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Membership of Academic Societies:
MSJ (Mathematical Society of Japan)

Research Interest:

- Number theory (modular forms, (various variants of) multiple zeta values, q-analogues, Combinatorial Hopf algebras)
- Computer Science (machine learning, scientific computing)

Research Summary:

My research primarily focuses on the intersection of modular forms and the various aspects of q-analogues of multiple zeta values, along with their connections to other areas in mathematics and theoretical physics. I primarily employ techniques from number theory, modular forms theory, and combinatorics to study these objects. My research approach often involves observations and intensive computational experiments using tools such as PARI/GP, Mathematica, and Sage.

Multiple zeta values are natural generalizations of the Riemann zeta values. Due to their presence in various fields of mathematics and physics, these real numbers are particularly interesting. My research explores different facets of these numbers, with a keen interest in their relationships to other mathematical areas. I am especially focused on their connection to modular forms, which are holomorphic functions that occur in several aspects of number theory. A natural link between these domains is provided by multiple Eisenstein series and q-analogues of multiple zeta values. Both are understood as holomorphic functions (or formal power series) that mimic multiple zeta values in certain respects and extend the concept of modular forms. This study inevitably leads to the exploration of combinatorial Hopf algebras.

In addition to classical multiple zeta values, my interest also extends to their variants, including finite multiple zeta values, Schur multiple zeta values, and multiple zeta values of higher levels.

In my recent work, I have been particularly focused on the formal aspects of these objects, introducing the notion of formal multiple Eisenstein series. This concept extends formal multiple zeta values and offers a new perspective on the theory of modular forms.

Major Publications:

[1] H. Bachmann: Interpolated Schur multiple zeta values, J. Aust. Math. Soc. **104**, 289–307.
[2] H. Bachmann, A. Burmester: Combinatorial multiple Eisenstein series, Res. Math. Sci. **10**, 35.
[3] H. Bachmann, J.W. van Ittersum: Partitions, Multiple Zeta Values and the q-bracket, Selecta Math. **30**:3, 46 p.
[4] H. Bachmann, Y. Takeyama, K. Tasaka: Cyclotomic analogues of finite multiple zeta values, Compositio Math. **154** (12), 2701–2721.
[5] H. Bachmann, K. Tasaka: The double shuffle relations for multiple Eisenstein series, Nagoya Math. J. **230**, 180–212.

Education and Appointments:

2022 - Now	Associate Professor, Nagoya University.
2019 - 2022	Designated Associate Professor (G30), Nagoya University.
2018 - 2019	YLC Assistant Professor, IAR, Nagoya University.
2017 - 2018	Guest Scientist, MPIM, Bonn.
2016 - 2017	JSPS Postdoctoral fellow, Nagoya University.
2016	Ph.D from University of Hamburg.

Message to Prospective Students:

I highly welcome students of any level. In my research area there are various open problems suitable for Bachelor, Master and Doctor course. Prospective students should have a look at my publications (`https://www.henrikbachmann.com/publications.html`) or at my talk slides (`https://www.henrikbachmann.com/talkslides--posters.html`) to see which paper or talk might interest them. We could then together decide on a topic which interests the student the most. Another source of inspiration could also be Michael Hoffman's website of references on multiple zeta values `http://www.usna.edu/Users/math/meh/biblio.html`.

Students who are not interested in going into the direction of (any type of) multiple zeta values should contact me. I am open to supervise projects in the area of number theory, combinatorics, algebra, or computer science as long as they are not too far away from my personal research.