

# Eric A. Lehmann

## *Curriculum Vitæ*

*Applied Research Scientist/Data Analyst with multi-disciplinary expertise in image and signal processing, statistical modelling, remote sensing and acoustics*



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### Personal Details

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Full name	Eric André Lehmann (Ph.D. Eng. ANU, M.Phil. Eng. ANU, Dipl. El.-Ing. ETHZ)		
Current position	Research Scientist/Engineer, Commonwealth Scientific and Industrial Research Organisation (CSIRO), Data61, Canberra ACT, Australia		
Contact details	<i>Mail:</i> CSIRO Data61, GPO BOX 664, Acton ACT 2601, Australia <i>Phone:</i> +61 (0)2 6216 7070 <i>E-mail:</i> <a href="mailto:mail@eric-lehmann.com">mail@eric-lehmann.com</a> <i>Fax:</i> +61 (0)2 6216 7111 <i>Web:</i> <a href="http://www.eric-lehmann.com">www.eric-lehmann.com</a>		
Miscellaneous	Born in 1976; Swiss & Australian citizenship; married with two children		

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### Higher Education

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#### *Postgraduate*

2001 – 2004	Ph.D. in Electrical Engineering, Research School of Information Sciences and Engineering, the Australian National University (ANU), Canberra ACT, Australia
1999 – 2000	M.Phil. in Electrical Engineering, Faculty of Engineering and Information Technology, the Australian National University (ANU), Canberra ACT, Australia

#### *Undergraduate*

1994 – 1999	Dipl. El.-Ing. ETH diploma (M.Sc. in Electrical Engineering), Dept. of Electrical Engineering, Swiss Federal Institute of Technology (ETHZ), Zurich, Switzerland
1991 – 1994	Scientific baccalaureate, Lycée cantonal de Porrentruy, Jura, Switzerland

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### Scholarships and Awards

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2008	CMIS Partnership Excellence Award
2001 – 2004	ANU Ph.D. Scholarship & Ph.D. Tuition Fee Scholarship
1999 – 2000	ANU M.Phil. Scholarship & M.Phil. Tuition Fee Scholarship

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### Employment History & Practical Experience

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2008 – present	Research Scientist/Engineer, CSIRO Data61, Remote Sensing & Image Integration team, Canberra ACT, Australia (in Perth WA until December 2014)
2005 – 2008	Research Fellow with the Western Australian Telecommunications Research Institute (WATRI), Signal Processing Group, Perth WA, Australia
2004	Research Engineer with National ICT Australia (NICTA), Canberra (3 months)
2001 – 2004	Ph.D. studies (Electrical Engineering) at ANU, Canberra, Australia
1999 – 2000	M.Phil. studies (Electrical Engineering) at ANU, Canberra, Australia
1998 – 1999	Industry-based diploma thesis at Oerlikon Contraves (Space Technology), Zurich
1997 – 1998	Two semester projects at ETHZ, Zurich (6 months each)
1997	Internship at Philips Semiconductor AG, Cordless Technology, Zurich (3 months)

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## Professional Skills

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### *Expertise & Application Domains*

- Image processing
  - *Environmental applications*: processing of remote sensing data (optical, radar and sonar) for environmental mapping and monitoring (e.g. analysis of vegetation condition and temporal trends, mapping of coastal seabed condition)
  - *Dynamic target tracking*: joint audio-video speaker tracking
- Statistical data analysis
  - *Bayesian inference and learning*: image data fusion/assimilation and spatiotemporal analysis of remote sensing data; sequential Monte Carlo methods (particle filtering) for dynamic target tracking; MCMC methods (numerical simulation)
  - *Discrimination techniques*: classification of satellite imagery for ecological mapping (e.g. forest mapping using optical and radar remote sensing data)
- Modelling
  - *Bayesian modelling*: hierarchical models for image data blending/assimilation (e.g. remotely sensed soil moisture data) and spatiotemporal monitoring of environmental/climatic variables (e.g. forest mapping, analysis of extreme weather events under climate change)
  - *Acoustics*: room acoustics modelling for the simulation of impulse responses
  - *Target tracking*: evolutionary optimisation of dynamics models (dual estimation)
- Signal processing
  - *Acoustics*: sensor array processing and beamforming; speech detection and enhancement; acoustic speaker tracking
  - *Digital signal processing*: Assembler programming for micro-controller and digital signal processor applications (e.g. real-time acoustic beamforming)
- Technical skills
  - *Programming*: coding of complex/parallel algorithms in various languages (such as Python, R, C/C++); implementation of computationally demanding numerical methods (MCMC simulations) on high-performance CPU/GPU clusters
  - *Real-time processing*: implementation of real-time algorithms on digital signal processors (e.g. acoustic speaker tracking, beamforming with microphone arrays)

### *Computer Science & Software Proficiency*

- Coding languages Matlab/Simulink, R, C/C++, Maple, Python, Windows batch scripting, HTML, Assembler (micro-controller and DSP)
- Specialised software
  - *Document typesetting*: L<sup>A</sup>T<sub>E</sub>X 2 $\epsilon$ , Microsoft Word 2013
  - *Image and geographical data analysis*: ENVI, SARscape, ER Mapper, ArcGIS
  - *Generic software (Windows and Unix/Linux)*: Microsoft Office 2013, OpenOffice, X-Emacs, Visual C++, Adobe Products, Gimp, etc.
  - *Miscellaneous (electrical engineering)*: Protel (circuit board design); SCOPE DSP Dev. Kit (signal processing tool); SHARC EZ-Kit (DSP development tool)

### *Other Professional Skills*

- **Leading and management skills**: leader of several technical projects; coaching/supervision of staff and students; conference organiser; successful (internal) funding bids
- Excellent written and oral **communication skills**: high-quality publications and technical reports; speaker at conferences; collaborations with various industrial and governmental partners/clients
- Extensive **problem solving skills** for complex scientific assignments, and implementation of innovative solutions: scientific research in the frame of international/governmental initiatives
- Excellent **learning skills**: contribution to many projects in a variety of application domains
- Aptitude for **independent work** with self-assessment, as well as productive **teamwork**: employment in multicultural academic and industrial environments; collaborations with external partners

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## Languages

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- French Fluent: native language
- English Fluent: first language since 1999
- German Good general proficiency (Swiss schooling; studies at ETHZ, Zurich, from 1994 to 1999)

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## Selected Publications

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Please also visit [www.eric-lehmann.com](http://www.eric-lehmann.com) for a full list of my publications to date. All-time citations from Google Scholar as at 28 Sep. 2016: 960 (h-index: 13).

- E. A. Lehmann *et al.*, “Spatial modelling framework for the characterisation of rainfall extremes at different durations and under climate change”, *Environmetrics*, 27(4), pp. 239–251, 2016
- J. Reiche, R. Lucas, A. Mitchell, J. Verbesselt, D. Hoekman, J. Haarpaintner, J. Kellndorfer, A. Rosenqvist, Eric A. Lehmann, C. Woodcock, F.M. Seifert and M. Herold, “Combining satellite data for better tropical forest monitoring”, *Nature Climate Change*, 6, pp. 120–122, 2016
- E. A. Lehmann *et al.*, “SAR and optical remote sensing: assessment of interoperability and complementarity in the context of a large-scale operational forest monitoring system”, *Remote Sensing of Environment*, 156, pp. 335–348, 2015
- E. A. Lehmann *et al.*, “Forest cover trends from time series Landsat data for the Australian continent”, *Intl. Journal of Applied Earth Observation and Geoinformation*, 21, pp. 453–462, 2013
- G. S. Chiu, E. A. Lehmann and J. C. Bowden, “A spatial modelling approach for the blending and error characterization of remotely sensed soil moisture products”, *Journal of Environmental Statistics*, 4(9), pp. 1–17, 2013
- E. A. Lehmann *et al.*, “Joint processing of Landsat and ALOS-PALSAR data for forest mapping and monitoring”, *IEEE Transactions on Geoscience and Remote Sensing*, 50(1), pp. 55–67, 2012
- G. S. Chiu and E. A. Lehmann, “Bayesian hierarchical modelling: incorporating spatial information in water resources assessment and accounting”, *International Congress on Modelling and Simulation (MODSIM)*, pp. 3349–3355, Perth, Australia, December 2011
- A. M. Johansson and E. A. Lehmann, “Evolutionary optimization of dynamics models in sequential Monte Carlo target tracking”, *IEEE Transactions on Evolutionary Computation*, 13(4), pp. 879–894, 2009
- E. A. Lehmann and A. M. Johansson, “Prediction of energy decay in room impulse responses simulated with an image-source model”, *Journal of the Acoustical Society of America*, 124(1), pp. 269–277, 2008
- D. B. Ward, E. A. Lehmann and R. C. Williamson, “Particle filtering algorithms for tracking an acoustic source in a reverberant environment”, *IEEE Transactions on Speech and Audio Processing*, 11(6), pp. 826–836, 2003

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## Research Interests

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A significant part of my career so far has dealt with various issues of signal processing/analysis in application fields such as Bayesian estimation and sequential Monte Carlo methods, room acoustics, speech detection and enhancement, and (real-time) array signal processing.

My current research work is related to the task of mapping and monitoring for various environmental variables (e.g. vegetation cover, water resources, extreme weather events), with main focus on the processing of remote sensing data (e.g. *in-situ* sensors, optical, radar and sonar imagery), Bayesian methods for the fusion of spatio-temporal data, and statistical data assimilation/blending techniques.

I am also interested in applying my knowledge of signal processing and statistical techniques to different fields of scientific research (such as robotics, biomedical engineering/imaging, finance applications, etc.) and gaining new skills in the process (e.g. machine learning, programming languages, new application domains, etc.). Essentially, I am passionate about working on applied and challenging engineering problems as part of a dynamic and creative research and development team.

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## Personal Interests

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Music	Didgeridoo, acoustic and electric guitar
Sport	Swimming, horse riding, hiking, outdoor activities
Precision games	Darts, billiards (French and American)
Electronics & software	Design and production of custom printed circuit boards, Assembler programming for micro-processor-based electronic circuits, general software and GUI coding
Other	Photography, travelling, cooking, wood working, Calvin & Hobbes comics