment** |
| 3 | Find thesis topic. Start project plan, read 2 scientific articles |  |  |
| 4 | Read 2 scientific articles, first meeting with supervisor, finalize project plan |  | Deadline: 1/2  Meeting with gastronomy students |
| 5 | Change project plan according to the feedback, start practical part, contact gastronomy students working with us. Choose tools for the practical part. |  |  |
| 6 | Data collection |  |  |
| 7 | Data cleanup, labelling |  |  |
| 8 | Machine learning algorithms training |  |  |
| 9 | Machine learning algorithms training 2 |  |  |
| 10 | Comparing algorithms |  |  |
| 11 | Testing if the results are as expected |  |  |
| 12 | Eventual changes to thesis report. Insert base information from experiments to thesis report.  Upload for midway seminar end of week |  | 60% of thesis done.  Deadline: 27/3 |
| 13 | Prepare for midway seminar |  |  |
| 14 | Midway Seminar + eventual changes in thesis report |  | 3/4 - 5/4 |
| 15 | Thesis report – write Analysis |  |  |
| 16 | Thesis report – write Result |  |  |
| 17 | Thesis report – write Discussion |  |  |
| 18 | Self evalutation |  | Upload self-evaluation |
| 19 | Finalize Thesis Report and Submit |  | Deadline: 8/5 |
| 20 | Do and Upload Opposition report |  | Deadline: 22/5 |
| 21 | Prepare for the final presentation |  |  |
| 22 | Final Presentation |  | 29/5 – 1/6 |

# Appendix B

| **Title** | **Link** | **Keywords** | **Results** | **DB** |
| --- | --- | --- | --- | --- |
| Assessment of Beer Quality Based on a Robotic Pourer, Computer Vision, and Machine Learning Algorithms Using Commercial Beers | <https://ift.onlinelibrary.wiley.com/doi/abs/10.1111/1750-3841.14114?casa_token=uIxmA6etlzQAAAAA%3A798DUj1cyHPL8ci_3Nkzl7GdINTomntWjwSRpoqa6D7Upgg3_fvGYGMOSb9njyNdmO85uKAvgUYtyBj6> | "machine learning" AND "beer brewing" | 254 | Google Scholar |
| Deep Learning Approaches to Chemical Property Prediction from Brewing Recipes | <https://ieeexplore.ieee.org/abstract/document/8489492?casa_token=GpxwfgzOqf4AAAAA:6LRegS3ZWquLOVeK8oJdpJ2xgwObzXRMRNxhZJUQsggwKAaYOXKjRAjCxGxobfmge0jc9hZ3fk7w7g> | "machine learning" AND "beer brewing" | 254 | Google Scholar |
| The Importance of a Comparative Characterization of Saccharomyces Cerevisiae and Saccharomyces Pastorianus Strains for Brewing | <https://www.mdpi.com/2311-5637/3/3/41> |  | 1 | Fredrik Frisk |
| Saccharomyces Cerevisiae Var. Boulardii: Valuable Probiotic Starter for Craft Beer Production | <https://www.mdpi.com/2076-3417/9/16/3250> | image processing AND beer AND fermentation | 45 500 | Google Scholar |
| Computer Vision Method in Beer Quality Evaluation—A Review | <https://www.mdpi.com/2306-5710/5/2/38> |  |  |  |
| Encyclopedia of Microbiology | <https://books.google.se/books?hl=sv&lr=&id=fhC_nz8eHh0C&oi=fnd&pg=PA412&dq=beer+brewing&ots=FRY2_YcjWP&sig=tvrbS3qfngqSBWWs0IFIqlV4OAI&redir_esc=y#v=onepage&q=beer%20brewing&f=false> | beer brewing | 290 000 | Google Scholar |

*Table 1. Literature search.*

# Appendix C

Diagram

Description automatically generated

*Figure 1. The flow of the whole brewing process[6].*