

APPROVED BY

Director of Institute of Cybernetics

 / D. M. Sonkin

## Data Visualization

**Field of Study:** Big Data

**Programme name:** 09.04.04 Software Engineering

**Level of Study:** Master Degree Programme

**Year of admission:** 2020

**Semester, year:** 3, 2

**ECTS:** 5

**Total Hours:** 180

**Contact Hours:** 64

- **Lectures:** 32
- **Labs:** 32
- **Practical experience:** 0


**Assessment:** exam, programming project

**Department:** Department of Software Engineering

**Head of Department**

 / V.S. Sherstnev

**Instructor(s)**

 / Cherdyntsev E.S.

## Data Visualization

### Course Overview

<b>Course Objectives</b>	The goal of this course is to introduce students to data visualization including both the principles and techniques. Students will learn the value of visualization, specific techniques in information visualization and scientific visualization, and how understand how to best leverage visualization methods.
<b>Learning Outcomes</b>	<p>After completing this course, the students should:</p> <ul style="list-style-type: none"> <li>• understand the evolution of the data visualization from its early beginnings as text only, to text and 2D images, to the emerging rich digital media environment of text, 2D images, 3D graphics, animations, interactive visualizations and virtual environments;</li> <li>• understand the existing visualization paradigms and perceptual issues;</li> <li>• understand application areas of data visualization technology, such as e-commerce, scientific visualization, data mining and virtual worlds;</li> <li>• be familiar with existing data visualization techniques, authoring and validation tools;</li> <li>• have built a data visualization application using available technologies and/or visualization tools; understand evaluation techniques for successful design and development of efficient and effective data visualization applications.</li> </ul>
<b>Course Outline</b>	The course consists of 16 lectures and 16 labs covering the following main topics: Introduction to Data Visualization; Human Perception and Information Processing; Visualization Foundations; Data Visualization Techniques; Data Visualization Systems.
<b>Prerequisites (if available)</b>	Programming languages (Python), Data Analysis Methods
<b>Course Structure</b>	The course consists of 3 parts. The first part, “Introduction to Data Visualization”, introduces students to data foundations, human perception and information processing, visualization foundations. The second part, “Data Visualization Techniques”, provides an in-depth explanation of visualization techniques for different data types, text and document visualization, interaction concepts and techniques. The third part, “Data Visualization Systems” provides an in-depth explanation of designing effective visualizations, comparing and evaluating visualization techniques, visualization systems, and research directions in visualization.
<b>Facilities and Equipment</b>	<p>3 servers with Big Data processing software (HP DL385p Gen8, 2 processors 6320 (2.8GHz-16MB) 8-Core Processor Option Kit, 6 Memory modules 8GB 2Rx4 PC3L-10600R-9 , RAID controller P420i (512MB) FBWC RAID 0,1,1+0,5,5+0, 11 HDD 500GB SC 6G 7.2K LFF SATA HotPlug Midline Drive 1y war, Flash drive 120GB 6G SATA VE 3.5in SCC EV G1 SSD)</p> <p>Hadoop cluster (Pig, Hive, Spark)</p>
<b>Grading Policy</b>	In accordance with TPU rating system we use:

	<ul style="list-style-type: none"> <li>• Current assessment which is performed on a regular basis during the semester by scoring the quality of mastering of theoretical material and the results of practical activities (labs). Max score for current assessment is 60 points, min – 30 points.</li> <li>• Course final assessment (exam) is performed at the end of the semester. Max score for course final assessment is 40 points, min – 25 points.</li> <li>• Programming project</li> </ul> <p>The final rating is determined by summing the points of the current assessment during the semester and exam (credit test) scores at the end of the semester. Maximum overall rating corresponds to 100 points, min pass score is 55 points.</p>
<b>Course Policy</b>	Class attendance will be taken into consideration when evaluating students' participation in the course.
<b>Teaching Aids and Resources</b>	<p>Compulsory Readings:</p> <ol style="list-style-type: none"> <li>1. M. Ward, G. Grinstein, and D. Keim. Interactive Data Visualization: Foundations, Techniques, and Applications, AK Peters Ltd, 2010. ISBN 978-1-56881-473-5.</li> <li>2. Tamara Munzner. Visualization Analysis and Design. A K Peters Visualization Series, CRC Press, 2014.</li> </ol> <p>Additional Readings:</p> <ol style="list-style-type: none"> <li>3. Scott Murray Interactive Data Visualization for the Web (<a href="http://chimera.labs.oreilly.com/books/1230000000345">http://chimera.labs.oreilly.com/books/1230000000345</a>)</li> </ol>
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