Qi WEI

Research Associate & Teaching Assistant

University of Cambridge

Signal Processing and Communications Laboratory (SigProC)
Department of Engineering, University of Cambridge
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Professional Profile

A competent, highly motivated and PhD qualified research associate in data science with 2 years' experience in sequential/dynamic data processing and 4 years' experience in multi-band image processing, computer vision and machine learning. Possesses specific expertise in statistical analysis and optimization algorithms, including probabilistic modelling, Bayesian methodology (e.g., Monte Carlo, variational Bayesian methods) as well as convex and non-convex optimization techniques (e.g., alternating direction method of multipliers, block coordinate descent, primal-dual, matching pursuit, etc.). Proven ability in multi-cultural team-working environment. Highly intuitive and excellent communication skills.

Objective

A research position (i.e., postdoctoral, faculty in academia or research scientist in industry) allowing for state-of-the-art research in image/signal processing, computer vision and machine learning.

Work Experience

Aug. 2015 – Present **Research Associate & Teaching Assistant**, *Department of Engineering*, University of Cambridge.

Research:
- developing a new nonnegative matrix factorization algorithm applied in spectral unmixing
- developing a new algorithm to solve the Sylvester equation widely encountered in high-dimensional signal/data processing
- co-developing a fast single image super-resolution (SR) method and extending it to multi-frame SR
- proposing a new dynamic model for sequential (or multi-temporal) image decomposition and developing a new algorithm to analyze the massive image data

Teaching:
- Supervising the 3rd year undergraduate course 3F3 *Signal and Pattern Processing* (16h)
- Demonstrating the 3rd year project SF1 *Data Analysis - Statistical Signal Processing with Applications in Audio* (16h)

Sept. 2012 – Sept. 2015 **Assistant lecturer**, *ENSEEIHT, INPT*, University of Toulouse, Toulouse, France.
Teaching the 2nd year engineering course *Digital Signal Processing (Practical Part)* (48h)

Education

Sept. 2012 – Sept. 2015 **Ph.D. in "Signal, Image and Acoustics Processing"**, *University of Toulouse*, Toulouse, France.
Thesis Topic: Bayesian Fusion of Multi-band Images: A Powerful Tool for Super-resolution
Advisers: Prof. Jean-Yves Tourneret and Assoc. Prof. Nicolas Dobigeon
Rated as one of the best doctoral theses in 2015 at University of Toulouse (Prix Léopold Escande)

Sept. 2010 – Sept. 2012 **M.S. in "Electrical Engineering"**, *Beihang University (BUAA)*, Beijing, China.
GPA: 94.38/100 Rank: 1/258

Sept. 2006 – July. 2010 **B.S. in "Electrical Engineering"**, *Beihang University (BUAA)*, Beijing, China.
GPA: 87.19/100 Rank: 7/156

Publications

International Journal papers

[1] Q. Wei, J. M. Bioucas-Dias, N. Dobigeon, J-Y. Tourneret, M. Chen and S. Godsill, **Multi-band image fusion based on spectral unmixing**, *IEEE Trans. Geosci. and Remote Sens.*, 2016, to appear.

[2] Q. Wei, N. Dobigeon and J-Y. Tourneret, **Fast multi-band image fusion based on solving Sylvester equation**, *IEEE Trans. Image Process.*, vol. 24, no. 11, pp. 4109-4121, Nov. 2015.

[3] Q. Wei, N. Dobigeon and J-Y. Tourneret, **Bayesian fusion of multi-band images**, *IEEE J. Sel. Topics Signal Process.*, vol. 9, no. 6, pp. 1117-1127, Sept. 2015.

[4] Q. Wei, J. M. Bioucas-Dias, N. Dobigeon and J-Y. Tourneret, **Hyperspectral and multispectral image fusion based on a sparse representation**, *IEEE Trans. Geosci. and Remote Sens.*, vol. 53, no. 7, pp. 3658-3668, July 2015.

[5] Q. Wei, N. Dobigeon, J-Y. Tourneret, J. M. Bioucas-Dias and S. Godsill, **R-FUSE: Robust fast fusion of multi-Band images based on solving a Sylvester equation**, *IEEE Signal Process. Lett.*, to appear, 2016.

[6] N. Zhao, Q. Wei, A. Basarab, D. Kouamé and J-Y. Tourneret, **Fast single image super-resolution using a new analytical solution for $\ell_2 - \ell_2$ problems**, *IEEE Trans. Image Process.*, 2016, to appear.

[7] L. Loncan, L. B. Almeida, J. M. Bioucas-Dias, X. Briottet, J. Chanussot, N. Dobigeon, S. Fabre, W. Liao, G. Licciardi, M. Simoes, J-Y. Tourneret, M. Veganzones, G. Vivone, Q. Wei and N. Yokoya, **Hyperspectral pansharpening: a review**, *IEEE Geosci. and Remote Sens. Mag.*, vol. 3, no. 3, pp. 27–46, Sept. 2015.

[8] Q. Wang, W. Shi, P. M. Atkinson and Q. Wei, **Approximate Area-to-Point Regression Kriging for Fast Hyperspectral Image Sharpening**, *IEEE J. Sel. Topics Appl. Earth Observ.*, 2016, to appear.

Submitted papers

[1] Q. Wei, M. Chen, J-Y. Tourneret and S. Godsill, **Unsupervised nonlinear spectral unmixing based on a multilinear mixing model**, *IEEE Trans. Geosci. and Remote Sens.*, under review.

[2] Q. Wei, J. M. Bioucas-Dias, N. Dobigeon and J-Y. Tourneret, **Fast spectral unmixing based on Dykstra's alternating projection**, *IEEE Trans. Signal Process.*, under review.

Papers in preparation

[1] Q. Wei, J. Vilà-Valls, P. Closas and C. Fernandez-Prades, **Adaptive Gaussian sum filter with unknown noise statistics**, submitted.

[2] Q. Wei and S. Godsill, **Online non-negative matrix factorization based on coordinate updates**, in preparation.

[3] Q. Wei, C. Chaux, J-Y. Tourneret and J-C. Pesquet, **Linear spectral unmixing for microscopy images**, in preparation.

Conference papers

[1] Q. Wei, J. M. Bioucas-Dias, N. Dobigeon, J-Y. Tourneret and S. Godsill, **Blind model-based fusion of multi-band and panchromatic images**, in *Proc. IEEE Int. Conf. Multisensor Fusion and Integr. for Intell. Syst. (MFI)*, Baden-Baden, Germany, Sept. 2016, to appear.

[2] N. Zhao, Q. Wei, A. Basarab, D. Kouamé, J-Y. Tourneret, **Blind deconvolution of medical ultrasound images using a parametric model for the point spread function**, in *Proc. IEEE Int. Ultrason., Symp (IUS).*, Tours, France, Sept., 2016, to appear.

[3] Q. Wei, J. M. Bioucas-Dias, N. Dobigeon, J-Y. Tourneret and S. Godsill, **High-resolution hyperspectral image fusion based on spectral unmixing**, in *Proc. IEEE Int. Conf. Inf. Fusion (FUSION)*, Heidelberg, Germany, Jul. 2016, to appear.

[4] N. Zhao, Q. Wei, A. Basarab, D. Kouamé, J-Y. Tourneret, **Super-resolution of medical ultrasound images using a fast algorithm**, in *Proc. IEEE Int. Symp. Biomed. Imaging (ISBI)*, Prague, Czech Republic, Apr. 2016.

[5] Q. Wei, N. Dobigeon and J-Y. Tourneret, **FUSE: A fast multi-band image fusion algorithm**, in *Proc. IEEE Int. Workshop Comput. Adv. Multi-Sensor Adaptive Process. (CAMSAP)*, Cancun, Mexico, Dec. 2015.
Note: Awarded IEEE Travel Grant, Best Student Paper Finalist.

[6] L. Loncan, L. B. Almeida, J. M. Bioucas-Dias, X. Briottet, J. Chanussot, N. Dobigeon, S. Fabre, W. Liao, G. Licciardi, M. Simoes, J-Y. Tourneret, M. Veganzones, G. Vivone, Q. Wei and N. Yokoya, **Comparison of nine hyperspectral pansharpening methods**, in *Proc. IEEE Int. Geosci. Remote Sens. Symp. (IGARSS)*, Milan, Italy, Jul. 2015.

[7] Q. Wei, N. Dobigeon and J-Y. Tourneret, **Bayesian fusion of multispectral and hyperspectral images using a block coordinate descent Method**, in *Proc. IEEE GRSS Workshop Hyperspectral Image SIgnal Process.: Evolution in Remote Sens.(WHISPERS)*, Tokyo, Japan, Jun. 2015. Note: Invited paper.

[8] Q. Wei, N. Dobigeon and J-Y. Tourneret, **Bayesian fusion of multispectral and hyperspectral images with unknown sensor spectral response**, in *Proc. IEEE Int. Conf. Image Processing (ICIP)*, Paris, France, Oct. 2014, pp.698-702. Note: Invited paper, Oral.

[9] Q. Wei, J. M. Bioucas-Dias, N. Dobigeon and J-Y. Tourneret, **Fusion of multispectral and hyperspectral images based on sparse representation**, in *Proc. European Signal Processing Conf. (EUSIPCO)*, Lisbon, Portugal, Sept. 2014, pp. 1577-1581. Note: Invited paper, Oral.

[10] J. Vilà-Valls, Q. Wei, P. Closas and C. Fernandez-Prades, **Robust Gaussian sum filtering with unknown noise statistics: application to target tracking**, in *IEEE Statistical Signal Processing Workshop (SSP'14)*, Gold Coast, Australia, June 2014, pp. 416-419. Note: Invited paper, Oral.

[11] Q. Wei, N. Dobigeon and J-Y. Tourneret, **Bayesian fusion of hyperspectral and multispectral images**, in *Proc. IEEE Int. Conf. Acoust., Speech, and Signal Processing (ICASSP)*, Florence, Italy, May 2014, pp.3200-3204. Note: Oral, Awarded IEEE Travel Grant.

[12] Q. Wei, T. Jin and F. Yu, **Effective frequency selection algorithm for bandpass sampling of multiband RF signals based on relative frequency interval**, in *International Conference on Computer Application and System Modeling (ICCASM)*, Taiyuan, China, Oct. 2010, pp.V10-431-435. Note: Oral.

Reviewing Activities

Qi WEI has served as a reviewer for:

2014 - *IEEE Trans. Geosci. and Remote Sens.*
2015 - *IEEE Trans. Image Process.*
IEEE J. Sel. Topics Signal Process.
IEEE J. Sel. Topics Appl. Earth Observ. in Remote Sens.
Inform. Fusion
Remote Sens. Lett.
2015 Colloques GRETSI

Teaching Experience

2016 **Supervisor**, *Department of Engineering, University of Cambridge*, Cambridge, UK.
Supervising the 3rd year undergraduate course 3F3 *Signal and Pattern Processing*

2016 **Demonstrator**, *Department of Engineering, University of Cambridge*, Cambridge, UK.
Demonstrating the 3rd year project SF1 *Data Analysis - Statistical Signal Processing with Applications in Audio*

2012 – 2015 **Teaching Assistant**, *INP-ENSEEIHT, University of Toulouse*, Toulouse, France.
Teaching the 2nd year engineering course *Digital Signal Processing (Practical Part)*

2011 **Teaching Assistant**, *Beihang University*, Beijing, China.
Teaching the 1st year international graduate courses *Detection, Estimation and Modulation (Application Part) and Satellite Navigation (Application Part)*

Academic Activities

Jul. 2016 **Invited Talk**, *invited by Prof. Lyudmila S Mihaylova*, Sheffield University, Sheffield, UK.
Title: Multi-band Image Super-resolution and Spectral Unmixing

Jun. 2016 **Invited Talk**, *invited by Prof. Jun Li*, Sun Yat-sen University, Guangzhou, China.
Title: Fast Multi-band Image Super-resolution

May 2016 **Academic Visit**, *invited by Assoc. Prof. Chouzenoux Emilie and Prof. Jean-Christophe Pesquet*, University of Paris-Est, Paris, France.
One week visit for research collaboration in microscopy image processing with Prof. Jean-Christophe Pesquet's group

Apr. 2016 **Invited Talk**, *invited by Dr. David Burridge*, Harris Corporation, Reading, UK.
Title: Fast Multi-band Image Super-resolution

Apr. 2016 **Invited Talk**, *invited by Prof. Qiangqiang Yuan*, Wuhan University, Wuhan, China.
Title: Fast Fusion of Multi-band Images: A Powerful Tool for Super-resolution

Mar. 2016 **Invited Talk**, *invited by the British Machine Vision Association (BMVA)*, British Computer Society (BCS), London, UK.
Title: Fast Fusion of Multi-band Images: A Powerful Tool for Super-resolution

Mar. 2016 **Invited Poster Exhibition**, *Set for Britain event*, House of Commons, London, UK.
Title: Fast Multi-band Image Fusion

Dec. 2015 **Invited Talk**, *invited by Wuhan National Laboratory for Optoelectronics (WNLO)*, Huazhong University of Science and Technology, Wuhan, China.
Title: Fast Fusion of Multi-band Images: A Powerful Tool for Super-resolution

May 2015 **Invited Talk**, *invited by Prof. Michael Elad*, Technion, Haifa, Israel.
Title: Bayesian Fusion of Multi-band Images-A Powerful Tool for Super-resolution

Jan. 2015 **Invited Talk**, *invited by Prof. Simon Godsill*, Cambridge University, Cambridge, UK.
Title: Bayesian Fusion of Hyperspectral and Multispectral images

Sept. 2015 **Academic Visit**, *Instituto Superior Técnico*, Lisbon, Portugal.
One month academic visit in Prof. José M. Bioucas-Dias' group

Aug. 2013 **Summer School**, *Technion – Israel Institute of Technology*, Haifa, Israel.
Got highest score $(97/100)$ in one-month graduate student course *Digital Image Processing*
Note: Awarded Technion Summer Program Scholarship

Jun. 2013 **Summer School**, *CIMI Image Processing Thematic School*, Saint-Lary, France.
Gave a talk on *Bayesian hyperspectral and multispectral fusion*

Feb.-Aug. 2012 **Visiting Student**, *Universitat Politècnica de Catalunya (UPC)*, Barcelona, Spain.
Six months research with the Signal Processing and Communications Group in the Department of Signal Theory and Communications (TSC)

Jul. 2011 **Summer School**, *Beihang University*, Beijing, China.
Group leader of International Graduate Summer School (IGSS), organizing seminar of academic exchange between 28 students from Cambridge, MIT, ICL, Purdue Univ, Gatech, BUAA, etc

2010 – 2011 **Graduate Student Union**, *Beihang University*, Beijing, China.
Vice-Chairman of Academic Department in Graduation Student Union, organizing lectures, monthly seminars between Chinese students and foreign students, etc

2009 – 2010 **Intern**, *Youtaishuncheng Technology Development Co., Ltd.*, Beijing, China.
Research on Radar Avian Detection for aviation

Memberships & Community service

Since 2015: **Engineering Representative**, *Cambridge SIAM Student Chapter Committee*.

Since 2015: **Associate Member**, *Cambridge Trinity Mathematical Society*.

Since 2012: **Member**, *IEEE Signal Processing Society*.

Since 2012: **Member**, *IEEE Geoscience & Remote Sensing Society*.

Since 2012: **Member**, *French research group GdR-ISIS*.

Event organization

May 2016 **Co-organizer**, *one-day meeting*, DAMPT, Cambridge, UK.
SIAM Cambridge Student Chapter Annual Conference

July 2016 **Session chairs**, *FUSION 2016*, Heidelberg, Germany.
'Signal Processing I'
'Multimodal Image Processing and Fusion'

Collaborators (Current and Past)

Simon Godsill, University of Cambridge, Cambridge, UK
Marcus Chen, Nanyang Technological University, Singapore
Jean-Christophe Pesquet, University of Paris-Est, Paris, France
Emilie Chouzenoux, University of Paris-Est, Paris, France
Jean-Yves Tourneret, University of Toulouse, Toulouse, France
Nicolas Dobigeon, University of Toulouse, Toulouse, France
José M. Bioucas-Dias, University of Lisbon, Lisbon, Portugal
Lyudmila S Mihaylova, University of Sheffield, Sheffield, UK
Naoto Yokoya, University of Tokyo, Tokyo, Japan
Wenzhi Liao, Gent University, Gent, Belgium
Jocelyn Chanussot, GIPSA-lab, University of Grenoble, Grenoble, France
Gemine Vivone, NATO-STO-CMRE, Italy
Jordi Vilà-Valls, CTTC, Barcelona, Spain
Pau Closas, CTTC, Barcelona, Spain
Carles Fernández-Prades, CTTC, Barcelona, Spain
Tian Jin, Beihang University, Beijing, China

Honors

Fellowship BECA-ASIA Fellowship, Spanish Government

Scholarship GUANGHUA Scholarship

Excellent Student Prize of International Graduate Summer School

Excellent Graduate Student

1st Class Graduate Scholarship in two consecutive year
1st Prize of Outstanding Academic Performance Scholarship
1st Prize of Contest of Science and Technology Scholarship
2nd Prize of Subject Contest Scholarship
2nd Prize of Outstanding Freshman Scholarship
2nd Prize of MCM (*Mathematics Contest of Modeling*), International
2nd Prize of 19th *FengRu Science and Technology Cup Contest*, BUAA
3rd Prize of *Electronic Design Competition*, BUAA

Software Skills

Programming: 6 years for Matlab, 1 year for C, C++, Verilog, 4 years for HTML
Word processing: 4 years for LaTeX and 10 years for MS Office
DSP platforms: 1 year for ARM and FPGA

Language Skills

English fluent
French knowledgeable
Chinese mother tongue

References

Simon Godsill, University of Cambridge, UK
Jean-Yves Tourneret, University of Toulouse, France
José M. Bioucas-Dias, University of Lisbon, Portugal
Nicolas Dobigeon, University of Toulouse, France