

## Research Activity Report

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17 Oct 2012 to 17 Nov 2025

A report made in Pure. Prepared by: (Pure@bath.ac.uk), 17/11/25 13:20

## 1. Research Applications Overview

| Current application status > Status | Count |
|-------------------------------------|-------|
| Application submitted to funder     | 1     |
| Application awarded by funder       | 2     |
| Application rejected by funder      | 3     |
| Application withdrawn               | 1     |

## 2. Research Applications

| Application date | Title  | Funder   | List of investigators                  | Role | Total application value | Application status              |
|------------------|--|--|--|------|-------------------------|---------------------------------|
| 6/06/25          | NIHR predoctoral award for Ananya Biswas                                   | National Institute for Health Research             | Karim Anaya-Izquierdo, Haiyan Zheng    | PI   | 100,437                 | Application submitted to funder |
| 25/09/23         | CIMCOMP Hub - Core Project   | Engineering and Physical Sciences Research Council | Karim Anaya-Izquierdo                  | PI   | 13,608                  | Application rejected by funder  |
| 18/01/22         | GKN Prosperity Partnership   | Engineering and Physical Sciences Research Council | Karim Anaya-Izquierdo                  | PI   | 28,084                  | Application awarded by funder   |
| 18/01/22         | GKN Prosperity Partnership   | GKN Aerospace x                                    | Karim Anaya-Izquierdo                  | PI   | 0                       | Application withdrawn           |
| 6/06/18          | Re-shaping the Test Pyramid  | Engineering and Physical Sciences Research Council | Robert Scheichl, Karim Anaya-Izquierdo | Col  | 425,044                 | Application awarded by funder   |
| 16/06/15         | Statistical Assessment of Generalizability in Randomized Controlled Trials | MRC  | Karim Anaya-Izquierdo                  | PI   | 173,295                 | Application rejected by funder  |
| 13/02/15         | Centre for Mathematical  | Engineering and Physical                           | Christopher Jennison,                  | Col  | 2,076,770               | Application rejected by         |

| Application date | Title                  | Funder                    | List of investigators  | Role | Total application value | Application status |
|------------------|------------------------|---------------------------|--|------|-------------------------|--------------------|
|                  | Sciences in Healthcare | Sciences Research Council | Karim Anaya-Izquierdo, Nicole Augustin, Jonathan Dawes, Begona Delgado-Charro, Julian Faraway, Nikoletta Fotaki, Richie Gill, Richard Guy, Hartmut Logemann, Paul Milewski, Gavin Shaddick, Gordon Taylor, Grant Trewartha, Jane White |      |                         | funder             |

### 3. Research and Related Projects

| Research or related                    | Period             | Title   | Funder   | List of investigators  | Role | Awar ded amount                                    | Funding (non Agresso projects) |
|--|--------------------|---|--|--|------|--|--------------------------------|
| Funded project, Research council       | 1/12/23 → 30/11/28 | GKN Prosperity Partnership  | Engineering and Physical Sciences Research Council, Engineering and Physical Sciences Research Council, Engineering and Physical Sciences Research Council, Engineering and Physical Sciences Research Council | Richard Butler, Karim Anaya-Izquierdo, Chris Bowen, Antoine Buchard, Andy Burrows, John Chew, Chanel Fallon, Maciek Kopec, Evros Loukaides, Alexander Lunt, Rick Lupton, Tim Mays, Elise Pegg, Fulvio Pinto, Andrew Rhead, HaNa Yu | CoI  | £320,939.12, £1,125,111.20, £15,321.75, £19,231.16 |                                |
| Funded project, University consultancy | 4/10/21 → 29/10/21 | Computation of damage tolerance b-basis values accounting for different energies and multiple impacts-Methodology and illustration creation | Airbus Operations Ltd  | Karim Anaya-Izquierdo, Andrew Rhead  | PI   | £42,800.00   |                                |

| Research or related                          | Period              | Title  | Funder   | List of investigators  | Role | Awar ded amou nt         | Funding (non Agresso projects)  |
|--|---------------------|--|--|--|------|--------------------------|---|
| Funded project, Research council             | 1/08/19 → 31/08/25  | Re-shaping the Test Pyramid  | Engineering and Physical Sciences Research Council, Engineering and Physical Sciences Research Council | Richard Butler, Karim Anaya-Izquierdo, Andrew Rhead, Robert Scheichl                           | Col  | £466,856.21, £934,053.21 |   |
| Funded project, University consultancy       | 1/03/16 → 3/07/16   | Environmental Variability of Composite Allowables  | Airbus Operations Ltd  | Karim Anaya-Izquierdo, Andrew Rhead  | PI   | £0.00                    |   |
| Non-funded project, Research-related funding | 27/10/17 → 27/10/19 | Exploiting the analytic properties of accumulative hazards for survival analysis   |  | Karim Anaya-Izquierdo  | PI   |                          | £5,760  |
| Non-funded project, Research-related funding | 15/06/17 → 31/12/17 | Innovative Statistical Techniques (and software) for the Analysis of International Large-Scale Assessments in Education                          |  | Andres Sandoval Hernandez, Karim Anaya-Izquierdo, Roman Aguirre Perez, Uziel Gonzalez Gonzalez | PI   |                          | £5,000  |
| Non-funded project, UK industry              | 1/05/16 → 7/10/16   | Consultancy for Airbus   |  | Karim Anaya-Izquierdo, Catherine Barnaby, Lorna Wilson, Andrew Rhead                           | PI   |                          | 21,300  |
| Non-funded project, Research-related funding | 1/02/16 → 31/08/17  | Proposal for the Royal Statistical Society's Mardia Prize: Large-scale computing in statistical dependence models and uncertainty quantification |  | Karim Anaya-Izquierdo  | PI   |                          | £8000 (Application rejected by funder)  |
| Non-funded project, Research-related funding | 1/08/15 → 31/07/16  | Visiting PhD student project: On the development of new flexible and interpretable parametric  |  | Karim Anaya-Izquierdo  | Col  |                          | UoB fees (Application funded by the National Council for Scientific and Technological Development |

| Research or related | Period | Title  | Funder | List of investigators | Role | Awar ded amou nt | Funding (non Agresso projects) |
|---------------------|--------|--|--------|-----------------------|------|------------------|--------------------------------|
|                     |        | distributions and their use in survival analysis |        |                       |      |                  | (CNPq))                        |

#### 4. Research Publications Overview

| Current publication status > Status | Count |
|-------------------------------------|-------|
| In preparation                      | 6     |
| Published                           | 15    |

#### 5. Research Publications

| Type                              | Current publication status > Status | Publication date | Publication Reference   | Percentage contribution |
|-----------------------------------|-------------------------------------|------------------|---|-------------------------|
| Contribution to journal - Article | Published                           | 5/08/25          | Augustin, N, Albrecht, A, Anaya-Izquierdo, K, Davis, A, Meining, S, Puhlmann, H & Wood, S 2025, 'Modeling Tree Survival for Investigating Climate Change Effects', Journal of the American Statistical Association.<br><a href="https://doi.org/10.1080/01621459.2025.2516181">https://doi.org/10.1080/01621459.2025.2516181</a>  | 20%                     |
|                                   |                                     | 1/06/21          | Anaya-Izquierdo, K & Alexander, N 2021, 'Spatial regression and spillover effects in cluster randomized trials with count outcomes', Biometrics, vol. 77, no. 2, pp. 490-505.<br><a href="https://doi.org/10.1111/biom.13316">https://doi.org/10.1111/biom.13316</a>  | 70%                     |
|                                   |                                     | 31/05/21         | Anaya-Izquierdo, K, Davis, A & Jones, MC 2021, 'A family of cumulative hazard functions and their frailty connections', Statistics and Probability Letters, vol. 172, 109059.<br><a href="https://doi.org/10.1016/j.spl.2021.109059">https://doi.org/10.1016/j.spl.2021.109059</a>  | 30%                     |
|                                   |                                     | 3/09/20          | Alexander, N, Anaya-Izquierdo, K & Lenhart, A 2020, 'Spatial Spillover Analysis of a Cluster-Randomized Trial against Dengue Vectors in Trujillo, Venezuela', PLoS Neglected Tropical Diseases, vol. 14, no. 9, e0008576. <a href="https://doi.org/10.1371/journal.pntd.0008576">https://doi.org/10.1371/journal.pntd.0008576</a>   | 40%                     |
|                                   |                                     | 31/12/19         | Dolgov, S, Anaya-Izquierdo, K, Fox, C & Scheichl, R 2019, 'Approximation and sampling of multivariate probability distributions in the tensor train decomposition', Statistics and Computing, vol. 30, no. 3, pp. 603-625. <a href="https://doi.org/10.1007/s11222-019-09910-z">https://doi.org/10.1007/s11222-019-09910-z</a>  | 20%                     |
|                                   |                                     | 21/04/15         | Brauer, R, Smeeth, L, Anaya-Izquierdo, K, Timmis, A, Denaxas, SC, Farrington, CP, Whitaker, H, Hemingway, H & Douglas, I 2015, 'Antipsychotic drugs and risks of myocardial infarction: A self-controlled case series study', European Heart Journal, vol. 36, no. 16, pp. 984–992. <a href="https://doi.org/10.1093/eurheartj/ehu263">https://doi.org/10.1093/eurheartj/ehu263</a> | 10%                     |
|                                   |                                     | 18/07/14         | Vos, P & Anaya Izquierdo, KA 2014, 'Using Geometry to Select One Dimensional Exponential Families That Are Monotone Likelihood Ratio in the Sample Space, Are Weakly Unimodal and Can Be Parametrized by a Measure of Central Tendency', Entropy, vol. 16, no. 7, pp. 4088-4100. <a href="https://doi.org/10.3390/e16074088">https://doi.org/10.3390/e16074088</a>                  | 50%                     |
|                                   |                                     | 1/02/14          | Anaya Izquierdo, KA, Critchley, F & Marriott, P 2014, 'When are first order asymptotics adequate? A diagnostic', Stat, vol. 3, no. 1, pp. 17-22. <a href="https://doi.org/10.1002/sta4.40">https://doi.org/10.1002/sta4.40</a>  | 35%                     |
|                                   |                                     | 20/09/13         | Alexander, N & Anaya-Izquierdo, K 2013, 'Comments on 'Log   | 50%                     |

| Type  | Current publication status > Status | Publication date | Publication Reference  | Percentage contribution |
|---|-------------------------------------|------------------|--|-------------------------|
|   |                                     |                  | transformation: Application and interpretation in biomedical research", Statistics in Medicine, vol. 32, no. 21, pp. 3768-3769.<br><a href="https://doi.org/10.1002/sim.5774">https://doi.org/10.1002/sim.5774</a>   |                         |
|   |                                     | 1/07/13          | Farrington, CP, Unkel, S & Anaya-Izquierdo, K 2013, 'Estimation of basic reproduction numbers: Individual heterogeneity and robustness to perturbation of the contact function', Biostatistics , vol. 14, no. 3, pp. 528-40. <a href="https://doi.org/10.1093/biostatistics/kxs054">https://doi.org/10.1093/biostatistics/kxs054</a>   | 30%                     |
|   |                                     | 1/12/12          | Garthwaite, PH, Critchley, F, Anaya-Izquierdo, K & Mubwandarikwa, E 2012, 'Orthogonalization of vectors with minimal adjustment', Biometrika, vol. 99, no. 4, pp. 787-798.<br><a href="https://doi.org/10.1093/biomet/ass041">https://doi.org/10.1093/biomet/ass041</a>  | 25%                     |
| Working paper / Preprint - Working paper  | In preparation                      | 1/07/24          | Xiao, S, Scarth, C, Anaya-Izquierdo, K, Rhead, AT & Butler, R 2024 'Bayesian experimental design for composite structural testing based on expected information gain'.   |                         |
|   |                                     | 1/07/24          | Xiao, S, Laux, T, Dulieu-Barton, JM & Anaya-Izquierdo, K 2024 'Data fusion using Bayesian inference to predict behaviour of composite laminates subjected to multiaxial loading'.  |                         |
|   |                                     | 1/05/24          | Anaya-Izquierdo, K, Parry, M & Fox, C 2024 'Information separation and dimension reduction for inverse problems'.  |                         |
|   |                                     | 1/01/24          | Evans, J, Rhead, AT & Anaya-Izquierdo, K 2024 'Analytical compression after impact model incorporating GAMs statistical model for impact damage derived from experimental database'.   |                         |
|   |                                     | 1/01/24          | Davis, A & Anaya-Izquierdo, K 2024 'Survival parametric regression models based on the cumulative hazard function'.  |                         |
|   |                                     | 1/06/20          | Anaya-Izquierdo, K, Alexander, N, Lenhart, A, Morrison, AC & McCall, PJ 2020 'Spatial spillover analysis of the impact of insecticide-treated curtains on dengue seroconversion in a cluster-randomized trial'.  |                         |
| Chapter or section in a book/report/conference proceedings - Book chapter           | Published                           | 1/01/13          | Anaya-Izquierdo, K, Critchley, F, Marriott, P & Vos, P 2013, Computational information geometry in statistics: foundations. in F Nielsen & F Barbaresco (eds), Geometric Science of Information: First International Conference, Gsi 2013, Paris, France, August 28-30, 2013, Proceedings . vol. Part IX, Lecture Notes in Computer Science, vol. 8085, Springer, Berlin, Germany, pp. 311-318.<br><a href="https://doi.org/10.1007/978-3-642-40020-9_33">https://doi.org/10.1007/978-3-642-40020-9_33</a> | 30%                     |
|   |                                     | 1/01/13          | Anaya-Izquierdo, K, Critchley, F, Marriott, P & Vos, P 2013, Computational information geometry in statistics: mixture modelling. in F Nielsen & F Barbaresco (eds), Geometric Science of Information: First International Conference, GSI 2013, Paris, France, August 28-30, 2013. Proceedings. vol. IX, Lecture Notes in Computer Science, vol. 8085, Springer, Berlin, Germany, pp. 319-326.<br><a href="https://doi.org/10.1007/978-3-642-40020-9_34">https://doi.org/10.1007/978-3-642-40020-9_34</a> | 30%                     |
| Chapter or section in a book/report/conference proceedings - Chapter in a published | Published                           | 1/01/17          | Anaya-Izquierdo, K, Marriott, P, Vos, P & Critchley, F 2017, On the geometric interplay between goodness-of-fit and estimation: Illustrative examples. in F Nielsen, K Dodson & F Critchley (eds), Computational Information Geometry : For Image and Signal Processing. Signals and Communication Technology, Springer, pp. 63-77.<br><a href="https://doi.org/10.1007/978-3-319-47058-0_3">https://doi.org/10.1007/978-3-319-47058-0_3</a>   | 30%                     |

| Type                                  | Current publication status > Status | Publication date | Publication Reference   | Percentage contribution |
|---------------------------------------|-------------------------------------|------------------|---|-------------------------|
| d<br>conferen<br>ce<br>proceedi<br>ng |                                     |                  |   |                         |
|                                       |                                     | 1/01/17          | Anaya-Izquierdo, K, Critchley, F, Marriott, P & Vos, P 2017, Towards the geometry of model sensitivity: an Illustration. in F Nielsen, K Dodson & F Critchley (eds), Computational Information Geometry : For Image and Signal Processing. Signals and Communication Technology, Springer, pp. 33-62. <a href="https://doi.org/10.1007/978-3-319-47058-0_2">https://doi.org/10.1007/978-3-319-47058-0_2</a> | 40%                     |

## 6. Impact

| Title   | Impact Nature         | Impact Level |
|---|-----------------------|--------------|
| Bayesian statistics for certification of Aerospace structures | Professional practice | UK only      |

## 7. Activities

| Type  | Title   | Period                   | Description   |
|---|---|--------------------------|---|
| Publication peer-review and editorial roles - Editorial activity        | Statistical Methods and Applications (Journal)  | 1 Jan 2012 → 31 Dec 2013 |   |
| Knowledge Exchange (Industry, Government, NGOs) - Consultancy           | Computation of damage tolerance b-basis values accounting for different energies and multiple impact: Methodology and Illustration Creation | 1 Nov 2021 → 31 Dec 2021 | This consultancy project will develop a rigorous statistical methodology to compute compression after impact (CAI) strength b-basis values when accounting for the probability of multiple impacts at different energies.   |
|   | Environmental Variability of Composite Allowables   | 1 May 2016 → 7 Oct 2016  | This consultancy project applied statistical theory to allow inclusion of environmental variability, in the definition of a B-basis allowable, implemented the algorithms, using VBA behind an Excel spreadsheet, to include temperature and aging variability and Evaluated confidence in results, improving understanding of the methodology. |
| External examination and supervision - External supervision / mentoring | On the development of new flexible and interpretable parametric distributions and their use in survival analysis                            | 1 Aug 2015 → 30 Jul 2016 | External PhD supervisor (1 year) of Mrs Daniele Granzoto PhD student at the University of Sao Paulo, Brazil   |
|   | Spatial Analysis of Cluster Randomised Trials`  | 1 Apr 2015 → 30 Oct 2018 | Co-supervisor of Mr Christopher Jarvis, PhD student at LSHTM  |
| Public, Community and School Engagement - Public talk, lecture,         | Flexible parametric survival regression modelling   | 16 May 2024              | In this talk I will introduce a novel regression modelling methodology where  |

| Type   | Title   | Period                      | Description   |
|--|---|-----------------------------|---|
| debate, seminar, workshop  |   |                             | the key building block is the cumulative hazard function rather the hazard rate function. We exploit analytical properties that allow the cumulative hazard to serve as a clean modelling tool to construct new and flexible parametric survival regression models as well as new frailty models that do not require explicit integration. We will show that the new constructions recover and generalise known models such as the Proportional Hazards and Accelerated Failure Time models. We illustrate some aspects of the methodology in some real and simulated datasets. |
| Visiting an external academic institution - Visiting researcher  | University of Otago   | 1 Feb 2024 → 31 Jul 2024    | Research (sabbatical) leave.  |
| Academic conferences and events (excluding conference publications) - Conference presentation / attendance | Composite Materials Handbook 17 (CMH-17) PMC Coordination Meeting                                   | 21 Oct 2019 → 24 Oct 2019   | Key international event on the certification of aerospace structures  |
|  | Introduction to Information Geometry: Distributional Theory   | 28 Sept 2018                | Short (one day) course. In Spanish. International conference (South America).   |
|  | International Workshop on Bayesian Inference and Maximum Entropy Methods in Science and Engineering | 9 Jul 2017 → 14 Jul 2017    | This is a long standing conference with high profile international participation (150 attendees)  |
|  | 3rd International Clinical Trials Methodology Conference  | 16 Nov 2015                 | Poster "Software for spatial analysis and visualisation of cluster randomised trials - a review of available tools" at the 3rd International Clinical Trials Methodology Conference, Glasgow.   |
|  | Current developments in cluster randomised trials and stepped wedge designs                         | 7 Oct 2015                  | Contributed talk "Spatial regression and indirect effects in cluster randomized trials". Specialised workshop. UK wide conference (~ 30 attendees)  |
|  | Computational Information Geometry for Signal and Image Processingsignal processing                 | 21 Sept 2015 → 25 Sept 2016 | Invited Talk. International workshop with high profile international participation (30 attendees).  |
| Academic conferences and events (excluding conference publications) - Other academic event                 | Improving Administrative Records for SDGs implementation and evidence-based policymaking in         | 9 Mar 2020 → 14 Mar 2020    | Professional development course (Statistics) to civil servants of the government of Paraguay  |

| Type                                     | Title  | Period                    | Description  |
|--|--|---------------------------|--|
| (organisation, presentation, attendance) | Paraguay   |                           |  |
|  | 1 day course on Medical Statistics   | 19 Sept 2018              | ! day course on Medical Statistics   |
|  | Machine Learning - Ficha Social  | 30 Jul 2018 → 3 Aug 2018  | Machine Learning course to civil servants of the government of Paraguay.   |
|  | Annual conference of the Mexican Statistical Association                       | 28 Sept 2017              | 1 day course course on the applications of Differential Geometry to Statistics (~20 attendees)   |
|  | Thinking Globally: The Role of Big Data  | 23 Feb 2016 → 24 Feb 2016 | "Thinking Globally: The Role of Big Data"  |
|  |  |                           | 2 day course, 2nd BUC Workshop series, National University of Mexico, Mexico City. One of the three speakers. Advanced Statistics course for postgraduates Mathematics students and research assistants (~20 participants) |
|  | The self controlled case series method: A few generalities and some extensions | 31 Oct 2015               | Speaker. Internal seminar (regular series) in the Department of Pharmacy and Pharmacology (Bath)   |

## 8. Prizes

## 9. Postgraduate Supervision

| Student name | Research degree                        | Period                                 | Supervisor role | Percentage supervision | Other supervisors |
|--------------|--|--|-----------------|------------------------|-------------------|
| Alice Davis  | Teaching & Other, Doctor of Philosophy | 9/08/18 → 8/12/20, 29/09/14 → 22/11/18 |                 | 100%                   |                   |