User's manual
for
non-negative matrix factorization program

December 9, 2008

Contents

1 Content NMF Algorithm CD

CD of *NMF Alogrithm* program has very simple and easy understandable directory structure:

CD\Install
Consits of installable files to allow you to install *NMF Algorithm* on your computer.

CD\Ladybugs
Consits of all analyses and other materials required for development of this application.

CD\Sourceecode
Consists of all source codes in programming language **C#**.

CD\Sourcecode\Documentation
Consits of programming documentation in **HTML** format and **pdf** format.

C\User Documentation
Consits of user documentation file – file you are reading right now.

2 Installation

To begin the installation you need to execute file ***SetupNMFWizard.msi*** stored in install directory ***CD\Install***

2.1 Prepare Installation

Figure 1: *Installation - begin*

- ***Browse*** button allows you to specify destination of installed program.
- ***Disk Cost...*** button shows you how much free space you have in your computer
- To allow all users use installed program on your computer check ***Everyone***. To use only by current account, check ***Just me***.
- If all values are adjusted you can click ***Next>*** button to continue further in installation wizard.

2.2 Installation progress

Next step of installation process is to copy program files into folder specified in previous steps.

Figure 2: *Installation - progress*

- You can cancel installation in this step clicking the ***Cancel*** button.

2.3 Finish installation

After copying all program files the installation is completed.

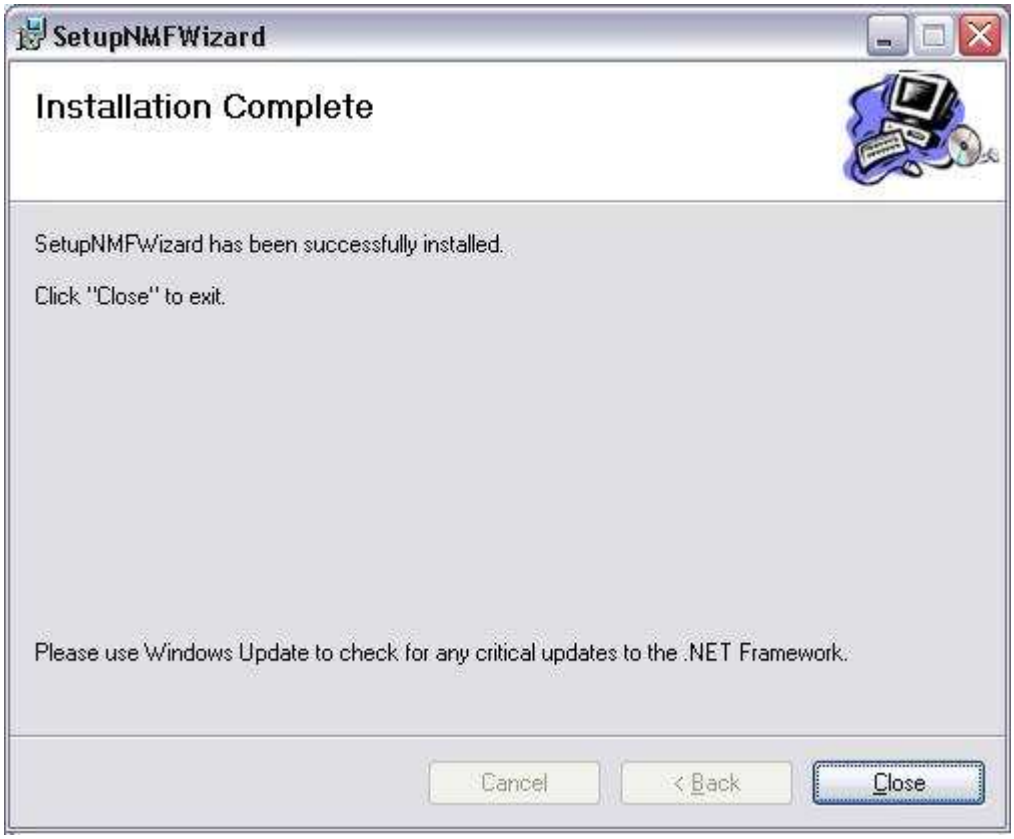

Figure 3: *Installation - finish*

- You can obtain an notice to update your Windows ***.NET Framework*** necessary for correct application running.
- Press the ***Close*** button to finish installation.

3 Running application

The **NMF Algorithm** application allows you to compute two matrices from one input matrix. For this computing is used approximative non-negative matrix factorization algorithm with accuracy of 0.000001.

Next feature of this program is ability to multiply two computed matrices and obtain again the input matrix (multipled matrix can slightly differ because the NMF algorithm is only approximative).

3.1 Compute NMF

First tab allows you to perform NMF algorithm on matrix.

3.1.1 Program settings

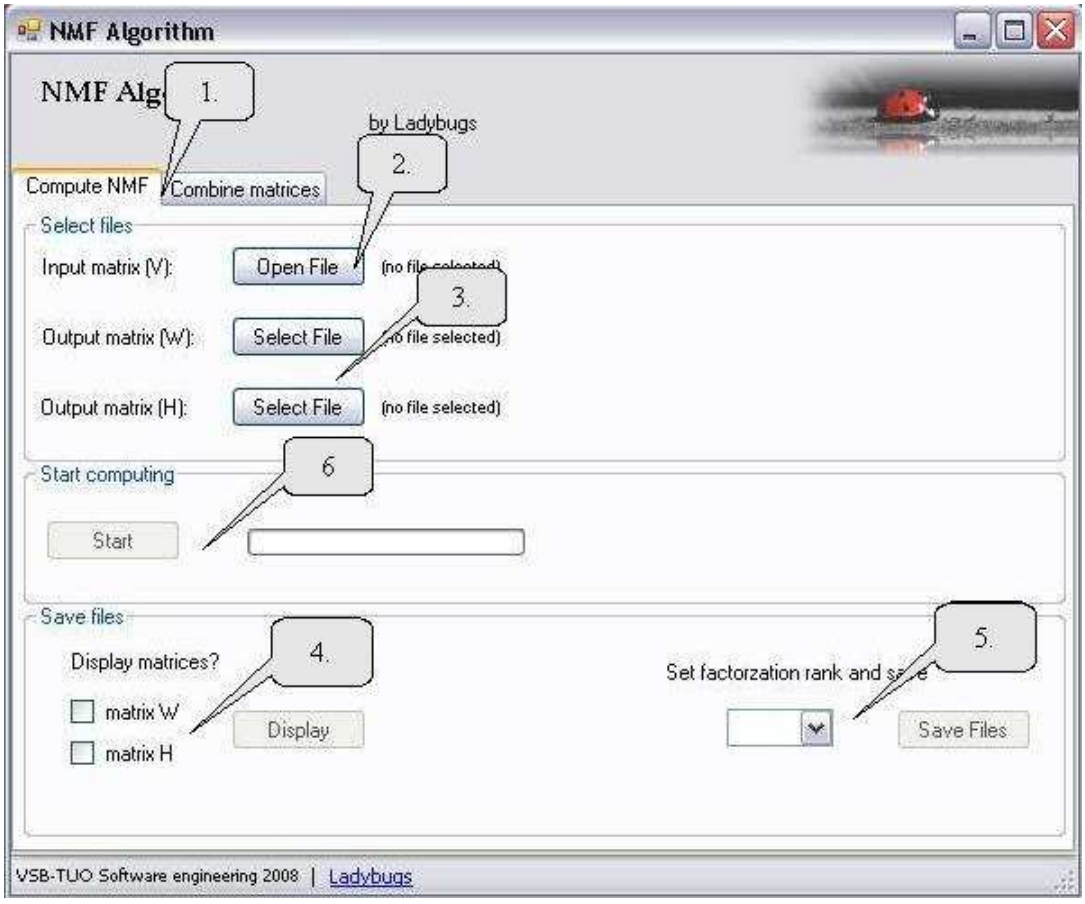

Figure 4: *Performing NMF algorithm - settings*

1. Select first tab for performing NMF algorithm.
2. Specify input file name with matrix stored in.
3. Specify output file names for two matrices created by NMF algorithm.
4. Before choosing value of factorization rank, you can display computed matrices to decide which part of them you require.
   Check matrix you want and click ***Display*** button to toggle its visibility.
5. Choose value of factorization rank from offered numbers.
6. Click ***Start*** button to perform NMF algorithm onto input matrix.

3.1.2 Functionality exhibit

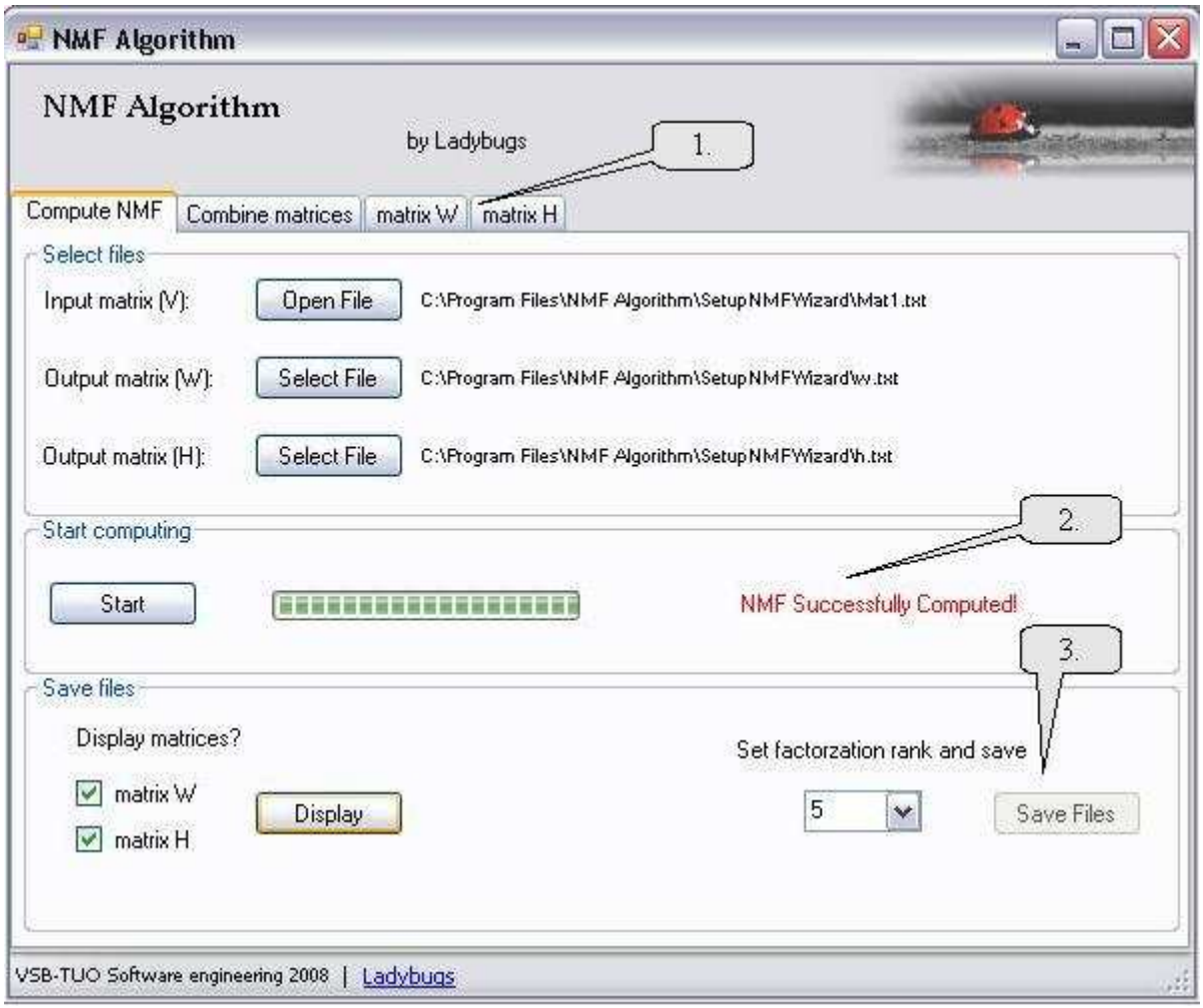

Figure 5: *Performing NMF algorithm - exhibit*

1. After clicking ***Display*** button two new tabs containing computed matrices are displayed
2. You will be noticed about result of performing NMF algorithm. If no error occured message *NMF Successfully Computed!* will be displayed.
3. By clicking ***Save files*** button, you save results into files specified above.

3.2 Multiplying computed matrices

Second tab allows you to combine two matrices.

3.2.1 Program settings

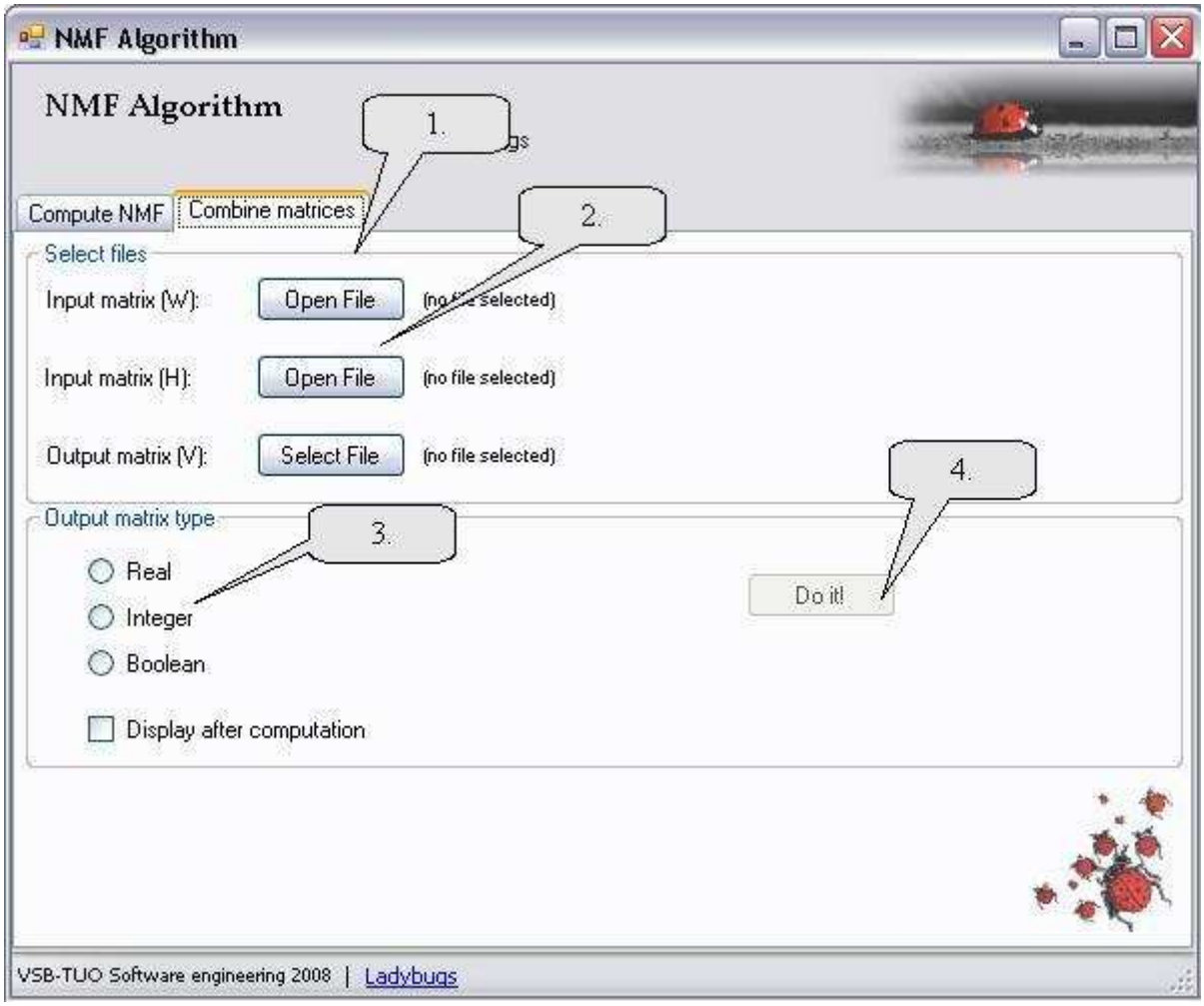

Figure 6: *Multiplying computed matrices - settings*

1. In *Select files* group you choose input matrices and output file to store combined matrix.

2. *Input matrix (W)* is matrix W computed by NMF algorithm
   Input matrix (H) is matrix H computed by NMF algorithm
   Output matrix (V) is matrix created as result of multiplication of previous thow matrices

3. Before multiplying, you can choose type of result. Alowed types are:
    - *Real number* result will be put into matrix of real numbers
    - *Boolean number* result will be put into matrix of integer numbers (rounded reals)
    - *Integer number* result will be put into matrix of boolean numbers (number smaller then 0.5 wil be set to 0 bigger to 1)
4. Clicking ***Do it!*** button you will do all work described above - multiply matrices, set result type and save into output file.

3.3 Multiplication of computed matrices

Second tab allows you to combine two matrices.

3.3.1 Multiplycation exhibit

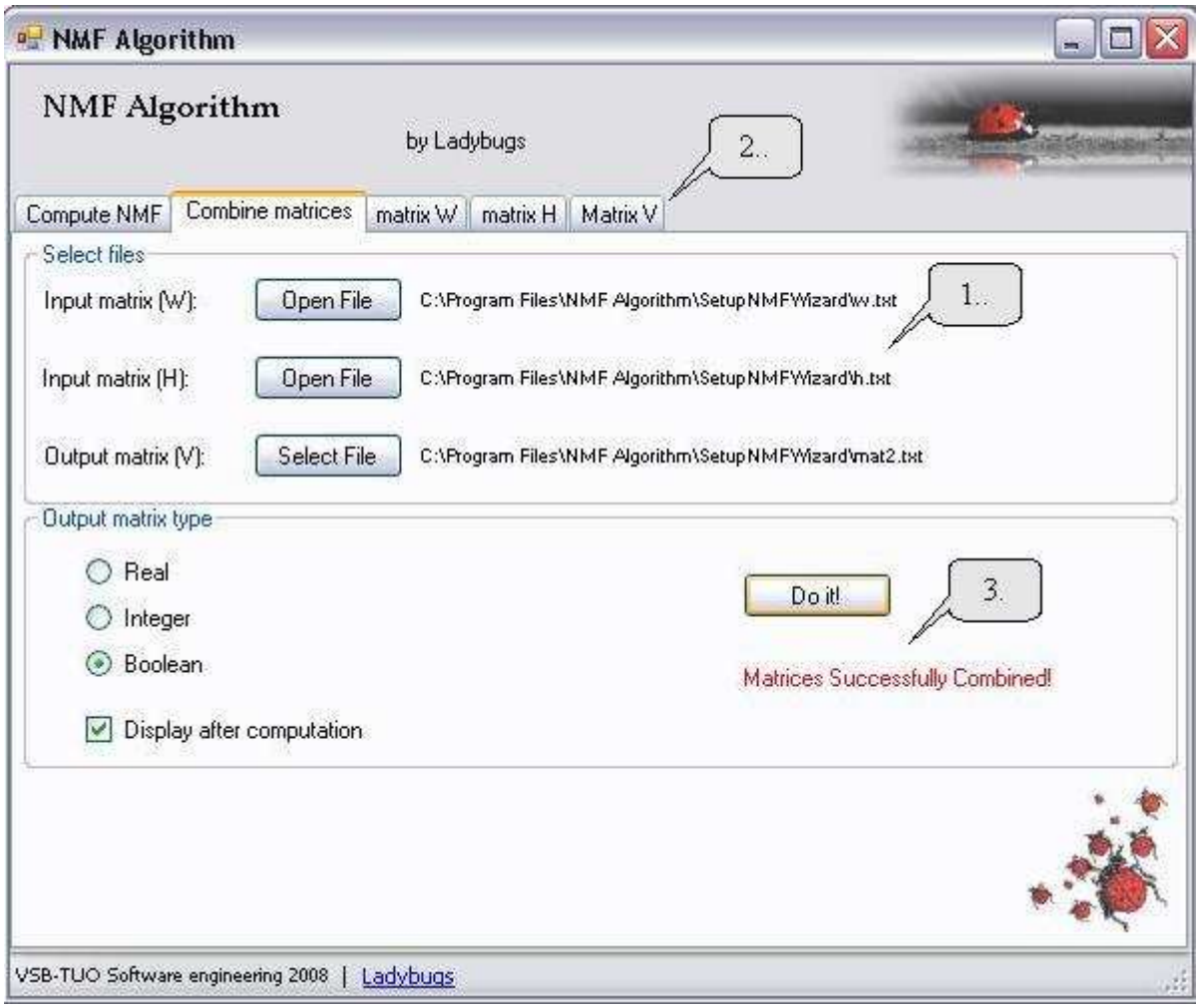

Figure 7: *Multiplying computed matrices - exhibit*

1. When you select file name, its full path is displayed.
2. After computation you can display result of this operation in next tab.
3. If no errors occured while computing, message *Matrices Successfully Combined!* will be displayed.

4 About Program

When you click the blue link *Ladybugs* label an informative window will be displayed.

Figure 8: *Informative program window*