

Short RESUME of Xavier MALDAGUE

I. Personal Data

Xavier Maldague is full professor at the Department of Electrical and Computing Engineering of Université laval, Québec, Canada (since 1989, Director of the Computing Engineering program 2002-2003, Director of the Department 2003-2008 and 2018, January to March). He has trained over 50 graduate students (M. Sc., Ph. D., postdoctoral level). His research interests are in infrared thermography, NonDestructive Evaluation (NDE) techniques and vision and digital systems for industrial inspection: he has set up a research group on infrared techniques for NonDestructive Evaluation with well known international reputation and was awarded a prestigious *Tier 1 - Canada Research Chair* in that field in 2004, renewed in 2011, 2018.

He authored or coauthored more than four hundred papers, several books, one patent on these topics. Among other realizations, he pioneered in 1996, the *Pulsed Phase Thermography* technique which is known for its fine subsurface defect detection capabilities. Two books he wrote are now part of the body of knowledge of the *American Society for Nondestructive Testing* (ASNT) on infrared NDE. He was also appointed technical editor for the first handbook of the ASNT on *Thermal and Infrared Techniques* (and also the next - fourth - edition due for 2021).

He is active in several (international) organizations working in infrared NDE, such as CINDE, ASNT, SPIE Thermosense, QIRT- Quantitative Infrared Thermography (he chairs the Council) among others. In 2015, under his impulse, the QIRT Asia Conference Series was launched with successful events in 2015 (in India), 2017 (in Korea), 2019 (in Japan) and next one planned for 2023 (2021 edition was canceled due to the pandemic). In 2017 he organized the 14th International Workshop on Advanced Infrared Technology and Applications, AITA 2017, in Quebec City, Canada. In 2020, he organized the International Symposium on *Structural Health Monitoring and Nondestructive Testing*, SHM-NDT.

II. Academic Degrees

- **Ph. D.**, 1989, University Laval (Quebec City, Quebec, Canada),
subject: *Infrared thermography: approaches and image processing*
- **M. Sc. A.**, 1984, University Laval (Quebec City, Quebec, Canada),
subject: *Tridimensional image acquisition*
- **B. Sc. A.**, 1982, Université Laval (Quebec City, Quebec, Canada), including one year at the State University of New York (SUNY-Stony Brook),
subject: *Electrical engineering*

III. Professional background

- **Institution:** Université Laval, **location:** Québec City (Quebec), Canada, **position:** professor (full professor since 1998, associate: 1994-1998, adjunct: 1989-1994).


- **Institution:** National Research Council of Canada, Industrial Materials Institute, **location:** Boucherville (Quebec), Canada, **positions:** research associate and visiting scientist, **period:** 1984-1989.
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IV. Some Major contributions

□ **Laboratory:** Since Laval X. Maldague has been with University Laval (1989), he has set up a complete laboratory for NonDestructive Evaluation (NDE) by infrared thermography. This well equipped laboratory is unique in Canada while been renowned internationally. Research work of X. Maldague's team made them known world-wide in infrared thermography for NDE. He is regularly solicited to present invited talks. Moreover, many laboratories abroad send him students.

□ In 2017, Xavier Maldague launched the «oN DuTy!» initiative. This initiative regroups four universities in Canada: U. Windsor, U. Toronto, École de Technologie Supérieure of Montréal, and U. Laval active in NonDestructive Testing (NDT) with the aim to better train graduate students (M. Sc., Ph. D., Postdoctoral fellows). This initiative was well received by the NSERC - Natural Science and Research Council of Canada that granted it funds for 6 years (2017-2023). More than 20 students are now involved in the oN DuTy! initiative across the country. The first Annual General Meeting (AGM) took place in June 2018 with great success and included training, hands-on demonstrations, industrial visits, close discussions, etc. for the benefits of the involved students. Next edition will take place in Québec City in May 2021 (depending on the sanitary situation related to the pandemic).

V. Awards and Fellowships

- Recipient of an « Doctor Honoris Causa in Infrared Thermography » by University of Antwerp  Belgium), April 4th, 2019.
- Fellow of the *Canadian Institute for NonDestructive Evaluation* (CINDE), June 2018, Halifax, NS (Canada).
- Fellow of the *American Society of NonDestructive Testing* (ASNT), Nov. 2017, Nashville, TN (USA).
- Honorary Fellow of the *Indian Society of NonDestructive Testing* (HFISNT), Nov. 2013, Mumbai (India).
- Fellow of the *Engineering Institute of Canada* (EIC), March 2009, Ottawa (ON), Canada.
- Fellow of *Humboldt Research Fellowship* from the prestigious Alexander von Humboldt Foundation in Germany, 1996.
- X. Maldague received the Canadian Governor General Medal in 1978.

VI. Recent Publications

- D. Pan, Z. Jiang, X. Maldague and W. Gui, "Research on the Influence of Multiple Interference Factors on Infrared Temperature Measurement," in *IEEE Sensors Journal*, doi: 10.1109/JSEN.2021.3055757, 10 pages. Early pub. 29 January 2021.
- Simon Verspeek, Jona Gladines, Bart Ribbens, Xavier Maldague, Gunther Steenackers, "Dynamic Line Scan Thermography optimisation using Response Surfaces implemented on PVC flat bottom hole plates, *MDPI Applied Sciences*, accepted 4 Feb.2021.
- Hai Zhang, Stefano Sfarra, Ahmad Osman, Xavier P.V. Maldague, "Infrared thermography and terahertz spectroscopy for cultural heritage non-invasive inspection", *CINDE Journal*, March-April 2021.
- Parham Nooralishahi, Fernando López, Xavier Maldague, A Drone-Enabled Approach For Gas Leak Detection Using Optical Flow Analysis, *MDPI Applied Sciences*, special issue SHM-NDT2020, accepted 1 Feb. 2021.
(https://www.mdpi.com/journal/applsci/special_issues/SHM_NDT2020)
- Iván Garrido, Jorge Erazo-Aux, Susana Lagüela, Stefano Sfarra, Clemente Ibarra-Castanedo, Elena Pivariová, Gianfranco Gargiulo, Xavier Maldague, Pedro Arias, "Deep Learning in thermographic monitoring of cultural heritage and improvement by automatic thermogram pre-processing algorithms," *MDPI Sensors*, accepted 20 I 2021.
- Bardia Yousefi, Clemente Ibarra Castanedo, Xavier P.V. Maldague, "Measuring heterogeneous thermal patterns in infrared-based diagnostic systems using sparse low-rank matrix approximation, comparative study," *IEEE Transactions on Instrumentation and Measurement*, **70**:1-9, 2021, Art no. 4501209, doi: 10.1109/TIM.2020.3031129.
- Bardia Yousefi, Hamed Akbari, Xavier P.V. Maldague, Detecting Vasodilation as Potential Diagnostic Biomarker in Breast Cancer using Deep Learning-Driven Thermomics, *Biosensors*, **10**[1]: 164, 2020. <https://doi.org/10.3390/bios10110164>.
- Qiang Fang and Xavier Maldague, A Method of Defect Depth Estimation for Simulated Infrared Thermography Data with Deep Learning, *MDPI Appl. Sci.* 2020, 10, 6819; doi:10.3390/app10196819
- Jacques Chabot, Marie-Michelle Dionne, Sara Shahsavarani et Xavier Maldague, Vers une tracéologie 2.0, le projet TONUS_PC : bilan de la phase 1 et poursuite des travaux, *Archéologiques*, no **33**, 67-77, 9.2020
- F.López, S.Sfarra, A.Chulkov, C.Ibarra-Castanedo, H.Zhang, M.A.Omar, V.Vavilov, X.P.V.Maldague, Thermal stresses applied on helicopter blades useful to retrieve defects by means of infrared thermography and speckle patterns, *Thermal Science and Engineering Progress*, **18**, 1 August 2020, 100511.

- Shakeb Deane, Nicolas P. Avdelidis, Clemente Ibarra-Castanedo, Hai Zhang, Hamed Yazdani Nezhad, Alex A. Williamson, Tim Mackley, Xavier Maldague, Antonios Tsourdos and Parham Nooralishahi, “Comparison of Cooled and Uncooled IR Sensors by Means of Signal-to-Noise Ratio for NDT Diagnostics of Aerospace Grade Composites,” *Sensors*, **20**: 3381, 29 p., 2020. DOI:10.3390/s20123381.
- B. Yousefi, Cl. Ibarra Castanedo, G. Beaudoin, X. Maldague, “Assessing the reliability of an automated system for mineral identification using LWIR Hyperspectral Infrared imagery,” *Mineral Engineering*, **155**: 106409, 2020
- S Sfarra, E Cheilakou, P Theodorakeas, C Ibarra-Castanedo, H Zhang, M Koui and X Maldague, Inspecting historical vaulted ceilings by means of physical and chemical analyses: an integrated approach combining active infrared thermography and reflectance spectroscopy, *Insight*, 62[3]: 144-151, March 2020. DOI: 10.1784/insi.2020.62.3.144
- Hai Zhang, S Sfarra, A Osman, C Ibarra-Castanedo and X P V Maldague, Using through-transmission mid-wave infrared vision and air-coupled ultrasound for artwork inspection: a case study on mock-ups of Portrait of the Painter’s Mother, *Insight*, 62[3]: 123-128, March 2020. DOI: 10.1784/insi.2020.62.3.123
- Hai Zhang, Shaker Meguid, Hai Zhang, Pieter Verberne, Clemente Ibarra-Castanedo, Xavier Maldague, “Autonomous high resolution inspection of kiss-bonds skins of carbon nanotube reinforced nanocomposites using novel dynamic line-scan thermography approach,” *Composites Science and Technology*, **192**, 108111, 2020.
- Simon Verspeek, Bart Ribbens, Xavier Maldague, and Gunther Steenackers, Optimisation of a Heat Source for Infrared Thermography Measurements: Comparison to Mehler Engineering + Service-Heater, *Applied Sciences*, **10**[4]: 1285-1294, 2020. <https://doi.org/10.3390/app10041285>.
- Dong Pan , Zhaohui Jiang, Weihua Gui , Xavier Maldague, Ke Jiang, Influence of Dust on Temperature Measurement Using Infrared Thermal Imager, *IEEE Sensors Journal*, **20**[6]: 2911-2918, 15 March, 2020. DOI: 10.1109/JSEN.2019.2957064.

VII. Contact

- email: Xavier.Maldague@gel.ulaval.ca
- mailing address: Electrical and Computing Engineering Department, Université Laval
Québec City (Québec) CANADA G1V 0V6

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