Springer

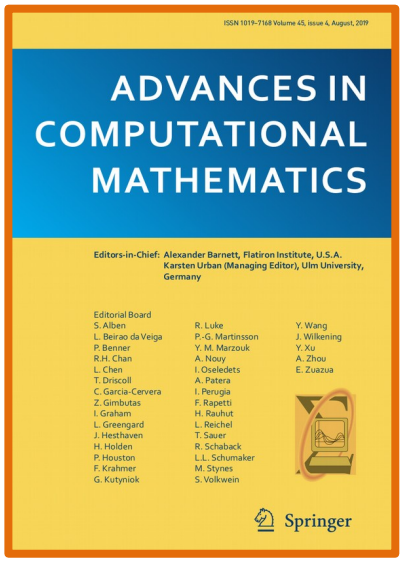
Invitation for Submissions for the Special Issue / Topical Collection

"Advances in Computational Integral Equations" (ACIE)

in the journal Advances in Computational Mathematics (ACOM)

Objective:

Integral equation methods bring tremendous advantages for the numerical solution of a wide variety of partial differential equations in complex geometries. Their representations are efficient, naturally handling unbounded domains, and they respect the physical conditioning of the underlying problem. The last 30 years has seen incredible advances in the both the mathematical theory and computational tools needed for their efficient and accurate numerical solution, such as: fast iterative and fast direct solvers for the resulting linear systems in low- and high-frequency regimes (building upon the fast multipole method of Greengard and Rokhlin), new representations, and high-order quadratures. Yet many challenges remain, and the research community is active and growing.



This topical collection is inspired by the workshop "Challenges in Computational Methods for Integral Equations" (OCCMIE) to be held May 31 to June 5, 2020, at the Casa Matematica Oaxaca (affiliated with the Banff International Research Station). Submissions from both this workshop and the global research community are welcome, and will be handled by the board listed below via ACOM's usual peer-review process.

The topical collection will gather current results in computational integral equation methods and their applications, numerical analysis, and outstanding challenges. Topics covered will include:

- Applications to PDEs such as heat, Poisson, Helmholtz, Maxwell, wave, elastodynamics, Stokes, Schrodinger
- Boundary integral equations (BIE) and high-order surface representations
- Quadrature for weakly-singular integral operators
- Fast direct solvers, randomized algorithms
- Fast algorithms for high-frequency wave problems, butterfly algorithms
- Inverse problems
- Analysis of integral equation methods, such as iterative methods for wave problems
- BIEs in moving geometries, time-domain integral equations
- Coupling of BIE or volume integral equations with other PDE solvers
- The solution of integral equations in singular geometries (corners, edges, close-to-touching surfaces, fibers)
- Numerical methods for special function and oscillatory integral evaluation
- High-performance computing implementations, software packages, industrial applications

Guest Editors:

The organizers of OCCMIE along with other researchers will act as Guest Editorial Board for the special issue:

- Stephanie Chaillat (POEMS, CNRS-ENSTA-INRIA, France)
- Adrianna Gillman (University of Colorado, Boulder, USA)
- Per-Gunnar Martinsson (University of Texas, Austin, USA)
- Michael O'Neil (Courant Institute, NYU, USA)
- Alex Barnett (Flatiron Institute, USA)
- Mary-Catherine Kropinski (Simon Fraser University, Canada)
- Timo Betcke (University College London, UK)

This board is chaired by Michael O'Neil.

Time Schedule:

Submission deadline: August 31, 2020

Please contact the guest editorial board with any questions.