Visual Data Analytics – Winter Term 2022/23

Practical Exercise

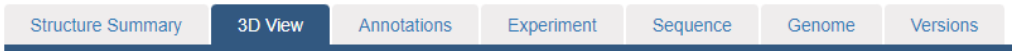
(due by 31 Jan 2023)

In the practical exercise, you will gain practical experience with different visualization tools such as **ParaView**, **ImageVis3D**, or **Tableau Desktop**. The exercise can be performed at any computer that is equipped with a reasonable graphics card. For the second part of the exercise, you can choose between ImageVis3D and Tableau Desktop.

The practical exercise is not mandatory. **However**, you can obtain a **grade-bonus of 0.3** on a successfully passed exam if the practical exercise has been passed (this also counts for the repetition exam). Also, there can be **questions** about ParaView, ImageVis3D, and Tableau **at the exam** (ImageVis3D and Tableau will also be shown during the lecture)!

In the first part of the exercise, you download and install **ParaView** (www.paraview.org), an open-source application supporting scientific data visualization. Once you have successfully installed the tool, you should visualize several data sets, which are given in different data formats. You should use different visualization techniques in ParaView, including *clipping planes, transfer functions, color tables*, and *iso-surfaces*. In particular:

a) Download the VisHuman Head from the course website and visualize it using direct volume rendering. Use a transfer function to assign different colors and transparencies to different structures in the data sets.
b) Go to http://graphics.stanford.edu/data/3Dscanrep/, download the **Asian Dragon** and visualize it with **ParaView**. Find out what kind of information is stored in the data file.
c) Create or download (from whatever source) an arbitrary vector data file. Visualize this data using **ParaView** via particle tracing and streamlines. If you do not find a suitable data set, you find some links at the course website in Moodle.
d) Search the RCSB protein data bank at www.rcsb.org and download some .pdb files. Visualize them using **ParaView** and compare the result with the online 3D viewer plugin, which is available in a separate tab for each structure.



In the second part of the exercise, you can **choose between** ImageVis3D and Tableau Desktop:

Option 1) With this option, you are supposed to download and install **ImageVis3D** (www.sci.utah.edu/software/imagevis3d.html), an open-source program supporting hardware-accelerated direct volume rendering. Once you have successfully installed the tool on your computer, you should visualize the four data sets we have made available for you on the exercise website (C60 Molecule, Engine, Piggy Bank, and VisHuman Head). Your task is to explore the content in these data sets by loading them into **ImageVis3D** and by using various volume rendering techniques to visualize this content. You should use *direct volume rendering*, *iso-surface rendering*, and the *clear-view mode*, and you should manipulate the *color transfer function* to assign different colors and transparencies to different structures in the data sets. You can also investigate the interior of certain structures by using *clipping planes*.

Option 2) As an alternative to ImageVis3D, you can do the exercise in **Tableau Desktop**, a commercial software for business intelligence that allows users to explore and understand data using visual dashboards. There is a 14-day trial license, and we have additional 400 student licenses available (www.tableau.com/tft/activation, product key will be sent in a separate email). Load the Superstore Sales data set that comes with Tableau and design dashboards that answers the following analysis questions:

a) Are US states with similar values for total sales also geographically close together?
b) Do states that are geographically close show a similar development of sales values over time?
c) How are profit and sales correlated in different US cities?
d) How do sales and profit in the cities of Florida compare to cities from other US states? Hint: you can use brushing in different views for this and other tasks.

Your solution in Tableau Desktop should use multiple views in a dashboard, which are linked via *filtering* or *highlighting* (Dashboard → Actions → Add action). You should use *geographic maps, function graphs*, and *scatter plots* for answering the analysis questions.

Hand-in: Write a 3-5-page summary including images of the visualizations you have created, in which you briefly describe what you have done and what kind of data you have visualized. Send the summary report via Moodle. The deadline for sending your reports is **31 January 2023**.