# Assignment I: Latex and Python Basics

## Exercises in Machine Learning (190.013), SS2022

**Joe Mann[1] and Anne Frank[2]**

[1]*joe.mann@unileoben.ac.at*, *Montanuniversität Leoben, Austria*
[2]*anne.frank@unileoben.ac.at*, *Montanuniversität Leoben, Austria*

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**This latex template provides some instructions on how to format your assignment report. Feel free to use your favorite latex editor. Follow the structure below if it suits your needs.**

## 1 Introduction

A short introduction to the problem.

You may want to list your contributions using the command *itemize*.

- First item in a list
- Second item in a list
- Third item in a list

## 2 Methods

Something about the used methods.

Define your equations using the *align* environment. or using *eqnarray*.

$$A = \begin{bmatrix} A_{11} & A_{21} \\ A_{21} & A_{22} \end{bmatrix} \tag{1}$$

$$\begin{aligned} y &= w_1 + w_2 x_1 + w_3 x_2 + \cdots + w_{D+1} x_D, \\ y &= \boldsymbol{x}^T \boldsymbol{w}. \end{aligned} \tag{2}$$

### 2.1 Referencing related work

You may want to use *Google Scholar* to find related scientific publications. Download the bib files and add the entries to the file *literature.bib*. Below are some examples of how to refer to related works.

The reader should get a copy of Bishop's book on pattern recognition and machine learning (Bishop, 2006) from our library. Also highly recommended are the books of Murphy and Williams *et al*. (Murphy, 2012; Williams and Rasmussen, 2006). Also make sure to refer to all artwork like Figure 1.

### 2.2 You may add more structure to your report

Your assignment report should comply with the following structure. Feel free to add latex structure elements like

`\paragraph*{...}, \subsubsection*{...}`

`\begin{itemize}..., \begin{enumerate}, etc.`

## 3 Results

Something about your results. Some plots would be also nice.

### 3.1 Formatting instructions for equations

Use the notation defined in our online slides defined in pages 8-11 in `https://docs.google.com/presentation/d/1mtpjSyuoBwhZxc8QUI1PUfMhyyXAXsXNXNqHsLSk-AQ/edit?usp=sharing`. In particular,

- Use single letters for scalars, i.e., $a \in \mathbb{R}^1$.
- Vectors are written in bold, i.e., $\boldsymbol{w} \in \mathbb{R}^{10}$.
- Matrices are written in bold capital letters, i.e., $\boldsymbol{M} \in \mathbb{R}^{\{10 \times 10\}}$.
- Use subscripts to denote elements in vectors, i.e., $w_i$ is part of $\boldsymbol{w} = [w_1, w_2, \ldots, w_i]$.
- Denote functions by single lower case letters, i.e., $x = f(y)$ which implements the transformation $f(y) : \mathbb{R}^1 \rightarrow \mathbb{R}^1$.
- You may use subscripts for functions, i.e., $x = f_{\text{fwd}}(y)$ which implements the forward kinematics transformation. Or $y = f_{\text{inv}}(x)$ which implements the inverse kinematics transformation.
- Denote continuous distribution using the lower case $p(x)$ term and use the symbol $\mathcal{N}(.)$ to denote Gaussian distributions.

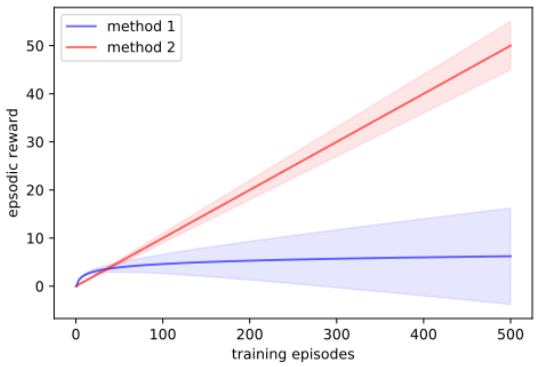


**Figure 1:** *Illustration of an figure generated using python. Make sure that all axis labels and legend texts are readable. The font size should be close to the the font size of this caption.*

### 3.2 Formatting instructions for figures

When creating **figures**,

- Make sure that all axis have labels.
- Always add a legend (images may be exceptions).
- Use different line colors, e.g., in MATLAB use the colormap *Lines*.
- Use a minimum line width of 2 and different line styles.
- The font size of text in figures should be equal to the figure caption font size. E.g., in MATLAB use a font size of $18 - 24$ for figures.

Use the command

```
\begin{figure*}[t] ... \end{figure*}
```

to print double column figures.

### 3.3 Tables are important

You may want to use some online latex table generators like `https://www.tablesgenerator.com/`. Below are some examples.

## 4 Conclusion

Something about the problems of the method you used and give hints on how to solve them.

**Table 1:** *Example table*

| Name | | |
|---|---|---|
| First Name | Last Name | Grade |
| John | Doe | 7.5 |
| Richard | Miles | 5 |

# APPENDIX

You can also directly print your source code using the command shown below.

```
# -*- coding: utf-8 -*-
"""
Created on Mon Apr  6 12:33:44 2020

@author: hongh
"""

import numpy as np
from matplotlib import pyplot as plt

fig = plt.figure()
x = np.linspace(0, 500, 500)
y_1 = np.log(x)
std_y_1 = 0.02 *x
plt.plot(x, y_1, color = 'b', alpha = 0.6, label='method 1')
plt.fill_between(x, y_1-std_y_1, y_1+std_y_1 ,color = 'b', alpha = 0.1) ##539caf

y_2 = x*0.1
std_y_2 = 0.01 *x
plt.plot(x, y_2, color = 'r', alpha = 0.6, label='method 2')
plt.fill_between(x, y_2-std_y_2, y_2+std_y_2 ,color = 'r', alpha = 0.1) ##539caf


#pl.title('Episodic spillage average')
plt.xlabel('training episodes')
plt.ylabel('epsodic reward')
plt.legend(loc='upper left')
plt.show()

fig.savefig("example plot.svg", format="svg")
```

# Bibliography

Bishop, Christopher M (2006). *Pattern recognition and machine learning*. springer.

Murphy, Kevin P (2012). *Machine learning: a probabilistic perspective*. MIT press.

Williams, Christopher KI and Carl Edward Rasmussen (2006). *Gaussian processes for machine learning*. Vol. 2. 3. MIT press Cambridge, MA.