Curriculum Vitae

Benjamin M. Kent

Email ben kent at live dot co dot uk **Website** https://benmkent.github.io/ **GitHub** https://github.com/benmkent/

Academic Experience

February 2024 – Present: Assegnista di Ricerca (Postdoctoral Researcher) at CNR-IMATI, Pavia, Italy

- Development of novel multi-fidelity surrogate modelling algorithm for use with "noisy solvers''.
- Focus on non-intrusive approximation via sparse grid methods and exploiting spectral polynomial approximation properties.
- Development of test cases including parametric elliptic and parabolic PDEs and using benchmark *Reynolds-Averaged Navier-Stokes* simulations.
- Containerisation and deployment of research models via *Docker* and *Kubernetes*.

September 2019 – November 2023: PhD in Numerical Analysis at The University of Manchester, UK

- Supervised by Professor Catherine Powell[1] and Professor David Silvester[2].
- Industry sponsored ICASE project with *IBM Research UK*.
- Thesis: *Efficient Approximation of Parametric Parabolic Partial Differential Equations*. [PDF][3]
- Investigated **adaptive-in-time sparse-grid stochastic collocation approximation** of a parametric time-dependent advection–diffusion problem.
- Techniques include *finite element method*, *adaptive timestepping* and *sparse polynomial approximation*.
- Hierarchical and residual error estimation strategies developed in the context of *novel adaptive approximation algorithms*.
- Studied *Functional Analysis, Approximation Theory and Finite Element Analysis, Adaptive Finite Element Methods, Uncertainty Quantification* (*Monte Carlo, stochastic collocation, stochastic Galerkin methods*) and *Bayesian inverse problems*.

September 2012 – July 2015: Mathematics and Physics BSc, First-Class Honours at The University of Warwick, UK

- Prize for the **best exam results in my cohort**.

September 2010 – July 2012: The College of Richard Collyer, Horsham, UK

- A Levels: Mathematics A*, Further Mathematics A*, Physics A*, Chemistry A*, Electronics A*.
- GCSE: 10 A* (inc Maths and English) + 1 A (French)

Publications

- Seelinger, L., Reinarz, A., Lykkegaard, M.B., Akers, R., Alghamdi, A.M.A., Aristoff, D., Bangerth, W., Bénézech, J., Diez, M., Frey, K., Jakeman, J.D., Jørgensen, J.S., Kim, K.-T., Kent, B.M., Martinelli, M., Parno, M., Pellegrini, R., Petra, N., Riis, N.A.B., Rosenfeld, K., Serani, A., Tamellini, L., Villa, U., Dodwell, T.J., Scheichl, R.: Democratizing Uncertainty Quantification. Journal of Computational Physics. 113542 (2024). https://doi.org/10.1016/j.jcp.2024.113542

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[1]https://personalpages.manchester.ac.uk/staff/Catherine.Powell/
[2]https://personalpages.manchester.ac.uk/staff/david.silvester/
[3]https://research.manchester.ac.uk/en/studentTheses/efficient-approximation-of-parametric-parabolic-partial-different

- Kent, B.M., Powell, C.E., Silvester, D.J., Zimoń, M.J.: Efficient Adaptive Stochastic Collocation Strategies for Advection–Diffusion Problems with Uncertain Inputs. Journal of Scientific Computing. 96, 64 (2023). https://doi.org/10.1007/s10915-023-02247-w
- Kent, B.M. Efficient Approximation of Parametric Parabolic Partial Differential Equations. PhD Thesis, University of Manchester (2024). [eThesis at Univeristy of Manchester][4]

In Preparation

- Kent, B. M., Tamellini, L., Giacomini, M., Huerta, A.: Multi-Fidelity Surrogate Modelling for "Noisy'' Solvers via a Novel Multi-Index Stochastic Collocation Algorithm.

Conference Organisation

- *Co-organiser:* Minisymposium on *Adaptive sampling and surrogate/reduced order modelling strategies for parametric differential equations*[5], XII International Conference on Adaptive Modeling and Simulation (ADMOS), June 2025.
- *Co-organiser:* Manchester Mathematics Research Student Conference[6] online conference, 2020.
- *Co-organiser:* Mathematics of Data Science[7] online student conference, 2020.

Conference Talks

- UM-Bridge Workshop 2024[8], December 2024. *An UM-Bridge-based setup for multi-fidelity surrogate models for UQ* (**invited talk**). [PDF][9] [YouTube][10]
- CNR-IMATI Internal Conference, November 2024. *Multi-fidelity Approach for Uncertainty Quantification of a Fluid Dynamics NASA Test Case*.
- Workshop on Frontiers of Uncertainty Quantification, September 2024. *Adaptive Stochastic Collocation for Parametric Parabolic PDEs*.
- The 29th Biennial Numerical Analysis Conference 2023, June 2023. *Adaptive in Time Approximation of Parametric Parabolic PDEs*.
- Manchester SIAM-IMA Student Chapter Conference 2023, April 2023. *Adaptive in Time Approximation of Parametric Parabolic PDEs (**Best Student Talk Prize Winner**)*. [PDF][11]
- SIAM Conference on Computational Science and Engineering, February 2023. *Efficient Adaptive Stochastic Collocation Strategies for Advection-Diffusion Problems with Uncertain Inputs*.
- SIAM UKIE National Student Chapter Conference, June 2022. *Error Estimation for Stochastic Collocation Approximation of Parametric Advection–Diffusion Problems*.
- IBM Research UK, April 2022. *Efficient Approximation of Parametric Parabolic PDEs* (**invited seminar**).
- SIAM Conference on Uncertainty Quantification, April 2022. *A Posteriori Error Estimation for Stochastic Collocation Applied to Parametric Parabolic PDEs*.
- 26th Annual Meeting of SIAM UKIE Section, January 2022. *A Posteriori Error Estimation for Stochastic Collocation Applied to Parametric Parabolic PDEs*.

Industrial Experience

September 2017 – August 2019: Algorithm Developer at Thales, Stockport, UK

- Array signal processing algorithm development for time series sensor data.
- Analysis, evaluation and reporting for customer experiments.
- Collaboration with systems engineers to transform customer requirements to algorithm specifications
- Collaboration with software engineers to implement algorithm specifications in products.

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[4]https://research.manchester.ac.uk/en/studentTheses/efficient-approximation-of-parametric-parabolic-partial-different

[5]https://admos2025.cimne.com/event/area/37eb9a31-759f-11ef-a6b7-000c29ddfc0c

[6]https://www.maths.manchester.ac.uk/~pgconf/

[7]https://maths-of-data.github.io/

[8]https://um-bridge.github.io/workshop/

[9]https://benmkent.github.io/assets/slides/umbridgeworkshop24.pdf

[10]https://youtu.be/mkkBlDaqAp0?si=qZ6dzUSnjm5oi9C3

[11]https://benmkent.github.io/assets/slides/bk-siam-student-conference.pdf

September 2015 – September 2017: Research Engineer at Thales, Reading, UK

- Two-year graduate scheme with training in both technical and core skills.
- Four project placements: cryptographic key exchange algorithms, radar signal processing algorithms, filtering, data fusion and tracking algorithms, array signal processing and data analysis.

July 2014 – August 2014: Rules and Procedures Software Internship, Lloyd's Register, Southampton, UK

- Upgrading FEM software components from FORTRAN to C++.

Programming Experience

- MATLAB: 4 years industrial algorithm development and data analysis. 4 years as a research tool for approximation of parametric partial differential equations.
- Python: 2 years including FEM approximation via *FEniCS* and *petsc4py*, packaging models for containerisation, interfacing with research models.
- Julia: Implementation of novel PDE approximation algorithms and development of sparse grids approximation package. Interfacing and exploiting existing Python packages.
- OpenFOAM: Experience as a user for *Reynolds-Averaged Navier-Stokes* turbulence modelling.
- Docker and Kubernetes: Containerisation of software models via Docker and deployment via Kubernetes.
- C / C++: Development of cryptographic key-exchange algorithms, development of FEM software.
- Unix systems, version control (git, SVN, workflow automation), LaTeX.

Teaching Experience

- University of Manchester: Teaching assistant for Matrix Analysis MATH36001 (semester one, 2021), Mathematical Workshop (MATH10001, semester one, 2021), for Complex Analysis MATH20142 (semester two, 2020).