Thesis Outline

# Rough Outline for thesis:

Cover [4]

Abs [2]

Toc [2]

Loa [1]

Intro [8]

Goals [1]

Mm [8]

Res [20]

Disc [10]

Ref [4]

**TOTAL: 59**

# Detailed outline

## Cover [4]

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

## Abs [2]

## Toc []

## Loa [1]

## Intro [8]

* 1. הצגת הבעיה [2]
  2. 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]
  3. Fluorescence spectroscopy [3]
     1. Scientific background (EEMs)
     2. Uses of fluorescence for the detection of bacteria
  4. Multivariate data analysis [3]
     1. Background – PCA, PLS [1.5]
     2. Examples related to Raman [1]
     3. Examples related to Fluorecence [0.5]

## Goals [1]

* 1. Hypothesis
  2. Goals

## Mm [6]

* 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. Imstrumentation
     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. Statistical analysis
      1. Mathematical sample prep
         1. Raman
         2. FTIR
         3. Fluorescence
      2. Excel, JMP

## Res [20]

* 1. Raman [6]:
     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. FTIR [2]:
     1. FTIR-ATR
     2. FTIR-ATR dry
     3. FTIR-ATR swab
     4. FTIR-ATR Membranes
  3. Fluorescence Spectroscopy [10]
     1. *E. coli* Simple correlations
     2. PLS analysis
        1. Mathematical sample prep optimization
           1. Raman normalizing, maxima normalizing, 1/R…
     3. *Aeromonas* experiment
     4. *B. subtilis* experiment
  4. Drinking water:
     1. Fluorescence PLS model for detecting the amount of heterotrophic bacteria
     2. Discriminant analysis for describing source.
     3. Comparison of VIPs
  5. Summary of results in a big table [1]

## Disc [12]

* 1. Raman and FTIR [2.5]
     1. Achievements
     2. Reservation
     3. suggestions
  2. Fluorescence spectroscopy [5]
     1. Detection of *E. coli*
     2. Detection of waterborne hetrotrophic bacteria
     3. Detection of *Aeromonas*
     4. Differentiation?
     5. Description of VIPs
  3. The importance of machine learning algorithms [2.5]
     1. Comparison of algorithms and mathematical sample prep
  4. Conclusions [2]

## Reff [4]