

Institute for Mathematical Innovation

Setting up a KE institute

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What's IMI?

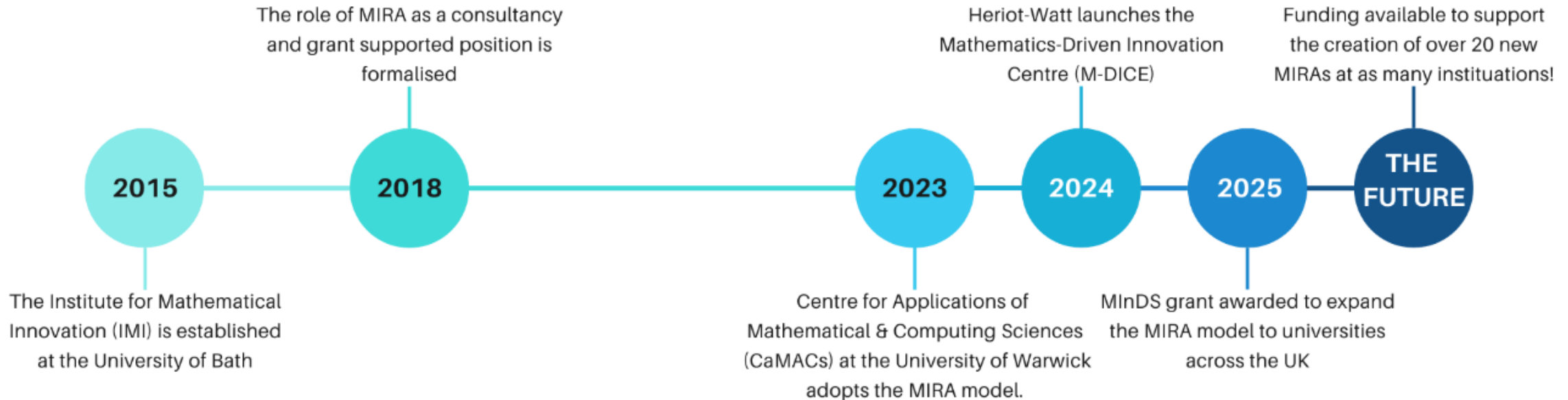


Mission:

Bridge the gap between cutting-edge mathematical research with real-world data science applications across diverse disciplines and industrial sectors.

How?

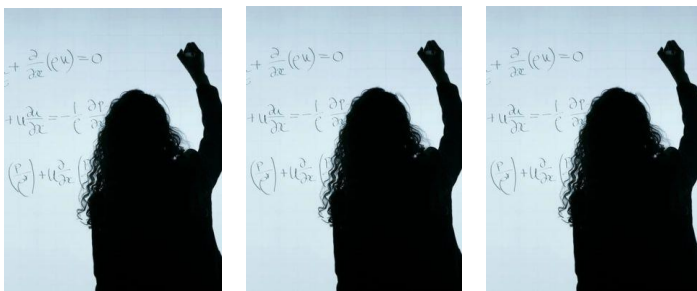
- Mathematical Innovation Research Team
 - 12 in house researchers
- IMI Research Themes
- IMI Academic Fellowship Scheme
- IMI Industrial Fellowship Scheme
- Small Grant Scheme
- Research workshops and colloquia support
- Grant drives
- Impact development



- **Started 2015**
 - Team of three Commercial Research Associates (CRAs, now MIRAs)
 - Focussed on consultancy
- **Institute status at Bath**
 - University-wide entity collaborating across all faculties
 - Only administratively associated with the Department of Mathematical Sciences
 - Receives core funding from University to support people and activities

Organisational structure





Mathematical Innovation Research Associate (MIRA) Team

Drive mathematical impact by developing and contributing the maths component of multidisciplinary research projects
Skilled working with cross-disciplinary and cross-sectoral teams

Collective expertise in:

- Machine learning
- Scientific computing
- Predictive modelling
- Optimisation
- Statistical and data analysis

Can be costed flexibly into grants at full- or part-time, at specific times during projects

Mix of open-ended and fixed-term contracts

Flexibility accommodates part-time work, career breaks

IMI's success is because of the MIRA team



Fixed term/Open-ended contracts

2-3year positions

Originally 3 posts underwritten by the university

Aim: Recover salary by grant/consultancy funding

MIRAs contribute to projects ranging from weeks to years, delivered at full- or part-time.

Built-in flexibility accommodates part-time work and career breaks, thereby allowing for greater workforce diversity:

- 42% women, 58% men
- Two part-time
- Five parental leaves



MIRIs

What are MIRIs?

- PhD students within and outside Bath can pause studies and join IMI for a short term project.
- Focussed on a single project, not spread over multiple.
- Became a core part of SAMBa renewal bid.

Example projects

- Industrial – Met Office/Jacobs/DSTL/NGD
- Academic – Maths/Mech Eng/Impact case study support



IMI funded research activity

IMI has contributed to over 60 projects since 2018 worth a total value of more than £27M to the University of Bath:

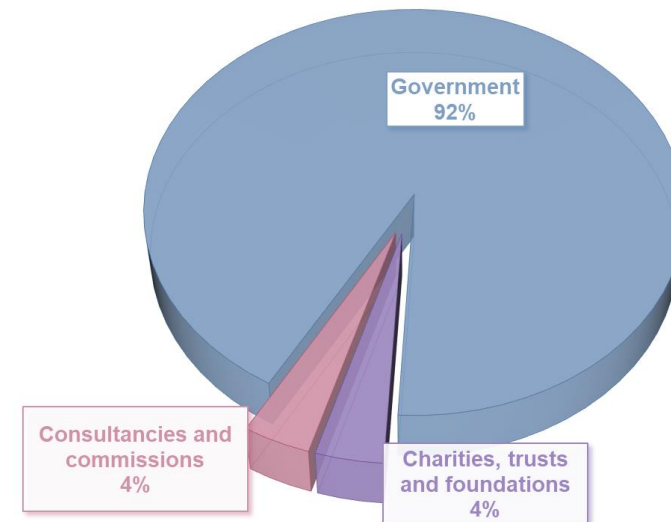
- £25M Government research funding (diverse portfolio!)
- £ 1M Charities, trusts and foundations research funding
- £ 1M Consultancies and commissioned work

Example successful grants including MIRA time and input:

- AI for Collective Intelligence Hub (0.2FTE over 60 months)
- Reducing cannabis harms through tools for quantifying use (0.25FTE over 24 months)

Small grants:

- FBSDE Methods in Heterogeneous Agent Models (0.5FTE for 10 months)
- Quantifying safe operation of sustainable seals for rotating systems (1.0FTE for 10 months)
- Ensuring Data Privacy in Deep Learning through Compressive Learning (0.8FTE for 10 months)



LEVERHULME
TRUST



Research

- Funded primarily by Innovate UK schemes, e.g. KTP, AKT, A4I, Smart Grants
- Companies include:



- Departments involved
 - Mathematical Sciences
 - Computer Science
 - Health

Consultancy

- Application of existing techniques to solve challenges
- Analysis and testing
- Scoping studies
- Clients include:
 - Multinational food and beverage company
 - UK Government
 - Multinational pharmaceutical company
- Departments involved
 - Mathematical Sciences



Everyone wants (or thinks they want) ML/AI

- ML/AI might not be the most appropriate (or relevant) approach
- Upskill the MIRA team in ML methods

MIRA project allocation

- Match project to MIRA expertise as best as possible
- Need to recover MIRA salary costs from external funding
- Logistically complex to schedule as new projects arrive, and to claim back salaries from multiple grants

Disciplinary focus

- What maths expertise to have on the MIRA team?
- How should research software engineers be categorised?

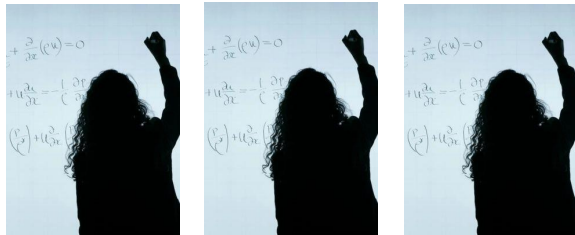
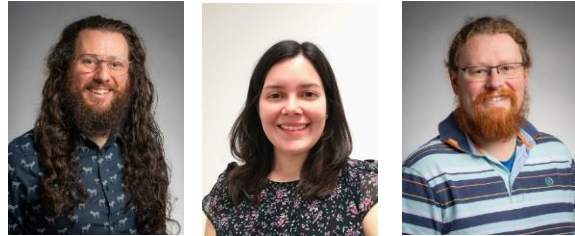
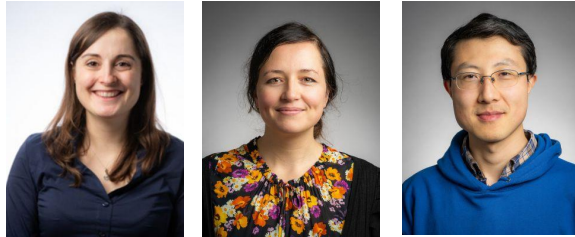
Can't compete with industrial remuneration

- Can offer job security and certain degree of research freedom
- Career structure...

MIRA team career pathway



Follows the University of Bath academic research promotion route



Mathematical Innovation Research Associate (MIRA)



Professor

Senior Mathematical Innovation Research Fellow (SMIRF)

Mathematical Innovation Research Fellow (MIRF)

What makes a good MIRA?

Mathematically versatile & adventurous

Career pathway examples - Can you help?

Please share examples of career pathways for MIRA-esque roles



How to Set Up a KE Institute



Recognise Need → Design Model → Secure Buy-In → Build Capacity → Grow Sustainably

- **Recognise the Need.** Formalise the growing demand for mathematical sciences impact in house.
- **Design the Model.** Create dedicated KE roles and embed impact delivery into research.
- **Secure Buy-In.** Fund initial salaries internally with clear mechanisms for salary recovery from grants, KE funds and consulting.
- **Build Capacity.** Set operational rules (e.g., 20% protected time) and cluster multiple researchers to manage project flow.
- **Grow Sustainably.** Expand organically, integrate career progression pathways, and collaborate nationally to strengthen the KE network.



Mathematical Innovation in the Digital Space (MInDS)



Funded by UKRI **Digital Research Technical Professional Skills NetworkPlus** call

- “...inclusive umbrella term which includes hundreds of job titles such as data scientists, research software engineers, computational researchers, systems administrators, and technical support for digital research infrastructures.”

<https://www.ukri.org/opportunity/ukri-digital-research-technical-professional-skills-networkplus/>

Justification:

- Mathematics underpins almost all aspects of digital technology and data science
- Most academic mathematicians do not have capacity to pursue many impact opportunities
- MIRAs’ primary purpose is to provide maths for impactful data-driven research
- £2M project (~£1.5M direct funding) - includes £1M Flexible Fund (FF). Starts April 2025 and runs for 4 years



MInDs components

1. Capacity building
 - UK institutions can apply for MInDS funding to underwrite MIRA-type roles and build their own teams
2. Training and professional development
 - National training programme for MIRAs and how to manage teams
3. Networking
 - National networking events to share best practice, monitor evolution of the role, strengthen community
4. Sandpits
 - Stakeholder engagement workshops to develop new projects and partnerships that involve MIRAs
5. Long-term career development
 - Advocate for consistent promotion structures across MIRA-hosting institutions



MInDs capacity building

- Calls at least twice/year for eligible institutions to bid for 6-12 months of underwriting support of MIRA-type position
- Host financial commitment to support the role for a minimum contract duration of 24 months
- Must include non-academic partner
- Clear pathways to impact
- Line management in place
- EDI & RRI strategy
- Initially, interested parties will work with MInDS executive to develop their proposals prior to submission

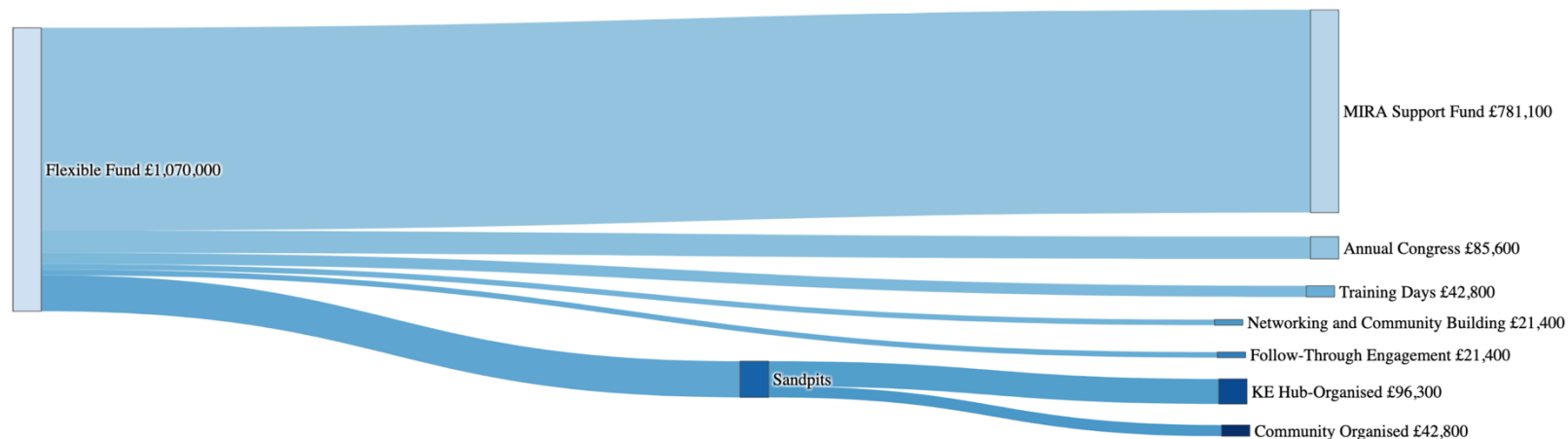


Other ways to engage with MInDS

Organisations can bid for Flexible Funds to host:

- Training sessions that address MIRA-specific requirements, for example:
 - Data & coding practice, EDI & RRI, Proposal and report writing, Communication skills, Project management, Understanding impact
- Networking events
- Annual congress

(Year 1 activities organised by the MInDS executive)



Thanks for listening!



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Anyone interested in setting up an equivalent KE entity in their own institution is welcome to contact Tristan Pryer tmp38@bath.ac.uk, or anyone else in the Minds network to discuss.

The following pages provide additional information on the framework for *Innovation Research Associates*.

Information sheet: The Innovation Research Associate

Background. In recent years, the UK's Mathematical Sciences community has significantly expanded its focus on impact and knowledge exchange, driven by an increased demand for mathematical modelling from industry, government, and the third sector. As the lines between academic and non-academic pursuits blur, the need for effective knowledge exchange and impactful research grows. Numerous funding opportunities now support both short-term and long-term collaborations with diverse partners, posing the question: Are academic departments adequately equipped to integrate these activities into their portfolio?

While academic staff can allocate some time to these endeavours, they often face a difficult balance between dedicating time to impact/knowledge exchange and engaging in traditional research that builds other forms of academic esteem. Effective impact requires sustained focus and cannot be realised through sporadic efforts. Often, the involvement of postdocs or PhD students in delivery comes at the expense of their other academic responsibilities. A more systematic approach to these activities is essential to ensure both impact and academic integrity.

Innovation Research Associates (InRA). Introduced in 2020 by the Institute for Mathematical Innovation (IMI) at Bath and subsequently adopted by the Centre for Mathematical and Computing Sciences (CAMAcs) at Warwick, the InRA role addresses the challenge of academic immersion in impactful research. Currently, more than 10 InRAs are supported across these institutions. InRAs are researchers at the RA grade, engaged in impactful research through both short and long projects. They support academics in translating research ideas into impact with external partners, thereby enhancing opportunities for funding and impactful outcomes. This role draws on precedents in engineering and medical statistics, where similar positions have long been successful.

InRA financial model. InRA salaries are primarily funded by the hosting university but are recuperated through project funding. This model necessitates continuous engagement to secure future income for InRAs. Typically, InRA contracts span three years but may vary in duration.

Funding for InRAs comes from multiple sources, the primary four are:

- **Residual Grant Funds** are used for short, impact-focused projects, often facilitating cross-departmental research initiatives.
- **Targeted Funds** include small-scale funding from sources like the Impact Acceleration Account, A4I (Newton Gateway), and various regional, industrial, NHS, and government funds.
- **Full Economic Cost Grants** across the UKRI spectrum (MRC, BBSRC, EPSRC, ESRC, AHRC, STFC, NERC, Research England, etc.) and learned societies, particularly for projects that emphasise impact and interdisciplinary research.
- **Consulting** remains a viable route for salary recovery, especially given the modern industry's keen interest in research co-creation.

It is necessary to agree with your university in advance that InRA accounting is set up to accommodate:

- InRA financial recovery can vary in method and rate, aiming to at least cover the 'on-cost' salary pro rata.
- The total annual income, including overheads, should meet or exceed the actual salary costs.
- A 6-12 month 'burn-in' period is typical before achieving a steady income flow, though immediate salary recovery is possible.
- The number of InRAs should be scalable based on the workload and funding availability.

Managing InRA Positions involves not only overseeing project flows across the mathematical sciences and its diverse partners but also addressing several other operational aspects:

- **Time Allocation** of the InRA's must enable up to 20% for future project engagement, broader knowledge exchange (KE) activities, and personal development. Although this portion of time is not directly

recoverable, overhead inclusion in accounting allows for the financial recovery of the remaining 80% of their time, typically exceeding the 100% salary 'at cost' by a margin.

- **Contract Terms** generally start with a three-year duration. For InRAs embedded in active operational groups, there may be an opportunity to transition to a permanent contract, provided that a clear career trajectory is established.
- **Project Alignment** can be challenging when managing a single InRA due to the unpredictable arrival of project opportunities. By clustering multiple InRAs, it becomes easier to integrate new projects as they arise, akin to arranging pieces in a game of Tetris.
- **Salary Recovery** is enhanced when working with several InRAs, enabling a collective approach to meeting financial targets.
- **Capacity Limits** mean that each department has a natural saturation point for the number of InRAs it can support effectively, beyond which time recovery becomes impractical. It is advisable to expand InRA positions organically towards this limit.
- **Collaborative Growth** is evident as institutions like Bath and Warwick already collaborate to mutually support the careers of their InRAs. As more universities engage in this model, there is significant potential to expand this community support network.

Summary table: Below we have tabulated a summary of the InRA role and its benefits which we would encourage you to use towards making the case for these roles to your own university.

<p>What are the benefits for the university?</p> <ul style="list-style-type: none"> ○ Enhanced industry collaboration. ○ Accelerated project initiations. ○ Research with societal impact. ○ Strategic preparation for REF assessments. ○ Distinctive academic leadership. ○ Development of well-rounded researchers. ○ Competitive advantage in the higher education landscape. ○ Broader access to funding. ○ Alignment with national priorities. ○ Networking and knowledge exchange. 	<p>What are the benefits to becoming an InRA?</p> <ul style="list-style-type: none"> ○ Opportunities to build strong professional networks with leading experts in academia and industry. ○ Engagement in cross-disciplinary projects that broaden research perspectives and methodologies. ○ Benefits from mentorship by seasoned academics and industry professionals. ○ Offers a degree of independence in research direction, subject to the overarching goals of the projects. ○ Increased access to special grants and funding streams dedicated to impactful research. ○ Contributes to high-profile projects, enhancing personal and professional visibility in the academic and industrial communities.
<p>Catering for InRA careers long term in academia?</p> <ul style="list-style-type: none"> ○ Similar to pure research roles, universities provide structured promotions, allowing InRAs to advance to senior positions under permanent contracts. ○ In more advanced roles, InRAs may take on increased responsibilities such as mentoring junior InRAs, leading grant writing efforts, managing projects, and directing projects academically without faculty input while also preparing impact case studies. ○ Despite the broad scope of their work, InRAs can develop specialised expertise in specific areas of mathematics, enhancing their professional profile. ○ Bath and Warwick encourage other universities to help build a national community that supports career development for InRAs, promoting a collaborative and sustainable career pathway in academia. 	<p>What makes a researcher an ideal InRA candidate?</p> <ul style="list-style-type: none"> ○ Thrives in dynamic environments and adjusts quickly to new research directions. ○ Capable of leading projects and small teams, demonstrating leadership in research settings. ○ Strong ability to communicate complex ideas clearly to diverse audiences, including industry partners and academic peers. ○ Experienced in overseeing projects from conception to completion, ensuring efficient and timely delivery. ○ Exceptional analytical skills to dissect research questions and synthesise information. ○ Constantly seeks to expand knowledge and skills, staying abreast of the latest developments in their field. ○ Ability to foresee research trends and align projects with long-term academic and industry goals.