# Anders Christian Hansen

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## Education

- **University of Cambridge, King's College**, UK.
  Ph.D, Mathematics, June 2008.
- **University of California, Berkeley**, USA.
  M.A., Mathematics, June 2005 (GPA: 4.0).
- **Norwegian University of Science and Technology, NTNU**, Norway.
  Siv. Ing. in Applied Mathematics, August 2002.
  Thesis title: *On the Order of Deferred Correction.* (Grade: A)

## Academic Positions

- **Reader in Mathematics (Associate Professor)**
  **University of Cambridge**, UK
  2017-present (Assistant professor since 2013)
- **Professor of Mathematics (20% position)**
  **University of Oslo**, Norway
  2014-present.
- **Royal Society University Research Fellow**
  **University of Cambridge**, UK
  2012-present.
- **Marie Curie Fellow**
  **University of Vienna**, Austria
  2012.
- **Junior Research Fellow**
  **University of Cambridge, Homerton College**, UK
  2009-2012.
- **von Karman Instructor**
  **California Institute of Technology**, USA
  2008-2009.

## Professional Activities

**Editorial Boards**

Proceedings of the Royal Society Series A

**Scientific Committees**

Royal Society Grant Committee (2017 - present)

Sampling Theory and Applications (SampTA), 12th International Conference (2017)

2016 IEEE Information Theory Workshop (2016)

Sampling Theory and Applications (SampTA), 11th International Conference (2015)

Signal Processing with Adaptive Sparse Structured Representations (SPARS) (2015)

## Awards

- 2018 IMA Prize in Mathematics and its Applications
- Philip Leverhulme Prize in Mathematics (2017) (100 000 GBP)

◇ University of Cambridge nomination for the Rosetree Award (2016)

◇ Royal Society University Research Fellowship (2012)

◇ Marie Curie Fellowship (2011)

GRANTS (PRINCIPAL INVESTIGATOR)

◇ *On fundamental computational barriers in deep learning* (Oct. 2018 - Sept. 2021)

Royal Society Enhancement Award

Total Value: 82,148 GBP

◇ *From Spectra to Sampling - Functional Analysis meets Applied Harmonic Analysis II* (Oct. 2017 - Sept. 2020)

Royal Society University Research Fellowship

Total Value: 336,340 GBP

◇ *From Spectra to Sampling - Functional Analysis meets Applied Harmonic Analysis I* (Oct. 2012 - Sept. 2017)

Royal Society University Research Fellowship

Total Value: 560,560 GBP

◇ *High-dimensional data processing: from theory to imaging applications* (Feb. 2016 - Jan. 2018)

European Commission H2020-MSCA-IF-2014-655282

Total Value: 183,000 GBP

◇ *From Spectra to Sampling - Functional Analysis meets Applied Harmonic Analysis* (Sept. 2013- Aug. 2016)

EPSRC grant EP/L003457/1.

Total Value: 187,236 GBP

◇ *Computations in infinite dimensions: Challenges in a continuous world* (Jan. 2014 - Dec. 2014)

Royal Society International Seminar Scheme.

Total Value: 10,000 GBP

◇ *Generalized Sampling and Infinite-Dimensional Compressed Sensing* (Jan 2012 - Dec. 2013)

European Commission MC-IEF Intra-European Fellowships-299566

Total Value: 181,871 GBP

**Approximate value of the total grants**: 1.53 million GBP

CONFERENCES (PLENARY SPEAKER)

◇ *On the Solvability Complexity Index (SCI) hierarchy and the foundations of computational mathematics*

· **Algebraic and geometric aspects of numerical methods for differential equations,** *Mittag-Leffler Institute, Stockholm, Sweden, June 2018.*

Other plenary speakers include: Y. Brenier (Ecole Normale Superieure, Paris), E. Hairer (Geneva), A. Iserles (Cambridge), C. Lubich (Tubingen).

◇ *On computational barriers in optimization and the paradoxes of deep learning*

· **Numerical Analysis and Approximation Theory meets Data Science,** *Banff, Canada, April 2018.*

Other plenary speakers include: A. Bertozzi (UCLA), W. Dahmen (University of South Carolina), M. Griebel (University of Bonn), H. Owhadi (Caltech).

◇ *On computational barriers in data science and the paradoxes of deep learning*

· **Generative models, parameter learning and sparsity,** *Isaac Newton Institute, Cambridge, UK, November 2017.*

Other plenary speakers include: F. Bach (Ecole Normale Superieure, Paris), R. Baraniuk (Rice), M. Figueiredo (Instituto Superior Tecnico), P. Vandergheynst (EPFL), R. Willett (University of Wisconsin).

◇ *Computing the non-computable - On the role of computability theory in the sciences*

· **Fourteenth International Conference on Computability and Complexity in Analysis,** *Daejeon, Republic of Korea, July 2017.*

Other plenary speakers include: T. Cubitt (University College London) (2016), L. C. Paulson (Cambridge) (2012), S. Simpson (Vanderbilt) (2011), M. Yampolsky (University of Toronto) (2011), M. Braverman (Princeton) (2009), R. I. Soare (University of Chicago) (2006).

◇ *On the Solvability Complexity Index (SCI) hierarchy, compressed sensing and sparse regularizations*

· **Signal Processing with Adaptive Sparse Structured Representations (SPARS 2017),** *Lisbon, Portugal, June 2017.*

Other plenary speakers include: E. Candès (Stanford) (2015), S. Mallat (Ecole Normale Superieure, Paris) (2013), D. Donoho (Stanford) (2011), M. Vetterli (EPFL) (2011), R. DeVore (Texas A&M) (2009), I. Daubechies (Princeton) (2007).

◇ *Infinite-dimensional/continuous compressed sensing in physics,*

· **The 14th International workshop on Quantum Chromodynamics (QCD) in extreme conditions,** *Plymouth, UK, Aug. 2016*

Other plenary speakers include: G. Fleming (Yale) (2016), T. Sakaguchi (Brookhaven National Laboratory, USA) (2015), D. Cebra (University of California, Davis) (2014), H. Yee (University of Illinois, Chicago) (2014).

◇ *The Solvability Complexity Index Hierarchy in scientific computing*

· **Strobl16: Time-Frequency Analysis and Related Topics,** *Strobl, Austria, June 2016.*

Other plenary speakers include: A. Iserles (Cambridge) (2016), M. Zworski (Berkeley) (2016), A. Singer (Princeton) (2014), J. Tropp (Caltech) (2014), J. Benedetto (Maryland) (2011), I. Daubechies (Duke) (2011), E. Candès (Stanford) (2009).

◇ *Can everything be computed? - On the Solvability Complexity Index and Towers of Algorithms*

· **Computational and Analytic Problems in Spectral Theory,** *Cardiff, UK, June 2016*

Other plenary speakers include: D. Evans (Cardiff). H. Langer (TU Wien), A. Pushnitski (King's College London), A. Shkalikov (Moscow State), M. van den Berg (Bristol).

◇ *What is the Solvability Complexity Index (SCI) of your problem? - On the SCI Hierarchy and the foundations of computational mathematics*

· **Low Complexity Models in Signal Processing,** *Hausdorff Institute, Bonn, Germany, Feb 2016.*

Other plenary speakers include: A. Cohen (Universite Pierre et Marie Curie), R. Gribonval (INRIA), L. Lim (University of Chicago), J. Nelson (Harvard), G. Peyre (Ecole Normale Superieure, Paris), J. Wright (Columbia).

◇ *Breaking the coherence barrier - A new theory for compressed sensing*

· **The Bath/RAL Numerical Analysis Day,** *Bath, UK, Jan. 2015.*

Other plenary speakers include: A. Wathen (Oxford) (2015), D. Arnold (Minnesota) (2013), K. Burrage (Oxford) (2013), N. Gould (Oxford) (2012), M. Powell, FRS (Cambridge) (2008), A. Iserles (Cambridge) (2005), N. Higham, FRS (Manchester) (2005), N. Trefethen, FRS (Oxford) (2004), A. Stuart (Caltech) (2003).

◇ *Breaking the coherence barrier - A new theory for compressed sensing*

· **The UCL-Duke Workshop on Sensing and Analysis of High-Dimensional Data,** *London, UK, Sept. 2014.*

Other plenary speakers include: F. Bach (INRIA), R. Baraniuk (Rice), Z. Ghahramani (Cambridge), J. Lafferty (University of Chicago), Y. LeCun (Facebook and NYU), Stephane Mallat (Ecole Normale Superieure), Y. W. Teh (Oxford), J. Tropp (Caltech).

◇ *Can everything be computed? - On the Solvability Complexity Index and Towers of Algorithms*

· **Pseudospectra of operators: spectral singularities, semiclassics, pencils and random matrices,** *International Centre for Mathematical Sciences (ICMS), Edinburgh, UK, Sept. 2014.*

Other plenary speakers include: C. Batty (Oxford), E.B. Davies, FRS (King's College London), N. Dencker (Lund), M. Overton (NYU), M. Zworski (Berkeley).

◇ *Compressed Sensing in the Real World - The Need for a New Theory*

· **international Traveling Workshop on Interactions between Sparse models and Technology (iTWIST'14),** *Belgium, August 2014.*

Other plenary speakers include: L. Vandenberghe (UCLA) (2016), H. Rauhut (Aachen) (2016), L. Demanet (MIT) (2014), A. Maleki (Columbia) (2014), D. Kressner (EPFL) (2014), M. Maggioni (Duke) (2014).

◇ *Compressed Sensing in the Real World - The Need for a New Theory*

· **French-German Conference on Mathematical Image Analysis,** *Institut Henri Poincare, Paris, Jan. 2014.*

Other plenary speakers include: R. Baraniuk (Rice), A. Bertozzi (UCLA), Y. Ma (University of Illinois, Urbana-Champaign and Microsoft Research), O. Scherzer (University of Vienna), E. Simoncelli (NYU), A. Singer (Princeton).

◇ *Breaking the Coherence Barrier: Asymptotic Incoherence and Asymptotic Sparsity in Compressed Sensing*

· **Sparse Representation of Functions: Analytic and Computational Aspects,***Berlin, Germany, Dec. 2012.*

Other plenary speakers include: R. Calderbank (Duke), W. Dahmen (Aachen), I. Daubecies (Duke), R. Gribonval (INRIA), G. Kutyniok (TU Berlin), M. Saunders (Stanford), L. Vandenberghe (UCLA).

◇ *Breaking the Coherence Barrier: Asymptotic Incoherence and Asymptotic Sparsity in Compressed Sensing*

· **Workshop on Sparsity, Localization and Dictionary Learning (the European UNLocX and SMALL projects).** *London, UK, June 2012.*

Other plenary speakers include: M. Elad (Technion), R. Gribonval (INRIA), G. Peyre (Ecole Normale Superieure, Paris), P. Vandergheynst (EPFL).

◇ *Generalized Sampling and Infinite Dimensional Compressed Sensing,*

· **Workshop on Compressed Sensing, Sparsity and Inverse Problems,** *TU Braunschweig, Germany, Sep 2010.*

Other speakers include: S. Dahlke (Marburg), M. Haltmeier (Innsbruck), T. Martinetz (Lubeck), H. Rauhut (Aachen).

◇ *Computational Complexity and Compressed Sensing,*

· **Workshop on Applied Analysis 2010,** *TU Chemnitz, Germany, Oct. 2010.*

Other plenary speakers include: V. Mehrmann (TU Berlin) (2015), R. Brualdi (Wisconsin), H. Rauhut (Aachen) (2012), E. Novak (Jena) (2010), H. Schneider (Wisconsin) (2010).

◇ *Computations with the Infinite Matrix,*

· **Wales Workshop on Analytical Computational Mathematics,** *Cardiff, UK, Feb. 2010.*

Other plenary speakers include: A. Böttcher (Chemnitz), S. Chandler-Wilde (Reading), J. Levesley (Leicester), C. Wulff (Surrey).

CONFERENCES (INVITED SPEAKER)

◇ *The Solvability Complexity Index hierarchy*

· **Foundations of Computational Mathematics,** *Barcelona, Spain, June. 2017.*

Other invited speakers include: A. Iserles (Cambridge), D. Kressner (EPFL), N. Pillai (Harvard), A. Singer (Princeton), R. van Handel (Princeton).

◇ *Can everything be computed? - On the Solvability Complexity Index and Towers of Algorithms*

· **Foundations of Computational Mathematics,** *Montevideo, Uruguay, Dec. 2014.*

Other invited speakers include: Albert Cohen (Universite Pierre et Marie Curie), W. Dahmen (Aachen), A. Edelman (MIT), A. Iserles (Cambridge), P. Olver (Minnesota), P. Parrilo (MIT), B. Recht (Berkeley), H. Wozniakowski (Columbia).

◇ *Compressed Sensing in the Real World - The Need for a New Theory*

· **5th International Conference on Computational Harmonic Analysis,** *Vanderbilt University, Tennessee, USA, May 2014.*

Other invited speakers include: L. Demanet (MIT), M. de Hoop (Purdue), Y. Eldar (Technion), S. Fomel (UT Austin), A. Laine (Columbia), Y. Lu (Harvard).

◇ *Compressed Sensing in the Real World - The Need for a New Theory*

· **Compressed sensing and its Applications,** *Berlin, Germany, Dec 2013.*

Other invited speakers include: R. Gribonval (INRIA), H. Rauhut (Aachen), R. Schneider (TU Berlin), R. Ward (UT Austin) R. Willett (Wisconsin),

◇ *Generalized Sampling and Infinite Dimensional Compressed Sensing,*

· **Analytic and Geometric Methods in Medical Imaging,** *I. Newton Institute, UK, Aug 2011*

Other invited speakers include: H. Ammari (ETH), G. Bal (Columbia), T. Chan (UCLA and Hong Kong University of Science and Technology), D. Hawkes (UCL), O. Scherzer (University of Vienna), G. Uhlmann (University of California, Irvine).

SEMINAR TALKS

◇ *About 50 seminar talks over the last 10 year at the following institutions:*

· Aalborg University, Aalto University, Caltech, Durham University, EPFL, ETH, Imperial College, Helmholtz Zentrum Munchen, Heriot-Watt University, INRIA (Rennes), Institut Henri Poincare, King's College London, LMU Munich, Norwegian University of Science and Technology (NTNU), Purdue University, TU Berlin, UC Berkeley, UCLA, University College London, University of Bath, University of Bergen, University of Cambridge, University of Cardiff, University of Edinburgh, University of London (Queen Mary), University of Manchester, University of Maryland, University of Oxford, University of Oslo, University of Reading, University of Toulouse, University of Vienna, University of Warwick, Stanford University

PHD CANDIDATES EXAMINED

◇ *Isospectral algorithms, Toeplitz matrices and orthogonal polynomials*

Marcus Webb (Advisor: A. Iserles)
University of Cambridge, October 2016

◇ *Sparse recovery from Fourier measurements using compactly supported shearlets*

Jackie Ma (Advisor: G. Kutyniok)
TU Berlin, Aug 2016

◇ *Numerical analysis of the Fokas method in two and three dimensions*

Kevin Crooks (Advisor: A. Ashton)
University of Cambridge, June 2016

◇ *Numerical Solution of Sturm-Liouville Problems via Fer Streamers*

Gil Ramos (Advisor: A. Iserles)
University of Cambridge, April 2016

◇ *Shapes from Pixels*

Mitra Fatemi (Advisor: M. Vetterli)
EPFL, March 2016

◇ *Block Constrained Compressed Sensing*

Claire Boyer (Advisor: P. Weiss)
University of Toulouse, May 2015

◇ *Novel higher order regularisation methods for image reconstruction*

Konstantinos Papatsoros (C. Schonlieb)
University of Cambridge, Sept 2014

PhD-students supervised

◇ Clarice Poon (Cambridge). Graduated: 2015
◇ Milana Gataric (Cambridge). Graduated: 2016
◇ Alexander Jones (Cambridge). Graduated: 2016
◇ Alexander Bastounis (Cambridge). Graduating: 2018
◇ Ben Jennings (Cambridge). Graduating: 2018
◇ Heiki Niglas (Cambridge). Graduating: 2018
◇ Laura Terhaar (Cambridge). Graduating: 2020
◇ Matt Colbrook (Cambridge). Graduating: 2020
◇ Vegard Antun (Oslo). Graduating: 2020
◇ Simon Becker(Cambridge). Graduating: 2021
◇ Nina Gottschling (Cambridge). Graduating: 2022

Post-Docs mentored

◇ Jonathan Ben-Artzi (PhD: Brown University) 2011-2014
◇ Bogdan Roman (PhD: University of Cambridge) 2013-2016, 2016-2019
◇ Priscilla Canizares (PhD: Autonomous University of Barcelona) 2015-2016
◇ Milana Gataric (PhD: University of Cambridge ) 2015-2016
◇ Francesco Renna (PhD: University of Padova ) 2016-2018

Master-students supervised

◇ Benoit Huet (Ecole Normale Superieure). Graduated: 2013
◇ Jackie MA (TU Berlin). Graduated: 2013
◇ Laura Terhaar (TU Berlin). Graduated: 2016
◇ Vegard Antun (University of Oslo). Graduated: 2016
◇ Kevin Sheehan (University of Oslo). Graduated: 2018
◇ Kristoffer Munsterhjelm (University of Oslo). Graduated: 2018
◇ Kristoffer Hoiseter (University of Oslo). Graduated: 2018