

# Jens Michael Carstensen, PhD

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## Education

*Mar 1989 – May 1992* **Technical University of Denmark**  
PhD, Image analysis  
Copenhagen, Denmark

## Thesis

Jens Michael Carstensen: *Description and simulation of visual texture*. 05/1992, Degree: Ph.D., Supervisor:  
Knut Conradsen

## Research Experience

*Oct 2009 – Oct 2014* **Adjoint professor**  
University of Copenhagen, Department of Agriculture and Ecology  
Copenhagen, Denmark  
Organism imaging

*Oct 2000 – present* **Technical director**  
Videometer A/S,  
, Denmark  
Co-founder and co-owner.

*Sep 1997 – present* **Professor (Associate)**  
Technical University of Denmark, Department of Informatics and  
Mathematical Modelling  
Copenhagen, Denmark

## Awards & Grants

*Nov 2010* Award: FoodPharmaTech Scandinavia Innovation Award 2010

*Nov 2001* Award: FoodTech Scandinavia Innovation Award 2001

## Skills & Activities

*Skills* Computer Vision, Pattern Recognition, Image Understanding, Image Processing, Machine Learning, Image Segmentation, Object Recognition, Machine Vision, Image Data Analysis, Statistical Learning, Automated Pattern Recognition,

## Spectral Imaging, Images

### Books

Jens Michael Carstensen: *Image analysis, vision, and computer graphics*. 2. edition edited by Jens Michael Carstensen, 01/2002; DTU Institute of Mathematical Modelling.

Jens Michael Carstensen: *Image Analysis, Vision, and Computer Graphics*. 1. Edition edited by Jens Michael Carstensen, 01/2001; DTU.

### Book Chapters

Michael A. E. Hansen, Ananda S. Kannan, Jacob Lund, Peter Thorn, Srdjan Sasic, Jens M. Carstensen: *State Estimation of the Performance of Gravity Tables Using Multispectral Image Analysis*. *Image Analysis*, 05/2017: pages 471-480; , ISBN: 978-3-319-59128-5, DOI:10.1007/978-3-319-59129-2\_40

Otto Højager Attermann Nielsen, Anders Lindbjerg Dahl, Rasmus Larsen, Flemming Møller, Frederik Donbæk Nielsen, Carsten L Thomsen, Henrik Aanaes, Jens Michael Carstensen: *In Depth Analysis of Food Structures*. *Scandinavian Workshop on Imaging Food Quality 2011*, 01/2011: pages 29-34; Technical University of Denmark.

Jens Michael Carstensen, Rune Fisker, Nette Schultz, Torsten Dörge: *Structural Inference Using Deformable Models*. *Machine Vision and Advanced Image Processing in Remote Sensing*, 01/1999: pages 61-71; , ISBN: 978-3-642-64260-9, DOI:10.1007/978-3-642-60105-7\_6

Rasmus Peter Tamstorf, Henrik Madsen, Jens M Carstensen: *On Optical Flow Estimation in Radar Images for Precipitation Forecasting*. *Operational Water Management*, Refsgaard & Karalis (eds), 01/1997: pages 65-72; Balkema.

### Journal Publications

Ananda Subramani Kannan, Klas Jareteg, Niels Christian Krieger Lassen, Jens Michael Carstensen, Michael Adsetts Edberg Hansen, Flemming Dam, Srdjan Sasic: *Design and performance optimization of gravity tables using a combined CFD-DEM framework*. DOI:10.1016/j.powtec.2017.05.046

Anna Novikova, Jens M. Carstensen, J. Axel Zeitler, Thomas Rades, Claudia S. Leopold: *Multispectral UV Imaging for Determination of the Tablet Coating Thickness*. *Journal of Pharmaceutical Sciences* 03/2017; 106(6)., DOI:10.1016/j.xphs.2017.02.016

Gerald N. De La Fuente, Jens Michael Carstensen, Michael A. Edberg, Thomas Lü bberstedt: *Discrimination of haploid and diploid maize kernels via multispectral imaging*. *Plant Breeding* 02/2017; 136(1):50-60., DOI:10.1111/pbr.12445

Anna Novikova, Jens M. Carstensen, Thomas Rades, Prof. Dr. Claudia S. Leopold: *Multispectral UV imaging for surface analysis of MUPS tablets with special focus on the pellet distribution*. *International Journal of Pharmaceutics* 10/2016; 515(1)., DOI:10.1016/j.ijpharm.2016.09.087

- Ananda Subramani Kannan, Niels Christian Krieger Lassen, Jens Michael Carstensen, Jacob Lund, Srdjan Sasic: *Segregation phenomena in gravity separators: A combined numerical and experimental study*. Powder Technology 07/2016; 301., DOI:10.1016/j.powtec.2016.07.003
- M. Klukkert, J.X. Wu, J. Rantanen, S. Rehder, J.M. Carstensen, T. Rades, C.S. Leopold: *Non-destructive Quality control of tablets and blister packs by UV imaging*.
- Marten Klukkert, Jian X. Wu, Jukka Rantanen, Jens M. Carstensen, Thomas Rades, Claudia S. Leopold: *Multispectral UV imaging for fast and non-destructive quality control of chemical and physical tablet attributes*. European journal of pharmaceutical sciences: official journal of the European Federation for Pharmaceutical Sciences 12/2015; 90., DOI:10.1016/j.ejps.2015.12.004
- Morten Allesø, Per Holm, Jens Michael Carstensen, René Holm: *Quantitative surface topography assessment of directly compressed and roller compacted tablet cores using photometric stereo image analysis*. European journal of pharmaceutical sciences: official journal of the European Federation for Pharmaceutical Sciences 11/2015; 87., DOI:10.1016/j.ejps.2015.11.002
- Marten Klukkert, Jian X. Wu, Jukka Rantanen, Soenke Rehder, Jens M. Carstensen, Thomas Rades, Claudia S. Leopold: *Rapid Assessment of Tablet Film Coating Quality by Multispectral UV Imaging*. AAPS PharmSciTech 10/2015; 17(4)., DOI:10.1208/s12249-015-0414-x
- Michael Adsetts Edberg Hansen, Fiona R. Hay, Jens Michael Carstensen: *A virtual seed file: the use of multispectral image analysis in the management of genebank seed accessions*. Plant Genetic Resources 08/2015;., DOI:10.1017/S1479262115000362
- Jian X. Wu, Sönke Rehder, Frans van den Berg, José Manuel Amigo, Jens Michael Carstensen, Thomas Rades, Claudia S. Leopold, Jukka Rantanen: *Chemical imaging and solid state analysis at compact surfaces using UV imaging*. International Journal of Pharmaceutics 12/2014; 477(1)., DOI:10.1016/j.ijpharm.2014.10.064
- Camilla H Trinderup, Anders Dahl, Kirsten Jensen, Jens Michael Carstensen, Knut Conradsen: *Comparison of a multispectral vision system and a colorimeter for the assessment of meat color*. Meat Science 12/2014; 102C:1-7., DOI:10.1016/j.meatsci.2014.11.012
- Johan Musaeus Bruun, Jens Michael Carstensen, Nermina Vejzagić, Svend Christensen, Allan Roepstorff, Christian M. O. Kapel: *OvaSpec – A vision-based instrument for assessing concentration and developmental stage of Trichuris suis parasite egg suspensions*. Computers in Biology and Medicine 10/2014; 53., DOI:10.1016/j.combiomed.2014.07.009
- Efstathios Z Panagou, Olga Papadopoulou, Jens Michael Carstensen, George-John E Nychas: *Potential of multispectral imaging technology for rapid and non-destructive determination of the microbiological quality of beef filets during aerobic storage*. International journal of food microbiology 01/2014; 174C:1-11., DOI:10.1016/j.ijfoodmicro.2013.12.026
- C.H. Trinderup, A.L. Dahl, J.M. Carstensen, K. Jensen, K. Conradsen: *Utilization of multispectral images for meat color measurements*.
- Bjørn Skovlund, Olga S Papadopoulou, Chrysoula Tassou, Bjarne Kjaer, Ersbøll, Jens, Michael Carstensen, Efstathios, Z Panagou, George-John Nychas: *Using Multispectral Imaging for Spoilage Detection of Pork Meat*. Food and Bioprocess Technology 12/2012; 6(9)., DOI:10.1007/s11947-012-0886-6

- Asger Nyman Christiansen, Jens Michael Carstensen, Flemming Møller, Allan Aasbjerg Nielsen: *Monitoring the change in colour of meat: A comparison of traditional and kernel-based orthogonal transformations*. 11/2012; 3(1):1-10., DOI:10.1255/jsi.2012.a1
- M. Halkjaer Olesen, J.M. Carstensen, B. Boelt: *Multispectral imaging as a potential tool for seed health testing of spinach (Spinacia oleracea L.)*. Seed Science and Technology 04/2011; 39(1):140-150., DOI:10.15258/sst.2011.39.1.12
- Asger N Christiansen, Jens Michael Carstensen, Olga Papadopoulou, Nikos Chorianopoulos, Efstathios Z Panagou, George-John E Nychas: *Multi spectral imaging for meat spoilage discrimination and prediction of microbiological counts*.
- Jens M. Carstensen, Rasmus Larsen: *Multispectral Colormapping Using Penalized Least Square Regression*. Journal of Imaging Science and Technology 05/2010; 54(3)., DOI:10.2352/J.ImagingSci.Technol.2010.54.3.030401
- Søren Blond Dagaard, Jens Adler-Nissen, Jens Michael Carstensen: *New vision technology for multidimensional quality monitoring of continuous frying of meat*. Food Control 05/2010; 21(5-21):626-632., DOI:10.1016/j.foodcont.2009.09.007
- David Delgado Gomez, Constantine Butakoff, Bjarne Ersbøll, Jens Michael Carstensen: *Automatic change detection and quantification of dermatological diseases with an application to psoriasis images*. Pattern Recognition Letters 07/2007; 28(9-28):1012-1018., DOI:10.1016/j.patrec.2006.12.020
- David Delgado Gomez, Line Harder Clemmensen, Bjarne K. Ersbøll, Jens Michael Carstensen: *Precise acquisition and unsupervised segmentation of multi-spectral images*. Computer Vision and Image Understanding 05/2007; 106(2-106):183-193., DOI:10.1016/j.cviu.2006.06.011
- David Delgado Gomez, Jens Michael Carstensen, Bjarne K. Ersbøll: *Collecting highly reproducible images to support dermatological medical diagnosis*. Image and Vision Computing 02/2006; 24(2):186-191., DOI:10.1016/j.imavis.2005.10.001
- Braithwaite Ian, Blanke Mogens, Zhang Guo-Qiang, Jens Michael Carstensen: *Design of a Vision-Based Sensor for Autonomous Pig House Cleaning*. EURASIP Journal on Advances in Signal Processing 08/2005; 2005(13)., DOI:10.1155/ASP.2005.2005
- Michael Edberg Hansen, Jens Michael Carstensen: *Density-based retrieval from high-similarity image databases*. Pattern Recognition 11/2004; 37(11-37):2155-2164., DOI:10.1016/j.patcog.2004.02.018
- Michael Edberg Hansen, Flemming Lund, Jens Michael Carstensen: *Visual clone identification of Penicillium commune isolates*. Journal of Microbiological Methods 03/2003; 52(2):221-9., DOI:10.1016/S0167-7012(02)00160-4
- Karsten Hartelius, Jens Michael Carstensen: *Bayesian Grid Matching*. IEEE Transactions on Pattern Analysis and Machine Intelligence 03/2003; 25(2):162-173., DOI:10.1109/TPAMI.2003.1177149
- Sverrir Gudmundsson, Freysteinn Sigmundsson, Jens Michael Carstensen: *Three-dimensional surface motion maps estimated from combined interferometric synthetic aperture radar and GPS data*. Journal of Geophysical Research Atmospheres 10/2002; 107(10)., DOI:10.1029/2001JB000283

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- Sverrir Gudmundsson, Jens Michael Carstensen, Freysteinn Sigmundsson: *Unwrapping ground displacement signals in satellite radar interferograms with aid of GPS data and MRF regularization*. IEEE Transactions on Geoscience and Remote Sensing 09/2002; 40(8-40):1743 - 1754., DOI:10.1109/TGRS.2002.802516
- J. M. Carstensen, Kare L. Jensen: *Fuzz and Pills Evaluated on Knitted Textiles by Image Analysis*. Textile Research Journal 01/2002; 72(1):34-34., DOI:10.1177/004051750207200106
- Henrik Aanaes, Rune Fisker, Kalle Åström, Jens Michael Carstensen: *Factorization with contaminated data*.
- Henrik Aanaes, Rune Fisker, Kalle Åström, Jens Michael Carstensen: *Factorization with erroneous data*.
- Sverrir Gudmundsson, Magnus Tumi Gudmundsson, Helgi Björnsson, Freysteinn Sigmundsson, Helmut Rott, Jens Michael Carstensen: *Three-dimensional glacier surface motion maps at the Gja'lp eruption site, Iceland, inferred from combining InSAR and other ice-displacement data*. Annals of Glaciology 01/2002; 34(1):315-322., DOI:10.3189/172756402781817833
- R. Fisker, J.M. Carstensen, M.F. Hansen, F. Bødker, S. Mørup: *Estimation of Nanoparticle Size Distributions by Image Analysis*. Journal of Nanoparticle Research 09/2000; 2(3):267-277., DOI:10.1023/A:1010023316775
- Thorsten Dörge, Jens Michael Carstensen, Jens Christian Frisvad: *Direct identification of pure Penicillium species using image analysis*. Journal of Microbiological Methods 08/2000; 41(2):121-33., DOI:10.1016/S0167-7012(00)00142-1
- R. Fisker, H. F. Poulsen, J. Schou, J. M. Carstensen, S. Garbe: *Use of Image-Processing Tools for Texture Analysis of High-Energy X-ray Synchrotron Data*. Journal of Applied Crystallography 10/1998; 31(5)., DOI:10.1107/S0021889897016439
- N.-P. Vest Nielsen, Jens Michael Carstensen, Jørn Smedsgaard: *Aligning of Single and Multiple Wavelength Chromatographic Profiles for Chemometric Data Analysis Using Correlation Optimised Warping*. Journal of Chromatography A 05/1998; 805(1-2-1-2):17-35., DOI:10.1016/S0021-9673(98)00021-1
- N.P. Vest Nielsen, J.M. Carstensen, J. Smedsgaard: *Aligning of single and multiple wavelength chromatographic profiles for chemometric data analysis using correlation optimised warping*.
- Jens Michael Carstensen: *An Active Lattice Model in a Bayesian Framework*. Computer Vision and Image Understanding 03/1996; 63(2):380-387., DOI:10.1006/cviu.1996.0027
- S Moller, C.S. Kristensen, L.K. Poulsen, J.M. Carstensen, S Molin: *Bacterial Growth on Surfaces: Automated Image Analysis for Quantification of Growth Rate-Related Parameters*. Applied and Environmental Microbiology 03/1995; 61(2):741-8.
- H Schulerud, J M Carstensen, H E Danielsen: *Multiresolution texture analysis of four classes of mice liver cells using different cell cluster representations*.
- Jens Michael Carstensen: *Morphological Markov random fields*. Statistics [?] Probability Letters 07/1994; 20(4):321-326., DOI:10.1016/0167-7152(94)90020-5

David Delgado Gomez, Toke Koldborg Jensen, Sune Darkner, Jens Michael Carstensen: *Automated visual scoring of psoriasis*.

Michael Edberg Hansen, Per Waaben Hansen, Sara Landvik, Mikako Sasa, Kristian Fog Nielsen, Jens Michael: *Identification of basidiomycetes using image analysis of colony morphology and pigmentation*.

## Patents

Jens Michael Carstensen, Johan Musaeus Bruun, Christian Moliin Outzen Kapel: *Computer Vision Based Method for Extracting Features Relating to the Developmental Stages of Trichuris Spp. Eggs*. Ref. No: WO2013159856A1, Year: 10/2013

Jens Michael Carstensen: *Equipment and method for detection of presence of an existence on or in the surface of an item conveyed by a conveyor*. Ref. No: WO2007095946, Year: 01/2007

Jens Michael Carstensen, Jørgen Folm-Hansen: *Apparatus and a Method of Recording an Image of an Object*. Ref. No: US7119930, Year: 10/2006

Jens Michael Carstensen, S. Christensen, I. Johannsen, L. Kuhlmann, M. Meldal: *Identification of encoded beads*. Ref. No: EP1701784, Year: 01/2006

Jens Michael Carstensen, C. Kapel, N. Hammeken, L. Dalum: *A method and a system for detection of trichinella larvae in meat samples*. Ref. No: WO02006034716, Year: 01/2006

Jens Michael Carstensen, J. Folm-Hansen: *An apparatus and a method of recording an image of an object*. Ref. No: EP1051660, Year: 01/2000

## Conference Proceedings

A. S. Kannan, M. A. E. Hansen, J. M. Carstensen, P. Thorn, J. Lund, S. Sasic: *Studies of grain segregation patterns on a destoner using a CFD-DEM approach*. MULTIPHASE FLOW 2015; 04/2015, DOI:10.2495/MPF150251

Otto Højager Attermann Nielsen, Ulf Andersen, Jens Michael Carstensen, Anders Lindbjerg Dahl, Rasmus Larsen, Flemming Møller, Faisal Kamran, Jeppe Revall. Frisvad: *Decomposition of Diffuse Reflectance Images - Features for Monitoring Structure in Turbid Media*. InsideFood Symposium : Book of proceedings, Leuven, Belgium; 04/2013

Johan Musaeus Bruun, Christian M. O. Kapel, Jens Michael Carstensen: *Detection and classification of parasite eggs for use in helminthic therapy*. Biomedical Imaging (ISBI), 2012 9th IEEE International Symposium on; 05/2012, DOI:10.1109/ISBI.2012.6235888

Ole Thomsen Buus, Johannes Ravn Jørgensen, Jens Michael Carstensen: *Analysis of Seed Sorting Process by Estimation of Seed Motion Trajectories*. Image Analysis - 17th Scandinavian Conference, SCIA 2011, Ystad, Sweden, May 2011. Proceedings; 05/2011, DOI:10.1007/978-3-642-21227-7\_26

Otto Højager Attermann Nielsen, Anders Lindbjerg Dahl, Rasmus Larsen, Flemming Møller, Frederik Donbæk Nielsen, Carsten L. Thomsen, Henrik Aanæs, Jens Michael Carstensen: *Supercontinuum Light Sources for Hyperspectral Subsurface Laser Scattering - Applications for Food Inspection*. Image

Analysis - 17th Scandinavian Conference, SCIA 2011, Ystad, Sweden, May 2011. Proceedings; 05/2011, DOI:10.1007/978-3-642-21227-7\_31

Michele ceccarelli, Jens Michael Carstensen: *Bayesian Grid matching for 2D gel registration*. Imaging Systems and Techniques (IST), 2010 IEEE International Conference on; 08/2010, DOI:10.1109/IST.2010.5548506

H. Aances, A.A. Nielsen, J.M. Carstensen, R. Larsen, B. Ersbll: *Efficient incorporation of Markov Random Fields in change detection*. Geoscience and Remote Sensing Symposium, 2009 IEEE International, IGARSS 2009; 08/2009, DOI:10.1109/IGARSS.2009.5417856

Jens Michael Carstensen, Flemming Møller: *Quantifying graininess of glossy food products*. International Symposium of Food Rheology and Structure ISFRS 2009, Zurich, Switzerland; 06/2009

Jens Michael Carstensen: *Unsupervised and supervised canonical discriminants in multispectral image analysis*. European association of spectral imaging conference EASIM 2009, Gembloux, Belgium; 03/2009

Jens Michael Carstensen, Flemming Møller, Jeppe Frisvad: *Online monitoring of food processes using sub-surface laser scattering*. Advances in Process Analytics and Control Technology 2009, Glasgow, Scotland; 01/2009

Henrik Aanaes, Allan Aasbjerg Nielsen, Jens Michael Carstensen, Rasmus Larsen, Bjarne K. Ersbøll: *Efficient Incorporation of Markov Random Fields in Change Detection..* IEEE International Geoscience & Remote Sensing Symposium, IGARSS 2009, July 12-17, 2009, University of Cape Town, Cape Town, South Africa, Proceedings; 01/2009

Michael Edberg Hansen, Bjarne K. Ersbøll, Jens Michael Carstensen, Allan Aasbjerg Nielsen: *Estimation of Critical Parameters in Concrete Production Using Multispectral Vision Technology*. Image Analysis, 14th Scandinavian Conference, SCIA 2005, Joensuu, Finland, June 19-22, 2005, Proceedings; 06/2005, DOI:10.1007/11499145\_124

D.D. Gomez, J.M. Carstensen, B.J. Ersbell: *Precise multi-spectral dermatological imaging*. Nuclear Science Symposium Conference Record, 2004 IEEE; 11/2004, DOI:10.1109/NSSMIC.2004.1466382

David Delgado Gomez, Jens Michael Carstensen, Bjarne K. Ersbøll, Lone Skov, Bo Bang: *Building an Image-Based System to Automatically Score Psoriasis*. Image Analysis, 13th Scandinavian Conference, SCIA 2003, Halmstad, Sweden, June 29 - July 2, 2003, Proceedings; 06/2003, DOI:10.1007/3-540-45103-X\_74

Michael Edberg Hansen, Jens Michael Carstensen: *Color-Based Image Retrieval from High-Similarity Image Databases*. Image Analysis, 13th Scandinavian Conference, SCIA 2003, Halmstad, Sweden, June 29 - July 2, 2003, Proceedings; 06/2003, DOI:10.1007/3-540-45103-X\_144

ME Hansen, JM Carstensen: *Color-based image retrieval from high-similarity image databases*. 13th Scandinavian Conference on Image Analysis (SCIA 2003); 01/2003

Rune Fisker, Nette Schultz, Jens Michael Carstensen, Nicolae Duta: *A General Scheme for Training and Optimization of the Grenander Deformable Template Model..* 2000 Conference on Computer Vision and Pattern Recognition (CVPR 2000), 13-15 June 2000, Hilton Head, SC, USA; 01/2000, DOI:10.1109/CVPR.2000.855888

Klaus Baggesen Hilger, Allan Aasbjerg Nielsen, Jens Michael Carstensen: *Unsupervised Classification of X-Ray Mapping Images of Polished Sections*.. Proceedings of the IAPR Conference on Machine Vision Applications (IAPR MVA 2000), November 28-30, 2000, Tokyo, Japan; 01/2000

R. Fisker, J.M. Carstensen: *On parameter estimation in deformable models*. Pattern Recognition, 1998. Proceedings. Fourteenth International Conference on; 09/1998, DOI:10.1109/ICPR.1998.711258

Nette Schultz, Jens Michael Carstensen: *Bimodal Histogram Transformation Based on Maximum Likelihood Parameter Estimates in Univariate Gaussian Mixtures*.. Image Analysis and Processing, 9th International Conference, ICIAP '97, Florence, Italy, September 17-19, 1997, Proceedings, Volume II; 09/1997, DOI:10.1007/3-540-63508-4\_165

Jens Michael Carstensen, Peter Frykman: *Towards integration of voxel models and object models in the simulation of geological sequences*. International workshop on Statistics of spatial process: Theory and applications, Bari, Italy; 01/1993

Jens Michael Carstensen, Michael Grunkin, Knut Conradsen: *Measurement of Enzymatic Treatment Effect on Textile Using Digital Image Analysis*.. Proceedings of IAPR Workshop on Machine Vision Applications, MVA 1992, December December 7-9, 1992, Tokyo, Japan; 01/1992

## Technical Reports