Thesis

# Simple:

Cover [4]

Abstract [2]

TOC [2]

LOA [1]

~~Introduction [8]~~

~~Goals [1]~~

Materials [10]

~~Results [18]~~

Discussion [9]

References [5]

# Detailed outline

## Cover [4]

* 1. Cover 1
  2. Cover 2
  3. This work was done under the supervision of…
  4. Acks

## Abs [2]

## Toc [2]

## Loa [1]

## Intro [8]

* 1. הצגת הבעיה [1]
  2. Spectroscopy in general [0.5]
  3. Multivariate data analysis [0.5]
  4. Raman spectroscopy [3]
     1. Scientific background [1]
     2. Uses of Raman spectroscopy for the detection of bacteria [1.5]
     3. Low resolution Raman spectroscopy [0.5]
  5. Fluorescence spectroscopy [3]
     1. Scientific background (EEMs)
     2. Uses of fluorescence for the detection of bacteria

## Goals [1]

* 1. Hypothesis
  2. Goals

## Mm [10]

* 1. Bacterial strains used
  2. Materials used
     1. Media, water, ethanol, alum foil, isopropanol, saline, membranes
  3. OD to CFUs calibration
  4. Swab calibration
  5. Sample preparation methods
     1. Basic bacteria in water
     2. “schlichta”
     3. Saline
     4. Glass slides
     5. Aluminium slides
     6. “Dirty” experiment
     7. Membrane prep
     8. Milk
  6. Raman setup
     1. Instrumentation
     2. Mechanical set-up:
        1. Alum cup
        2. Black box
        3. Probe holding mechanism
        4. Reverse dip mechanism
  7. FTIR Scanning
  8. Fluorescence scanning procedure
     1. Instrument
     2. Sample preparation
     3. pH, EC
     4. UV
  9. Water sampling
     1. Sampling procedure
     2. Transportation
     3. Standard testing
     4. Storage of sample and sample preparation (room temp)
  10. Water controlled experiment
      1. Sample prep
  11. Statistical analysis
      1. Mathematical sample prep
         1. Raman
         2. FTIR
         3. Fluorescence
      2. Excel, JMP

## Res [18]

* 1. Raman [4]:
     1. Optimization with *E. coli*
        1. Time
        2. Laser intensity
        3. Lysis by boiling
        4. Lysis by ethanol
        5. Cold treatment
        6. Saline
        7. Drying over glass
        8. Drying over aluminium
        9. Reverse dipping
        10. SERS - Oceanoptics
     2. Preliminary work with *B. sub*
     3. *E. coli* and *B. subtilis* data set in milk
     4. Statistical analysis of large datasets
        1. PCA-R
        2. PLS
        3. Neural networks
  2. Fluorescence Spectroscopy [15]
     1. Controlled experiment
        1. What is the detection threshold for bacteria in controlled experiments?
        2. What it the best way to detect bacteria between: classic "peak picking", PLS for single excitation, PLS for entire maps?
        3. What kind of pre-processing yealds the best results?
        4. Differentiation between bacteria? At what concentrations?
        5. VIPs and high concentrations fingerprints
     2. Drinking water experiment
        1. In drinking water, can I detect contaminations at the 100 CFU/ml level? Overall or well-specific models
        2. Can I visually differentiate particularly "dirty" water?
        3. Case study: Shimron 7
  3. Summary of results in a big table [1]

## Disc [9]

* 1. Raman[2.5]
     1. Achievements
     2. Reservation
     3. suggestions
  2. Fluorescence spectroscopy [4.5]
     1. Detection of *known bacteria*
     2. Differentiation
     3. Detection of waterborne hetrotrophic bacteria
     4. Description of VIPs
  3. The importance of machine learning algorithms [1]
     1. Comparison of algorithms and mathematical sample prep
  4. Conclusions [1]

## Reff [4]