Colas Schretter

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Bio

I completed the M.Sc. degree in computer science with great honors in 2004 and received an additional Master of advanced studies (DEA) in 2006 from the Université libre de Bruxelles, Belgium. In February 2007, I moved to Germany for a scientist position with Philips Research, Aachen. Meanwhile, I earned a Marie Curie EST fellowship for my doctoral thesis, awarded with magna cum laude in April 2010, at the Otto-von-Guericke University. Thereafter, I won a Marie Curie ERG grant for my postdoctoral project with the RWTH Aachen University and was visiting researcher at the Politecnico di Milano, Italy. I was selected for a M+Vision 2012 fellowship at the MIT in Cambridge, USA. I am back in Belgium since October 2013, as senior research scientist at the ETRO department of the Vrije Universiteit Brussel. My activities are funded by the INTERFERE ERC Consolidator grant of Peter Schelkens and the imec nanoelectronics institute.

Interests

I am interested in geometric algorithms, hierarchical data structures, sparse and compressed data representations, physically-based modeling, quasi Monte-Carlo sampling, statistical density estimation and regression. My current work applies these tools for natural image restoration, tomographic and interferometric image reconstruction, computational spectrometry and digital holography.

Education

Doctor of Engineering (Ph.D.), *magna cum laude* *April 2010*
Institution: Otto-von-Guericke University, Magdeburg, Germany
Thesis: "Correction of Non-Periodic Motion in Computed Tomography"
Advisors: Georg Rose and Matthias Bertram

Master of Advanced Studies in Sciences (DEA) *September 2006*
Institution: Université libre de Bruxelles, Brussels, Belgium
Thesis: "New Algorithms for Image Reconstruction From Emission Tomography List-Mode Data"
Advisors: Serge Goldman and Michel Defrise

Master of Computer Science (M.Sc.), *grande distinction* *September 2004*
Institution: Université libre de Bruxelles, Brussels, Belgium
Thesis: "Efficient N-Body Algorithms for Astrophysical Simulations"
Advisors: Jean Cardinal and Yves Busegnies

Experience

Interuniversity Microelectronics Centre (imec), Belgium *Since October 2020*
Project leader on development of photonics integrated circuits for scattering compensated imaging.

Vrije Universiteit Brussel, Belgium *Since October 2013*
Proposed a compressed sensing method for volumetric ultrasound imaging using dictionaries of wavelets created from physically-based simulations of sound transport (iMinds 3DUS Icon project).

Massachusetts Institute of Technology, USA *September 2012 – June 2013*
Received a postdoctoral fellowship from the Madrid-MIT M+Visión Consortium for leading innovative projects in translational biomedical imaging.(http://mvisionconsortium.mit.edu)

Hospital Clínico San Carlos, Madrid, Spain *July 1 – August 15, 2012*
Clinical residence and participation to the M+Visión 2012 Horizon lecture series.

Politecnico di Milano, Italy *October 2011 – June 2012*
Visiting scientist at the Departement of Electrical Engineering (DEI) of Politecnico di Milano.

RWTH Aachen University, Germany *May 2010 – June 2012*
Designed statistical image reconstruction methods for time-of-flight positron emission tomography.

Philips Research, Germany *February 2007 – April 2010*
Proposed new methods for estimating unexpected patient motion in X-ray computed tomography.

Institute of Molecular Biology and Medicine, Belgium *November 2003 – February 2005*
Developed searching heuristics and user interfaces for oligonucleotide design in bioinformatics.

Grants

I obtained a Marie Curie Early Stage Training fellowship (MEST-CT-2005-020424) for 4 years and a postdoctoral European Reintegration Grant of 30,000 Euros (PERG06-GA-2009-256519) from the European FP6 and FP7 programs. I was selected for the 2012 fellowship from the Madrid-MIT M+Visión Consortium. I won a FWO grant (G0B3521N) on Unified Sparse Representation for Plenoptic Modalities (UniMode). Current projects are supported by the imec research institute.

Journal Papers and Book Chapters

Kizhakkumkara M., R., Schretter, C., Blinder, D. and Schelkens, P., "Autoregressive modeling for lossless compression of holograms," *Optics Express*, vol. 31, no. 23, pp. 38589-38609, 2023.

Bresciani de Carvalho, M., Pagliari, C., Alves, G., Schretter, C., Schelkens, P., Pereira, F. and Da Silva, E., "Supporting Wider Baseline Light Fields in JPEG Pleno With a Novel Slanted 4D-DCT Coding Mode," *IEEE Access*, vol. 11, pp. 28294-28317, 2023.

Kizhakkumkara M., R., Birnbaum, T., Blinder, D., Schretter, C. and Schelkens, P., "Binary hologram compression using context based Bayesian tree models with adaptive spatial segmentation," *Optics Express*, vol. 30, no. 14, pp. 25597-25611, 2022.

Shcheglov, A., Nie, Y., Schretter, C., Heeman, R., van der Put, A., Hoving, W., Thienpont, H., Schelkens, P. and Ottevaere, H., "Miniaturized cost-effective broadband spectrometer employing a deconvolution reconstruction algorithm for resolution enhancement," *Optics Express*, vol. 30, no. 7, pp. 11459-11471, 2022.

Birnbaum, T., Blinder, D., Kizhakkumkara M., R, Schretter, C., Symeonidou, A. and Schelkens, P., "Object-based digital hologram segmentation and motion compensation," *Optics Express*, vol. 28, no. 8, pp. 11861-11882, 2020.

Kizhakkumkara M., R., Blinder, D., Symeonidou, A., Birnbaum, T., Watanabe, O., Schretter, C. and Schelkens, P., "Exact global motion compensation for holographic video compression," *Applied Optics*, vol. 58, no. 34, pp. G204-G217, 2019.

Birnbaum, T., Ahar, A., Blinder, D., Schretter, C., Kozacki, T. and Schelkens, P., "Wave atoms for digital hologram compression," *Applied optics*, vol. 58, no. 22, pp. 6193-6203, 2019.

Zhang, M., Markovsky, I., Schretter, C. and D'hooge, J., "Compressed ultrasound signal reconstruction using a low-rank and joint-sparse representation model," *IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control*, vol. 66, no. 7, pp. 1232-1245, 2019.

Blinder, D., Ahar, A., Bettens, S., Birnbaum, T., Symeonidou, A., Ottevaere, H.. Schretter, C. and Schelkens, P., "Signal processing challenges for digital holographic video display systems," *Signal Processing: Image Communication*, vol. 70, pp. 114-130, 2019.

Blinder, D., Schretter, C. and Schelkens, P., "Global motion compensation for compressing holographic videos," *Optics express*, vol. 26, no. 20, pp. 25524-25533, 2018.

Blinder, D., Schretter, C., Ottevaere, H., Munteanu, A. and Schelkens, P., "Unitary transforms using time-frequency warping for digital holograms of deep scenes," *IEEE Transactions on Computational Imaging*, vol. 4, no. 2, pp. 206-218, 2018.

Schretter, C., Bundervoet, S., Blinder, D., Dooms, A., D'hooge, J. and Schelkens, P., "Ultrasound imaging from sparse RF samples using system point spread functions," *IEEE transactions on ultrasonics, ferroelectrics, and frequency control*, vol. 65, no. 3, pp. 316-326, 2017.

Bettens, S., Schretter, C., Deligiannis, N. and Schelkens, P., "Bounds and conditions for compressive digital holography using wavelet sparsifying bases," *IEEE Transactions on Computational Imaging*, vol. 3, no. 4, pp. 592-604, 2017.

Bettens, S., Hao, Y., Blinder, D., Ottevaere, H., Schretter, C. and Schelkens, P., "Studies on the sparsifying operator in compressive digital holography," *Optics express*, vol. 25, no. 16, pp. 18656-18676, 2017.

Schretter, C., Blinder, D., Bettens, S., Ottevaere, H. and Schelkens, P., "Regularized non-convex image reconstruction in digital holographic microscopy," *Optics express*, vol. 25, no. 14, pp. 16491-16508, 2017.

Schretter, C., He, Z., Gerber, M. and Niederreiter, H., "Van der Corput and Golden Ratio Sequences Along the Hilbert Space-Filling Curve," *Monte Carlo and Quasi-Monte Carlo Methods: MCQMC, Leuven, Belgium, April 2014*, pp. 531-544, Springer Verlag, 2016.

Schretter, C. and Niederreiter, H., "A Direct Inversion Method for Non-Uniform Quasi-Random Point Sequences," *Monte Carlo Methods and Applications*, vol. 19, no. 1, pp. 1–9, 2013.

Schretter, C., Dehaye, P.-O. and Kobbelt, L., "Golden Ratio Sequences for Low-Discrepancy Sampling," *Journal of Graphics Tools*, vol. 16, no. 2, pp. 95–104, 2012.

Schretter, C., Rose, G. and Bertram, M., "Image-Based Iterative Compensation of Motion Artifacts in Computed Tomography," *Medical Physics*, vol. 36, no. 11, pp. 5323–5330, 2009.

Gatto, L. and Schretter, C., "Designing Primer Pairs and Oligos with OligoFaktorySE," *EMBnet news*, vol. 15, no. 3, pp. 22–24, 2009.

Schretter, C., "Event-by-Event Image Reconstruction From List-Mode PET Data," *IEEE Transactions on Image Processing*, vol. 8, no. 1, pp. 117–124, 2009.

Meyer, P. E., Schretter, C. and Bontempi, G., "Information-Theoretic Feature Selection in Microarray Data Using Variable Complementarity," *IEEE Journal of Selected Topics in Signal Processing*, vol. 2, no. 3, pp. 261–274, 2008.

Schretter, C., "A Fast Tube of Response Ray-Tracer," *Medical Physics*, vol. 33, no. 12, pp. 4744–4748, 2006.

Schretter, C. and Milinkovitch, M. C., "OligoFaktory: A Visual Tool for Interactive Oligonucleotide Design," *Bioinformatics*, vol. 22, no. 1, pp. 115–116, 2006.

Schretter, C., "A Brush Tool for Interactive Texture Synthesis," *ICGST International Journal on Graphics, Vision and Image Processing*, vol. 6, no. 5, pp. 55–60, 2005.

Schretter, C., "Discover OligoFaktory Standalone Edition," *EMBnet news*, vol. 11, no. 4, pp. 24–25, 2005.

Conference Papers

Liu, J., Schretter, C., Shcheglov, A., Ottevaere, H. and Nie Y., "Digital aberration correction to enhance the spectral resolution of miniaturized optical spectrometers," *Optics, Photonics, and Digital Technologies for Imaging Applications VIII*, vol. 12998, pp. 225-238, 2024.

Blinder, D., Wang, F., Schretter, C., Kakue, T., Shimobaba, T. and Schelkens, P., "Joint color optimization for computer-generated holography without color replicas," *Optics, Photonics, and Digital Technologies for Imaging Applications VIII*, vol. 12998, pp. 117-124, 2024

Schelkens, P., Blinder, D., Kizhakkumkara M., R., Mahmoudpour, S., Schretter, C. and Shimobaba, T., "Compression challenges for digital holography," *Digital Holography and Three-Dimensional Imaging*, Optica Publishing Group pp. HW4C. 1, 2023.

Kizhakkumkara M., R., Birnbaum, T., Blinder, D., Schretter, C. and Schelkens, P., "Perceptually lossless compression of bi-level holograms using adaptive Markovian models," *Digital Holography and Three-Dimensional Imaging*, Optica Publishing Group pp. HM3C. 4, 2023.

Schretter, C. and Schelkens, P., "Sequential Adaptive Scattering-Compensated Holography for Fluorescence Microscopy," *Digital Holography and Three-Dimensional Imaging*, Optica Publishing Group pp. Th2A. 8., 2022.

Kizhakkumkara M., R., Birnbaum, T., Blinder, D., Schretter, C. and Schelkens, P., "INTERFERE: A unified compression framework for digital holography," *Digital Holography and Three-Dimensional Imaging*, Optica Publishing Group pp. Th4A. 2, 2022.

Kizhakkumkara M., R., Birnbaum, T., Blinder, D., Schretter, C. and Schelkens, P., "Lossless Compression of Binary Holograms with Context Models and Adaptive Segmentation," *Digital Holography and Three-Dimensional Imaging*, Optica Publishing Group pp. DTh7C. 7, 2021.

Kizhakkumkara M., R., Symeonidou, A., Blinder, D., Birnbaum, T., Schretter, C. and Schelkens, P., "Exact compensation of rotational motion for holographic video compression," *Digital Holography and Three-Dimensional Imaging*, Optica Publishing Group pp. Tu4A. 2, 2019.

Birnbaum, T., Ahar, A., Montrésor, S., Picart, P., Schretter, C. and Schelkens, P., "Speckle denoising of computer-generated macroscopic holograms," *Digital Holography and Three-Dimensional Imaging*, Optica Publishing Group pp. W3A. 1, 2019.

Birnbaum, T., Ahar, A., Blinder, D., Schretter, C., Kozacki, T. and Schelkens, P., "Wave atoms for lossy compression of digital holograms," *IEEE Data Compression Conference (DCC)*, pp. 398-407, 2019.

Zhang, M., Markovsky, I., Schretter, C. and D'hooge, J., "Ultrasound Signal Reconstruction from Sparse Samples Using a Low-Rank and Joint-Sparse Model," *IEEE International Ultrasonics Symposium (IUS)*, pp. 1-4, 2018.

Schelkens, P., Blinder, B., Birnbaum, T., Symeonidou, A., Ahar, A. and Schretter, C., "Source coding of holographic data: challenges, algorithms and standardization efforts," *Speckle 2018: VII International Conference on Speckle Metrology*, vol. 10834, pp. 257-262, 2018.

Birnbaum, T., Blinder, D., Schretter, C. and Schelkens, P., "Compressing macroscopic near-field digital holograms with wave atoms," *Digital Holography and Three-Dimensional Imaging*, Optica Publishing Group pp. DW2F. 5, 2018.

Schelkens, P., Ahar, A., Bettens, S., Bilous, V., Birnbaum, T., Blinder, D., Ottevaere, H., Munteanu, A., Schretter, C. and Symeonidou, A., "A Roadmap Towards Holographic Television From a Signal Processing Perspective," *Digital Holography and Three-Dimensional Imaging*, Optica Publishing Group pp. M2B. 1, 2017.

Schretter, C., Bettens, S., Blinder, D., Pesquet-Popescu, B., Cagnazzo, M., Dufaux, F. and Schelkens, P., "Compressed digital holography: from micro towards macro," *Applications of Digital Image Processing XXXIX*, vol. 9971, pp. 261-276, 2016.

Symeonidou, A., Blinder, D., Ahar, A., Schretter, C., Munteanu, A. and Schelkens, P., "Speckle noise reduction for computer generated holograms of objects with diffuse surfaces," *Optics, Photonics and Digital Technologies for Imaging Applications IV*, vol. 9896, pp. 67-76, 2016.

Schretter, C., Blinder, D., Bruylants, T., Schelkens, P. and Munteanu, A., "Efficient scalable compression of sparsely sampled images," *IEEE International Conference on Image Processing (ICIP)*, pp. 2030-2034, 2015.

Ahar, A., Blinder, D., Bruylants, T., Schretter, C., Munteanu, A. and Schelkens, P., "Subjective quality assessment of numerically reconstructed compressed holograms," *Applications of Digital Image Processing XXXVIII*, Optica Publishing Group vol. 9599, pp. 188-202, 2015.

Schretter, C., Sun, J., Bundervoet, S., Dooms, A., Schelkens, P., de Brito Carvalho, C., Slagmolen, P. and D'hooge, J., "Continuous ultrasound speckle tracking with Gaussian mixtures," *IEEE Engineering in Medicine and Biology Society (EMBC)*, pp. 129-132, 2015.

Blinder, D., Ahar, A., Symeonidou, A., Xing, Y., Bruylants, T., Schretter, C., Pesquet-Popescu, B., Dufaux, F., Munteanu, A. and Schelkens, P., "Open access database for experimental validations of holographic compression engines," *7th International Workshop on Quality of Multimedia Experience (QoMEX)*, pp. 1-6, 2015.

Bettens, S., Hao, Y., Bundervoet, S., Schretter, C., Dooms, A. and Schelkens, P., "Reconstruction resilience to subsampling in compressive fresnel holography," *Digital Holography and Three-Dimensional Imaging*, Optica Publishing Group pp. DT1A. 3, 2015.

Schretter, C., Loris, I., Dooms, A. and Schelkens, P., "Total Variation Reconstruction From Quasi-Random Samples," *iTWIST'14,* , Namur, Belgium, August 27–29, 2014.

Bundervoet, S., Schretter, C., Dooms, A. and Schelkens, P., "Bayesian Estimation of Sparse Smooth Speckle Shape Models for Motion Tracking in Medical Ultrasound," *iTWIST'14,* , Namur, Belgium, August 27–29, 2014.

Schretter, C., Sun, J. and Kobbelt, L., "Online Estimation of B-Spline Mixture Models From TOF-PET List-Mode Data," *Proc. of the 11th International Meeting on Fully Three-Dimensional Image Reconstruction in Radiology and Nuclear Medicine*, Potsdam, Germany, July 11–15, pp. 271–274, 2011.

Chun, S. Y., Schretter, C. and Fessler, J. A., "Sufficient Condition for Local Invertibility of Spatio-Temporal 4D B-Spline Deformations," *Proc. of the 7th IEEE International Symposium on Biomedical Imaging*, Rotterdam, The Netherlands, April 14–17, pp. 1221–1224, 2010.

Schretter, C., "Online PET Reconstruction From List-Mode Data," *Proc. of the 10th International Meeting on Fully Three-Dimensional Image Reconstruction in Radiology and Nuclear Medicine*, Beijing, China, September 5–10, pp. 195–198, 2009.

Schretter, C., Pilatus, F., Rose, G., Aach, T. and Bertram, M., "Optical Flow Motion Estimation for Approximate Motion Compensation in Cone-Beam CT," *Proc. of the 10th International Meeting on Fully Three-Dimensional Image Reconstruction in Radiology and Nuclear Medicine*, Beijing, China, September 5–10, pp. 327–330, 2009.

Schretter, C., Neukirchen, C., Rose, G. and Bertram, M., "Optimal Pre-Filtering for Linear Interpolation in Computed Tomography," *Proc. of the 2nd Workshop on High-Performance Image Reconstruction*, Beijing, China, September 6, pp. 29–32, 2009.

Schretter, C., Neukirchen, C., Rose, G. and Bertram, M., "Image-Based Iterative Compensation of Motion Artifacts in Computed Tomography," *SPIE Medical Imaging*, Lake Buena Vista, USA, February 7–12, vol. 7258, pp. 1W–8, 2009.

Schretter, C., Neukirchen, C., Rose, G. and Bertram, M., "Local Correction of Non-Periodic Motion in Computed Tomography," *SPIE Medical Imaging*, Lake Buena Vista, USA, February 7–12, vol. 7258, pp. 2M–12, 2009.

Schretter, C., Neukirchen, C., Bertram, M. and Rose, G., "Correction of Some Time-Dependent Deformations in Parallel-Beam Computed Tomography," *Proc. of the 5th IEEE International Symposium on Biomedical Imaging*, Paris, France, May 14–17, pp. 764–767, 2008.

Brinks, R., Schretter, C. and Meyer, C., "Comparison of Maximum-Likelihood List-Mode Reconstruction Algorithms in PET," *Proc. of the IEEE Nuclear Science Symposium and Medical Imaging Conference*, San Diego, USA, October 29 – November 4, vol. M11-389, pp. 2801–2803, 2006.

Schretter, C., Gatto L. and Milinkovitch, M. C., "Oligo-Faktory: A Web Portal for Interactive Oligonucleotide Design," *First BENELUX Bioinformatics Conference*, Ghent, Belgium, April 14–15, 2005.

Technical Reports

Schretter, C., "Computing Random Points on Sphere," *Boost C++ Ticket 1059*, June, 2007.

Schretter, C. and Gatto, L., "A Tiny Queuing System for Blast Servers," December 2005.

Schretter C. and Milinkovitch, M. C., "Automated Long Oligo Design on Consensus Regions of Similar Genomes," *Technical Report UEG, IBMM*, Université libre de Bruxelles, Brussels, Belgium, 2005.

Schretter, C. and Milinkovitch, M. C., "Oligonucleotide Design by Multilevel Optimization," *Technical Report UEG, IBMM*, Université libre de Bruxelles, Brussels, Belgium, 2005.

Patents

Blinder, D., Schretter, C. and Schelkens, P., "Method and apparatus for compensating motion for a holographic video stream," US 11277633/16965493, March 2022.

Schretter, C., Bundervoet, S., Dooms, A. and Schelkens, P., "Ultrasound imaging system and method for representing RF signals therein," US 15570604, October 2018.

Schretter, C., Bertram, M. and Neukirchen, C., "Method and Apparatus For Large Field of View Imaging and Detection and Compensation of Motion Artifacts," US 30961/04024, January, 2009.

Forthmann, P., Köhler, T., Van Stevendaal, U., Bertram, M., Hohmann, S. and Schretter, C., "Method and Apparatus to Improve CT Image Acquisition Using Displaced Geometry," US 30961/04021, September, 2008.