

## Faculty of Science and Engineering

### Profile report: Visual Computing

- Discipline: Computing Science
- Level: Tenure-track assistant professor with an education profile
- Fte: Full time (0.8-1.0 FTE)

#### 1. Scientific discipline

Visual computing encompasses computing science disciplines that produce or process digital images or 3D models. This includes computer graphics, visualization, image processing, computer vision, geometry modeling and processing, visual perception, and virtual and augmented reality. It is also related to and often includes human-computer interaction, pattern recognition, digital information processing, and machine learning. The core research challenges in visual computing lie in the acquisition, analysis, processing and visualization/rendering of (visual) information.

#### 2. Vacancy

This position is opened by the Board of the Faculty (ref: PT/gl/22/00181) and will be embedded in the Bernoulli Institute for Mathematics, Computer Science and Artificial Intelligence, basic unit Scientific Visualization and Computer Graphics. The criteria and conditions pertaining to the position are described in the document '[Assistant professor with an education profile](#)'.

#### 3. Selection committee (BAC)

Prof. dr. N. Taatgen (chair)	Professor of Artificial Intelligence, Bernoulli Institute Research Director
Prof. dr. J. Kosinka	Associate Professor, Geometric Modeling and Computer Graphics
Prof. dr. A. Lazovik	Programme and Education Director for Computing Science
Prof. Dr. K. Bunte	Associate Professor, Machine Learning for Interdisciplinary Data Analysis
Dr. C. Tursun	Assistant Professor, Visual Perception
Prof. dr. A. C. Telea	Professor of Visual Data Analytics, Utrecht University; External member
Niels Bügel	Student member

#### *HR advisor:*

M. Laning, MSc

#### *Advisors:*

Dr. S. Frey	Assistant Professor, Scientific Big Data Visualization
A.G. Gringhuis, MSc	Policy Officer Bernoulli Institute

#### 4. Area of expertise

As the modern day is more and more characterized by larger and larger amounts of data, visual computing plays an increasingly important role, both in academia as well as industry, and thus it should be included in all educational programmes in computing science and is relevant for many computing science research groups. It strongly contributes to applications such as medical image processing, multimedia systems,

computer-aided design, and the entertainment industry. Visual computing topics are perfectly aligned with the three themes of the Bernoulli Institute: Geometry and its applications; Systems, data and society; and Computing and cognition. Visual computing offers the potential for cross-disciplinary collaboration and applications within these themes, as well as in Dutch top sectors such as Creative Industry.

Given the importance of visual computing and the strongly increasing influx of students to the educational programmes in computing science, the Bernoulli Institute needs to strengthen its teaching activities as well as scientific research in that area. The successful candidate will coordinate and teach basic and advanced courses in the area of visual computing, and supervise BSc/MSc thesis projects on relevant topics. In addition, the position entails coordinating the development of consistent learning tracks in visual computing, spanning the BSc and MSc programmes in computing science at the University of Groningen, including the introduction of novel teaching methods and innovative learning materials.

### **5. Embedding: institute (and base unit)**

The Bernoulli Institute for Mathematics, Computer Science and Artificial Intelligence is part of the Faculty of Science and Engineering (FSE). The profile of the institute centers around modeling, computation, and cognition with a focus on science and technology, keeping a balanced mix of fundamental and applied aspects. The Bernoulli Institute comprises five mathematics research groups, seven computer science groups, and four groups in the field of artificial intelligence. The constituting research groups participate in various national research schools and most of the PhD students are enrolled in an educational programme and take part in other activities offered by these schools. The Bernoulli Institute aims to strengthen the current research portfolio in Mathematics, Computer Science and Artificial Intelligence by expanding both in fundamental areas that have a prominent role in education as well as in directions that are essential for new technological and societal developments.

The Bernoulli Institute has a leading role in the recently established cross-disciplinary research theme on Data Science and Systems Complexity (DSSC) within the Faculty of Mathematics and Natural Sciences. This concerns a research cluster of 60+ researchers in a number of basic disciplines (mathematics, computer science, artificial intelligence, systems & control, engineering, astronomy) and various scientific application domains. The ambition is to understand and solve big data problems by exploiting the joint perspectives from both data science and complexity science. The institute is also heavily involved in the Groningen Cognitive Systems and Materials Center (CogniGron), which is a joint venture between the Bernoulli Institute and the Zernike Institute for Advanced Materials. It comprises researchers from materials science, physics, chemistry, mathematics, computer science and artificial intelligence. The center provides structure, coherence, and visibility for a joint research programme in the direction of cognitive systems and materials.

Visual computing is a broad topic, nowadays far from limited to just graphics and visualization, with influence in many related areas. As such, the Computer Science department has positioned the topic in its Scientific Visualization and Computer Graphics group, which conducts prominent research and education activities in computer graphics, scientific and information visualization, geometric modeling, and visual perception.

Therefore, the successful candidate will be embedded in the Scientific Visualization and Computer Graphics group.

## **6. Local and (inter)national position**

At the national level the Bernoulli Institute participates in the Dutch computer science research schools Advanced School for Computing and Imaging (ASCI), Dutch Research School in Logic (OZSL), the School for Information and Knowledge Systems (SIKS), and the Dutch Research School in Programming and Algorithmics (IPA); the ASCI school being the most relevant for the position. At the international level, the BI is involved in several EU research projects (e.g., Human Brain Project, Smart Homes, Visual Analytics), has established collaborations with major companies (Philips Research, IBM) and technological institutes (Astron, TNO, NLR, ECN), and has cooperation and exchange programmes with many universities (e.g., Rome, Leipzig, Birmingham, Barcelona, Ghent, ESIEE-Paris, Tampere).

In Computer Science, the BI has a strong position (as evidenced by participation in NWO and EU projects, publications in renowned journals and conferences, memberships of editorial boards and program committees, conference chairing, etc.). Its expertise lies in intelligent systems (biologically inspired computational modelling, machine learning, morphological image processing); pervasive middleware and energy distribution infrastructures; architecting of software-intensive systems and object-oriented software design; adaptive information systems, middleware, enterprise, services and cloud computing and autonomous process performance improvement; computer architecture, microarchitecture and reconfigurable computing; data and information visualization, and visual analytics.

At the national level, there are several groups with explicit focus on visual computing, including [Utrecht University](#), [Delft University of Technology](#), and [Eindhoven University of Technology](#). This tenure track position with an education profile will allow us to strengthen our visual computing education, close the existing gap in our educational programmes, and consequently meet the need to deliver up-to-date education to our growing student population.

## **7. Expected contributions to teaching**

The successful candidate is expected to develop new courses and/or contribute to teaching courses in the area of visual computing, including computer graphics, visualization, visual perception, geometry modeling/processing, human computer interaction, and virtual/augmented reality. Several of these courses will come with a basic introductory course at the BSc level and then an advanced continuation in the MSc programme. The candidate is expected to take the role of course coordinator, lecturer, and examiner. Furthermore, the candidate is also expected to supervise BSc and MSc thesis and internship projects in the area of visual computing. Last but not least, the candidate is required to oversee and ensure high quality education in the visual computing cluster, such as by being an active member of the curriculum committee or the programme committee of the computing science programme.

The selected candidate is further expected to contribute to both extending the computing science curriculum with courses, lectures and student projects, as well as to using and developing new teaching methods for computing science education, focusing on the visual computing topics of this position. The candidate will also be required to bridge the gap

between high school education and the expected level of awareness and understanding of visual computing at universities. This may include designing, conducting and assessing various options for raising the awareness of prospective university students in the areas of visual computing, for instance by engaging in educational activities at high schools and introductory events for high school and prospective university students. To foster educational developments, the candidate will apply for grants that support teaching innovation.

#### **8. Expected contributions to research**

The successful candidate is expected to contribute to the ongoing research activities of the Scientific Visualization and Computer Graphics research group with a focus on visual computing topics, such as rendering, geometry processing, and/or human computer interaction. The co-supervision of PhD students will be a concrete mechanism for contributing to the group's research efforts. Additionally, the candidate will carry out research in the field of education and develop new didactic methods used in teaching courses within the visual computing cluster.

#### **9. Expected contributions to the organisation**

The candidate is expected to have an active interest and to provide a positive contribution to the management and organisational tasks of the institute. At the level of FSE, the candidate will contribute to the organisation of the faculty, for example by participating in working groups and committees in the area of education. The candidate will participate in relevant national and international organisations.