

## Lab Information

### 1 Information about Python

It is easy to handle vector and matrix operations in Python (via numpy).

#### List of Python commands

Write the program using any text editor (e.g. emacs), and save in a file with extension “.py”, e.g. “PellesOwnSimplexmethodNr1.py”. (Note that Unix distinguishes between uppercase and lowercase letters.)

The file must first contain `from numpy import *`, to be able to use numpy. Observe that indices for vectors and matrices normally start from 0 (not 1) in Python.

Expected result	Python (numpy)
Scalar product of two vectors $a$ and $b$ .	<code>dot(a,b)</code>
Product of matrix $A$ and vector $x$ , i.e. $Ax$ .	<code>dot(A,x)</code>
Transpose of matrix $A$ , i.e. $A^T$ .	<code>A.T</code>
Compute inverse $B^{-1}$ .	<code>linalg.inv(B)</code>
Solve $x$ from $Bx = b$ .	<code>linalg.solve(B,b)</code>
Compute $A^T y$ .	<code>dot(A.T,y)</code>
Component-wise $a * b$ , $a/b$ .	<code>a*b, a/b</code>
Find minimum of the vector $x$ .	<code>min(x)</code>
Find index of the minimum element of $x$ .	<code>argmin(x)</code>
Indices of particular elements in the vector $x$ .	<code>nonzero(x&gt;0.5)</code>
Number of rows, $m$ , and columns, $n$ , in $A$ .	<code>[m,n]=shape(A)</code>
Create $m \times n$ matrix with zero elements.	<code>zeros((m,n))</code>
Create $m \times m$ identity matrix.	<code>eye(m)</code>
The norm of the difference between vectors $x$ and $y$ .	<code>linalg.norm(x-y)</code>
The vector (1,2,3,4,5,6,7).	<code>range(1,7)</code>
The columns in $A$ with the indices $t$ .	<code>A[:,t]</code>
Display 'text' on the screen.	<code>print('text')</code>
Display value of $z$ on the screen.	<code>print('z = '+repr(z))</code>
Display values of vector $x$ on the screen.	<code>print('x: ', '+', '.join(map(str,x)))</code>
Save time in $t$ . (Use difference between after and before.)	<code>t=time.time()</code>
Repeat for $j = 1 \dots n$ .	<code>for jin range(1,n)</code>
Extract those values in vector $a$ that are not in vector $b$ (the result is sorted).	<code>setdiff1d(a,b)</code>
While-clause.	<pre>while e &gt; 0:     e = e - 1</pre>
If-clause.	<pre>if i == j:     a[i,j] = 2 elseif abs[i-j] == 1:     a[i,j] = -1 else:     a[i,j] = 0 end</pre>

In order to read file name and load data from files, see the file “lp\_init.py”. It is run with the command `python lp_init.py datafilename`.