Lab 3 - due 23 April 2017

Your Name

18. aprill 2017. a.
References in your solutions

Please add references to any external material that you base your answers on.

Typesetting

Please put your answers in a LaTeX document and submit both a pdf and the LaTeX source. Try to keep a similar template to the one given. You may find it helpful to use sharelatex or install a LaTeX distribution and editor, such as texworks. Some documentation on LaTeX can be found at https://en.wikibooks.org/wiki/LaTeX.

Study material

- Neos Guide
  https://neos-guide.org/Optimization-Guide

- Chapter 7 and sections 13.1 and 13.2 of of Quarteroni, Sacco and Saleri Numerical Mathematics
  Springer (2010)

- Perona P. and Malik J. “Scale space and edge detection using anisotropic diffusion” IEEE

- Kutz, JN Data-Driven Modeling and Scientific Computation Chapters 5 and 8.

- Krishnamurthy J.S., Finding Analogies in Semantic Networks using the Singular Value

- Chapter 10 of Shapira Y., Solving PDEs in C++ SIAM (2006)

- LaTeX
  https://en.wikibooks.org/wiki/LaTeX

Optimization

**Homework question 1**

a) Write a program which uses the Nelder-Mead method to find the minimum of the Rosenbruck function.

ANSWER

COMMENT

GRADE

b) Try out your program for the Nelder-Mead method on the function

\[ f(x, y) = x^2 + ((y - 1)^2 + 1) \times (y + 1)^2 \]

How does the final result depend on the starting point?

ANSWER

COMMENT

GRADE
c) What other optimization strategies might you use to find the minimum of

\[ f(x, y) = x^2 + ((y - 1)^2 + 1) \times (y + 1)^2 \]?

ANSWER
COMMENT
GRADE

d) What is Dakota and where might you use it? Are there any other similar packages to Dakota? ANSWER
COMMENT
GRADE

e) Summarize the information available at https://neos-guide.org/Optimization-Guide?
ANSWER
COMMENT
GRADE
SVD again

**Homework question 2**

   ANSWER
   COMMENT
   GRADE

b) Try out one of the tutorial examples associated to DIVSI2[1].
   ANSWER
   COMMENT
   GRADE
Image processing

**Homework question 3**

a) What is the heat equation and how may it be applied to image processing?
   ANSWER
   COMMENT
   GRADE

b) Modify the example heat equation program (or write your own) to do image segmentation. How well does it work on an image of your choice?
   ANSWER
   COMMENT
   GRADE
Kirjandus

[8] LaTeX website http://www.latex-project.org/