RESUME - Xu Ma

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Education

- 2015/11-2015/12, Interuniversity Microelectronics Centre, Belgium, Advanced study in "IMEC Training on CMOS Process Technology and IC Modeling" (Serve as Training Group Leader).
- 2005/09-2009/08: University of Delaware, USA, Ph.D. in Electrical and Computer Engineering. Advisor: Professor Gonzalo R. Arce (IEEE/OSA/SPIE Fellow, Charles Black Evans Professor).
- 2001/09-2005/07: Tsinghua University, China, B.S. in Electrical Engineering.

Professional Experiences

- 2022/06-Current: Beijing Institute of Technology, School of Optics and Photonics, Academic Leading Professor.
- 2017/10-2018/2: University of Delaware, Department of Electrical and Computer Engineering, Visiting Professor.
- 2013/07-Current: Beijing Institute of Technology, School of Optics and Photonics, Professor.
- 2010/10-2013/07: Beijing Institute of Technology, School of Optics and Photonics, Associate Professor.
- 2009/08-2010/08: University of California, Berkeley, USA, Postdoctoral Researcher in Department of Electrical Engineering and Computer Sciences. Advisor: Professor Avideh Zakhor (IEEE Fellow).

Research Interests and Achievements

- **Research Interests:** Computational imaging, resolution enhancement technology, intelligent and advanced optoelectronic image processing based on compressive sensing, machine learning, and deep learning.
- **Research Achievements:** Most of Prof. Xu Ma's research works focus on the compressive encoded computational hyperspectral imaging, coded aperture X-ray tomosynthesis and computed tomography, mathematical modeling and resolution enhancement technologies for high-precision imaging systems. In the past, he has developed a set of numerical approaches and optical systems to demonstrate the leading-edge computational imaging principles and technologies. He has published an English monograph, more than 140 papers on the top journals and international conferences. He has filed 52 patents, 42 of which have been granted. He also holds 6 software copyrights. His research achievements have been reported by the SPIE Newsroom, and some famous technical magazines.

Awards and Honors

- The Third-Class Prize of Advanced Optical Remote Sensing Design Competition, 2023.
- Winner of the Best Paper Award of the 6th International Workshop on Advanced Patterning Solutions (IWAPS), 2022.
- Excellent Project of Education Ministry's Collaborative Education Program with Industry, 2021.
- Winner of Innovation and Entrepreneurship Demonstration Team of Chongqing City, 2020.
- The First-Class Prize of the 9th Teaching Skill Competition in Beijing Institute of Technology, 2015.

- Technology Foundation for Selected Overseas Chinese Scholar supported by the Ministry of Human Resources and Social Security, 2012.
- New Century Excellent Talents Supporting Plan of Ministry of Education, 2010.
- Allan P. Colburn Prize in Mathematical Sciences and Engineering, University of Delaware, 2010.
- Signal Processing & Communication Graduate Faculty Award, University of Delaware, 2009.

Professional Society Activities

- Guest Editor of Special Issue of Computational Optical Sensing and Imaging in the Journal of Sensors (Impact Factor 3.4).
- Editorial Board Member of the Journal of Chinese Journal of Engineering.
- Senior Members of IEEE, OSA and SPIE.
- Serve as the reviewers of Wiley & Sons, SPIE Press, and the Hong Kong Research Grants Council.
- Serve as the reviewers of more than 20 peer-reviewed journals including IEEE Transactions on Computational Imaging, IEEE Transactions on Image Processing, IEEE Transactions on Signal Processing, and etc.
- Committee Member of Optoelectronic Technology of the Chinese Optical Society (COS), Council Member of the Optoelectronics and Electromechanical Branch of the China Instrument and Control Society (CIS), Council Member of the Micro-Nano Actuator and Microsystem Branch of the Chinese Society of Micro-Nano Technology (CSMNT), Committee Member of Lithography Material and Technology of the Chinese Society for Imaging Science and Technology (CSIST), Committee Member of Digital Imaging Technology of the Chinese Society for Imaging Science and Technology (CSIST), Committee Member of Optoelectronic Testing and Measurement Technology and Application of the Chinese Society for Optical Engineering (CSOE).
- Serve as the Session Chairs and Program Committee Members for several international academic conferences and provide invited talks.

Publications

- **Book**

[1] **Xu Ma** and Gonzalo R. Arce, *Computational Lithography*, Wiley & Sons, 2010.

- **Journal Papers**

[1] Shengen Zhang, **Xu Ma***, Chaojun Huang, Fuli Wang, and Gonzalo R. Arce, “Model-driven optical proximity correction via hypergraph convolutional neural networks and its experimental demonstration,” Optics and Laser Technology, 183, 112199 (2025).

[2] Chaojun Huang, **Xu Ma***, Shengen Zhang, Mu Lin, Néstor Porras-Díaz, and Gonzalo R. Arce, “Block-based inverse lithography technology with adaptive level-set algorithm,” Optics and Laser Technology, 182, 112211 (2025).

[3] Ziqi Li, Lisong Dong, **Xu Ma**, et. al, “Fast source mask co-optimization method for high-NA EUV lithography,” Opto-Electronic Advances 7(4), 44-54 (2024).

[4] Wensheng Chen, **Xu Ma***, and Shengen Zhang, “Bandwidth-aware fast inverse lithography technology using Nesterov accelerated gradient,” Optics Express 32(24), 42639-42651 (2024).

[5] Shengen Zhang, **Xu Ma***, Gonzalo R. Arce, “Robust source and polarization joint optimization for thick-mask lithography imaging,” Journal of Micro/Nanopatterning, Materials, and Metrology 23(4), 043201 (2024).

[6] Jianwen Meng, Wenyi Ren*, Ruoning Yu, **Xu Ma**, et. al, “Learning based polarization image fusion under an alternative paradigm,” Optics and Laser Technology, 168, 109969 (2024).

[7] Hantang Chen, **Xu Ma***, Jihui Wang, et. al, “Sparse-angle optical projection tomography based on multi-layer sparsity and deep image priors,” Applied Optics, 63, 5137-5143 (2024).

[8] Jingwen Lei, **Xu Ma***, and Jun Ke, “Freeform-surface-based optical design of a broadband compressive spectral imager with co-aperture coding,” Applied Optics. 63, 6165-6172 (2024).

[9] Ziqi Li, Lisong Dong, **Ma Xu**, et. al, “Mask structure optimization for beyond EUV lithography,” Optics Letters 49, 3604-3607 (2024).

[10] Junbi Zhang and **Xu Ma***, “Fast diffraction model of lithography mask based on improved pixel-to-pixel generative adversarial network,” Optics Express, 31(15), 24437-24452 (2023).

[11] Qile Zhao, **Xu Ma***, Carlos Restrepo, et. al, “Instant coded X-ray computed tomography via nonlinear reconstruction,” Optical Engineering, 62(6), 068107 (2023).

[12] Tong Zhang, Shengjie Zhao*, **Xu Ma**, et. al, “Compressive Spectral Imaging via Misalignment Induced Equivalent Grayscale Coded Aperture,” IEEE Geoscience and Remote Sensing Letters, 20, 1-5 (2023).

[13] Yechuan Qiu, Shengjie Zhao*, **Xu Ma**, et. al, “Hyperspectral Image Reconstruction via Patch Attention Driven Network,” Optics Express, 31(12), 20221-20236 (2023).

[14] Ziqi Li, Lisong Dong, **Xu Ma**, et. al, “Decomposition-learning-based thick-mask model for partially coherent lithography system,” Optics Express, 31(12), 20321-20337 (2023).

[15] Pengjie Kong, Lisong Dong*, **Xu Ma**, et. al, “Optimization of chemically amplified resist formulation based on simple random sampling and kernel density estimation,” Journal of Micro/Nanopatterning, Materials, and Metrology, 22(2), 024601-0246041 (2023).

[16] Zhen Fang, **Xu Ma***, Huifeng Pan, et. al, “Movement forecasting of financial time series based on adaptive LSTM-BN network,” Expert System with Application, 213, 119027 (2023).

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[18] Junbi Zhang, **Xu Ma*** and Shengen Zhang, “Classification method of lithographic layout patterns based on GCN with graph attention mechanism,” Journal of Micro/Nanopatterning, Materials, and Metrology, 22(3), 034202-034202 (2023).

[19] Xia Wang*, **Xu Ma***, Jun Ke*, et. al, “Advances in Speckle and Compressive Computational Imaging,” Acta Optica Sinica, 43(15), 1511001 (2023).

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[21] Shengen Zhang, **Xu Ma***, and Junbi Zhang, “Fast inverse lithography approach based on model-driven graph convolutional network, ” Optics Express, 31(22), 36451-36467 (2023).

[22] Jiashou Wang, Lisong Dong, Xiaojing Su*, Yajuan Su, **Xu Ma**, et. al, “Selection approach of critical patterns for calibrating the physical resist model based on spectrum coverage,” Journal of Micro/Nanopatterning, Materials, and Metrology, 22(4), 043201 (2023).

[23] Jiangbo Lyu, Tao Zhu, Yan Zhou, Zhenmin Chen, Yazhi Pi, Zhengtong Liu, Xiaochuan Xu, Ke Xu*, **Xu Ma***, et. al, “Inverse design for material anisotropy and its application for a compact X-cut TFLN on-chip wavelength demultiplexer,” Opto-Electronic Science, 2(11), 230038 (2023).

[24] Tong Zhang, Shengjie Zhao*, **Xu Ma**, et. al, “Compressive Spectral X-Ray CT Reconstruction via Deep Learning,” IEEE Transactions on Computational Imaging, 8, 1038-1050 (2022).

[25] Ling Ma, Lisong Dong*, Taian Fan, **Xu Ma**, et. al, “Mitigating the forbidden pitch of extreme ultraviolet lithography using mask optimization based on genetic algorithm,” Journal of Micro/Nanopatterning,

Materials, and Metrology, 21(4), 043204 (2022).

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[29] Yihua Pan and **Xu Ma***, “Informatics-based computational lithography for phase-shifting mask optimization,” Optics Express, 30(12), 21282-21294 (2022).

[30] **Xu Ma***, Shengen Zhang, Yihua Pan, et. al, “Research and Progress of Computational Lithography,” Laser & Optoelectronics Progress, **Highlight Paper**, 59(9), 0922008 (2022).

[31] Axin Fan, Tingfa Xu*, **Xu Ma**, et. al, “Four-dimensional compressed spectropolarimetric imaging,” Signal Processing, 195, 108437 (2022).

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[34] Tong Zhang, Shengjie Zhao*, **Xu Ma**, et. al, “K-edge coded aperture optimization for uniform illumination in compressive spectral X-ray tomosynthesis,” Optics Express, 29(25), 41048-41066 (2021).

[35] Angela P. Cuadros,* Xiaokang Liu, Paul E. Parsons, **Xu Ma**, et. al, “Experimental demonstration and optimization of X-ray StaticCodeCT,” Applied Optics, 60(30), 9543-9552 (2021).

[36] Angela P. Cuadros *, **Xu Ma**, Carlos M. Restrepo, et. al, “StaticCodeCT: single coded aperture tensorial X-ray CT,” Optics Express, 29(13), 20558-20576 (2021).

[37] Ruixuan Wu, Lisong Dong*, **Xu Ma**, et. al, “Compensation of EUV lithography mask blank defect based on an advanced genetic algorithm,” Optics Express, 29(18), 28872-28885 (2021).

[38] Hao Zhang, **Xu Ma***, Xianhong Zhao, et. al, “Compressive hyperspectral image classification using a 3D coded convolutional neural network,” Optics Express, 29(21), 32875-32891 (2021).

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[45] Zhen Fang, **Xu Ma***, Carlos Restrepo, et. al, “Blue noise coding for a coherent x-ray diffraction imaging system,” Applied Optics 60(10), 2751-2760 (2021).

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[49] Xianqiang Zheng, **Xu Ma***, Qile Zhao, et. al, "Model-informed deep learning for computational lithography with partially coherent illumination," Optics Express 28(26), 39475-39491 (2020).

[50] **Xu Ma**, Dong Wang, Angela Cuadros, et. al, "Conveyor x-ray tomosynthesis imaging with optimized structured sequential illumination," IEEE Photonics Journal, 12(5), 3400217 (2020).

[51] Qile Zhao, **Xu Ma***, Angela Cuadros, et. al, "Single-snapshot X-ray imaging for nonlinear compressive tomosynthesis," Optics Express 28(20), 29390-29407 (2020).

[52] **Xu Ma**, Xianqiang Zheng, and Gonzalo R. Arce, "Fast inverse lithography based on dual-channel model-driven deep learning," Optics Express 28(14), 20404-20421 (2020).

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[54] Zhiqiang Wang, **Xu Ma***, Rui Chen, et. al, "Fast pixelated lithographic source and mask joint optimization based on compressive sensing," IEEE Transactions on Computational Imaging 6, 981-992 (2020).

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[56] Hao Zhang, **Xu Ma***, Daniel L. Lau, et. al, "Compressive spectral imaging based on hexagonal blue noise coded apertures," IEEE Transactions on Computational Imaging 6, 749-763 (2020).

[57] Hao Zhang, **Xu Ma***, Gonzalo R. Arce, "Compressive spectral imaging approach using adaptive coded apertures," Applied Optics 59(7), 1924-1938 (2020).

[58] Chang Xu, Tingfa Xu*, Ge Yan, **Xu Ma***, et. al, "Super-resolution compressive spectral imaging via two-tone adaptive coding," Photonics Research 8(3), 395-411 (2020).

[59] **Xu Ma**, Qile Zhao, Angela P. Cuadros, et. al, "Source and coded aperture joint optimization for compressive X-ray tomosynthesis," Optics Express 27(5), 6640-6659 (2019).

[60] **Xu Ma**, Zhiqiang Wang, Xuanbo Chen, et. al, "Gradient-based source mask optimization for extreme ultraviolet lithography," IEEE Transactions on Computational Imaging 5(1), 120-135 (2019).

[61] **Xu Ma**, Zhiqiang Wang, Jianchen Zhu, et. al, "Nonlinear compressive inverse lithography aided by low-rank regularization," Optics Express 27(21), 29992-30008 (2019).

[62] Jiaxin Lin, Lisong Dong, Taian Fan, **Xu Ma***, et. al, "Learning-based compressive sensing method for EUV lithographic source optimization," Optics Express 27(16), 22563-22581 (2019).

[63] Tianyi Mao, Angela P. Cuadros, **Xu Ma**, et. al, "Coded aperture optimization in X-ray tomography via sparse principal component analysis," IEEE Transactions on Computational Imaging 6, 73-86 (2019).

[64] Angela P. Cuadros, **Xu Ma**, and Gonzalo R. Arce, "Compressive spectral X-ray tomography based on spatial and spectral coded illumination," Optics Express 27(8), 10745-10764 (2019).

[65] Yuhan Zhang, Xi Wang, Haishu Tan, Cheng Xu, **Xu Ma**, et. al, "Region merging method for remote sensing spectral image aided by inter-segment and boundary homogeneities," Remote Sensing 11, 1414 (2019).

[66] **Xu Ma***, Zhiqiang Wang, and Gonzalo R. Arce*, "Compressive sensing approaches for lithographic source and mask joint optimization," Journal of Microelectronic Manufacturing 1(2), 18010202 (2018).

[67] **Xu Ma***, Qile Zhao, Hao Zhang, et. al, "Model-driven convolution neural network for inverse lithography," Optics Express 26(25), 32565-32584 (2018).

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[69] Tianyi Mao, Angela P. Cuadros, **Xu Ma**, et. al, "Fast optimization of coded aperture x-ray computed tomography," Optics Express 26(19), 24461-24478 (2018).

[70] Zhiqiang Wang, **Xu Ma***, Gonzalo R. Arce, et. al, "Information theoretical approaches in computational lithography," Optics Express 26(13), 16736-16751 (2018).

[71] **Xu Ma***, Zhiqiang Wang, et. al, "Fast optical proximity correction method based on nonlinear compressive sensing," Optics Express 26(11), 14479-14498 (2018).

[72] **Xu Ma***, Zhiqiang Wang, Haijun Lin, et. al, "Optimization of lithography source illumination arrays using diffraction subspaces," Optics Express 26(4), 3738-3755 (2018).

[73] Yan Ge, Tingfa Xu*, **Xu Ma***, et. al, "Hyperspectral image compression sensing based on dynamic measurement", Chinese Optics 11(4), 550-559 (2018).

[74] Cuimei Tan, Tingfa Xu*, **Xu Ma***, et. al, "Graph-spectral hyperspectral video restoration based on compressive sensing", Chinese Optics 11(6), 949-957 (2018).

[75] **Xu Ma***, Hao Zhang, Zhiqiang Wang, et. al, "Information theoretical aspects in coherent optical lithography systems," Optics Express 25(23), 29043-29057 (2017).

[76] **Xu Ma***, Dongxiang Shi, Zhiqiang Wang, et. al, "Lithographic source optimization based on adaptive projection compressive sensing," Optics Express 25(6), 7131-7149 (2017).

[77] **Xu Ma***, Haijun Lin, Guoli Jiao, et. al, "Fast lithographic source optimization using a batch-processing sequential least square estimator," Applied Optics 56(21), 5903-5913 (2017).

[78] **Xu Ma***, Xuejiao Zhao, Zhiqiang Wang, et. al, "Fast lithography aerial image calculation method based on machine learning," Applied Optics 56(23), 6485-6495 (2017).

[79] **Xu Ma***, Gonzalo R. Arce, Zhiqiang Wang, et. al, "Compressive position and attitude estimation using ground-based beacon," Journal of Guidance, Control, and Dynamics 40(10), 2630-2645 (2017).

[80] Laura Galvis*, Daniel Lau, **Xu Ma**, Henry Arguello, and Gonzalo R. Arce*, "Coded aperture design in compressive spectral imaging based on side information," Applied Optics 56(22), 6332-6340 (2017).

[81] **Xu Ma**, Shangliang Jiang, Jie Wang, et. al, "A fast and manufacture-friendly optical proximity correction based on machine learning," Microelectronic Engineering 168, 15-26 (2017).

[82] **Xu Ma**, Jie Wang, Xuanbo Chen, et. al, "Gradient-based inverse extreme ultraviolet lithography," Applied Optics 54(24), 7284-7300 (2015).

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[84] Chunying Han, Yanqiu Li*, **Xu Ma**, et. al, "Robust hybrid source and mask optimization to lithography source blur and flare," Applied Optics 54(17), 5291-5302 (2015).

[85] Zhiyang Song, **Xu Ma**, Jie Gao, et. al, "Inverse lithography source optimization via compressive sensing," Optics Express 22(12), 14180-14198 (2014).

[86] **Xu Ma**, Bingliang Wu, Zhiyang Song, et. al, "Fast pixel-based optical proximity correction based on nonparametric kernel regression," Journal of Micro/Nanolithography, MEMS, and MOEMS 13(4), 043007 (2014).

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[91] **Xu Ma**, Chunying Han, et. al, "Hybrid source mask optimization for robust immersion lithography," Applied Optics 52(18), 4200-4211 (2013).

[92] **Xu Ma**, Zhiyang Song, et. al, "Block-based mask optimization for optical lithography," Applied Optics 52(14), 3351-3363 (2013).

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[101] **Xu Ma*** and Gonzalo R. Arce, "Binary mask optimization for forward lithography based on the boundary layer model in coherent systems," Journal of the Optical Society of America A 26(7), 1687-1695 (2009).

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- **Conference Papers**

[1] Bingyang Wang and **Xu Ma***, "Advanced Computational Lithography based on Information Theory," Proc. SPIE 13423,1342314 (2024).

[2] Xin Sun, Jun Ke*, and **Xu Ma***, "Thermal Microscopic Imaging based on Diffusion Models for Super resolution Inspection," Proc. SPIE 13423,134231E (2024).

[3] Hantang Chen, **Xu Ma*** and Jihui Wang, "Comparison of reconstruction methods for optical projection tomography with sparse angle projections," Proc. SPIE 13179, 1317918 (2024).

[4] Chaojun Huang, **Xu Ma***, Shengen Zhang, et al, "Mask correction for DMD-based lithography testbed with calibrated imaging model," Proc. SPIE 13179, 131791F (2024).

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[8] Peng Wang, **Xu Ma*** and Qile Zhao, "Learning-based classification approach for coded aperture compressive spectral image," Proc. SPIE 12707, 127071E (2023).

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[10] Jinshan Li, Hantang Chen, **Xu Ma***, et al, "Polarization image recognition based on cascade deep learning," Proc. SPIE 12747, 127471L (2023).

[11] Chengzhen Yu, **Xu Ma*** and Junbi Zhang, "Mask 3D model based on complex-valued convolution neural network for EUV lithography," 2022 International Workshop on Advanced Patterning Solutions (IWAPS), Beijing, China (2022).

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[18] Zhiqiang Wang, **Xu Ma***, Rui Chen, et. al, "Comparison of different lithographic source optimization methods based on compressive sensing," Proc. SPIE 11327, 1132716 (2020).

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