Body of Knowledge for Visual Analytics Education

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ABSTRACT

Our workshop is designed to develop and discuss with experts a body of knowledge for Visual Analytics education with the goal of providing a basis for university curricula with particular focus on postgraduate education. The outcome of our workshop will be summarized in a white paper, including recommendations for further development of (postgraduate) Visual Analytics education.

KEYWORDS: Visual Analytics, Education, Visualization, Data Analysis

INDEX TERMS: K.3.2 [Computers and Education]: Computer and Information Science Education – Curriculum; H.1.2 [Models and Principles]: User/Machine Systems – Human information processing; H.2.8 [Database Management]: Database Applications – Data mining; I.3.6 [Computer Graphics]: Methodology and Techniques – Interaction techniques

1 ORGANIZERS

Alexander Schratt is scientific researcher and coordinator for curricula development and teaching at the Department of Information & Knowledge Engineering (ike) at Danube University Krems. He studied Cartography and Geoinformation at the University of Vienna, Department of Geography and Regional Research, where he focused on navigation and orientation within image-based VR scenes as well as on geographic 2D & 3D animation.

Wolfgang Aigner is scientific researcher at the Department of Information and Knowledge Engineering (ike), Danube University Krems, and lecturer at Vienna University of Technology, Austria. He received his PhD in computer science from Vienna University of Technology in March 2006 and his main research interests include Visual Analytics, Information Visualization, Human-Computer Interaction (HCI), and User-Centered Design.

Alessio Bertone is scientific researcher at the Department of Information and Knowledge Engineering (ike), Danube University Krems, Austria. He is PhD candidate at Vienna University of Technology and holds an MSc in Computer Science from University of Genoa, Italy. His main research interests include Visual Analytics, Information Visualization, Temporal Data Mining, Multi-relational Data Mining, and Semantic Web.

Silvia Miksch is full professor and head of the Department of Information and Knowledge Engineering (ike), Danube University Krems, Austria. Since 1998, she has been the head of the Information and Knowledge Engineering Research Group (IEG), Institute of Software Technology and Interactive Systems (ISIS), Vienna University of Technology. Her main research interests include Information Visualization and Visual Analytics (in particular, Focus & Context and Interaction techniques), Plan Management, and evaluation of knowledge-based systems in real-world environments (Health Care).

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2 GOALS

Our workshop is designed to:

- Discuss with experts a draft for a body of knowledge to serve as a basis for creating university curricula for Visual Analytics with particular focus on postgraduate education
- Learn about teaching activities concerning Visual Analytics at other universities and their associated experiences
- Discuss the relevant topics for a (postgraduate) MSc curriculum of Visual Analytics
- Derive a body of knowledge which covers the most important parts of a curriculum about Visual Analytics that can be used/adapted for different other courses
- Write a white paper about the experiences in teaching Visual Analytics and recommendations for further development of (postgraduate) Visual Analytics education

Our draft body of knowledge for postgraduate Visual Analytics education focuses on persons who prepare materials for decision makers and developers of decision supporting systems of different data- and information-intensive economic and scientific domains (e.g., business intelligence, market analysis, strategic controlling, security and risk management, health care and biotechnology, automotive industry, environmental and climate research, as well as other disciplines of natural, social, and economic sciences). A key feature is the interdisciplinary approach. It is also influenced by the Visual Analytics taxonomy that was presented by James Foley (Georgia Tech) et al. [1] at the IEEE VAST 2006 Panel on Visual Analytics Education, the Research and Development Agenda for Visual Analytics [2], and the IEEE VIS 2006 workshop on Visualization Education for Non-Technical Majors [3].

The draft body of knowledge for postgraduate Visual Analytics education is currently structured as follows:

Introduction and Overview to Visual Analytics
- *Overview of Application Domains*
- *Visual Analytics Science and Technology*

Perception, Cognitive Processes and Human Concerns
- *Perception*
- *Cognitive Processes and Human Concerns*
- *Case Studies on Users and Tasks*

Analytical Reasoning
- *Models of Analytical Reasoning Processes*
- *Decision Theory and Uncertainty Management*
- *Collaborative Reasoning*

Data, Information, and Knowledge
Data Representations and Modelling
Information, Knowledge Representation and Management
Syntax and Semantics: Terminologies and Ontologies
Visualization and Interaction
Introduction to Visualization
Visual Design Principles
Visualization Methods and Techniques
Interaction and Active Discourse
Concepts of the Visualization Process
Applications and Case Studies
Statistical and Analytical Methods
Statistical Methods (EDA, Statistical Computing, etc.)
Knowledge Discovery & Data Mining
Machine Learning
Applications and Case Studies
Development, Evaluation and Usability
Design and Development of Visual Analytics Applications
User-Centered Design
Usability Engineering & Evaluation Methods
Production, Presentation and Dissemination
Visual Communication
Production Technologies and Management
Dissemination Contexts and Dynamics
Privacy, Security, and Legal Aspects
Systems, Tools, and Applications
Software and Hardware for Visual Analytics Systems
Toolkits and Libraries
Scientific Working, Writing and Presentation
Scientific Working
Scientific Writing and Presentation

3 PLANNED ACTIVITIES

The workshop is designed to discuss the described body of knowledge and its scientific approach with experts from several disciplines in the fields of Visual Analytics, Visualization (SciVis, InfoVis, VolVis, GIS, etc.) and Data Analysis, ranging from sciences to engineering and business. Participants will be encouraged to provide input and recommendations for further development and the future of (postgraduate) Visual Analytics education. Time would be allotted for any proposed presentations and follow-up discussions. A member of the workshop organizers would moderate the sessions and manage the schedule in order to ensure there is enough time for discussion after each presentation. A workshop organizer would take the minutes of the workshop as well. The session protocol would serve as a basis for the white paper.

4 LENGTH

The length of the workshop would be one half day.

5 PARTICIPANTS

We recommend 10 to 20 participants for the workshop. They could be scientists, educators or students in the fields of Visualization, Data Analysis or Visual Analytics. Employees of the Visual Analytics domain, who prepare materials for decision makers, as well as developers of decision supporting systems, are also welcome. It would be advantageous, if participants have a technical background, but this is not mandatory. Persons, who would like to participate, will be selected on the basis of a submitted short article (position statements), where they should express their ideas and conceivability of Visual Analytics education (one page at maximum). This article may also include their experience with and/or attitude towards Visual Analytics in general or may comprise several questions/concerns about our proposed body of knowledge. In this article, participants may also announce short presentations (10 minutes at maximum) on her/his experiences in the area of Visualization, Data Analysis, or Visual Analytics, respectively, to be given during the workshop.

6 FACILITIES

We would prefer a round table set-up and a projection unit for presentations from our laptops. If a projector is not available, handouts will be placed at the participants' disposal at the beginning of the workshop.

7 RESULTS

The follow-up result of the workshop would be a white paper on the participants' recommendations for (postgraduate) Visual Analytics education, including various fields of application – reaching from scientific research to engineering and business. This will be reported during the conference.

8 IMPACT

Our intention is to have the white paper published in an *IEEE Computer Graphics and Applications* "Vis Viewpoints" or "Graphically Speaking" department's forum (although preliminary approval for a publication like that has not yet been granted). The minimum goal is to have the results appear as a technical report at the Department of Information and Knowledge Engineering (ike) of Danube University Krems, co-authored by the workshop participants. In the long run, our plan is to implement the outcome of the workshop in follow-up classes and/or the adaptation of a planned curriculum for a postgraduate Visual Analytics MSc programme "Interactive Visualization and Data Analysis".

REFERENCES

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[3] Holly Rushmeier. *Visualization Education for Non-Technical Majors*. VIS 2006 (Baltimore, Maryland, October 29 – November 3, 2006), IEEE Visualization 2006 Workshop Proposal, 2006.