Faculty of Science and Engineering

Profile report: Teaching Tenure-Track Assistant Professor in Mathematics or Applied Mathematics with a focus on Interdisciplinary Mathematics Education (Computing Science, Artificial Intelligence, Industrial Engineering & Management and Physics)

- Discipline: Mathematics; Applied Mathematics
- Level: Tenure-track assistant professor
- Focus: Education
- Fte: 0,8-1,0 fte

1. Scientific discipline

The position is created in Mathematics or Applied Mathematics. It can range from abstract fundamental research to very concrete applications with a strong societal relevance. Mathematics both has its own continuing research development and plays a crucial role in every discipline of science and engineering.

2. Vacancy

This position is opened by the Board of the Faculty (PT/gl/22/0338) and will be embedded in the Mathematics-oriented base unit of the Bernoulli Institute that provides the best fit with the actual research profile of the selected candidate. The preferred education focus is on mathematics for Computing Science, Artificial Intelligence, Industrial Engineering & Management and Physics. The position falls within the framework of 'Career Paths in Science and Engineering', which outlines the criteria and timeline for promotion, up to full professor. As the focus domain of the position is education, the criteria of the career path with a focus on education apply. Please see the link for the criteria and conditions.

3. Selection committee (BAC)

The selection committee comprises:

Prof.dr. N.A. Taatgen	Scientific Director Bernoulli Institute, Professor Cognitive Modeling, Chair
Prof.dr.ir. R.W.C.P. Verstappen	Education Director Mathematics, Professor Computational Mathematics
Prof.dr. N.A. Taatgen	Scientific Director Bernoulli Institute, Professor Cognitive Modeling
Prof.dr. J. Top	Department Head Mathematics, Professor Number Theory & Algebraic Geometry
Dr. G.H. Jonker	Programme Director BSc IEM
F.M. Schipper	MSc Student Mathematics, Member Programme Board Mathematics
Prof.dr. A.J. Cabo	Professor in Statistics for Innovation in Education

	Academic director TUD Teaching Academy
Prof.dr. C. Salgado	Associate Professor Arithmetic Geometry

Advisors to the selection committee:

Prof.dr. S. Trenn	Programme Director MSc Math/Applied Math/S&C
Prof.dr. A. Lazovik	Programme Director BSc/MSc Computing Science
M. Laning, MSc	HR advisor
A.G. Gringhuis, MSc	Policy Officer Bernoulli Institute and secretary of the selection committee

4. Area of expertise

Learning mathematics is a critical gateway to many fields of study. BSc students in FSE have to acquire mathematical skills and knowledge to achieve the learning objectives of their degree programme. Currently, over 25 math courses for non-math students are provided by the Mathematics Department of the Bernoulli Institute. This mainly concerns courses in the field of Calculus, Linear Algebra, Statistics and Numerical Mathematics. In FSE mathematics service teaching uses mostly classical methods of knowledge transfer. The primary stages of e-learning and remedial teaching have been introduced successfully and here and there has been experimented with concepts like flipping the classroom to stimulate active participation of students. The classical approach has been effective in the past, but starts to show cracks. With this position it is intended to innovate the teaching of mathematics to non-math students (in science and engineering) as well as to integrate mathematics more strongly in the degree programme to which the mathematics course is provided, thus improving both conceptual and contextual understanding of students. It is therefore a combination of teaching mathematical concepts and learning how to apply them in science and engineering. The position focuses on math courses in the Bachelor's degree programmes in Computing Science, Artificial Intelligence, Industrial Engineering & Management and Physics. Over time, the candidate must be able to teach mathematics in any FSE BSc degree programme.

5. Embedding: institute (and base unit)

The Bernoulli Institute (BI) for Mathematics, Computer Science and Artificial Intelligence is part of the Faculty of Science and Engineering (FSE). The Bernoulli Institute is a vibrant community with an international outlook, that fosters talent in all its research areas and disciplines, and is active in pure and applied science, and (multi)disciplinary research and teaching. BI strives at maintaining a balanced mix of fundamental and applied research. It comprises 15 basic research units, of which 5 are mathematics oriented. The five mathematics-oriented basic units are: 1. Algebra, 2. Computational & Numerical Mathematics, 3. Dynamical Systems, Geometry & Mathematical Physics, 4. Probability & Statistics, and 5. Systems, Control & Optimization. The position will be embedded in one of these five existing basic units of BI, depending on the actual research profile of the selected candidate. The aim is for an equal distribution of assistant professors with an

education profile over the mathematics-oriented base units. Considering the current distribution, candidates for basic units 2, 4 and 5 are given preference if candidates have equivalent qualities. The candidate is expected to have an open eye for research connections to other groups within the Bernoulli Institute.

6. Local and (inter)national position

The research groups of the Bernoulli Institute participate in various national research schools. Most of the PhD students are enrolled in an educational program and take part in a number of activities offered by these schools. BI has a leading role in the cross-disciplinary research theme on Data Science and Systems Complexity (DSSC), and in the Groningen Cognitive Systems and Materials Center (CogniGron) within FSE. The intended candidate will play a central role in teaching math to non-math students, and is expected to cooperate with experts on Science & Engineering Education at FSE, particularly with the Center for Learning and Teaching. Furthermore, cooperation with (math) teachers who are part of the School of Science and Engineering (SSE) is foreseen. Both nationally and internationally, many contacts are possible with groups working on innovations in higher education, particularly interdisciplinary mathematics education. TU Delft, for example, has the Programme of Innovation in Mathematics Education (PRIME) for redesigning mathematics courses for engineers.

7. Expected contributions to teaching

The candidate is expected to be a pioneer as well as a catalyst in improving math courses for non-math students at FSE, and to support staff members of the Bernoulli Institute, as well as associated PhD-students and Teaching Assistants, in improving their education. The candidate is expected to undertake educational projects that improve (interdisciplinary) mathematics education, for instance by improving the activation of students, introducing new learning techniques, increasing conceptual understanding as well as contextual understanding, integrating mathematics into the non-math degree programmes at FSE. The candidate is expected to apply for teaching grants to be able to undertake some of these projects. The teaching duties will consist of courses like Calculus for Computing Science, Linear Algebra for Computing Science, Multivariate Calculus for Computing Science, Calculus for Artificial Intelligence, Linear Algebra for Industrial Engineering & Management, Calculus for Physics.

8. Expected contributions to research

The candidate is expected to conduct research in one of the five existing sub-areas of Mathematics represented in the Bernoulli Institute. As with the previous two TTe positions in mathematics, the precise research profile is not determined in advance. The best candidate (where education and research are weighted in the ratio 2:1) who offers a good addition to existing research is selected. The research should lead to publications

in leading journals. Both (co)-supervision of PhD students and (co)-writing of grant proposals are an important part of the envisioned research activities. Nationally as well as internationally, the candidate is expected to maintain strong connections with other research groups in related areas.

9. Expected contributions to the organization

The candidate is expected to have an active interest and to provide a positive contribution to the management and organizational tasks of the institute. At the level of FSE, the candidate will contribute to the organization 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 organizations.