University of
Strathclyde
Glasgow

28th Biennial Conference
on
Numerical Analysis

25 June - 28 June, 2019

Programme

Tuesday 25th June

Chair:	JA325	**G Barrenechea**		
9:00-9:05	Opening Remarks			
9:05-10:05	**V Girault**	Discretization of some elastic models with implicit non linear constitutive relations		
10:05-11:05	**H Wendland**	Kernel-based reconstructions for uncertainty quantification		
11:05–11:30	COFFEE/TEA			

Chair:	JA325 M1	JA314 M2	JA317 M3	JA506 M4
11:30-11:55	**B Li** M1 Subdiffusion with a time-dependent coefficient: analysis and numerical solution	**K Soodhalter** M2 Some augmented methods for treatment of ill-posed problems	**M Moreta** M3 Exponential quadrature rules without order reduction for integrating linear initial boundary value problems	**A Ramage** M4 Preconditioning for the 4D-Var method in data assimilation
11:55-12:20	**J Wang** M1 Convergence of $L1$-Galerkin FEMs for nonlinear time-fractional Schrödinger equations	**M Sabaté Landman** M2 Adaptive regularization parameter choice rules for large-scale problems	**N Reguera** M3 Avoiding order reduction when integrating nonlinear problems with Strang splitting	**E Sachs** M4 Preconditioning for partial integro-differential equations
12:20-12:45	**C Huang** M1 Sharp spatial H^1-norm analysis of a finite element method for a time-fractional initial-boundary value problem	**J Winkler** M2 Blind image deconvolution using a non-separable point spread function	**H Herrero** M3 A Schwarz method for a Rayleigh-Bénard problem	**J Stocek** M4 Optimal operator preconditioning for pseudodifferential boundary problems

12:45-14:00	LUNCH-Urban Bean Java Cafe			
Chair:	JA325	**P Knight**		
14:00-15:00	**U Rüde**	Parallel multigrid for systems with a trillion unknowns and beyond		

Chair:	JA325 M1	JA314 M2	JA317 M3	JA506 M4
15:05-15:30	**Y Yan** M1 Laplace transform method for solving the fractional cable equation with nonsmooth data	**C Zhang** M2 Expectation propagation for Poisson data	**J C Jorge** M3 Solving efficiently time dependent singularly perturbed convection-diffusion systems	**D Loghin** M4 Preconditioners for boundary control of elliptic PDE
15:30-15:55	**H Chen** M1 Error analysis of the Grünwald–Letnikov scheme for fractional initial-value problems with weakly singular solutions	**F Sherry** M2 Learning a sampling pattern for MRI	**A Portillo** M3 High-order full discretization for two-dimensional coupled seismic wave equations	**N Bootland** M4 On least-squares commutator (LSC) preconditioning for incompressible two-phase flow
15:55-16:20	**X Meng** M1 Error analysis for a fractional-derivative parabolic problem on quasi-graded meshes using barrier functions	**A Theljani** M2 Variational models for image registration		**J Pearson** M4 Fast interior point solvers and preconditioning for PDE-constrained optimization

16:20-16:45	COFFEE/TEA			
Chair:	JA325	**P Davies**		
16:45-17:55	**D Higham**	(A R Mitchell Lecture)	Walk This Way	
18:15-19:15	DINNER-Aroma Dining Room-Lord Todd			
20:00-21:00	RECEPTION-Glasgow City Chambers			

Tuesday 25th June

11:05–11:30	COFFEE/TEA	
Chair:	JA505 **I Graham**	JA507 **P Jimack**
11:30-11:55	**D Duncan** Approximation of time domain boundary integral equations	**A Bespalov** Convergence analysis of adaptive stochastic Galerkin FEM for elliptic PDEs with parametric uncertainty
11:55-12:20	**M Khumalo** Numerical methods for Cordial Volterra integral equation with vanishing delays	**M Aljohani** Multilevel numerical algorithms for thin film flow
12:20-12:45	**P Davies** The MRE inverse problem for the elastic shear modulus	**R Youngnoi** Fast iterative solver for stochastic Galerkin finite element approximations
12:45-14:00	LUNCH-Urban Bean Java Cafe	

Chair:	JA505 **D Duncan**	JA507 **I Duff**
15:05-15:30	**A Bastounis** Computational paradoxes in deep learning	**I Kuzmanović Ivičić** Structured Sylvester and T-Sylvester equations
15:30-15:55	**D Stewart** Minimax approximation by ridge functions, and neural networks	**C Ferreira** Wilkinson test matrices
15:55-16:20	**D Savostyanov** Parallel cross interpolation for high–precision computation of high–dimensional integrals	**N Mastronardi** Computing the Jordan structure of totally nonnegative matrices
16:20-16:45	COFFEE/TEA	

Wednesday 26th June

Chair:	JA325:	**J Pestana**	
9:00-10:00	**R Chan**	Flexible methodology for image segmentation	
10:00-11:00	**G Kreiss**	Stability and accuracy for initial-boundary value problems revisited	

11:00–11:30	COFFEE/TEA

Chair:	JA325 M1	JA314 M5	JA317 M4	JA506 M6
11:30-11:55	**M Kovács** M1 Mittag-Leffler Euler integrator for a stochastic fractional order equation with additive noise	**M Braack** M5 Local pressure correction for the Stokes equations	**A Wathen** M4 Parallel preconditioning for time-dependent PDE problems	**M Tretyakov** M6 Uncertainty quantification for moving boundary problems with applications in composites manufacturing
11:55-12:20	**Y Hu** M1 Mittag-Leffler Euler integrator for solving semilinear time fractional stochastic partial differential equations driven by fractionally integrated additive noise	**M González** M5 Adaptive augmented mixed methods for the Oseen problem	**M Mazza** M4 Multigrid preconditioners for anisotropic space-fractional diffusion equations	**S Gerster** M6 Controlling fluctuations in gas networks using stochastic Galerkin formulations
12:20-12:45	**M Stynes** M1 Blow-up in time-fractional initial-boundary value problems	**A Allendes** M5 A posteriori error analysis for stabilized methods: a nonlinear Boussinesq problem, and a Stokes model under singular sources	**S Leveque** M4 On preconditioners and higher-order time discretizations for PDE-constrained optimization problems	**D Kalise** M6 Polynomial approximation of Isaacs' equation and robust control of parabolic PDEs

12:45-14:00	LUNCH-Urban Bean Java Cafe

Chair:	JA325:	**J Mackenzie**	
14:00-15:00	**A Forbes**	The uncertainty contribution of numerical software	

Chair:	JA325 M7	JA314 M5	JA317 M8	JA506 M6
15:05-15:30	**M Girolami** M7 A measure based construction of the finite element method	**G Matthies** M5 Higher order variational time discretisations for the incompressible flow problems	**F Tudisco** M8 Networks core–periphery detection with nonlinear Perron eigenvectors	**A Tosin** M6 Kinetic models of traffic flow control via driver-assist vehicles
15:30-15:55	**J Levesley** M7 Approximation with Gaussians of fixed and varying scales	**G Barrenechea** M5 Low-order divergence-free finite element methods in fluid mechanics	**M Cucuringu** M8 Spectral methods for certain inverse problems on graphs	**A Festa** M6 Hybrid differential games and their application to a match race problem
15:55-16:20	**I Tyukin** M7 Kernel stochastic separation theorems and mathematics for making data-driven artificial intelligence systems better	**S Rubino** M5 Numerical comparisons of finite element stabilized methods for a 2D vortex dynamics simulation at high Reynolds number	**G Estrada** M8 Metaplex networks: influence of the exo-endo structure of complex systems on diffusion	**S Gomes** M6 Parameter estimation for macroscopic pedestrian dynamics models

16:20-16:45	COFFEE/TEA

Chair:	JA325 M8	JA314 M5	JA317 M8	JA506 M6
16:45-17:10	**Z Shao** M9 Sketching for sparse linear least squares	**B García-Archilla** M5 Mixed finite elements applied to continuous data assimilation for the Navier-Stokes equations	**D Fasino** M8 The random walk centrality, revised	**B Düring** M6 Kinetic models for optimal control of wealth inequalities
17:10-17:35	**G Ughi** M9 Model based optimisation applied to black-box attacks in deep learning	**J Novo** M5 Two-grid based postprocessing of mixed finite element approximations to the Navier-Stokes equations	**P Knight** M8 Bipartivity measures and methods	**U Vaes** M6 Spectral methods for optimal control problems for equations of Fokker–Planck type
17:35-18:00	**L Roberts** M9 Improving the scalability of derivative-free optimization for nonlinear least-squares problems	**M Discacciati** M5 Conforming mixed finite element approximation of the Navier-Stokes/Darcy-Forchheimer problem	**F Arrigo** M8 Eigenvector-based centrality measures in multilayer networks	**M Zanella** M6 Structure preserving gPC methods for kinetic equations with uncertainties

18:15-19:15	DINNER-Aroma Dinning Room-Lord Todd

Wednesday 26th June

11:00–11:30	COFFEE/TEA	
Chair:	JA505 **N Trefethen**	JA507 **K Soodhalter**
11:30-11:55	**K Xu** Backward errors incurred by the CORK linearizations	**O Fercoq** An adaptive primal-dual framework for nonsmooth convex minimization
11:55-12:20	**P Maxwell** Path-following methods for the matrix numerical range, waves on a shear flow, and other parametrised eigenvalue problems	**I McInerney** Modeling round-off error in the fast gradient method for predictive control
12:20-12:45	**S Miodragović** Relative perturbation bounds for regular quadratic eigenvalue problem	**J Karátson** Iterative methods for elliptic PDEs based on operator preconditioning
12:45-14:00	LUNCH-Urban Bean Java Cafe	

Chair:	JA505 **C Rowlatt**	JA507 **N Madden**
15:05-15:30	**S Gong** Domain decomposition preconditioners for heterogeneous Helmholtz problems	**J Fatokun** Two-step implicit higher order numerical integrator for stiff systems of initial boundary value problems of ordinary differential equations
15:30-15:55	**D Palitta** Matrix equations techniques for time-dependent partial differential equations	**H Wilber** Compression properties in rank-structured solvers for Toeplitz linear systems
15:55-16:20	**F Nouri** An image restoration by a stochastic model	
16:20-16:45	COFFEE/TEA	
Chair:	JA505 **A Wathen**	
16:45-17:10	**F Fairag** Preconditioning techniques for the Darcy-Forchheimer model using block-centered finite difference method	
17:10-17:35	**R Čiegis** High order compact finite difference schemes on nonuniform grids for nonstationary PDEs	
17:35-18:00	**M Aduamoah** Numerical methods for PDE-constrained optimization problems in particle dynamics	

Thursday 27th June

Chair:	JA325	V Dolean		
9:00-10:00	**F Kuo**	High dimensional integration and approximation: the quasi-Monte Carlo (QMC) way		
10:00-11:00	**C-B Schönlieb**	Variational models and partial differential equations for mathematical imaging		
11:00–11:30		COFFEE/TEA		

Chair:	JA325 M9	JA314 M10	JA317 M11	JA506 M5
11:30-11:55	**E Riis** M9	**M Colbrook** M10	**T Hagstrom** M11	**E Georgoulis** M5
	A geometric integration approach to nonsmooth, non-convex optimisation	Spectral problems and new resolvent based methods	Radiation boundary conditions for waves: extensions and applications	hp-Version discontinuous Galerkin methods on essentially arbitrarily-shaped elements
11:55-12:20	**J Grant-Peters** M9	**A Horning** M10	**L Xu** M11	**R Araya** M5
	An exact line search algorithm for piecewise smooth functions	Resolvent techniques for computing the spectrum of differential operators	Coupling methods for elliptic problems in the unbounded domain	An a posteriori error estimator for the MHM method applied to Stokes and Brinkman problems
12:20-12:45	**L Kreusser** M9	**M Webb** M10	**H Yang** M11	**D Silvester** M5
	A deterministic approach to avoid saddle points	Structured matrices and other desiderata for spectral methods	Optimal control in a bounded domain for wave propagating in the whole space	IFISS: A computational laboratory for investigating incompressible flow problems
12:45-14:00		LUNCH - Urban Bean Java Cafe		

Chair:	JA325	**A Ramage**		
14:00-15:00	**M Wright**	(Fletcher-Powell Lecture)	Optimization and machine learning: what are the connections?	

Chair:	JA324 M9	JA314 M10	JA317 M11	JA506 **S Franz**
15:05-15:30	**J Hall** M9	**T Gutleb** M10	**L Banjai** M11	**A Hegarty**
	HiGHS: a high-performance linear optimizer	A sparse spectral method for Volterra integral equations on the triangle	Fast and memory efficient solution of boundary integral formulations of the Schrödinger equation	Numerical solution of the Hemker problem
15:30-15:55	**I Galabova** M9	**A Gopal** M10	**W Lu** M11	**N Madden**
	Solution of quadratic programming problems for fast approximate solution of linear programming problem	A fast, robust solver for the Lippmann-Schwinger equation	Analyzing wave scattering problems in layered media by using perfectly matched layers	A first-order system method for boundary layer problems
15:55-16:20	**M Kočvara** M9	**S Olver** M10	**Y Tjandrawidjaja** M11	**P Méndez**
	On barrier and modified barrier multigrid methods for 3d topology optimization	Orthogonal polynomials on algebraic curves and surfaces	The half-space matching method and its application to wave scattering in elastic plates	On divergence-free methods for double-diffusion equations in porous media
16:20-16:45		COFFEE/TEA		

Chair:	JA325 M19	JA314 M10	JA317 M11	JA506 **A Hegarty**
16:45-17:10	**A. Otemissov** M9	**D Fortunato** M10	**S Falletta** M11	**A Jha**
	Dimensionality reduction techniques for global optimization	The ultraspherical spectral element method	A boundary integral equation method for linear elastodynamics problems on unbounded domains	On numerical simulations and a posteriori analysis for algebraic flux correction schemes
17:10-17:35	**J Fowkes** M9	**A Townsend** M10	**C Zheng** M11	**S Franz**
	A block-coordinate Gauss-Newton method for nonlinear least squares	Continuous analogues of Krylov methods for differential operators	Rational approximation of the square root function in the complex plane	Variational time integration for evolutionary systems
17:35-18:00	**D Driggs** M9	**N Trefethen** M10		
	An analysis of biased stochastic gradient descent methods	A new Laplace solver for regions with corners		
19:30 for 20:00		DRINKS RECEPTION and CONFERENCE DINNER-Trades Hall		

Thursday 27th June

11:00–11:30	COFFEE/TEA

Chair:	JA505 **F Tudisco**

11:30-11:55	**A Lawless** Improving the condition number of sample covariance matrices for use in variational data assimilation
11:55-12:20	**E Hall** Bayesian network PDEs for multiscale representations of porous materials
12:20-12:45	**A Kyriakis** Robust solvers for highly heterogeneous Maxwell's equations
12:45-14:00	LUNCH - Urban Bean Java Cafe

Chair:	JA505 **D Silvester**

15:05-15:30	**P Leleux** Multigrid-based augmented block-Cimmino method
15:30-15:55	**B Ghosh** A new two-step stable high accuracy implicit method for general second order nonlinear initial-value problems on a graded mesh
15:55-16:20	**J Van lent** Invertible piecewise rational interpolation
16:20-16:45	COFFEE/TEA

Chair:	JA505 **N Mastronardi**

16:45-17:10	**L le Gorrec** Doubly-stochastic scaling of adjacency matrices for community detection
17:10-17:35	**I Duff** Some highlights from NLAFET WP3 on parallel sparse direct solution
17:35-18:00	**I Graham** Analysis of circulant embedding methods for sampling stationary random fields

Friday 28th June

Chair:	JA325	**F Arrigo**	
9:00-10:00	**P Constantine**		
10:00-11:00	**N Kopteva**	A posteriori error estimation on anisotropic meshes	
11:00–11:30		COFFEE/TEA	
Chair:	JA325 M12	JA314 M13	JA317 **A Spence**
11:30-11:55	**E Gawlik** M12 Rational minimax iterations for computing fractional powers of matrices	**M Giles** M13 Multilevel Monte Carlo using approximate distributions	**J Mackenzie** A conservative finite element ALE scheme for reaction-diffusion equations on evolving two-dimensional domains
11:55-12:20	**Y Nakatsukasa** M12 Approximating the pth root by composite rational functions	**K Law** M13 Inference with multilevel Monte Carlo	**T Shi** What kind of tensors are compressible?
12:20-12:45	**I Pontes Duff** M12 Data-driven model order reduction for Rayleigh-damped second-order systems	**J Beck** M13 Multilevel methods for fast Bayesian optimal experimental design	**Y Yang** Optimal transport based reflection inversion: uncover model below reflectors
12:45-14:00		LUNCH-Foyer outside JA325	
		END OF CONFERENCE	

Number	Title	Organiser(s)
M1	Fractional-derivative problems	M Stynes and Y Yan
M2	Recent advances in the numerical solution of inverse problems in imaging	S Gazzola
M3	Trends in numerical methods for partial differential equations	AM Portillo, MJ Moreta and N Reguera
M4	Preconditioning and iterative methods for differential equations	J Pearson and J Pestana
M5	Finite element methods for Navier-Stokes equations: theory and algorithms	G Barrenechea and J Novo
M6	Computational methods for model-driven optimization and control under uncertainty	D Kalise and M Zanella
M7	Probabilistic numerical computation and high-dimensional data analysis	I Tyukin
M8	Matrix methods for networks	F Arrigo and F Tudisco
M9	Recent advances in continuous optimisation	N Gould and L Roberts
M10	Spectral methods	S Olver, A Townsend and M Webb
M11	Numerical methods for partial differential equations in unbounded domains	B Li and C Zheng
M12	Rational approximation	E Gawlik and Y Nakatsukasa
M13	Hierarchical methods in stochastic numerical approximations	A Haji-Ali