**Faculty of Science and Engineering**

**Profile report:** Teaching Tenure-Track Assistant Professor in Mathematics or Applied Mathematics

- 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/22/0181) 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 position falls within the framework of 'Career Paths in Science and Engineering', which outlines the criteria and timeline for promotion, up to full professor (see link below). 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:

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| Prof.dr. N.A. Taatgen | Scientific Director Bernoulli Institute,<br>Professor Cognitive Modeling, Chair |
| Prof.dr.ir. R.W.C.P. Verstappen | Education Director Mathematics,<br>Professor Computational Mathematics |
| Prof.dr. J. Top | Department Head Mathematics,<br>Professor Number Theory & Algebraic Geometry |
| Dr. A.E. Sterk | Programme Director BSc Math/Applied Math<br>Assistant Professor Dynamical Systems |
| F.M. Schipper | MSc Student Mathematics,<br>Member Programme Board Mathematics |
| Prof.dr. A.J. Cabo | Professor in Statistics for Innovation in Education<br>Academic director TUD Teaching Academy |
| Prof.dr. C. Salgado | Associate Professor Arithmetic Geometry |

*Advisors to the selection committee:*

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| Prof.dr. T. Müller | Professor Combinatorics and Probability Theory |
| M. Laning, MSc | HR advisor |
| A.G. Gringhuis, MSc | Policy Officer Bernoulli Institute and secretary of the selection committee |

**4. Area of expertise**

Mathematics teaching in the first two years of the Bachelor's degree programmes in Mathematics and Applied Mathematics uses classical methods of knowledge transfer, mostly blackboard-and-chalk lectures and tutorials. The primary stages of e-learning, remedial teaching and learning communities have been introduced successfully and here and there has been experimented with concepts like flipping the classroom. This approach has been effective in the past, but there is definitely room for improvement. The number of first-year students actively participating in lectures and tutorials is decreasing. Active learning aims to shift the use of class time from instructors transmitting information toward students working to understand mathematical concepts, using logical lines of reasoning and applying mathematical concepts and reasonings. A number of universities uses evidence-based teaching strategies that engage BSc students in successful learning mathematics and applied mathematics. This position will contribute to the realization of these new strategies. Secondly, first-year students often see the links between the first-year courses insufficiently. Part of the educational innovation will therefore be focused on strengthening the cohesion between first-year modules. Thirdly, during second- and third-year courses it appears that some of the students do not actively master the required prior knowledge. Verifying prior knowledge and making refreshers thereof is the third part of the desired educational innovation. Finally, this position offers the opportunity to expand the number of courses in the BSc programmes in Mathematics and Applied Mathematics and thus enriches these degree programmes.

**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 in the first two years of the BSc degree programmes in Mathematics and Applied Mathematics, and is expected to cooperate with experts on Science & Engineering Education at FSE, in particular 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. Additionally, the candidate may contribute to Math4All, the Dutch fast-track mathematics teacher training programme for students having a Master's degree in science or engineering. Both nationally and internationally, many contacts are possible with groups working on innovations in mathematics education.

**7. Expected contributions to teaching**

The candidate is expected to be a pioneer as well as a catalyst in improving math courses for first- and second-year students in Mathematics and Applied Mathematics, 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 mathematics education, for instance by improving the activation of students, introducing new learning techniques to increase students conceptual understanding as well as mathematical reasoning. The candidate is expected to apply for teaching grants to be able to undertake some of these projects. The teaching duties will include courses in the first two years of the Bachelor's degree programmes in Mathematics and Applied Mathematics.

**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.