

Farhad Babaee

School of Mathematics
University of Bristol
Fry Building, 2.13
Woodland Road
BRISTOL, BS8 1UG

January 31, 2024

Dear Professor MacLagan,

It is my pleasure to write this letter of recommendation in support of Dr. James Maxwell's application for the Research Fellowship (108603-1223) at the University of Warwick.

My acquaintance with James began when he expressed interest in applying for a Heilbronn Postdoctoral Research Fellowship at the University of Bristol. Subsequently, he assumed his position in September 2022, immediately after completing his PhD. Since then, I have had many fruitful discussions with him regarding mathematics and the organisation of seminars and conferences at Bristol.

James has conducted various research works in the fields of tropical geometry, general convexity theory, matroid theory, and recently, rigidity theory. In his PhD thesis, James focused on a fundamental result in tropical geometry known as Kapranov's theorem. This theorem asserts that tropicalising a polynomial and computing the corner set yields the same tropical variety as computing the algebraic variety and then tropicalising the algebraic variety. James' main result extended Kapranov's theorem over hyperfields. Subsequently, his single-authored article was accepted by the Journal of Algebra.

James also has two preprints with Dr. Ben Smith, a postdoctoral fellow at the University of Manchester, where they establish basic theorems about convexity over hyperfields. In another article, they establish the Fundamental Theorem of tropical geometry over hyperfields. I expect these works to be published in reputable journals.

Since arriving in Bristol, James has been actively developing his network and collaborations. For instance, he raised a question about the relationship between rigidity theory and tropical geometry, and this question has led to a joint work-in-progress with Dr. Sean Dewar, a postdoctoral fellow in Bristol, and myself. We expect this work to appear on arXiv shortly.

In another work-in-progress, James and his former PhD supervisor, Prof. Jeffrey Giansiracusa, University of Durham, plan to utilise *tropical modification*, akin to a birational morphism in algebraic geometry, to establish equivalences between the realisable class of tropical varieties. This approach can be understood as

reminiscent of the minimal model programme in algebraic geometry for tropical varieties. It is worth noting that understanding the properties of tropical modification and how this operation preserves the Hodge theoretic properties of matroids was also the focus of June Huh and his collaborators in several groundbreaking articles.

In addition to organising and co-organising several reading seminars, conferences, and focused research groups which have been beneficial for researchers and in particular postgraduate students in Bristol, James has taught a course at the Taught Course Centre on matroid theory, attracting considerable interest from postgraduate students in Bristol and across the UK. Through teaching matroid theory, James has shared his knowledge and deepened his expertise in the field.

In conclusion, I believe that Dr. James Maxwell's projects are promising and together with his organisational and communication skills, his presence is beneficial for every department. Another postdoctoral position under your mentorship can provide him the opportunity to accomplish and expand his projects, and therefore I highly recommend him for this position.

Thank you for your time and consideration. If you have any questions, please do not hesitate to contact me.

Sincerely yours,



Farhad Babaee
Lecturer in Pure Mathematics