

References

1. S. Bow, *Pattern Recognition and Image Preprocessing*, Signal Processing and Communications Series (Marcel Dekker Inc, NY, USA, 2002)
2. S. Mickan, D. Abbott, J. Munch, X.-C. Zhang, T. van Doorn, Analysis of system trade-offs for terahertz imaging. *Microelectron. J.* **31**(7), 503–514 (2000)
3. E. Pickwell, V.P. Wallace, Biomedical applications of terahertz technology. *J. Phys. D Appl. Phys.* **39**(17), R301–R310 (2006)
4. W. Withayachumnankul, G.M. Png, X. Yin, S. Atakaramians, I. Jones, H. Lin et al., T-ray sensing and imaging. *Proc. IEEE* **95**(8), 1528–1558 (2007)
5. P. Siegel, Terahertz technology in biology and medicine. *IEEE Trans. Microw. Theory Tech.* **52**(10), 2438–2447 (2004)
6. S. Hadjiloucas, L. Karatzas, J.W. Bowen, Measurements of leaf water content using terahertz radiation. *IEEE Trans. Microw. Theory Tech.* **47**(2), 142–149 (1999)
7. S. Hadjiloucas, J.W. Bowen, Precision of quasioptical null-balanced bridge techniques for transmission and reflection coefficient measurements. *Rev. Sci. Instrum.* **70**(1), 213–219 (1999)
8. D. Mittleman, R. Neelamani, R.B.J. Rudd, M. Koch, Recent advances in terahertz imaging. *Appl. Phys. B Lasers Opt.* **68**(6), 1085–1094 (1999)
9. R.M. Woodward, V.P. Wallace, R.J. Pye, B.E. Cole, D. Arnone, E.H. Linfield- et al., Terahertz pulse imaging of ex vivo basal cell carcinoma. *J. Investig. Dermatol.* **120**(1), 72–78 (2003)
10. V.P. Wallace, A.J. Fitzgerald, S. Shankar, N. Flanagan, R. Pye, J. Cluff- et al., Terahertz pulsed imaging of basal cell carcinoma ex vivo and in vivo. *J. Investig. Dermatol.* **151**(2), 424–432 (2004)
11. X.-X. Yin, B.W.-H. Ng, D. Abbott, B. Ferguson, S. Hadjiloucas, Application of auto regressive models of wavelet sub-bands for classifying terahertz pulse measurements. *J. Biol. Syst.* **15**(4), 551–571 (2007)
12. X.X. Yin, B.W.H. Ng, B. Ferguson, S.P. Mickan, D. Abbott, Statistical model for the classification of the wavelet transforms of T-ray pulses, in *Proceeding of 18th International Conference on Pattern Recognition* (2006), pp. 236–239
13. T. Lahtinen, J. Nuutinen, E. Alanen, M. Turunen, L. Nuortio, T. Usenius- et al., Quantitative assessment of protein content in irradiated human skin. *Int. J. Radiat. Oncol. Biol. Phys.* **43**(3), 635–638 (1999)
14. H. Frölich, The biological effects of microwaves and related questions. *Adv. Electron. Electron Phys.* **53**, 85–152 (1980)
15. W. Grundler, F. Kaiser, Experimental evidence for coherent excitations correlated with cell growth. *Nanobiology* **1**, 163–176 (1992)
16. D.M. Mittleman, R. Jacobsen, M. Nuss, T-Ray imaging. *IEEE J. Sel. Top. Quantum Electron.* **2**(679), 679–692 (1996)
17. X.-X. Yin, B.W.-H. Ng, B.M. Fischer, B. Ferguson, D. Abbott, Support vector machine applications in terahertz pulsed signals feature sets. *IEEE Sens. J.* **7**(12), 1597–1608 (2007)

18. X.-X. Yin, K.M. Kong, J.W. Lim, B.W.H. Ng, B. Ferguson, S.P. Micken, D. Abbott, Enhanced T-ray signal classification using wavelet preprocessing. *Med. Biol. Eng. Comput.* **45**(6), 611–616 (2007)
19. B. Fischer, M. Hoffmann, H. Helm, P.U. Jepsen, Chemical recognition in terahertz time-domain spectroscopy and imaging, semiconductor science and technology. *Semicond. Sci. Technol.* **20**(7), S246–S253 (2005)
20. D. Martin, E. Puplett, Polarised interferometric spectrometry for the millimetre and submillimetre spectrum. *Infrared Phys.* **10**, 105–109 (1970)
21. D.H. Martin, J.W. Bowen, Long-wave optics. *IEEE Trans. Microw. Theory Tech.* **41**(10), 1676–1690 (1993)
22. S. Smye, J. Chamberlain, A. Fitzgerald, E. Berry, The interaction between terahertz radiation and biological tissue. *Phys. Med. Biol.* **46**(9), R101–R112 (2001)
23. P.F. Taday, I.V. Bradley, D.D. Arnone, M. Pepper, Using terahertz pulse spectroscopy to study the crystalline structure of a drug: A case study of the polymorphs of ranitidine hydrochloride. *J. Pharm. Sci.* **92**(4), 831–838 (2003)
24. X. Yin, B.W.H. Ng, J.A. Zeitler, K.L. Nguyen, L.F. Gladden, D. Abbott, Local computed tomography using a THz quantum cascade laser. *IEEE Sens. J.* **10**(11), 1718–1731 (2010)
25. S. Hadjiloucas, J. Bowen, Precision of quasi-optical null-balanced bridge techniques for transmission and reflection coefficient measurements. *Rev. Sci. Instrum.* **70**, 213–219 (1999)
26. R. Donnan, B. Yang, Enhanced rapid and accurate sub-THz magneto-optical characterization of hexaferrite ceramics. *J. Magn. Magn. Mater.* **323**(15), 1992–1997 (2011)
27. B. Yang, R. Wylde, D. Martin, P. Goy, R. Donnan, S. Carroopen, The determination of the gyrotropic characteristics of hexaferrite ceramics from 75 to 600 GHz using an ultra-wideband vector-network-analyser. *IEEE Trans. Microw. Theory Tech.* **58**(12), 3587–3597 (2010)
28. W. Sun, B. Yang, X. Wang, Y. Zhang, R. Donnan, Accurate determination of terahertz optical constants by vector network analyzer of fabry-perot response. *Opt. Lett.* **38**(24), 5438–5441 (2013)
29. R.M. Woodward, B. Cole, V.P. Wallace, D.D. Arnone, R. Pye, E.H. Linfield et al., Terahertz pulse imaging in reflection geometry of human skin cancer and skin tissue. *J. Investig. Dermatol.* **47**(21), 3853–3863 (2002)
30. B. Ferguson, S. Wang, D. Gray, D. Abbott, X.C. Zhang, Identification of biological tissue using chirped probe THz imaging. *Microelectron. J.* **33**(12), 1043–1051 (2002)
31. X.X. Yin, B.W.H. Ng, D. Abbott, *Terahertz Imaging for Biomedical Applications: Pattern Recognition and Tomographic Reconstruction* (Springer Science & Business Media, Berlin, Germany, 2012)
32. C. Rønne, P. Åstrand, S.R. Keiding, THz spectroscopy of liquid H₂O and D₂O. *Phys. Rev. Lett.* **82**(14), 2888–2891 (1999)
33. X.-X. Yin, B.W.H. Ng, B. Ferguson, D. Abbott, Wavelet based local tomographic image using terahertz techniques. *Digit. Signal Proc.* **19**(4), 750–763 (2009)
34. B. Ferguson, S. Wang, H. Zhong, D. Abbott, and X.-C. Zhang, Powder detection with T-ray imaging, in *Proceeding of SPIE Terahertz for Military and Security Applications*, vol. 5070, eds. by R.J. Hwu and D.L. Woolard (SPIE, USA, 2003), pp. 7–16
35. B.S.-Y. Ung, J. Li, H. Lin, B.M. Fischer, W. Withayachumankul, D. Abbott, Dual-mode terahertz time-domain spectroscopy system. *IEEE Trans. Terahertz Sci. Technol.* **3**(2), 216–220 (2013)
36. A. Pashkin, M. Kempa, H. Nemeč, F. Kadlec, P. Kuzel, Phasesensitive time-domain terahertz reflection spectroscopy. *Rev. Sci. Instrum.* **74**(11), 4711–4717 (2003)
37. C.M. Watts, D. Shrekenhamer, J. Montoya, G. Lipworth, J. Hunt, T. Sleasman, S. Krishna, D.R. Smith, W.J. Padilla, Terahertz compressive imaging with metamaterial spatial light modulators. *Nat. Photonics* **8**, 605–609 (2014)
38. A. Horestani, J. Naqui, D. Abbott, C. Fumeaux, F. Martén, Two-dimensional displacement and alignment sensor based on reflection coefficients of open microstrip lines loaded with split ring resonators. *Electron. Lett.* **50**(8), 620–622 (2014)

39. M. Herrmann, M. Tani, K. Sakai, Display modes in time-resolved terahertz imaging. *Jpn. J. Appl. Phys. Part 1 Regul. Pap. Short Notes Rev. Pap.* **39**(11), 6254–6258 (2000)
40. X.X. Yin, B.W.H. Ng, B. Ferguson, S.P. Micken, D. Abbott, 2-D wavelet segmentation in 3-D T-ray tomography. *IEEE Sens. J.* **7**(3), 342–343 (2007)
41. O. Sushko, R. Dubrovka, R. Donnan, Sub-terahertz spectroscopy reveals that proteins influence the properties of water at greater distances than previously detected. *J. Chem. Phys.* **142**(5), Art Number: 055101 (2015)
42. O. Sushko, R. Dubrovka, R. Donnan, Terahertz spectral domain computational analysis of hydration shell of proteins with increasingly complex tertiary structure. *J. Phys. Chem. B* **117**(51), 16486–16492 (2013)
43. M. Naftaly, *Terahertz Metrol.* (Artech House, Boston London, 2015)
44. S. Hadjiloucas, G.C. Walker, J.W. Bowen, One-port de-embedding technique for the quasi-optical characterization of integrated components. *IEEE Sens. J.* **13**(1), 111–123 (2013)
45. S. Hadjiloucas, R. Galvão, J. Bowen, R. Martini, M. Brucherseifer, H.P. Pellemans et al., Measurement of propagation constant in waveguides using wideband coherent THz spectroscopy. *J. Opt. Soc. Am. B* **20**(2), 391–401 (2003)
46. R. Galvão, S. Hadjiloucas, V. Becerra, J. Bowen, Subspace system identification framework for the analysis of multimoded propagation of THz-transient signals. *Meas. Sci. Technol.* **16**(5), 1037–1053 (2005)
47. S. Qian, *Time-Frequency and Wavelet Transforms* (Prentice Hall Inc, New Jersey, USA, 2002)
48. T. Froese, S. Hadjiloucas, R. Galvão, V. Becerra, C. Coelho, Comparison of extrasystolic ECG signal classifiers using discrete wavelet transforms. *Pattern Recogn. Lett.* **27**(5), 393–407 (2006)
49. E. Berry, R.D. Boyle, A.J. Fitzgerald, J.W. Handley, Time frequency analysis in terahertz pulsed imaging, in *Proceeding of Computer Vision Beyond the Visible Spectrum (Advances in Pattern Recognition)*, ed. by B. Bhanu, I. Pavlidis (Springer Verlag, London, UK, 2005), pp. 290–329
50. A. Meyer-Base, *Pattern Recognition for Medical Imaging* (Elsevier, California, USA, 2003)
51. S. Hadjiloucas, R. Galvão, J. Bowen, Analysis of spectroscopic measurements of leaf water content at thz frequencies using linear transforms. *J. Opt. Soc. Am. A* **19**(12), 2495–2509 (2002)
52. R. Galvão, S. Hadjiloucas, J. Bowen, C. Coelho, Optimal discrimination and classification of THz spectra in the wavelet domain. *Opt. Express* **11**(12), 1462–1473 (2003)
53. J.W. Handley, A. Fitzgerald, E. Berry, R. Boyle, Wavelet compression in medical terahertz pulsed imaging. *Phys. Med. Biol.* **47**(21), 3885–3892 (2002)
54. R.K.H. Galvão, S. Hadjiloucas, K.H. Kienitz, H. Paiva, R. Afonso, Fractional order modeling of large three-dimensional RC networks. *IEEE Trans. Circuits Syst. I* **60**(3), 624–637 (2013)
55. R.K.H. Galvão, K.H. Kienitz, S. Hadjiloucas, G. Walker, J. Bowen, S.F.C. Soares- et al., Multivariate analysis of random three-dimensional RC networks in the time and frequency domains. *IEEE Trans. Dielectr. Electr. Insul.* **20**(3), 995–1008 (2013)
56. L.A. Jacyntho, M.C.M. Teixeira, E. Assunção, R. Cardim, R.K.H. Galvão, S. Hadjiloucas, Identification of fractional-order transfer functions using a step excitation. *IEEE Trans. Circuits Syst. II Express Briefs* **62**(9), 896–900 (2015)
57. J.Y. Park, H.J. Choi, G.-E. Nam, K.-S. Cho, J.-H. Son, In vivo dual-modality terahertz/magnetic resonance imaging using superparamagnetic iron oxide nanoparticles as a dual contrast agent. *IEEE Trans. Terahertz Sci. Technol.* **2**(1), 93–98 (2012)
58. G. Chavhan, P. Babyn, B. Thomas, M. Shroff, E. Haacke, Principles, techniques, and applications of T2*-based MR imaging and its special applications. *Radiographics* **29**(5), 1433–1449 (2009)
59. X.-X. Yin, S. Hadjiloucas, Y. Zhang, M.Y. Su, Y. Miao, D. Abbott, Pattern identification of biomedical images with time series: Contrasting THz pulse imaging with DCE-MRIs. *Artif. Intell. Med.* **67**, 1–3 (2016)
60. X.X. Yin, Y. Zhang, J. Cao, J.L. Wu, S. Hadjiloucas, Exploring the complementarity of THz pulse imaging and DCE-MRIs: Toward a unified multi-channel classification and a deep learning framework. *Comput. Methods Programs Biomed.* **137**, 87–114 (2016)

61. A. Karahaliou, K. Vassiou, N.S. Arikidis, S. Skiadopoulos, T. Kanavou, L. Costaridou, Assessing heterogeneity of lesion enhancement kinetics in dynamic contrast enhanced MRI for breast cancer diagnosis. *Br. J. Radiol.* **83**(988), 296–309 (2010)
62. X.X. Yin, B.W.-H. Ng, Q. Yang, A. Pitman, K. Ramamohanarao, D. Abbott, Anatomical landmark localization in breast dynamic contrast-enhanced MR imaging. *Med. Biol. Eng. Comput.* **50**(1), 91–101 (2012)
63. S.H. Lee, J.H. Kim, N. Cho, J.S. Park, Z. Yang, Y.S. Jung et al., Multilevel analysis of spatiotemporal association features for differentiation of tumor enhancement patterns in breast DCE-MRI. *Med. Phys.* **37**(8), 3940–3956 (2010)
64. N. Bhooshan, M.L. Giger, S.A. Jansen, H. Li, L. Lan, G.M. Newstead, Cancerous breast lesions on dynamic contrast-enhanced MR images: computerized characterization for image-based prognostic markers. *Radiology* **254**(3), 680–690 (2010)
65. X.-X. Yin, B.W.-H. Ng, K. Ramamohanarao, A. Baghai-Wadji, D. Abbott, Exploiting sparsity and low-rank structure for the recovery of multi-slice breast MRIs with reduced sampling error. *Med. Biol. Eng. Comput.* **50**(9), 991–1000 (2012)
66. C.F. Beckmann, S.M. Smith, Tensorial extensions of independent component analysis for multisubject fMRI analysis. *Neuroimage* **25**(1), 294–311 (2005)
67. W. Chen, M.L. Giger, L. Lan, U. Bick, Computerized interpretation of breast MRI: investigation of enhancement-variance dynamics. *Med. Phys.* **31**(5), 1076–1082 (2004)
68. Y. Zheng, S. Englander, S. Baloch, E. Zacharaki, Y. Fan, M.D. Schnall- et al., STEP: spatiotemporal enhancement pattern for MR-based breast tumor diagnosis. *Med. Phys.* **37**(7), 3192–3204 (2009)
69. S. Agner, S. Soman, E. Libfeld, M. McDonald, K. Thomas, S. Englander- et al., Textural kinetics: a novel dynamic contrast enhanced (DCE)-MRI feature for breast lesion classification. *J. Digit. Imaging* **24**(3), 446–463 (2011)
70. M. Mahrooghy, A.B. Ashraf, D. Daye, C. Mies, M. Feldman, M. Rosen-et al., Heterogeneity wavelet kinetics from DCE-MRI for classifying gene expression based breast cancer recurrence risk, in *Proceeding of Medical Image Computing and Computer-Assisted Intervention—MICCAI 2013*, eds. by K. Mori, I. Sakuma, Y. Sato, C. Barillot, N. Navab. LNCS16(Part II), (Springer-Verlag, Berlin, Heidelberg, 2013), pp. 295–302
71. F. Bloch, Nuclear induction. *Phys. Rev.* **70**(7–8), 460–474 (1946)
72. H. Torrey, Bloch equations with diffusion terms. *Phys. Rev.* **104**(3), 563–565 (1956)
73. C. Neuman, Spin echo of spins diffusing in a bounded medium. *J. Chem. Phys.* **60**, 4508–4511 (1974)
74. E. Stejskal, J. Tanner, Spin diffusion measurements: spin echoes in the presence of time-dependent field gradient. *J. Chem. Phys.* **42**(1), 288–292 (1965)
75. M. Neeman, J. Freyer, L. Sillerud, Pulsed-gradient spin-echo studies in nmr imaging. effects of the imaging gradients on the determination of diffusion coefficients. *J. Magn. Reson.* **90**(2), 303–312 (1990)
76. G. Cleveland, D. Chang, C. Hazlewood, H. Rorschach, Nuclear magnetic resonance measurement of skeletal muscle: anisotropy of the diffusion coefficient of the intracellular water. *Biophys. J.* **16**(9), 1043–1053 (1976)
77. L. Garrido, V. Wedeen, K. Kwong, U. Spencer, H. Kantor, Anisotropy of water diffusion in the myocardium of the rat. *Circ. Res.* **74**(5), 789–793 (1994)
78. J. Tanner, Self diffusion of water in frog muscle. *Circ. Res.* **28**(1), 107–116 (1979)
79. R. Henkelman, G. Stanisiz, J. Kim, M. Bronskill, Anisotropy of NMR properties of tissues. *Magn. Reson. Med.* **32**(5), 592–601 (1994)
80. M. Moseley, Y. Cohen, J. Kucharczyk, J. Mintorovitch, H. Asgari, M. Wendland, J. Tsuruda, D. Norman, Diffusion-weighted MR imaging of anisotropic water diffusion in cat central nervous system. *Radiology* **176**(2), 439–445 (1990)
81. M. Moseley, J. Kucharczyk, H. Asgari, D. Norman, Anisotropy in diffusion-weighted MRI. *Magn. Reson. Med.* **19**(2), 321–326 (1991)
82. P. Basser, J. Mattiello, D. Le Bihan, Estimation of the effective self-diffusion tensor from the NMR spin echo. *J. Magn. Reson. Ser. B* **103**(3), 247–254 (1994)

83. P. Basser, J. Mattiello, D. Le Bihan, Estimation of the effective self-diffusion tensor from the NMR spin echo. *Biophys. J.* **66**(1), 259–267 (1994)
84. J. Mattiello, P. Basser, D. Le Bihan, Analytical expression for the b matrix in NMR diffusion imaging and spectroscopy. *J. Magn. Reson. Ser. A* **108**(2), 131–141 (1994)
85. J. Mattiello, P. Basser, D. Le Bihan, The b matrix in diffusion tensor echo-planar imaging. *Magn. Reson. Med.* **37**(2), 292–300 (1997)
86. P. Basser, S. Pajevic, C. Pierpaoli, J. Duda, A. Aldroubi, In vivo fiber-tractography in human brain using diffusion tensor MRI (DT-MRI) data. *Magn. Reson. Med.* **44**(4), 625–632 (2000)
87. D. Jones, A. Simmons, S. Williams, M. Horsfield, Noninvasive assessment of axonal fiber connectivity in the human brain via diffusion tensor MRI. *Magn. Reson. Med.* **42**(1), 37–41 (1999)
88. S. Mori, B. Crain, V. Chacko, P. van Zijl, Three-dimensional tracking of axonal projections in the brain by magnetic resonance imaging. *Ann. Neurol.* **45**(2), 265–269 (1999)
89. X.-X. Yin, S. Hadjiloucas, J.-H. Chen, Y. Zhang, J.-L. Wu, M.-Y. Su, Tensor based multi-channel reconstruction for breast tumours identification from DCE-MRIs. *PLoS One* **12**(3), Article Number: e0172111 (2017)
90. T. Conturo, N. Lori, T. Cull, E. Akbudak, A. Snyder, J. Shimony, R. McKinstry, H. Burton, M. Raichle, Tracking neuronal fiber pathways in the living human brain. *Proc. Natl. Acad. Sci.* **96**(18), 10422–10427 (1999)
91. P.J. Basser, D.K. Jones, Diffusion-tensor MRI: Theory, experimental design and data analysis. *NMR Biomed.* **15**(7–8), 456–467 (2002)
92. J. Simpson, H. Carr, Diffusion and nuclear spin relaxation in water. *Phys. Rev.* **111**(5), 1201–1202 (1958)
93. R. Mills, Self-diffusion in normal and heavy water in the range 1–45 degree. *J. Phys. Chem.* **77**(5), 685–688 (1973)
94. D. Le Bihan, J. Delannoy, R. Levin, Temperature mapping with MR imaging of molecular diffusion: application to hyperthermia. *Radiology* **171**(3), 853–857 (1989)
95. U. Castellani, M. Cristani, C. Combi, V. Murino, A. Sbarbati, P. Marzola, Visual MRI: Merging information visualization and non-parametric clustering techniques for MRI dataset analysis. *Artif. Intell. Med.* **44**(3), 171–282 (2008)
96. C. Lavinia, M. de Jongea, M. Van de Sandeb, P. Takb, A.J. Nederveena, M. Maas, Pixel-by-pixel analysis of DCE MRI curve patterns and an illustration of its application to the imaging of the musculoskeletal system. *Magn. Reson. Imaging* **25**(5), 604–612 (2007)
97. M.J. Stoutjesdijk, J. Veltman, M. Huisman, N. Karssemeijer, J. Barents, H. Huisman, Automatic analysis of contrast enhacement in breast MRI lesions using mean shift clustering for roi selection. *J. Magn. Reson. Imaging* **26**(3), 606–614 (2007)
98. E. Eyal, H. Degani, Model-based and model-free parametric analysis of breast dynamic-contrast-enhanced MRI. *NMR Biomed.* **22**(1), 40–53 (2009)
99. J.E. Levman, P.M.A.L. Warner, E. Causer, A vector machine formulation with application to the computer-aided diagnosis of breast cancer from DCE-MRI screening examinations. *J. Digit. Imaging* **27**(1), 145–151 (2014)
100. M. Rakoczy, D. McGaughey, M.J. Korenberg, J. Levman, A.L. Martel, Feature selection in computer-aided breast cancer diagnosis via dynamic contrast-enhanced magnetic resonance images. *J. Digit. Imaging* **26**(2), 198–208 (2013)
101. H. Hawighorst, M. Libicher, M.V. Knopp, T. Moehler, G.W. Kaufmann, G.V. Kaick, Evaluation of angiogenesis and perfusion of bone marrow lesions: role of semiquantitative and quantitative dynamic MRI. *J. Magn. Reson. Imaging* **10**(3), 286–294 (1999)
102. C.S.P. van Rijswijk, M.J.A. Geirnaerd, A.H.M. Taminiaw, F. van Coevorden, A.H. Zwinderman, T.Pope et al., Soft-tissue tumours: value of static and dynamic gadopentate dimeglumine-enhanced MR imaging in prediction of malignancy. *Radiology* **233**(2), 493–502 (2004)
103. K.L. Verstraete, P. Lang, Bone and soft tissue tumors: the role of contrast agents for MR imaging. *Eur. J. Radiol.* **34**(3), 229–246 (2000)
104. J. Levman, T. Leung, P. Causer, D. Plewes, A.L. Martel, Classification of dynamic contrast-enhanced magnetic resonance breast lesions by support vector machines. *IEEE Trans. Med. Imaging* **27**(5), 688–696 (2008)

105. J. Yao, Breast tumor analysis in dynamic contrast enhanced MRI using texture features and wavelet transform. *IEEE J. Sel. Top. Signal Process.* **3**(1), 94–100 (2009)
106. C. Tanner, D.J. Hawkes, M. Khazen, P. Kessar, M.O. Leach, Does registration improve the performance of a computer aided diagnosis system for dynamic contrast-enhanced MR mammography?, in *IEEE International Symposium on Biomedical Imaging*, (2006), pp. 466–469
107. S. Marrone, G. Piantadosi, R. Fusco, A. Petrillo, M. Sansone, C. Sansone, Automatic lesion detection in breast DCE-MRI, in *Proceeding of The 17th International Conference on Image Analysis and Processing (ICIAP2013)*, ed. by A. Petrosino. LNCS8157 (Part II), (Springer-Verlag, Berlin, Heidelberg, 2013), pp. 359–368
108. M. Lustig, D. Donoho, J.M. Pauly, Sparse MRI: the application of compressed sensing for rapid MR imaging. *Magn. Reson. Imaging* **58**(6), 1182–1195 (2007)
109. L. Duvillearet, F. Garet, L. Coutaz, De-noising techniques for terahertz responses of biological samples. *IEEE J. Sel. Top. Quantum Electron.* **2**(3), 739–746 (1996)
110. L. Duvillearet, F. Garet, J.-L. Coutaz, Highly precise determination of optical constants and sample thickness in terahertz time-domain spectroscopy. *Appl. Opt.* **38**(2), 409–415 (1999)
111. T.D. Dorney, R.G. Baraniuk, D.M. Mittleman, Material parameter estimation with terahertz time-domain spectroscopy. *J. Opt. Soc. Am. A* **18**(7), 1562–1571 (2001)
112. I. Pupeza, R. Wilk, M. Koch, Highly accurate optical material parameter determination with thz time-domain spectroscopy. *Opt. Express* **15**(7), 4335–4350 (2007)
113. M. Scheller, C. Jansen, M. Koch, Analyzing sub-100 nm samples with transmission terahertz time domain spectroscopy. *Opt. Commun.* **282**(7), 1304–1306 (2009)
114. R. Wilk, I. Pupeza, R. Cernat, M. Kochh, Highly accurate thz time-domain spectroscopy of multilayer structures. *IEEE J. Sel. Top. Quantum Electron.* **14**(2), 392–398 (2008)
115. G.P. Kniffin, L.M. Zurk, Model-based material parameter estimation for terahertz reflection spectroscopy. *IEEE Trans. Terahertz Sci. Technol.* **2**(2), 231–241 (2012)
116. G.K. Aguire, J.A. Detre, J. Wang, Perfusion fmri for functional neuroimaging. *Int. Rev. Neurobiol. Neuroimaging Part A* **66**, 213–236 (2005)
117. E. Özarslan, P.J. Basser, MR diffusion-“diffraction” phenomenon in multi-pulse-field-gradient experiments. *J. Magn. Reson.* **188**(2), 285–294 (2007)
118. J.M. Papy, L. De Lathauwer, S. Van Huffel, Exponential data fitting using multilinear algebra: The single-channel and multi-channel case. *Numer. Linear Algebr. Appl.* **12**, 809–826 (2005)
119. M. Abramoff, M. Garvin, M. Sonka, Retinal imaging and image analysis. *IEEE Rev. Biomed. Eng.* **3**, 169–208 (2010)
120. J.D. Lewis, G. Destito, A. Zijlstra, M.J. Gonzalez, J.P. Quigley, M. Manchester, H. Stuhlmann”, *Nat. Med.* **12**, 354–360 (2006)
121. D. Huang, E.A. Swanson, C.P. Lin, J.S. Schuman, W.G. Stinson, W. Chang, M.R. Hee, T. Flotte, K. Gregory, C.A. Puliafito, J.G. Fujimoto, Optical Coherence Tomography. *Science* **254**, 1178–1181 (1991)
122. R.J. Cooper, E. Magee, N. Everdell, S. Magazov, M. Varela, D. Airantzis, A.P. Gibson, J.C. Hebden, MONSTIR II: a 32-channel, multispectral, time-resolved optical tomography system for neonatal brain imaging. *Rev. Sci. Instrum.* **85**(5). Article Number 053105 (2016)
123. L.A. Dempsey, R.J. Cooper, S. Powell, A. Edwards, C.-W. Lee, S. Brigadoi et al., Whole-head functional brain imaging of neonates at cot-side using time-resolved diffuse optical tomography, in *SPIE Proceedings on Diffuse Optical Imaging V*, Article Number 953818 (2015)
124. L.A. Dempsey, R.J. Cooper, T. Roque, T. Correia, E. Magee, S. Powell et al., Data-driven approach to optimum wavelength selection for diffuse optical imaging. *J. Biomed. Opt.* **20**(1). Article Number 016003 (2015)
125. S. Powell, L. Dempsey, R.J. Cooper, A. Gibson, J.C. Hebden, S. Arridge, Real-time dynamic image reconstruction in time-domain diffuse optical tomography, in *Biomedical Optics 2016 OSA Technical Digest (online)*, Article Number: OM4C.5 (2016)
126. Y. Pan, H. Xie, G.K. Fedder, Endoscopic optical coherence tomography based on a micro-electromechanical mirror. *Opt. Lett.* **26**(24), 1966–1968 (2001)

127. H. Xie, Y. Pan, G.K. Fedder, Endoscopic optical coherence tomographic imaging with a CMOS-MEMS micromirror. *Sens. Actuators A* **103**(1–2), 237–241 (2003)
128. L. Xi, C. Duan, H. Xie, H. Jiang, Miniature probe combining optical-resolution photoacoustic microscopy and optical coherence tomography for in vivo microcirculation study. *Appl. Opt.* **52**(9), 1928–1931 (2013)
129. X. Dai, L. Xi, C. Duan, H. Yang, H. Xie, H. Jiang, Miniature probe integrating optical-resolution photoacoustic microscopy, optical coherence tomography, and ultrasound imaging: proof-of-concept. *Opt. Lett.* **40**(12), 2921–2924 (2015)
130. M.S. Mahmud, D.W. Cadotte, B. Vuong, C. Sun, T.W. Luk, A. Mariampillai, V.X. Yang, Review of speckle and phase variance optical coherence tomography to visualize microvascular networks. *J. Biomed. Opt.* **18**(5). Article Number 050901 (2013)
131. A.G. Markelz, A. Roiberg, E.J. Heilweil, Pulsed terahertz spectroscopy of DNA, bovine serum albumin and collagen between 0.1 and 2.0 THz. *Chem. Phys. Lett.* **320**(1–2), 42–48 (2000)
132. P. Martel, P. Calmettes, B. Hennion, Vibrational modes of hemoglobin in red blood cells. *Biophys. J.* **59**(2), 363–377 (1991)
133. P. Siegel, Terahertz technology. *IEEE Trans. Microw. Theory Tech.* **50**(3), 910–928 (2002)
134. P.U. Jepsen, J.K. Jensen, U. Møller, Characterization of aqueous alcohol solutions in bottles with thz reflection spectroscopy. *Opt. Express* **16**(13), 9318–9331 (2008)
135. A.G. Markelz, Terahertz dielectric sensitivity to biomolecular structure and function. *Spectrochim. Acta Part A Mol. Biomol. Spectrosc.* **14**(1), 180–190 (2008)
136. M. Brucherseifer, M. Nagel, P.H. Bolivar, H. Kurz, A. Bosserhoff, R. Büttner, Label-free probing of the binding state of DNA by time-domain terahertz sensing. *Appl. Phys. Lett.* **77**(24), 4049–4051 (2000)
137. A. Mazhorova, A. Markov, A. Ng, R. Chinnappan, O. Skorobogata, M. Zourob- et al., Label-free bacteria detection using evanescent mode of a suspended core terahertz fiber. *Opt. Express* **20**(5), 5344–5355 (2012)
138. T. Chen, Z. Li, W. Mo, Identification of biomolecules by terahertz spectroscopy and fuzzy pattern recognition. *Spectrochim. Acta Part A Mol. Biomol. Spectrosc.* **106**, 48–53 (2013)
139. A. Menikh, S.P. Mickan, H. Liu, R. MacColl, X.-C. Zhang, Label-free amplified bioaffinity detection using terahertz wave technology. *Biosens. Bioelectron.* **20**(3), 658–662 (2004)
140. A. Menikh, R. MacColl, C. Mannella, X. Zhang, Terahertz biosensing technology: Frontiers and progress. *ChemPhysChem* **3**(8), 655–658 (2002)
141. B. Fischer, M. Hoffmann, H. Helm, R. Wilk, F. Rutz, T. Kleine-Ostmann- et al., Terahertz time-domain spectroscopy and imaging of artificial RNA. *Opt. Express* **13**(14), 5205–5215 (2005)
142. M.K. Choi, K. Taylor, A. Bettermann, D.W. van der Weide, Broadband 10–300 GHz stimulus-response sensing for chemical and biological entities. *Phys. Med. Biol.* **47**(21), 3777–3789 (2002)
143. M. Herrmann, R. Fukasawa, O. Morikawa, Terahertz imaging. *Terahertz Optoelectronics* **97**, 331–381 (2005)
144. J. Nishizawa, T. Sasaki, K. Suto, T. Tanabe, K. Saito, T. Yamada- et al., THz transmittance measurements of nucleobases and related molecules in the 0.4- to 5.8-THz region using a GaP THz wave generator. *Opt. Commun.* **246**(1–3), 229–239 (2005)
145. M. Walther, B. Fischer, M. Schall, H. Helm, P.U. Jepsen, Far-infrared vibrational spectra of all-trans, 9-cis and 13-cis retinal measured by THz time-domain spectroscopy. *Chem. Phys. Lett.* **332**(3–4), 389–395 (2000)
146. I. Jones, T.J. Rainsford, B. Fischer, D. Abbott, Towards T-ray spectroscopy of retinal isomers: a review of methods and modelling. *Vib. Spectrosc.* **41**(2), 144–154 (2006)
147. C.J. Strachan, P.F. Taday, D. Newnham, K.C. Gordon, J.A. Zeitler, M. Pepper- et al., Using terahertz pulsed spectroscopy to study crystallinity of pharmaceutical materials. *Chem. Phys. Lett.* **390**(1–3), 20–24 (2004)
148. C.J. Strachan, P.F. Taday, D. Newnham, K.C. Gordon, J.A. Zeitler, M. Pepper- et al., Using terahertz pulsed spectroscopy to quantify pharmaceutical polymorphism and crystallinity. *J. Pharm. Sci.* **94**(4), 837–846 (2005)

149. C.J. Strachan, P.F. Taday, D.A. Newnham, K.C. Gordon, J.A. Zeitler, M. Pepper- et al., Terahertz pulsed spectroscopy and imaging in the pharmaceutical setting—a review. *J. Pharm. Pharmacol.* **59**(2), 209–223 (2005)
150. A.I. McIntosh, B. Yanga, S.M. Goldupb, M. Watkinsonb, R.S. Donnana, Crystallization of amorphous lactose at high humidity studied by terahertz time domain spectroscopy. *Chem. Phys. Lett.* **558**, 104–108 (2013)
151. C. Hayes, A. Padhani, M. Leach, Assessing changes in tumour vascular function using dynamic contrast enhanced magnetic resonance imaging. *NMR Biomed.* **15**, 154–163 (2002)
152. A. Jackson, D.L. Buckley, G.J.M. Parker, M. Ah-See, *Dynamic Contrast-Enhanced Magnetic Resonance Imaging in Oncology* (Springer-Verlag, Heidelberg, Germany, 2005)
153. P.D. Friedman, S.V. Swaminathan, R. Smith, SENSE imaging of the breast. *Am. J. Roentgenol.* **184**(2), 448–451 (2005)
154. S. Ljunggren, A simple graphical representation of fourier-based imaging methods. *J. Magn. Reson.* **54**(2), 338–343 (1983)
155. D. Twieg, The k-trajectory formulation of the NMR imaging process with applications in analysis and synthesis of imaging methods. *Med. Phys.* **10**(5), 610–621 (1983)
156. T. Parrish, X. Hu, Continuous update with random encoding (CURE): a new strategy for dynamic imaging. *Magn. Reson. Med.* **33**(3), 326–336 (1995)
157. R.C. Semelka, N.L. Kelekis, D. Thomasson, M.A. Brown, G.A. Laub, HASTE MR imaging: description of technique and preliminary results in the abdomen. *J. Magn. Reson. Imaging* **6**(4), 698–699 (1996)
158. D.S. Smith, E.B. Welch, X. Li, L.R. Arlinghaus, M.E. Loveless, T. Koyama- et al., Quantitative effects of using compressed sensing in dynamic contrast enhanced MRI. *Phys. Med. Biol.* **56**(15), 4933–4946 (2011)
159. H. Wang, Y. Miao, K. Zhou, Y. Yu, S. Bao, Q. He- et al., Feasibility of high temporal resolution breast DCE-MRI using compressed sensing theory. *Med. Phys.* **37**(9), 4971–4981 (2010)
160. L. Chen, M.C. Schabel, E.V.R. DiBella, Reconstruction of dynamic contrast enhanced magnetic resonance imaging of the breast with temporal constraints. *Magn. Reson. Imaging* **28**(5), 637–645 (2010)
161. J.F. Cai, E.J. Candès, Z. Shen, A singular value thresholding algorithm for matrix completion. *SIAM J. Optim.* **20**(4), 1956–1982 (2010)
162. L. Astolfi, F. Cincotti, D. Mattia, S. Salinari, C. Babiloni, A. Basilisco, P. Rossini, L. Ding, Y. Ni, B. He, M. Marciani, F. Babiloni, Estimation of the effective and functional human cortical connectivity with structural equation modeling and directed transfer function applied to high-resolution EEG. *Magn. Reson. Imaging* **22**(10), 1457–1470 (2004)
163. A. Luna, J.C. Vilanova, L.C. Hygino Da Cruz Jr., S.E. Rossi, in *Functional Imaging in Oncology, Biophysical Aspects and Technical Approaches*, (Springer Verlag Berlin, Heidelberg, 2014)
164. X.-C. Zhang, Terahertz wave imaging: horizons and hurdles. *Phys. Med. Biol.* **47**(21), 3667–3677 (2002)
165. D.L. Woolard, T.R. Globus, B.L. Gelmont, M. Bykhovskaia, A.C. Samuels, D. Cookmeyer, J.L. Hesler, T.W. Crowe, J.O. Jensen, J.L. Jensen, W.R. Loerop, Submillimeter-wave phonon modes in DNA macromolecules. *Phys. Rev. E* **65**, Article Number 051903 (2002)
166. A.J. Fitzgerald, S. Pinder, A.D. Purushotham, P. O’Kelly, P.C. Ashworth, V.P. Wallace, Classification of terahertz-pulsed imaging data from excised breast tissue. *J. Biomed. Opt.* **17**(1), Article Number 016005 (2012)
167. A.J. Fitzgerald, V.P. Wallace, M. Jimenez-Linan, L. Bobrow, R.J. Pye, A.D. Purushotham- et al., Terahertz pulsed imaging of human breast tumors. *Radiology* **239**(2), 533–540 (2006)
168. E. Pickwell, B.E. Cole, A.J. Fitzgerald, V.P. Wallace, M. Pepper, Simulation of terahertz pulse propagation in biological systems. *Appl. Phys. Lett.* **84**(12), 2190–2192 (2004)
169. C. Yu, S. Fan, Y. Sun, E. Pickwell-MacPherson, The potential of terahertz imaging for cancer diagnosis: a review of investigations to date. *Quant. Imaging Med. Surg.* **2**(1), 33–45 (2012)
170. G.-B. Huang, Q.-Y. Zhu, C.-K. Siew, Extreme learning machine: theory and applications. *Neurocomputing* **70**(1–3), 489–501 (2006)

171. V.P. Wallace, A.J. Fitzgerald, E. Pickwell, R.J. Pye, P.F. Taday, N. Flanagan, T. Ha, Terahertz pulsed spectroscopy of human Basal Cell Carcinoma. *Appl. Spectrosc.* **60**, 1127–1133 (2006)
172. P. Knobloch, C. Schildknecht, T. Kleine-Ostmann, M. Koch, S. Hoffmann, M. Hofmann, E. Rehberg, M. Sperling, K. Donhuijsen, G. Hein, K. Pierz, Medical THz imaging: an investigation of histo-pathological samples. *Phys. Med. Biol.* **47**, 3875–3884 (2002)
173. G.M. Png, J.-W. Choi, B.W.-H. Ng, S.P. Micken, D. Abbott, X.-C. Zhang, The impact of hydration changes in fresh bio-tissue on THz spectroscopic measurements. *Phys. Med. Biol.* **53**, 3501–3517 (2008)
174. J. OConnor, P. Tofts, K. Miles, L. Parkes, G. Thompson, A. Jackson, Dynamic contrast-enhanced imaging techniques: CT and MRI. *Br. J. Radiol.* **84**(2), S112–S120 (2011)
175. M.A. Lindquist, The statistical analysis of fMRI data. *Stat. Sci.* **23**(4), 439–464 (2008)
176. M. Tonouchi, Cutting-edge terahertz technology. *Nat. Photonics* **1**, 97–105 (2007)
177. W. Shi, Y.J. Ding, Continuously tunable and coherent terahertz radiation by means of phase-matched difference-frequency generation in zinc germanium phosphide. *Appl. Phys. Lett.* **83**, Article Number: 1.1596730 (2003)
178. W. Shi, M. Leigh, J. Zong, S. Jiang, Single-frequency terahertz source pumped by Q-switched fiber lasers based on difference-frequency generation in GaSe crystal. *Opt. Lett.* **32**(8), 949–951 (2007)
179. E.R. Brown, K.A. McIntosh, K.B. Nichols, C.L. Dennis, Photomixing up to 3.8 THz in low-temperature-grown GaAs. *Appl. Phys. Lett.* **66**, Article Number: 1.113519 (1998)
180. T. Tanabe, K. Suto, J. Nishizawa, T.K.K. Saito, Frequency-tunable high-power terahertz wave generation from GaP. *J. Appl. Phys.* **93**(8), Article Number: 1.1560573 (2003)
181. A. Nahata, A.S. Weling, T.F. Heinz, A wideband coherent terahertz spectroscopy system using optical rectification and electro-optic sampling. *Appl. Phys. Lett.* **69**, Article Number: 1.117511 (1998)
182. C. Janke, M. Först, M. Nagel, H. Kurtz, A. Bartels, Asynchronous optical sampling for high-speed characterization of integrated resonant terahertz sensors. *Opt. Lett.* **30**, 1405–1407 (2005)
183. A. Bartels, A. Thoma, C. Janke, T. Dekorsy, A. Dreyhaupt, S. Winnerl, M. Helm, High resolution THz spectrometer with kHz scan rates. *Opt. Express* **14**, 430–437 (2006)
184. A. Bartels, R. Cerna, C. Kistner, A. Thoma, F. Hudert, C. Janke, T. Dekorsy, Ultrafast time-domain spectroscopy based on high-speed asynchronous optical sampling. *Rev. Sci. Instrum.* **78**(3), Article Number: 035107 (2007)
185. S. Hadjiloucas, G.C. Walker, J.W. Bowen, V.M. Becerra, A. Zafirooulos, R.K.H. Galvão, High signal to noise ratio THz spectroscopy with ASOPS and signal processing schemes for mapping and controlling molecular and bulk relaxation processes. *J. Phys. Conf. Ser.* **183**, Article Number: 012003 (2009)
186. G.C. Walker, *Modelling the Propagation of Terahertz Radiation in Biological Tissue*, (Ph.D. Thesis) (Centre of Medical Imaging Research, University of Leeds, 2003)
187. B. Knoll, F. Keilmann, Near-field probing of vibrational absorption for chemical microscopy. *Nature* **399**, 134–137 (1999)
188. B. Knoll, F. Keilmann, Enhanced dielectric contrast in scattering-type scanning near-field optical microscopy. *Opt. Commun.* **182**, 321–328 (2000)
189. R. Hillenbrand, F. Keilmann, Complex Optical Constants on a Subwavelength Scale. *Phys. Rev. Lett.* **85**(14), 3029–3032 (2000)
190. I.S. Averbukh, B.M. Chernobrod, O.A. Sedletsy, Y. Prior, Coherent near field optical microscopy. *Opt. Commun.* **174**, 33–41 (2000)
191. R. Hillenbrand, T. Taubner, F. Keilmann, Phonon-enhanced light-matter interaction at the nanometre scale. *Nature* **418**, 159–162 (2002)
192. S.J. Oh, J.Y. Kang, I.H. Maeng, J.-S. Suh, Y.-M. Huh, S.J. Haam, J.-H. Son, Nanoparticle-enabled terahertz imaging for cancer diagnosis. *Opt. Express* **17**(5), 3469–3475 (2009)
193. J.-H. Lee, Y.-W. Jun, S.-I. Yeon, J.-S. Shin, J.W. Cheon, Dual-mode nanoparticle probes for high-performance magnetic resonance and fluorescence imaging of neuroblastom. *Angew. Chem. Int.* **45**(48), 8160–8162 (2006)

194. W. Cai, K. Chen, Z.-B. Li, S.S. Gambhir, X. Chen, Dual-function probe for PET and near-infrared fluorescence imaging of tumor vasculature. *J. Nucl. Med.* **48**(11), 1862–1870 (2007)
195. K. Chen, Z.-B. Li, H. Wang, W. Cai, X. Chen, Dual-modality optical and positron emission tomography imaging of vascular endothelial growth factor receptor on tumor vasculature using quantum dots. *Eur. J. Nucl. Med. Mol. Imaging* **35**(12), 2235–2244 (2008)
196. E.S. Kawasaki, A. Player, Nanotechnology, nanomedicine, and the development of new, effective therapies for cancer. *Nanomed. Nanotechnol. Biol. Med.* **1**, 101–109 (2005)
197. A.P. Alivisatos, W. Gu, C. Larabell, Quantum dots as cellular probes. *Annu. Rev. Biomed. Eng.* **7**, 55–76 (2005)
198. W.C.W. Chan, D.J. Maxwell, X. Gao, R.E. Bailey, M. Han, S. Nie, Luminescent quantum dots for multiplexed biological detection and imaging. *Curr. Opin. Biotechnol.* **13**, 40–46 (2002)
199. X. Michalet, F.F. Pinaud, L.A. Bentolila, J.M. Tsay, S. Doose, J.J. Li, G. Sundaresan, A.M. Wu, S.S. Gambhir, S. Weiss, Quantum dots for live cells, in vivo imaging, and diagnostics. *Science* **307**(5709), 538–544 (2005)
200. W. Jifang, R. Jicun, Luminescent quantum dots: a very attractive and promising tool in biomedicine. *Curr. Med. Chem.* **13**, 897–909 (2006)
201. F. Keilmann, C. Gohle, R. Holzwarth, Time-domain mid-infrared frequency-comb spectrometer. *Opt. Lett.* **29**, 1542–1544 (2004)
202. A. Schliesser, M. Brehm, F. Keilmann, D.W. van der Weide, Frequency-comb infrared spectrometer for rapid, remote chemical sensing. *Opt. Express* **13**(22), 9029–9038 (2005)
203. A.P. Alivisatos, Semiconductor clusters, nanocrystals, and quantum dots. *Science* **271**(22), 933–937 (1996)
204. S.K. Shin, H.-J. Yoon, Y.J. Jung, J.W. Park, Nanoscale controlled self-assembled monolayers and quantum dots. *Curr. Opin. Chem. Biol.* **10**(5), 423–429 (2006)
205. A.L. Rogach, A. Eychmüller, S.G. Hickey, S.V. Kershaw, Infrared-emitting colloidal nanocrystals: synthesis, assembly, spectroscopy, and applications. *Small* **3**(4), 536–557 (2007)
206. M. Bruchez Jr., M. Moronne, P. Gin, S. Weiss, A.P. Alivisatos, Semiconductor nanocrystals as fluorescent biological labels. *Science* **281**, pp. 2013–2016 (1998)
207. X. Gao, L. Yang, J.A. Petros, F.F. Marshall, J.W. Simons, S. Nie, In vivo molecular and cellular imaging with quantum dots. *Curr. Opin. Biotechnol.* **16**, 63–72 (2005)
208. A. Fu, W. Gu, C. Larabell, A.P. Alivisatos, Semiconductor nanocrystals for biological imaging. *Curr. Opin. Neural Biol.* **15**, 568–575 (2005)
209. R. Hardman, A toxicologic review of quantum dots: toxicity depends on physicochemical and environmental factors. *Environ. Health Perspect.* **114**(2), 165–172 (2006)
210. U. Resch-Genger, M. Grabolle, S. Cavaliere-Jaricot, R. Nitschke, T. Nann, Quantum dots versus organic dyes as fluorescent labels. *Nat. Methods* **5**, 763–775 (2008)
211. S. Pandya, J. Yu, D. Parker, Engineering emissive europium and terbium complexes for molecular imaging and sensing. *Dalton Trans.* **23**, 2757–2766 (2006)
212. L.R. Medeiros, L.B. Freitas, D.D. Rosa, F.R. Silva, L.T. Birtencourt, M.I. Edelweiss, M.I. Rosa, Accuracy of magnetic resonance imaging in ovarian tumor: a systematic quantitative review. *Am. J. Obstet. Gynecol.* **204**(1), 67–69 (2011)
213. J.P. McCarthy, R. Weissleder, Multifunctional magnetic nanoparticles for targeted imaging and therapy. *Adv. Drug Deliv. Rev.* **60**(11), 1241–1251 (2008)
214. J.M. Yang, J.W. Lee, J.Y. Kang, S.J. Oh, H.-J. Ko, J.-H. Son, K.G. Lee, J.-S. Suh, Y.-M. Huh, S.J. Haam, Smart drug-loaded polymer gold nanoshells for systemic and localized therapy of human epithelial cancer. *Adv. Mater.* **21**(43), 4339–4342 (2009)
215. A.S. Arbab, L.A. Bashaw, B.R. Miller, E.K. Jordan, B.K. Lewis, H. Kalish, J.A. Frank, Characterization of biophysical and metabolic properties of cells labeled with superparamagnetic iron oxide nanoparticles and transfection agent for cellular MR imaging. *Radiology* **229**(3), 838–846 (2003)
216. P.T.C. So, *Two-photon Fluorescence Light Microscopy* (Macmillan Publishers Ltd, Encyclopedia of Life Sciences, 2002)
217. S.W. Botchway, A.W. Parker, R.H. Bisby, A.G. Crisostomo, Real-time cellular uptake of serotonin using fluorescence lifetime imaging with two-photon excitation. *Microsc. Res. Tech.* **71**, 267–273 (2008)

218. S.W. Botchway, K. Scherer, S. Hook, C.D. Stubbs, E. Weston, R.H. Bisby, A.W. Parker, A series of flexible design adaptations to the Nikon E-C1 and E-C2 confocal microscope systems for UV, multiphoton and FLIM imaging. *J. Microsc.* **258**, 68–78 (2015)
219. B.J. Gaffney, Electron Spin Resonance of Biomolecules. *Rev. Cell Biol. Mol. Med.* (2006). doi:[10.1002/3527600906.mcb.200300104](https://doi.org/10.1002/3527600906.mcb.200300104)
220. P.P. Borbat, A.J. Costa-Filho, K.A. Earle, J.K. Moscicki, J.H. Freed, Electron spin resonance in studies of membranes and proteins. *Science* **291**, 266–269 (2001)
221. B.F. Spencer, W.F. Smith, M.T. Hibberd, P. Dawson, M. Beck, A. Bartels, I. Guiney, C.J. Humphreys, D.M. Graham, Terahertz cyclotron resonance spectroscopy of an AlGaIn/GaN heterostructure using a high-field pulsed magnet and an asynchronous optical sampling technique. *Appl. Phys. Lett.* **108**, Article Number: 1.4948582 (2016)
222. D. Marsh, Electron spin resonance: spin labels, *Membrane Spectroscopy* (Springer, 1981)
223. E.A. Nanni, A.B. Barnes, R.G. Griffin, R.J. Temkin, THz dynamic nuclear polarization NMR. *IEEE Trans. Terahertz Sci. Technol.* **1**, 145–163 (2011)
224. A. Abragam, M. Goldman, Principles of dynamic nuclear polarisation. *Rep. Prog. Phys.* **41**(3), 395–467 (1978)
225. F. Conti, *Fisiología Médica*, 1st edn. (McGraw-Hill, New York, USA, 2015)
226. X.-X. Yin, B.W.-H. Ng, J. He, Y. Zhang, D. Abbott, Accurate image analysis of the retina using hessian matrix and binarisation of thresholded entropy with application of texture mapping. *PLoS one* **9**(4), Article Number: e95943 (2014)
227. S. Irshad, X.X. Yin, L.Q. Li, U. Salman, Automatic Optic Disk Segmentation in Presence of Disk Blurring. *Int. Symp. Vis. Comput.* 13–23 (2016)
228. K.M. Twietmeyer, R.A. Chipman, Optimization of mueller matrix polarimeters in the presence of error sources. *Opt. Express* **16**(15), 11589–11603 (2008)
229. S.A. Burns, A.E. Elsner, M.B. Mellem-Kairala, R.B. Simmons, Improved contrast of subretinal structures using polarization analysis. *Investig. Ophthalmol. Vis. Sci.* **44**(9), 4061–4068 (2003)
230. M.B. Mellem-Kairala, A.E. Elsner, A. Weber, R.B. Simmons, S.A. Burns, Improved contrast of peripapillary hyperpigmentation using polarization analysis. *Investig. Ophthalmol. Vis. Sci.* **46**(3), 1099–1106 (2005)
231. A.E. Elsner, A. Weber, M.C. Cheney, D.A. VanNasdale, M. Miura, Imaging polarimetry in patients with neovascular age-related macular degeneration. *J. Opt. Soc. Am. A* **24**(5), 1468–1480 (2007)
232. D. Huang, E.A. Swanson, C.P. Lin, J.S. Schuman, W.G. Stinson, W. Chang, M.R. Hee, T. Flotte, K. Gregory, C.A. Puliafito, et al., Optical coherence tomography. *Science* **254**(5035), 1178–1181 (1991)
233. C. Salvini, D. Massi, A. Cappetti, M. Stante, P. Cappugi, P. Fabbri, P. Carli, Application of optical coherence tomography in non-invasive characterization of skin vascular lesions. *Skin Res. Technol.* **14**(1), 89–92 (2007)
234. I.K. Jang, B.E. Bouma, D.H. Kang, S.J. Park, S.W. Park, K.B. Seung, K.B. Choi, M. Shishkov, K. Schlendorf, E. Pomerantsev, S.L. Houser, H.T. Aretz, G.J. Tearney, Visualization of coronary atherosclerotic plaques in patients using optical coherence tomography: comparison with intravascular ultrasound. *J. Am. Coll. Cardiol.* **39**(4), 604–609 (2002)
235. M.R. Hee, J.A. Izatt, E.A. Swanson, D. Huang, J.S. Schuman, C.P. Lin, J.G. Fujimoto, Optical coherence tomography of the human retina. *Arch. Ophthalmol.* **113**(3), 325–332 (1995)
236. C.A. Puliafito, M.R. Hee, C.P. Lin, E. Reichel, J.S. Schuman, J.S. Duker, J.A. Izatt, E.A. Swanson, J.G. Fujimoto, Imaging of macular diseases with optical coherence tomography. *Ophthalmology* **102**(2), 217–229 (1995)
237. M. Wojtkowski, A. Kowalczyk, R. Leitgeb, A.F. Fercher, Full range complex spectral optical coherence tomography technique in eye imaging. *Opt. Lett.* **27**(16), 1415–1417 (2002)
238. J.M. Schmitt, Optical Coherence Tomography (OCT): A Review. *IEEE J. Sel. Top. Quantum Electron.* **5**(4), 1205–1215 (1999)
239. A.F. Fercher, W. Drexler, C.K. Hitzenberger, T. Lasser, Optical coherence tomography-principles and applications. *Rep. Prog. Phys.* **66**, 239–303 (2003)

240. R.C. Youngquist, S. Carr, D.E.N. Davies, Optical coherence domain reflectometry: A new optical evaluation technique. *Opt. Lett.* **12**(3), 158–160 (1987)
241. M.A. Hussain, A. Bhuiyan, A. Turpin, A.D. Luu, R.T. Smith et al. Automatic identification of pathology distorted retinal layer boundaries using SD-OCT imaging. *IEEE Trans. Biomed. Eng.* **PP**(99) (2016). doi:[10.1109/TBME.2016.2619120](https://doi.org/10.1109/TBME.2016.2619120)
242. A.M. Zysk, F.T. Nguyen, A.L. Oldenburg, D.L. Marks, S.A. Boppart, Optical coherence tomography: a review of clinical development from bench to bedside. *J. Biomed. Opt.* **12**(5). Article Number: 051403 (2007)
243. H.G. Bezerra, M.A. Costa, G. Guagliumi, A.M. Rollins, D.I. Simon, Intracoronary optical coherence tomography: a comprehensive review. *JACC: Cardiovasc. Interv.* **2**(11), 1035–1046 (2009)
244. W. Drexler, U. Morgner, R.K. Ghanta, F.X. Kärtner, J.S. Schuman, J.G. Fujimoto, Ultrahigh-resolution optical coherence tomography. *J. Biomed. Opt.* **7**(4), 502–507 (2001)
245. U. Morgner, W. Drexler, F.X. Kärtner, X.D. Li, C. Pitris, E.P. Ippen, J.G. Fujimoto, Spectroscopic optical coherence tomography. *Opt. Lett.* **25**(2), 111–113 (2000)
246. T.E. Carlo, A. Romano, N.K. Waheed, J.S. Duker, A review of optical coherence tomography angiography (OCTA). *Int. J. Retin. Vitreous* **1**(1), 1–15 (2015)
247. R.F. Spaide, J.G. Fujimoto, N.K. Waheed, Optical coherence tomography angiography. *Retina* **35**(11), 2161–2162 (2015)
248. I. Grulkowski, I. Gorczynska, M. Szkulmowski, D. Szlag, A. Szkulmowska, R.A. Leitgeb, A. Kowalczyk, M. Wojtkowski, Scanning protocols dedicated to smart velocity ranging in spectral OCT. *Opt. Express* **17**(26), 23736–23754 (2009)
249. A. Mariampillai, B.A. Standish, E.H. Moriyama, M. Khurana, N.R. Munce et al., Speckle variance detection of microvasculature using swept-source optical coherence tomography. *Opt. Lett.* **33**(13), 1530–1532 (2008)
250. C. Blatter, T. Klein, B. Grajciar, T. Schmolz, W. Wieser, R. Andre, R. Huber, R.A. Leitgeb, Ultrahighspeed non-invasive widefield angiography. *J. Biomed. Opt.* **17**(7). Article Number: 070505 (2012)
251. A. Mariampillai, B.A. Standish, E.H. Moriyama, M. Khurana, N.R. Munce et al., Speckle variance detection of microvasculature using swept-source optical coherence tomography. *Opt. Express* **33**(13), 1530–1532 (2008)
252. X.J. Wang, T.E. Milner, J.S. Nelson, Characterization of fluid flow velocity by optical Doppler tomography. *Opt. Lett.* **20**(11), 1337–1339 (1995)
253. Y. Zhao, K.M. Brecke, H. Ren, Z. Ding, J.S. Nelson, Z. Chen, Three-dimensional reconstruction of in vivo blood vessels in human skin using phase-resolved optical Doppler tomography. *IEEE J. Sel. Top. Quantum Electron.* **7**(6), 931–935 (2001)
254. S. Makita, Y. Hong, M. Yamanari, T. Yatagai, Y. Yasuno, Optical coherence angiography. *Opt. Express* **14**(17), 7821–7840 (2006)
255. D.Y. Kim, J. Fingler, J.S. Werner, D.M. Schwartz, S.E. Fraser, R.J. Zawadzki, In vivo volumetric imaging of human retinal circulation with phase-variance optical coherence tomography. *Biomed. Opt. Express* **2**(6), 1504–1513 (2011)
256. D.M. Schwartz, J. Fingler, D.Y. Kim, R.J. Zawadzki, L.S. Morse, S.S. Park, S.E. Fraser, J.S. Werner, Phase-variance optical coherence tomography: a technique for noninvasive angiography. *Ophthalmology* **121**(1), 180–187 (2014)
257. M. Akiba, K.P. Chan, N. Tanno, Full-field optical coherence tomography by two-dimensional heterodyne detection with a pair of CCD cameras. *Opt. Lett.* **28**(10), 816–818 (2003)
258. Z. Chen, M. Liu, M. Minneman, L. Ginner, E. Hoover, H. Sattmann, M. Bonesi, W. Drexler, R.A. Leitgeb, Phase-stable swept source OCT angiography in human skin using an akinetic source. *Biomed. Opt. Express* **7**(8), 3032–3048 (2016)
259. F.E.W. Schmidt, M.E. Fry, E.M.C. Hillman, J.C. Hebden, D.T. Delpy, A 32-channel time-resolved instrument for medical optical tomography. *Rev. Sci. Instrum.* **71**(1), 256–265 (1999)
260. M.E. Fermann, I. Hartl, Ultrafast fibre lasers. *Nat. Photonics* **7**, 868–874 (2013)
261. F. Couny, F. Benabid, Optical frequency comb generation in gas-filled hollow core photonic crystal fibres. *J. Opt. A Pure Appl. Opt.* **11**(10). Article Number: 103002 (2009)

262. D. Strickland, G. Mourou, Compression of amplified chirped optical pulses. *Opt. Commun.* **56**(3), 447–449 (1985)
263. P. Maine, D. Strickland, P. Bado, M. Pessot, G. Mourou, Generation of ultrahigh peak power pulses by chirped pulse amplification. *IEEE J. Quantum Electron.* **24**(2), 398–403 (1988)
264. S.R. Deans, *The Radon Transform and Some of Its Applications* (Dover Publications Inc., 2007)
265. E.M.C. Hillman, J.C. Hebden, F.E.W. Schmidt, S.R. Arridge, M. Schweiger, H. Dehghani, D.T. Delpy, Calibration techniques and datatype extraction for time-resolved optical tomography. *Rev. Sci. Instrum.* **71**(9), 3415–3427 (2000)
266. J.C. Hebden, H. Veenstra, H. Dehghani, E.M.C. Hillman, M. Schweiger, S.R. Arridge, D.T. Delpy, Three-dimensional time-resolved optical tomography of a conical breast phantom. *Appl. Opt.* **40**(19), 3278–3287 (2001)
267. T. Teng, M. Lefley, D. Claremont, Use of two-dimensional matched filters for estimating a length of blood vessels newly created in angiogenesis process. *Med. Biol. Eng. Comput.* **40**(1), 2–13 (2002)
268. A.M. Mendonça, A. Campilho, Segmentation of retinal blood vessels by combining the detection of centerlines and morphological reconstruction. *IEEE Trans. Med. Imaging* **25**(9), 1200–1213 (2003)
269. S. Hammond, J. Wells, D. Marcus, L. Prisant, Ophthalmoscopic findings in malignant hypertension. *J. Clin. Hypertens.* **8**(3), 221–223 (2006)
270. A. Ghorbanihaghjo, A. Javadzadeh, H. Argani, N. Nezami, N. Rashtchizadeh, M. Rafeey, M. Rohbaninoubar, B. Rahimi-Ardabili, Lipoprotein(a), homocysteine, and retinal arteriosclerosis. *Mol. Vis.* **14**, 1692–1697 (2008)
271. J.S. Patrick, E. Marshall, *Ophthalmic Photography: Retinal Photography, Angiography, and Electronic Imaging*, 2nd edn. (Tyler Butterworth-Heinemann Medical, Chicago, Illinois, USA, 2011)
272. M. Bhargava, T.Y. Wong, Current concepts in hypertensive retinopathy. *Retin. Phys.* **10**(11/2013), 43–54 (2013)
273. G. Liew, J.J. Wang, Retinal Vascular Signs: A Window to the Heart? *Revista Espanola de Cardiología* **64**(6), 515–521 (2011)
274. R. Galvão, S. Hadjiloucas, A. Zafirooulos, G. Walker, J. Bowen, R. Dudley, Optimization of apodization functions in thz transient spectrometry. *Opt. Lett.* **32**(20), 3008–3010 (2007)
275. J.W. Bowen, S. Hadjiloucas, G.C. Walker, H.W. Huebers, J. Schubert, Interferometric Technique for Measuring Terahertz Antenna Phase Patterns. *IEEE Sens. J.* **13**(1), 100–110 (2013)
276. N. Wiener, *Extrapolation and Smoothing of Stationary Time Series*, Wiley (U.S.A, New York, 1949)
277. I. Jolliffe, *Principal Component Analysis* (Springer-Verlag, U.S.A, New York, 1986)
278. J. Hertz, A. Krogh, R. Palmer, *Introduction to the Theory of Neural Computation* (Addison-Wesley, California, U.S.A, 1989)
279. J.N. Kapur, H.K. Kesavan, *Entropy Optimization Principles with Applications* (Academic Press, Boston, 1992)
280. E. Özarslan, P.J. Basser, T.M. Shepherd, P.E. Thelwall, B.C. Vemuri, S. Blackband, Observation of anomalous diffusion in excised tissue by characterizing the diffusion-time dependence of the MR signal. *J. Magn. Reson.* **183**(2), 315–323 (2006)
281. K. Bennett, K. Schmainda, R. Bennett, D. Rowe, H. Lu, J. Hyde, Characterization of continuously distributed cortical water diffusion rates with a stretched-exponential model. *Magn. Reson. Med.* **50**(4), 727–734 (2003)
282. P. Sen, M. Hürlimann, T. de Swiet, Debye-porod law of diffraction for diffusion in porous media. *Phys. Rev. B: Condens. Matter* **51**(1), 601–604 (1995)
283. L. Richard, M.O. Abdullah, D. Baleanu, X. Zhou, Anomalous diffusion expressed through fractional order differential operators in the bloch-torrey equation. *J. Magn. Reson.* **190**, 255–270 (2008)
284. T.H. Jochimsen, A. Schöfer, R. Bammer, M.E. Moseley, Efficient simulation of magnetic resonance imaging with bloch-torrey equations using intra-voxel magnetization gradients. *J. Magn. Reson.* **180**(1), 29–38 (2006)

285. X. Zhou, Q. Gao, O. Abdullah, R.L. Magin, Studies of anomalous diffusion in the human brain using fractional order calculus. *Magn. Reson. Med.* **63**(3), 562–569 (2010)
286. J.-L. Battaglia, O. Cois, L. Puigsegur, A. Oustaloup, Solving an inverse heat conduction problem using a non-integer identified model. *Int. J. Heat Mass Transf.* **44**, 2671–2680 (2001)
287. M. Aoun, R. Malti, F. Levron, A. Oustaloup, Numerical Simulations of Fractional Systems: An Overview of Existing Methods and Improvements. *Nonlinear Dyn.* **38**, 117–131 (2004)
288. R. Malti, X. Moreau, F. Khemani, A. Oustaloup, Stability and resonance conditions of elementary fractional transfer functions. *Automatica* **47**, 2462–2467 (2011)
289. S. Victor, R. Malti, H. Garnier, A. Oustaloup, Parameter and differentiation order estimation in fractional models. *Automatica* **49**, 926–935 (2013)
290. Z. Wang, Fast algorithms for the discrete W transform and for the discrete fourier transform. *IEEE Trans. Acoust. Speech Signal Process. ASSP* **32**, 803–816 (1984)
291. Y. Arai, T. Agui, M. Nakajima, A fast DCT-SQ scheme for images. *IEICE Trans.* **E-71**(11), 1095–1097 (1988)
292. E. Feig, S. Winograd, Fast algorithms for the discrete cosine transform. *IEEE Trans. Signal Process.* **40**(9), 2174–2193 (1992)
293. K. Wahid, V. Dimitrov, G. Jullien, W. Badawy, Error-free computation of daubechies wavelets for image compression applications. *Electron. Lett.* **39**(5), 428–429 (2003)
294. J.F. Canny, A computational approach to edge detection. *IEEE Trans. Pattern Anal. Mach. Intell.* **8**(6), 679–698 (1986)
295. R. Deriche, Using Canny’s criteria to derive a recursively implemented optimal edge detector. *Int. J. Comput. Vis.* **1**(2), 167–187 (1987)
296. M. Heath, S. Sarkar, T. Sanocki, K. Bowyer, Comparison of edge detectors: a methodology and initial study. *Comput. Vis. Image Underst.* **69**(1), 38–54 (1998)
297. D. Marr, E. Hildreth, Theory of edge detection. *Proc. R. Soc. Lond. B* **207**, 301–328 (1982)
298. J.S. Lim, *Two-Dimensional Signal and Image Processing* (Prentice-Hall, Englewood Clis, NJ, 1990)
299. B. Mathieu, P. Melchior, A. Oustaloup, C. Ceyral, Fractional differentiation for edge detection. *Sig. Process.* **83**, 2421–2432 (2003)
300. J.N.S. Matthews, D.G. Altman, M.J. Campbell, P. Royston, Analysis of serial measurements in medical research. *Br. Med. J.* **300**, 230–235 (1990)
301. P.M.J. Van den Hof, P.S.C. Heuberger, J. Bokor, System identification with generalized orthonormal basis functions. *Automatica* **31**, 1821–1834 (1995)
302. R. Malti, M. Aoun, F. Levron, and A. Oustaloup, Unified construction of fractional generalized orthogonal bases, in *Fractional Differentiation and its Applications, U-Books*, (2005), pp. 87–102
303. R. Malti, P. Melchior, P. Lanusse, A. Oustaloup, Towards an object oriented CRONE Toolbox for fractional differential systems, in *18th IFAC World Congress IFAC Proceedings*, vol. 44, pp. 10830–10835 (2011)
304. S.G. Mallat, *A Wavelet Tour of Signal Processing* (Academic Press, CA, San Diego, 1999)
305. I. Daubechies, *Ten Lectures on Wavelets* (Society for Industrial and Applied Mathematics, Philadelphia, USA, 1992)
306. A. Jensen, A. La Cour-Harbo, *Ripples in Mathematics: The Discrete Wavelet Transform* (Springer Verlag, Berlin, Germany, 2001)
307. S. Hadjiloucas, R. Galvão, V. Becerra, J. Bowen, R. Martini, M. Brucherseifer- et al., Comparison of state space and ARX models of a waveguide’s THz transient response after optimal wavelet filtering. *IEEE Trans. Microw. Theory Tech. MTT* **52**(10), 2409–2419 (2004)
308. B. Ferguson, D. Abbott, Denoising techniques for terahertz responses of biological samples. *Microelectron. J.* **32**(12), 943–953 (2001)
309. S. Qian, D. Chen, *Joint Time-Frequency Analysis-Methods and Applications* (Prentice Hall PTR, New Jersey, 1996)
310. M. Vetterli, J. Kovacevic, *Wavelets and Subband Coding* (Prentice-Hall PTR, New Jersey, USA, 1995)

311. P.P. Vaidyanathan, *Wavelets and Filter Banks* (Wellesley-Cambridge Press, Wellesley, USA, 1996)
312. P.P. Vaidyanathan, *Multirate Systems and Filter Banks* (Prentice Hall Inc, New Jersey, USA, 1993)
313. K. Ramchandran, M. Vetterli, C. Herley, Wavelets, subband coding, and best bases. *Proc. IEEE* **84**(4), 541–560 (1998)
314. P. Moulin, M. Anitescu, K. Kortanek, F. Potra, The role of linear semi-infinite programming in signal-adapted QMF bank design. *IEEE Trans. Signal Process.* **45**(9), 2160–2174 (1997)
315. J. Tuqun, P.P. Vaidyanathan, A state-space approach to the design of globally optimal FIR energy compaction filters. *IEEE Trans. Signal Process.* **48**(10), 2822–2838 (2000)
316. M. Unser, On the optimality of ideal filters for pyramid and wavelet signal approximation. *IEEE Trans. Signal Process.* **41**(12), 3591–3596 (1993)
317. H.M. Paiva, M.N. Marins, R.K.H. Galvão, J.P.L.M. Paiva, On the space of orthonormal wavelets: additional constraints to ensure two vanishing moments. *IEEE Signal Process. Lett.* **16**(2), 101–104 (2009)
318. H.M. Paiva, R.K.H. Galvão, Optimized orthonormal wavelet filters with improved frequency separation. *Digit. Signal Proc.* **22**(4), 622–627 (2012)
319. Y. Kim, Wavelet power spectrum estimation for high-resolution terahertz time-domain spectroscopy. *J. Opt. Soc. Korea* **15**(1), 103–108 (2011)
320. P. Moulin, Wavelet thresholding techniques for power spectrum estimation. *IEEE Trans. Signal Process.* **42**(11), 126–136 (1994)
321. H. Stephani, J. Jonscheit, C. Robine, B. Heise, Automatically detecting peaks in terahertz time-domain spectroscopy, in *Proceeding of The 20th International Conference on Pattern Recognition*, ed. by J.E. Guerrero. IEEE Computer Society Conference Publishing Services (2010), pp. 4468–4471
322. M. Otsuka, J. Nishizawa, J. Shibata, M. Ito, Quantitative evaluation of mefenamic acid polymorphs by terahertz-chemometrics. *J. Pharm. Sci.* **99**(9), 4048–4053 (2010)
323. H. Wu, E.J. Heilweil, A.S. Hussain, M.A. Khan, Process analytical technology (pat): Quantification approaches in terahertz spectroscopy for pharmaceutical application. *J. Pharm. Sci.* **97**(2), 970–984 (2008)
324. D. Zimdars, J.A. Valdmán, J.S. White, G. Stuk, S. Williamson, W.P. Winfree et al., Technology and applications of terahertz imaging non-destructive examination: inspection of space shuttle sprayed on foam insulation, in *AIP Conference Proceedings*, eds. by T. Bulik, B. Rudak, G. Madejski, vol. 760, issue no. 1. (American Institute of Physics, USA, 2005), pp. 570–577
325. R.P. Cogdill, R.N. Forcht, Y.C. Shen, P.F. Taday, J.R. Creekmore, C.A. Anderson- et al., Comparison of terahertz pulse imaging and near-infrared spectroscopy for rapid, non-destructive analysis of tablet coating thickness and uniformity. *J. Pharm. Innov.* **2**(1–2), 29–36 (2007)
326. J. Stolarek, Improving energy compaction of a wavelet transform using genetic algorithm and fast neural network. *Arch. Control Sci.* **20**(4), 417–433 (2010)
327. I. Dinov, J. Boscardin, M. Mega, E. Sowell, A. Toga, A wavelet-based statistical analysis of fMRI data: I. motivation and data distribution modeling. *Neuroinformatics* **3**(4), 319–342 (2005)
328. J. Weaver, Y. Xu, D. Healy, L. Cromwell, Filtering noise from images with wavelet transforms. *Magn. Reson. Med.* **21**(2), 288–295 (1991)
329. M. Alexander, R. Baumgartner, A. Summers, C. Windischberger, M. Klarhoefer, E. Moser, R. Somorjai, A wavelet-based method for improving signal-to-noise ratio and contrast in MR images magnetic resonance imaging. *Magn. Reson. Med.* **18**(2), 169–180 (2000)
330. C.S. Anand, J.S. Sahambi, Wavelet domain non-linear filtering for MRI denoising magnetic resonance imaging. *Magn. Reson. Imaging* **28**(6), 842–861 (2010)
331. R.D. Nowak, Wavelet-based rician noise removal for magnetic resonance imaging. *IEEE Trans. Image Process.* **8**(10), 1408–1419 (1999)
332. A. Pižurica, W. Philips, I. Lemahieu, M. Acheroy, A versatile wavelet domain noise filtration technique for medical imaging. *IEEE Trans. Med. Imaging* **22**(3), 323–331 (2003)

333. S. Zaroubi, G. Goelman, Complex denoising of MR data via wavelet analysis: application for functional MRI magnetic resonance imaging. *Magn. Reson. Imaging* **18**(1), 59–68 (2000)
334. R. Wirestam, A. Bibic, J. Lätt, S. Brockstedt, F. Ståhlberg, Denoising of complex MRI data by wavelet-domain filtering: application to high-b-value diffusion-weighted imaging. *Magn. Reson. Med.* **56**(5), 1114–1120 (2006)
335. U.E. Ruttimann, M. Unser, R.R. Rawlings, D. Rio, N.F. Ramsey, V.S. Mattay, D.W. Hommer, J.A. Frank, D.R. Weinberger, Statistical analysis of functional MRI data in the wavelet domain. *IEEE Trans. Med. Imaging* **17**(2), 142–154 (1998)
336. A. Pižurica, A. Wink, E. Vansteenkiste, W. Philips, J.B. Roerdink, A review of wavelet denoising in MRI and ultrasound brain imaging. *Med. Imaging Rev.* **2**(2), 247–260 (2006)
337. E. Zarahn, G.K. Aguirre, M. D’Esposito, Empirical analyses of BOLD fMRI statistics. I. spatially unsmoothed data collected under null-hypothesis conditions. *Neuroimage* **5**(3), 179–197 (1997)
338. G.K. Aguirre, E. Zarahn, M. D’Esposito, Empirical analyses of BOLD fMRI statistics. ii. spatially smoothed data collected under null-hypothesis and experimental conditions. *Neuroimage* **5**(3), 199–212 (1997)
339. S. Wang, B. Ferguson, D. Abbott, X.-C. Zhang, T-ray imaging and tomography. *J. Biol. Phys.* **29**(2–3), 247–256 (2003)
340. H. Wang, L. Dong, J. O’Daniel, R. Mohan, A. Garden, K. Ang- et al., Validation of an accelerated ‘demons’ algorithm for deformable image registration in radiation therapy. *Phys. Med. Biol.* **50**(12), 2887–2905 (2005)
341. K.J. Worsley, S. Marrett, P. Neelin, A.C. Evans, Searching scale space for activation in PET images. *Hum. Brain Mapp.* **4**(1), 74–90 (1996)
342. S. Honale, V. Kapse, A review of methods for blood vessel segmentation in retinal images. *Int. J. Eng. Res. Technol.* **1**(10), 1–6 (2012)
343. P. Kovesi, Phase preserving denoising of images, in *Proceeding of The Australian Pattern Recognition Society Conference: DICTA* (1999), pp. 212–217
344. S. Fischer, F. Sroubek, L. Perrinet, R. Redondo, G. Cristobal, Selfinvertible 2D log-Gabor wavelets. *Int. J. Comput. Vis.* **75**(2), 231–246 (2007)
345. D. Pandey, X. Yin, H. Wang, Y. Zhang, Accurate vessel segmentation using maximum entropy incorporating line detection and phase preserved denoising. *Comput. Vis. Image Underst.* **155**, 162–172 (2016)
346. I. Delakis, O. Hammad, R.I. Kitney, Wavelet-based de-noising algorithm for images acquired with parallel magnetic resonance imaging (MRI). *Phys. Med. Biol.* **52**(13), 3741–3751 (2007)
347. G. Piella, A general framework for multiresolution image fusion: from pixels to regions. *Inf. Fusion* **4**(4), 259–280 (2003)
348. E. Morris, L. Liberman, *Pattern Classification and Scene Analysis* (John Wiley and Sons Inc, New York, NY, 1973)
349. J. Shawe-Taylor, N. Cristianini, *Kernel Methods for Pattern Analysis* (Cambridge University Press, Cambridge, UK, 2004)
350. Siuly, X.-X. Yin, S. Hadjiloucas, and Y. Zhang, Classification of THz pulse signals using two-dimensional cross-correlation feature extraction and non-linear classifiers. *IEEE Trans. Signal Process.* **127**, 64–82 (2016)
351. H. Stephani, B. Heise, K. Wiesauer, S. Katzletz, D. Molter, J. Jonuscheid et al., A feature set for enhanced automatic segmentation of hyperspectral terahertz images, in *Proceedings of the 2011 Irish Machine Vision and Image Processing Conference*, eds. by O. Ghita, D. Molloy, R. Sadleir. (IEEE Computer Society Conference Publishing Services, (USA), 2011), pp. 117–122
352. Q. Fu, L.M. Cheng, F. Liu, Terahertz time-domain spectroscopy analysis with wave atoms transform, in *Proceedings of the 2011 Asia-Pacific Signal and Information Processing Association*, vol. 2013, issue no. 1. (IEEE Computer Society Conference Publishing Services, (USA), 2011). Article Number: APSIPA137
353. H.M. Paiva, R.K.H. Galvão, Wavelet-packet identification of dynamic systems in frequency sub-bands. *Signal Process.* **86**(8), 2001–2008 (2006)

354. X.-X. Yin, B.M. Fischer, B.W.-H Ng, D. Abbott, H.M. Paiva, R.K.H. Galvão, S. Hadjiloucas, G.C. Walker, J.W. Bowen, Classification of lactose and mandelic acid THz spectra using subspace and wavelet-packet algorithms, in *Microelectronics: Design, Technology, and Packaging III*, eds. by A.J. Hariz, V.K. Varadan. Proceedings of SPIE, vol. 6798 (SPIE, Bellingham, WA, 2008). Article Number: 679814
355. L. Zhang, H. Zhong, D.-C. Zhu, J. Zuo, C. Zhang, Feature extraction without phase error for THz reflective spectroscopy. *Arch. Control Sci.* **55**(1), 127–132 (2011)
356. C. Davatzikos, Why voxel-based morphometric analysis should be used with great caution when characterizing group differences. *Neuroimage* **23**(1), 17–20 (2004)
357. K.A. Norman, S.M. Polyn, G.J. Detre, J.V. Haxby, Beyond mind-reading: multi-voxel pattern analysis of fMRI data. *Trends Cogn. Sci.* **10**(9), 230–242 (2006)
358. Y.A. Tolia, S.M. Panas, A fuzzy vessel tracking algorithm for retinal images based on fuzzy clustering. *IEEE Trans. Med. Imaging* **17**(2), 263–273 (1998)
359. K. Akyol, B. Şen, Ş. Bayır, Automatic detection of optic disc in retinal image by using keypoint detection, texture analysis, and visual dictionary techniques. *Comput. Math. Methods Med.* Article Number: 6814791 (2016)
360. E. Ricci, R. Perfetti, Retinal blood vessel segmentation using line operators and support vector classification. *IEEE Trans. Med. Imaging* **26**(10), 1357–1365 (2007)
361. G. Azzopardia, N. Strisciuglio, M. Ventob, N. Petkova, Trainable COSFIRE filters for vessel delineation with application to retinal images. *Med. Image Anal.* **19**(1), 46–57 (2015)
362. J. Richiardi, M. Gschwind, S. Simioni, J.-M. Annoni, B. Greco, P. Hagmann, M. Schluep, P. Vuilleumier, D. Van-De, Classifying minimally disabled multiple sclerosis patients from resting-state functional connectivity. *NeuroImage* **62**(3), 2021–2033 (2012)
363. J.V. Haxby, M.I. Gobbini, M.L. Furey, A. Ishai, J.L. Schouten, P. Pietrini, Distributed and overlapping representations of faces and objects in ventral temporal cortex. *Science* **293**(5539), 2425–2430 (2001)
364. R. Ryniec, P. Zagrajek, N. Palka, Terahertz frequency domain spectroscopy identification system based on decision trees. *Acta Phys. Pol. A* **122**(5), 891–895 (2012)
365. Z. Xu, J. Tu, J. Li, Y. Pi, Research on micro-feature extraction algorithm of target based on terahertz radar. *EURASIP J. Wirel. Commun. Netw.* **2013**(77), 1–9 (2013)
366. G. Hieftje, R. Bystroff, R. Lim, Application of correlation analysis for signal-to-noise enhancement in flame spectrometry: use of correlation in determination of rhodium by atomic fluorescence. *Anal. Chem.* **45**(2), 253–258 (1973)
367. S. Dutta, A. Chatterjee, S. Munshi, Correlation techniques and least square support vector machine combine for frequency domain based ECG beat classification. *Med. Eng. Phys.* **32**(10), 1161–1169 (2010)
368. Siuly, Y. Li, P. Wen, Modified CC-LR algorithm with three diverse feature sets for motor imagery tasks classification in EEG based brain computer interface. *Comput. Methods Programs Biomed.* **113**(3), 767–780 (2014)
369. R. De Veaux, P. Velleman, D. Bock, *Intro Stats*, 3rd edn. (Pearson Addison Wesley, Boston, 2008)
370. S. Siuly, E. Kabir, H. Wang, Y. Zhang, Improving the separability of motor imagery EEG signals using a cross correlation-based least square support vector machine for brain computer interface. *Comput. Math. Methods Med.* **20**(4), 526–538 (2012)
371. M.D. Pickles, M. Lowry, P. Gibbs, Pretreatment prognostic value of dynamic contrast-enhanced magnetic resonance imaging vascular, texture, shape, and size parameters compared with traditional survival indicators obtained from locally advanced breast cancer patients. *Invest. Radiol.* **51**(3), 177–185 (2016)
372. D. Woolf, A. Padhani, N. Taylor, A. Gogbashian, S. Li, M. Beresford, M. Ah-See, J. Stirling, D. Collins, A. Makris, Assessing response in breast cancer with dynamic contrast-enhanced magnetic resonance imaging: are signal intensity-time curves adequate? *Breast Cancer Res. Treat.* **147**(2), 335–343 (2014)
373. X. Yang, M. Knopp, Quantifying tumor vascular heterogeneity with dynamic contrast-enhanced magnetic resonance imaging: a review. *J. Biomed. Biotechnol.* Article ID 732848(2011)

374. A. Jackson, J. O'Connor, G. Parker, G. Jayson, Imaging tumor vascular heterogeneity and angiogenesis using dynamic contrast-enhanced magnetic resonance imaging. *Clin. Cancer Res.* **13**(12), 3449–3459 (2007)
375. N. Just, Improving tumour heterogeneity MRI assessment with histograms. *Br. J. Cancer* **111**(12), 2205–2213 (2014)
376. M. Asselin, J. O'Connor, R. Boellaard, N. Thacker, A. Jackson, Quantifying heterogeneity in human tumours using MRI and PET. *Eur. J. Cancer* **48**(4), 447–455 (2012)
377. F. Davnall, C.S.P. Yip, G. Ljungqvist, M. Selmi, F. Ng, B. Sanghera- et al., Assessment of tumor heterogeneity: an emerging imaging tool for clinical practice? *Insights Imaging* **3**(6), 573–589 (2012)
378. L. Alic, W. Niessen, J. Veenland, Quantification of heterogeneity as a biomarker in tumor imaging: a systematic review. *PLoS one* **9**(10), Article Number: e110300 (2014)
379. S.A. Waugh, C.A. Purdie, L.B. Jordan, S. Vinnicombe, R.A. Lerski, P. Martin, A.M. Thompson, Magnetic resonance imaging texture analysis classification of primary breast cancer. *J. Biomed. Biotechnol.* **26**(2), 322–330 (2016)
380. B. Chaudhury, M. Zhou, D.B. Goldgof, L.O. Hall, R.A. Gatenby, R.J. Gillies, B.K. Patel, R.J. Weinfurter, J.S. Drukestein, Heterogeneity in intratumoral regions with rapid gadolinium washout correlates with estrogen receptor status and nodal metastasis. *J. Magn. Reson. Imaging* **42**(5), 1421–1430 (2015)
381. C. Gallego-Ortiz, A.L. Martel, Improving the accuracy of computer-aided diagnosis for breast MR imaging by differentiating between mass and nonmass lesions. *Radiology* **278**(3), 679–688 (2016)
382. A. Ahmed, P. Gibbs, M. Pickles, L. Turnbull, Texture analysis in assessment and prediction of chemotherapy response in breast cancer. *J. Magn. Reson. Imaging* **38**(1), 89–101 (2013)
383. R. Haralick, K. Shanmugam, I. Dinstein, Textural features for image classification. *IEEE Trans. Syst. Man Cybern.* **3**(6), 610–621 (1973)
384. J.R. Teruel, M.G. Heldahl, P.E. Goa, M. Pickles, S. Lundgren, T.F. Bathen, P. Gibbs, Dynamic contrast-enhanced MRI texture analysis for pretreatment prediction of clinical and pathological response to neoadjuvant chemotherapy in patients with locally advanced breast cancer. *J. Magn. Reson. Imaging* **27**(8), 887–896 (2014)
385. X.X. Yin, B.W.-H. Ng, K. Ramamohanarao, D. Abbott, Tensor based sparse decomposition of 3D shape for visual detection of mirror symmetry. *Comput. Methods Programs Biomed.* **108**(2), 629–643 (2012)
386. M.J. Fox, P. Gibbs, M.D. Pickles, Minkowski functionals: An MRI texture analysis tool for determination of the aggressiveness of breast cancer. *J. Magn. Reson. Imaging* **43**(4), 903–910 (2016)
387. H. Boehm, C. Fink, U. Attenberger, C. Becker, J. Behr, M. Reiser, Automated classification of normal and pathologic pulmonary tissue by topological texture features extracted from multi-detector CT in 3D. *Eur. Radiol.* **18**(12), 2745–2755 (2008)
388. H. Boehm, T. Schneider, S. Buhmann-Kirchhoff, T. Schlossbauer, D. Rjosk-Dendorfer, S. Britsch, M. Reiser, Automated classification of breast parenchymal density: topologic analysis of x-ray attenuation patterns depicted with digital mammography. *Am. J. Roentgenol.* **191**(6), W275–W282 (2008)
389. H. Boehm, T. Fischer, D. Riosk, S. Britsch, M. Reiser, Application of the minkowski-functionals for automated pattern classification of breast parenchyma depicted by digital mammography, in *Proceeding of SPIE on Medical Imaging 2008: Computer-Aided Diagnosis, Pts 1 and 2*, eds. by M.L. Giger, N. Karssemeijer, vol. 6915 (SPIE Digital Library, Bellingham, 2008), Art No 691522
390. M. Nagarajan, M. Huber, T. Schlossbauer, G. Leinsinger, A. Krol, A. Wismuller, Classification of small lesions in dynamic breast MRI: eliminating the need for precise lesion segmentation through spatiotemporal analysis of contrast enhancement. *Mach. Vis. Appl.* **24**(7), 1371–1381 (2013)
391. T. Larkin, H. Canuto, M. Kettunen, T. Booth, D. Hu, A. Krishnan, S. Bohndiek et al., Analysis of image heterogeneity using 2D minkowski functionals detects tumor responses to treatment. *Magn. Reson. Med.* **71**(1), 402–410 (2014)

392. H. Canuto, C. McLachlan, M. Kettunen, M. Velic, A. Krishnan, A. Neves, M. de Backer, D. Hu, M. Hobson, K. Brindle, Characterization of image heterogeneity using 2D minkowski functionals increases the sensitivity of detection of a targeted MRI contrast agent. *Magn. Reson. Med.* **61**(5), 1218–1224 (2009)
393. H. Krim, T. Gentimis, H. Chintakunta, Discovering the whole by the coarse: a topological paradigm for data analysis. *IEEE Signal Process. Mag.* **33**(2), 95–104 (2016)
394. J. Ernst, M.K. Singh, V. Ramesh, Discrete texture traces: topological representation of geometric context. *Proc. IEEE Conf. Comput. Vis. Pattern Recognit. (CVPR)* **71**(1), 422–429 (2012)
395. P. Saveliev, A graph, non-tree representation of the topology of a gray scale image, in *Proceedings IS&T/SPIE Electronic Imaging*, vol. 7870, pp. O1–O19 (2011)
396. P. Skraba, M. Ovsjanikov, F. Chazal, L. Guibas, Persistence based segmentation of deformable shapes, in *Proceeding of IEEE Computer Society Conference on Computer Vision and Pattern Recognition Workshops (CVPRW)*, (2010), pp. 45–52
397. M. Vejdemo-Johansson, F.T. Pokorny, P. Skraba, D. Kragic, Cohomological learning of periodic motion. *Appl. Algebra Eng. Commun. Comput.* **26**(1), 5–26 (2015)
398. M.C. Kale, J.D. Fleig, N. Ímal, Assessment of feasibility to use computer aided texture analysis based tool for parametric images of suspicious lesions in DCE-MR mammography. *Comput. Math. Methods Med.* **23** Article Number: 872676 (2013)
399. J. Wang, F. Kato, N. Oyama-Manabe, R. Li, Y. Cui, K.K. Tha, H. Yamashita, K. Kudo, H. Shirato, Identifying triple-negative breast cancer using background parenchymal enhancement heterogeneity on dynamic contrast-enhanced MRI: a pilot radiomics study. *PLoS one* **10**(11), Article Number: e0143308 (2015)
400. J. Wang, X. Wang, M. Xia, X. Liao, A. Evans, Y. He, GREYNA: a graph theoretical network analysis toolbox for imaging connectomics. *Frontiers in Human Neuroscience* **9**. Article Number: 386 (2015)
401. N. Michoux, S.V. den Broeck, L. Lacoste, L. Fellah, C. Galant, M. Berlière, I. Leconte, Texture analysis on MR images helps predicting non-response to NAC in breast cancer. *BMC Cancer* **15**(574) (2015). doi:[10.1186/s12885-015-1563-8](https://doi.org/10.1186/s12885-015-1563-8)
402. R. Connors, M. Trivedi, C. Harlow, Segmentation of a high-resolution urban scene using texture operators. *Comput. Vis. Graph. Image Process.* **25**(3), 273–310 (1984)
403. M.A. Mazurowski, J. Zhang, L.J. Grimm, S.C. Yoon, J.I. Silber, Radiogenomic analysis of breast cancer: Luminal B molecular subtype is associated with enhancement dynamics at MR imaging. *Radiology* **273**(2), 365–372 (2014)
404. L.J. Grimm, J. Zhang, M.A. Mazurowski, Computational approach to radiogenomics of breast cancer: Luminal A and luminal B molecular subtypes are associated with imaging features on routine breast MRI extracted using computer vision algorithms. *J. Magn. Reson. Imaging* **42**(4), 902–907 (2015)
405. E.J. Sutton, J.H. Oh, B.Z. Dashevsky, H. Veeraraghavan, A.P. Apte, S.B. Thakur et al., Breast cancer subtype intertumor heterogeneity: MRI-based features predict results of a genomic assay. *J. Magn. Reson. Imaging* **42**(5), 1398–1406 (2015)
406. I. Daubechies, E. Roussos, S. Takerkart, M. Benharrosh, C. Golden, K. D'Ardenne, W. Richter, J.D. Cohen, J. Haxby, Independent component analysis for brain fMRI does not select for independence. *Proc. Natl. Acad. Sci.* **106**(26), 10415–10422 (2009)
407. M.D. Greicius, K. Supekar, V. Menon, R.F. Dougherty, Resting-state functional connectivity reflects structural connectivity in the default mode network. *Cereb. Cortex* **19**, 72–78 (2009)
408. J.D. Power, A.L. Cohen, S.M. Nelson, G.S. Wig, K.A. Barnes, J.A. Church, A.C. Vogel, T.O. Laumann, F.M. Miezin, B.L. Schlaggar, S.E. Petersen, Functional network organization of the human brain. *Neuron* **72**(4), 665–678 (2011)
409. E. Bullmore, O. Sporns, Complex brain networks: graph theoretical analysis of structural and functional systems. *Nat. Rev. Neurosci.* **10**, 186–198 (2009)
410. M. Rubinov, O. Sporns, Complex network measures of brain connectivity: Uses and interpretations. *NeuroImage* **52**(3), 1059–1069 (2010)

411. G. Caldarelli, *Scale-Free Networks Complex Webs in Nature and Technology* (Oxford University Press, Oxford, New York, 2007)
412. M. Newman, *Networks: An Introduction* (Oxford University Press, Oxford, New York, 2009)
413. O. Sporns, Graph theory methods for the analysis of neural connectivity patterns, in *Neuroscience Databases: A Practical Guide*, ed. by R.Kötter. (Springer, New York, 2003), pp. 169–183
414. H. Onias, A. Viol, F. Palhano-Fontes, K. Andrade, M. Sturzbecher, G. Viswanathan, D. de Araujo, Brain complex network analysis by means of resting state fMRI and graph analysis: Will it be helpful in clinical epilepsy? *Epilepsy Behav.* **38**, 71–80 (2014)
415. V. Latora, S. Marchiori, Efficient behavior of small-world networks. *Phys. Rev. Lett.* **87**(19), 198701–1–198701–4 (2001)
416. A. Fornito, A. Zalesky, E. Bullmore, *Fundamentals of Brain Network Analysis* (Elsevier, London, UK, 2016)
417. Y. He, A. Dagher, Z. Chen, A. Charil, A. Zijdenbos, K. Worsley, A. Evans, Impaired small-world efficiency in structural cortical networks in multiple sclerosis associated with white matter lesion load. *Brain* **132**(12), 3366–3379 (2009)
418. D. Watts, S. Strogatz, Collective dynamics of ‘small-world’ networks. *Nature* **393**, 440–442 (1998)
419. L. da F. Costa, F.A. Rodrigues, A.S. Cristino, Complex networks: the key to systems biology. *Genetics Mol. Biol.* **31**(3), 591–601 (2008)
420. P. Hagmann, L. Cammoun, X. Gigandet, R. Meuli, C.J. Honey, V.J. Wedeen, O. Sporns, Mapping the structural core of human cerebral cortex. *Plos Biol.* **6**(7), Article Number: e0060159 (2008)
421. B. Zhang, L. Zhang, L. Zhang, F. Karray, Retinal vessel extraction by matched filter with first-order derivative of gaussian. *Comput. Biol. Med.* **40**(4), 438–445 (2010)
422. G. Luo, C. Opat, M. Shankar, Detection and measurement of retinal vessels in fundus images using amplitude modified second-order Gaussian filter. *IEEE Trans. Biomed. Eng.* **49**(2), 168–172 (2008)
423. A.F. Frangi, W.J. Niessen, K.L. Vincken, M.A. Viergever, Multiscale vessel enhancement filtering, in *Proceedings of the Third International Conference on Medical Image Computing and Computer-Assisted Intervention—MICCAI 1998*. Lecture Notes in Computer Science, vol. 1496, pp. 130–137 (1998)
424. M. Palomera, Pérez, M. Martínez Pérez, H. Benítez Pérez, J. Ortega Arjona, Parallel multiscale feature extraction and region growing: application in retinal blood vessel detection. *IEEE Trans. Inf. Technol. Biomed.* **14**(2), 500–506 (2010)
425. Y. Wang, G. Ji, P. Lin, E. Trucco, Retinal vessel segmentation using multiwavelet kernels and multiscale hierarchical decomposition. *Pattern Recognit.* **46**(8), 2117–2133 (2013)
426. P. Feng, Y. Pan, B. Wei, W. Jin, D. Mi, Enhancing retinal image by the contourlet transform. *Pattern Recognit. Lett.* **28**, 516–522 (2007)
427. J. Soares, M. Cree, Retinal vessel segmentation using the 2D Gabor wavelet and supervised classification. *IEEE Trans. Inf Technol. Biomed.* **25**(9), 1214–1222 (2006)
428. G. Zaaopardi, N. Petkov, Trainable COSFIRE filters for keypoint detection and pattern recognition. *IEEE Trans. Pattern Anal. Mach. Intell.* **35**(2), 490–503 (2013)
429. W.H. Spencer, *Ophthalmic Pathology: An Atlas and Textbook* (Elsevier-Health Sciences Division, Philadelphia, PA, 1996)
430. U.T. Nguyen, A. Bhuiyana, A. Park, K. Ramamohanarao, An effective retinal blood vessel segmentation method using multi-scale line detection. *Pattern Recognit.* **46**(3), 703–715 (2013)
431. A. Bhuiyan, R. Kawasaki, E. Lamoureux, R. Kotagiri, T.Y. Wong, Retinal artery-vein caliber grading using colour fundus imaging. *Comput. Methods Programs Biomed.* **111**(1), 104–114 (2013)
432. Y. Kanagasingam, A. Bhuiyan, M.D. Abramoff, R.T. Smith, L. Goldschmidt, T.Y. Wong, Progress on retinal image analysis for age related macular degeneration. *Prog. Retin. Eye Res.* **38**, 20–42 (2014)

433. S. Kirkpatrick, C.D. Gelatt Jr., M.P. Vecchi, Optimization by simulated annealing. *Science* **220**(1), 671–680 (1983)
434. M. Fraz, P. Remagnino, A. Hoppem, B. Uyyanonvara, A. Rudnicka, C. Owen, S. Barman, Blood vessel segmentation methodologies in retinal images—a survey. *Comput. Methods Programs Biomed.* **108**(1), 407–433 (2012)
435. J. Schürmann, *Pattern Classification: A Unified View of Statistical and Neural Approaches* (John Wiley and Sons Inc, New York, USA, 1996)
436. R. Pan, S. Zhao, J. Shen, Terahertz spectra applications in identification of illicit drugs using support vector machines, in *Proceeding of 2010 Symposium on Security Detection and Information Processing*, eds. by M. Li, D. Yu. vol. 7 (Elsevier Ltd., (Netherlands), 2010), pp. 15–21
437. H. Selvaraj, S.T. Selvi, D. Selvathi, L. Gewali, Brain MRI slices classification using least squares support vector machine. *Int. J. Intell. Comput. Med. Sci. Image Process.* **1**(1), 21–33 (2007)
438. J. Dukart, K. Mueller, H. Barthel, A. Villringer, O. Sabri, M.L. Schroeter, Meta-analysis based SVM classification enables accurate detection of alzheimer’s disease across different clinical centers using FDG-PET and MRI. *Psychiatry Res. Neuroimaging* **212**(3), 230–236 (2013)
439. D. Singh, K. Kaur, Classification of abnormalities in brain MRI images using GLCM, PCA and SVM. *Int. J. Eng. Adv. Technol.* **1**(6), 243–248 (2012)
440. E.I. Zacharaki, S. Wang, S. Chawla, D.S. Yoo, R. Wolf, E.R. Melhem, C. Davatzikos, Classification of brain tumor type and grade using MRI texture and shape in a machine learning scheme. *Magn. Reson. Med.* **62**(2), 1609–1618 (2009)
441. N. Zhang, S. Ruan, S. Lebonvallet, Q. Liao, Y. Zhu, Multi-kernel SVM based classification for brain tumor segmentation of MRI multi-sequence, in *16th IEEE International Conference on Image Processing* (2009), pp. 3373–3376
442. A. Ortiz, J.M. Górriz, J. Ramón, F. Martínez-Murcia, LVQ-SVM based CAD tool applied to structural MRI for the diagnosis of the alzheimer’s disease. *Pattern Recognit. Lett.* **34**(14), 1725–1733 (2013)
443. H.-I. Suk, D. Shen, Deep learning-based feature representation for AD/MCI classification. *Med. Image Comput. Comput. Assist. Interv.* **8150**, 583–590 (2013)
444. C. Aguilar, E. Westman, J.-S. Muehlboeck, P. Mecocci, B. Vellas, M. Tsolaki, I. Kloszewska, H. Soininen, S. Lovestone, C. Spenger, A. Simmons, L.-O. Wahlund, Different multivariate techniques for automated classification of MRI data in alzheimer’s disease and mild cognitive impairment. *Psychiatry Res. Neuroimaging* **212**(2), 89–98 (2013)
445. A. Akselrod-Ballin, M. Galun, M.J. Gomori, R. Basri, A. Brandt, Atlas guided identification of brain structures by combining 3D segmentation and SVM classification. *Med. Image Comput. Comput. Assist. Interv.* **4191**, 209–216 (2006)
446. S. Ozer, D.L. Langer, X. Liu, M.A. Haider, T.H. van der Kwast, A.J. Evans, Y. Yang, M.N. Wernick, I.S. Yetik, Supervised and unsupervised methods for prostate cancer segmentation with multispectral MRI. *Med. Phys.* **37**(4), 1873–1883 (2010)
447. X.-X. Yin, S. Hadjiloucas, J. He, Y. Zhang, Y. Wang, D. Zhang, Application of complex extreme learning machine to multiclass classification problems with high dimensionality: A THz spectra classification problem. *Digit. Signal Proc.* **40**, 40–52 (2015)
448. G.B. Huang, H. Zhou, X. Ding, R. Zhang, Extreme learning machine for regression and multiclass classification. *IEEE Trans. Syst. Man Cybern. B Cybern.* **42**(2), 513–529 (2011)
449. G.-B. Huang, D. Wang, Y. Lan, Extreme learning machines: a survey. *Int. J. Mach. Learn. Cybern.* **2**(2), 107–122 (2011)
450. C.J.C. Burges, A tutorial on support vector machines for pattern recognition. *Data Min. Knowl. Disc.* **2**, 121–167 (1998)
451. V. Vapnik, *The Nature of Statistical Learning Theory* (Springer-Verlag, New York, USA, 1995)
452. N. Cristianini, J. Shawe-Taylor, *An Introduction to Support Vector Machines and Other Kernel Based Methods* (Cambridge University Press, Cambridge, UK, 2000)

453. K.R. Muller, S. Mika, G. Ratsch, K. Tsuda, B. Schölkopf, An introduction to kernel-based learning algorithms. *IEEE Trans. Neural Netw.* **12**(2), 181–201 (2001)
454. B. Schölkopf, A. Smola, *Learning with Kernels Support Vector Machines, Regularization, Optimization, and Beyond* (MIT Press, Cambridge, MA, 2002)
455. M.A. Hearst, Trends controversies: Support vector machines. *IEEE Intell. Syst.* **13**(4), 18–28 (1998)
456. T.M. Cover, Geometrical and statistical properties of systems of linear inequalities with applications in pattern recognition. *IEEE Trans. Electron. Comput.* **14**, 326–334 (1965)
457. G.-B. Huang, H. Zhou, X. Ding, R. Zhang, Extreme learning machine for regression and multiclass classification. *IEEE Trans. Syst. Man Cybern. B Cybern.* **42**(2), 513–529 (2012)
458. P. Bouboulis, K. Slavakis, S. Theodoridis, Adaptive learning in complex reproducing kernel hilbert spaces employing wirtinger’s subgradients. *IEEE Trans. Neural Netw. Learn. Syst.* **2**(99), 260–276 (2012)
459. F.A. Tobar, A. Kuh, D.P. Mandic, A novel augmented complex valued kernel LMS, in *Proceeding of the 7th IEEE Sensor Array and Multichannel Workshop 2012* (IEEE Computer Society Conference Publishing Services, (USA), 2012), pp. 473–476
460. A. El-Gindy, G.M. Hadad, Nonparametric bayes error estimation using unclassified samples. *J. AOAC Int.* **95**(3), 609–623 (2012)
461. M.E. Van-Valkenburg, In memoriam: Hendrik W. Bode (1905–1982). *IEEE Trans. Autom. Control* **AC-29**(3), 193–194 (1984)
462. S. Le-Cessie, J. Van-Houwelingen, Ridge estimators in logistic regression. *Appl. Stat.* **41**(1), 191–201 (1992)
463. F. Zahid, G. Tutz, Ridge estimation for multinomial logit models with symmetric side constraints. *Comput. Stat.* **28**(3), 1017–1034 (2013)
464. M. Wiggins, A. Saad, B. Litt, G. Vachtsevanos, Evolving a bayesian classifier for ECG-based age classification in medical applications. *Appl. Soft Comput.* **8**(1), 599–608 (2011)
465. M. Nuss, Chemistry is right for t-rays. *IEEE Circuits Devices* **12**(2), 25–30 (1996)
466. W. Chaovalitwongse, Y. Fan, R. Sachdeo, On the time series k-nearest neighbor classification of abnormal brain activity. *IEEE Trans. Syst. Man Cybern. Part A: Syst. Hum.* **37**(6), 1005–1016 (2007)
467. B. Efron, Estimating the error rate of a prediction rule: improvement on cross-validation. *J. Am. Stat. Assoc.* **78**(382), 316–331 (1983)
468. Siuly, E. Kabir, H. Wang, Y. Zhang, Exploring sampling in the detection of multicategory EEG signals. *Comput. Math. Methods Med.* Article Number: 576437 (2015)
469. L. Patnaik, O. Manyamb, Epileptic EEG detection using neural networks and post-classification. *Comput. Methods Programs Biomed.* **9**(1), 100–109 (2008)
470. L. Fraiwan, K. Lweesy, N. Khasawneh, M. Fraiwan, H. Wenz, H. Dickhaus, Classification of sleep stages using multi-wavelet time frequency entropy and LDA. *Methods Inf. Med.* **49**(3), 230–237 (2010)
471. L. Eadie, C.B. Reid, A. Fitzgerald, V. Wallace, Optimizing multi-dimensional terahertz imaging analysis for colon cancer diagnosis. *Expert Syst. Appl.* **40**(6), 2043–2050 (2013)
472. J. Jensen, *Introductory Digital Image Processing-A Remote Sensing Perspective* (Prentice Hall Inc, Upper Saddle River, New Jersey, 1996)
473. M.A. Brun, F. Formanek, A. Yasuda, M. Sekine, N. Ando, Y. Eishii, Terahertz imaging applied to cancer diagnosis. *Phys. Med. Biol.* **55**(16), 4615–4623 (2010)
474. M.W. Ayech, D. Ziou, Terahertz image segmentation based on k-harmonic-means clustering and statistical feature extraction modeling, in *Proceeding of 21st IEEE International Conference on Pattern Recognition* (IEEE Computer Society Conference Publishing Services, (USA), 2012), pp. 222–225
475. M.W. Ayech, D. Ziou, Segmentation of terahertz imaging using k-means clustering based on ranked set sampling. *Expert Syst. Appl.* **42**(6), 2959–2974 (2015)
476. M.W. Ayech, D. Ziou, Automated feature weighting and random pixel sampling in k-means clustering for terahertz image segmentation. *IEEE Comput. Vis. Pattern Recognit.* 35–40 (2015)

477. E. Leiss Holzinger, K. Wiesauer, H. Stephani, B. Heise, D. Stifter, B. Kriechbaumer et al., Imaging of the inner structure of cave bear teeth by novel non-destructive techniques. *Palaeontologia electronica* **18**(1), Art No. 18.1.1T, (2015)
478. M. Brito, E. Chavez, A. Quiroz, J. Yukich, Connectivity of the mutual k-nearest-neighbor graph in clustering and outlier detection. *Probab. Lett.* **35**, 33–42 (1997)
479. E. Berry, J.W. Handley, A.J. Fitzgerald, W.J. Merchant, R.D. Boyle, N.N. Zinov'ev- et al., Multispectral classification techniques for terahertz pulsed imaging: an example in histopathology. *Med. Eng. Phys.* **26**(5), 423–430 (2004)
480. P. Bankhead, C.N. Scholfield, J.G. McGeown, T.M. Curtis, Fast retinal vessel detection and measurement using wavelets and edge location refinement. *PLoS one* **7**(3), art. no. e32435, (2012)
481. J. Staal, M.D. Abramoff, M. Niemeijer, M.A. Viergever, B. van Ginneken, Ridge-based vessel segmentation in color images of the retina. *IEEE Trans. Med. Imaging* **23**(4), 501–509 (2004)
482. P. Choukikar, A.K. Patel, R.S. Mishra, Segmenting the optic disc in retinal images using bihistogram equalization and thresholding the connected regions. *Int. J. Emerg. Technol. Adv. Eng.* **4**(6), 933–942 (2014)
483. K. Yaseen, A. Tariq, M.U. Akram, A comparison and evaluation of computerized methods for OD localization and detection in retinal images. *Int. J. Futur. Comput. Commun.* **2**(6), 613–616 (2013)
484. A. Aquino, M.E. Gegúndez-Arias, D. Marín, Detecting the optic disc boundary in digital fundus images using morphological, edge detection, and feature extraction techniques. *IEEE Trans. Med. Imaging* **29**(11), 1860–1869 (2010)
485. A. Usman, S.A. Khitran, M.U. Akram, Y. Nadeem, A robust algorithm for optic disc segmentation from colored fundus images, in *Proceeding of ICIAR, Part II*, eds. by A. Campilho, M. Kamel. LNCS 8815 (Springer International Publishing, (Switzerland), 2014), pp. 303–310
486. D. Relan, T. MacGillivray, L. Ballerini, E. Trucco, Retinal vessel classification: sorting arteries and veins, in *Proceeding of 35th Annual International Conference of the IEEE EMBS*, vol. 2013, pp. 7396–7399 (2013)
487. M. Saez, S. González, Vázquez, M. González Penedo, M. Barceló, M. Pena Seijo, G. Coll de Tuero, A. Pose Reino, Development of an automated system to classify retinal vessels into arteries and veins. *Comput. Methods Programs Biomed.* **108**(1), 367–376 (2012)
488. D. Ortiz, M. Cubides, A. Suárez, M. Zequera, Q.J., J. Gómez, N. Arroyo, Support system for the preventive diagnosis of hypertensive retinopathy, in *Proceeding of 32nd Annual International Conference of the IEEE EMBS*, vol. 2010, pp. 7396–7399 (2010)
489. R. Estrada, M.J. Allingham, P.S. Mettu, S.W. Cousins, C. Tomasi, S. Farsiu, Retinal artery-vein classification via topology estimation. *Comput. Methods Programs Biomed.* **34**(12), 2518–2534 (2015)
490. C. Herweh, P.A. Ringleb, G. Rauch, S. Gerry, L. Behrens, M. Mählenbruch et al., Performance of e-ASPECTS software in comparison to that of stroke physicians on assessing CT scans of acute ischemic stroke patients. *Int. J. Stroke* **11**(4), 438–445 (2016)
491. S. Nagel, D. Sinha, D. Day, W. Reith, R. Chapot, P. Papanagiotou et al., 'e-ASPECTS software is non-inferior to neuroradiologists in applying the ASPECT score to computed tomography scans of acute ischemic stroke patients. *Int. J. Stroke* (2016). (In Press)
492. D.G. Altman, J.M. Bland, Measurement in medicine: the analysis of method comparison studies. *J. R. Stat. Soc. D (The Statistician)* **32**, 307–317 (1983)
493. A.M. Euser, F.W. Dekker, S. le Cessie, A practical approach to Bland-Altman plots and variation coefficients for log transformed variables. *J. Clin. Epidemiol.* **61**, 978–982 (2008)
494. D.R. Matthews, J.P. Hosker, An unbiased, flexible computer programme for glucose clamping, with graphics and running statistics. *Diabetologia* **27**, 308–309 (1984)
495. M. De Luca, C.F. Beckmann, N. De Stefano, P.M. Matthews, S.M. Smith, fMRI resting state networks define distinct modes of long-distance interactions in the human brain. *NeuroImage* **29**, 1359–1367 (2006)
496. S. Orel, M.D. Schnall, C.M. Powell, M.G. Hochman, L.J. Solin, B.L. Fowble- et al., Staging of suspected breast-cancer-effect of MR imaging and MR-guided imaging and biopsy. *Radiology* **196**(1), 115–122 (1995)

497. D. Saslow, C. Boetes, W. Burke, S. Harms, M.O. Leach, C.D. Lehman- et al., American cancer society guidelines for breast screening with MRI as an adjunct to mammography. *CA Cancer J. Clin.* **57**(2), 75–89 (2007)
498. B. Szabó, P. Aspelin, M. Wiberg, B. Bone, Dynamic MR imaging of the breast - analysis of kinetic and morphologic diagnostic criteria. *Acta Radiol.* **44**(4), 379–386 (2003)
499. C.W. Piccoli, Contrast-enhanced breast MRI: factors affecting sensitivity and specificity. *Eur. Radiol.* **7**(Suppl. 5), S281–S288 (1997)
500. K. Nie, J.-H. Chen, H.J. Yu, Y. Chu, O. Nalcioglu, M.-Y. Su, Quantitative analysis of lesion morphology and texture features for diagnostic prediction in breast MRI. *Acta Radiol.* **15**(12), 1513–1525 (2008)
501. B.K. Szabó, P. Aspelin, M.K. Wiberg, Neural network approach to the segmentation and classification of dynamic magnetic resonance images of the breast: comparison with empiric and quantitative kinetic parameters. *Acta Radiol.* **11**(12), 1344–1354 (2004)
502. T. Twellmann, A. Meyer Baese, O. Lange, S. Foo, T.W. Nattkemper, Model-free visualization of suspicious lesions in breast MRI based on supervised and unsupervised learning. *Eng. Appl. Artif. Intell.* **21**(2), 129–140 (2008)
503. W. Chen, M.L. Giger, U. Bick, G.M. Newstead, Automatic identification and classification of characteristic kinetic curves of breast lesion on DCE-MRI. *Acta Radiol.* **33**(8), 2878–2887 (2006)
504. C.E. McLaren, W.-P. Chen, K. Nie, M.-Y. Su, Prediction of malignant breast lesions from mri features: a comparison of artificial neural network and logistic regression techniques. *Acta Radiol.* **16**(7), 842–851 (2009)
505. L.A. Meinel, A.H. Stolpen, K.S. Berbaum, L.L. Fajardo, J.M. Reinhardt, Breast MRI lesion classification: improved performance of human readers with a backpropagation neural network computer-aided (CAD) system. *J. Magn. Reson. Imaging* **25**(1), 89–95 (2007)
506. A. Penn, S. Thompson, R. Brem, C. Lehman, P. Weatherall, M. Schnall- et al., Morphologic blooming in breast MRI as a characterization of margin for discriminating benign from malignant lesions. *Acta Radiol.* **13**(11), 1344–1354 (2006)
507. P. Gibbs, L.W. Turnbull, Texture analysis of contrast-enhanced MR images of the breast. *Magn. Reson. Med.* **50**(1), 92–98 (2003)
508. H. Degani, V. Gusic, D. Weinstein, S. Fields, S. Strano, Mapping pathophysiological features of breast tumors by MRI at high spatial resolution. *Nat. Med.* **3**(7), 780–782 (1997)
509. D. Weinstein, S. Strano, P. Cohen, S. Fields, J.M. Gomori, H. Degani, Breast fibroadenoma: mapping of pathophysiologic features with three-time-point, contrast-enhanced MR imaging-pilot study. *Radiology* **210**(1), 233–240 (1999)
510. E.A.M. Hauth, H. Jaeger, S. Maderwald, A. Muhler, R. Kimmig, M. Forsting, Quantitative 2- and 3-dimensional analysis of pharmacokinetic model-derived variables for breast lesions in dynamic, contrast-enhanced MR mammography. *Eur. J. Radiol.* **66**(6), 300–308 (2008)
511. J. Pan, B.E. Dogan, S. Carkaci, L. Santiago, E. Arribas, S.B. Cantor- et al., Comparing performance of the CADstream and thedynaCAD breast MRI CAD systems. *J. Digit. Imaging* **26**(5), 971–976 (2013)
512. F. Keyvanfar, M.A. Shoorehdeli, M. Teshnehlab, K. Nie, M.-Y. Su, Feasibility of high temporal resolution breast DCE-MRI using compressed sensing theory. *Neural Comput. Appl.* **22**(1), 35–45 (2013)
513. T. Helbich, Contrast-enhanced magnetic resonance imaging of the breast. *Eur. J. Radiol.* **34**(3), 208–219 (2000)
514. C.E. Beckman, S.M. Smith, Tensorial extensions of independent component analysis for multi-subject fMRI analysis. *NeuroImage* **25**(1), 294–311 (2005)
515. Y. Lee, Y. Lin, G. Wahba, Multicategory support vector machines: theory and application to the classification of microarray data and satellite radiance data. *J. Am. Stat. Assoc.* **99**(465), 67–82 (2004)
516. J. Weston, C. Watkins, *Multi-Class Support Vector Machines* (Department of Computer Science, Royal Holloway, University of London, London, U.K., 1998)

517. I. Tsochantaridis, T. Hofmann, T. Joachims, Y. Altun, Support vector machine learning for interdependent and structured output spaces, in *Proceedings of the 21st International Conference on Machine Learning* (2004), pp. 104–111
518. E.J. Bayro Corrochano, N. Arana Daniel, Clifford support vector machines for classification, regression, and recurrence. *IEEE Trans. Neural Netw.* **21**(11), 1731–1746 (2010)
519. E. Hitzer, Angles between subspaces computed in clifford algebra. *Proc. Int. Conf. Numer. Anal. Appl. Math.* **1281**, 1476–1479 (2010)
520. C. Doran, A. Lasenby, *Geometric Algebra for Physicists* (Cambridge University Press, Cambridge, UK, 2003)
521. L. Dorst, D. Fontijne, S. Mann, *Geometric Algebra for Computer Science: An Object-oriented Approach to Geometry* (Morgan Kaufmann, Burlington, MA, 2007)
522. L. Dorst, Tutorial: structure-preserving representation of euclidean motions through conformal geometric algebra computing. *IEEE Comput. Graph. Appl.* **22**(3), 24–31 (2002)
523. L. Dorst, Tutorial: Structure-preserving representation of euclidean motions through conformal geometric algebra computing (2010), pp. 35–52
524. L. Dorst, The representation of rigid body motions in the conformal model of geometric algebra, in *Human Motion*, ed. by B. Rosenhahn, R. Klette, D. Metaxas (Springer, The Netherlands, Dordrecht, 2008), pp. 507–529
525. S. Mann, L. Dorst, T. Bouma, The making of a geometric algebra package in matlab, in *Research Report CS-99-27* (University of Waterloo, 1999)
526. E. Hodneland, A. Lundervold, J. Rørvik, A. Munthe-Kaas, Normalized gradient fields for nonlinear motion correction of DCE-MRI time series. *Comput. Med. Imaging Graph.* **38**(3), 202–210 (2014)
527. N. Michoux, J.P. Vallée, A. Pechère-Bertschi, X. Montet, L. Buehler, B.E. Van Beers, Analysis of contrast-enhanced MR images to assess renal function. *Magma* **19**(4), 167–179 (2006)
528. J. Tokuda, H. Mamata, R.R. Gill, N. Hata, R. Kikinis, R.F.P. Jr et al., Impact of nonrigid motion correction technique on pixel-wise pharmacokinetic analysis of free-breathing pulmonary dynamic contrast-enhanced MR imaging. *J. Magn. Reson. Imaging* **33**(4), 968–973 (2011)
529. J.P.B. O'Connor, A. Jackson, G.J.M. Parker, G.C. Jayson, DCE-MRI biomarkers in the clinical evaluation of antiangiogenic and vascular disrupting agents. *Br. J. Cancer* **96**, 189–195 (2007)
530. D. Zikic, S. Sourbron, X.X. Feng, H.J. Michaely, A. Khamene, N. Navab, Automatic alignment of renal DCE-MRI image series for improvement of quantitative tracer kinetic studies, in *Proceedings of the SPIE*, eds. by J.M. Reinhardt, J.P.W. Pluim, vol. 6914 (SPIE, (USA), 2008). (Art. No. 691432)
531. D. Rueckert, L.I. Sonoda, C. Hayes, D.L.G. Hill, M.O. Leach, D.J. Hawkes, Nonrigid registration using free-form deformations: application to breast mr images. *IEEE Trans. Med. Imaging* **18**(8), 712–721 (1999)
532. T. Rohlfing, C.R. Maurer, W.G. O'Dell, J. Zhong, Modeling liver motion and deformation during the respiratory cycle using intensity-based nonrigid registration of gated MR images. *Med. Phys.* **31**(3), 427–432 (2004)
533. Y. Yim, H. Hong, Y.G. Shin, Deformable lung registration between exhale and inhale ct scans using active cells in a combined gradient force approach. *Med. Phys.* **37**(8), 4307–4017 (2010)
534. G. Janssens, L. Jacques, J.O. de Xivry, X. Geets, B. Macq, Diffeomorphic registration of images with variable contrast enhancement. *Int. J. Biomed. Imaging* **2011**(3), Art. No. 891585 (2011)
535. T. Mansi, X. Pennec, M. Sermesant, H. Delingette, N. Ayache, Logdemons revisited: consistent regularisation and incompressibility constraint for soft tissue tracking in medical images, in *Proceedings of Medical Image Computing and Computer-Assisted Intervention—MICCAI 2010*, eds. by T. Jiang, N. Navab, J. Pluim, M. Viergever. LNCS6362 (Springer-Verlag, Berlin, Heidelberg, 2010), pp. 652–659
536. J. Modersitzki, FLIRT with rigidity-image registration with a local non-rigidity penalty. *Int. J. Comput. Vis.* **76**(2), 153–163 (2007)
537. A.D. Merrem, F.G. Zöllner, M. Reich, A. Lundervold, J. Rørvik, L.R. Schad, A variational approach to image registration in dynamic contrast-enhanced MRI of the human kidney. *Magn. Reson. Imaging* **31**(5), 771–777 (2013)

538. V.S. Lee, H. Rusinek, M.E. Noz, P. Lee, M. Raghavan, E.L. Kramer, Dynamic three dimensional MR renography for the measurement of single kidney function: initial experience. *Radiology* **227**(1), 289–294 (2003)
539. T. Song, V.L. Lee, H. Rusinek, M. Kaur, A.F. Laine, Automatic 4-D registration in dynamic MR renography based on over-complete dyadic wavelet and fourier transforms, in *Proceedings of the 8th International Conference on Medical Image Computing and Computer-Assisted Intervention*, eds. by J. Duncan, G. Gerig. LNCS3750 (Part II) (Springer-Verlag, Berlin, Heidelberg, 2005), pp. 205–213
540. G.A. Buonaccorsi, J.P. O'Connor, A. Counce, C. Roberts, S. Cheung, Y. Watson et al., Tracer kinetic model-driven registration for dynamic contrast-enhanced MRI timeseries data. *Magn. Reson. Med.* **58**(5), 1010–1019 (2007)
541. G.A. Buonaccorsi, C. Roberts, S. Cheung, Y. Watson, J.P. O'Connor, K. Davies- et al., Comparison of the performance of tracer kinetic model-driven registration for dynamic contrast enhanced MRI using different models of contrast enhancement. *Acad. Radiol.* **13**(9), 1112–1123 (2006)
542. Y. Sun, J. Moura, C. Ho, Subpixel registration in renal perfusion MR image sequence. *Proc. IEEE Int. Symp. Biomed. Imaging: Nano to Macro* **1**, 700–703 (2004)
543. F.G. Zöllner, R. Sance, P. Rogelj, M.J. Ledesma-Carbayo, J. Rørvik, A. Santos- et al., Assessment of 3D DCE-MRI of the kidneys using non-rigid image registration and segmentation of voxel time courses. *Comput. Med. Imaging Graph.* **33**(3), 171–181 (2008)
544. H.J. Johnson, G.E. Christensen, Consistent landmark and intensity-based image registration. *IEEE Trans. Med. Imaging* **21**(5), 450–461 (2002)
545. T. Rohlfing, C.R. Maurer Jr., D.A. Bluemke, M.A. Jacobs, Volume-preserving nonrigid registration of MR breast images using free-form deformation with an incompressibility constraint. *IEEE Trans. Med. Imaging* **22**(6), 730–741 (2003)
546. D. Loeckx, F. Maes, D. Vandermeulen, P. Suetens, Nonrigid image registration using free-form deformations with a local rigidity constraint, in *Proceedings of Medical Image Computing and Computer-Assisted Intervention - MICCAI 2004*, eds. by C. Barillot, D. Haynor, J. Falcao e Cunha, P. Hellier. LNCS3216, (Springer-Verlag, Berlin, Heidelberg, 2004), pp. 639–646
547. S.Schäfera., U. Preimb, S. Glaßera, B. Preima, K.D. Tönnies, Local similarity measures for lesion registration in DCE-MRI of the breast. *Ann. BMVA* **2011**(3),1–13 (2011)
548. S. Glaßer, S. Schäfer, S. Oeltze, U. Preim, K. Tönnies, B. Preim, A visual analytics approach to diagnosis of breast DCE-MRI data. *Comput. Graph.* **34**(5), 602–611 (2010)
549. F.G. Zöllner, R. Sance, P. Rogelj, M.J. Ledesma-Carbayo, J. Rørvik, A. Santos- et al., Assessment of 3D DCE-MRI of the kidneys using non-rigid image registration and segmentation of voxel time courses. *Comput. Med. Imaging Graph.* **33**(1), 171–181 (2009)
550. M. Bhushan, J.A. Schnabel, L. Risser, M.P. Heinrich, J.M. Brady, M. Jenkinson, Motion correction and parameter estimation in DCE-MRI sequences: application to colorectal cancer, in *Proceedings of Medical Image Computing and Computer-Assisted Intervention—MICCAI 2011*, eds. by G. Fichtinger, A. Martel, T. Peters. LNCS6891 (Part I), (Springer-Verlag, Berlin, Heidelberg, 2011), pp. 476–483
551. W. Lin, J. Guo, M.A. Rosen, H.K. Song, Respiratory motion-compensated radial dynamic contrast-enhanced (DCE)-MRI of chest and abdominal lesions. *Magn. Reson. Med.* **60**(5), 1135–1146 (2008)
552. J.B. Antoine Maintz, M.A. Viergever, A survey of medical image registration. *Comput. Surv.* **24**(4), 325–376 (1992)
553. A.N. Kumar, K.W. Short, D.W. Piston, A motion correction framework for time series sequences in microscopy images. *Microsc. Microanal.* **19**(2), 433–450 (2013)
554. L. Zhukov, K. Museth, D. Breen, R. Whitakery, A.H. Barr, Level set modeling and segmentation of DT-MRI brain data. *J. Electron. Imaging* **12**(1), 125–133 (2003)
555. T.F. Chan, L.A. Vese, Active contours without edges. *IEEE Trans. Image Process.* **10**(2), 266–277 (2001)
556. J. Andersson, C. Hutton, R.T.J. Ashburner, K. Friston, Modelling geometric distortions in EPI time series. *NeuroImage* **13**(5), 903–919 (2001)

557. M.A.O. Vasilescu, D. Terzopoulos, Multilinear analysis of image ensembles: Tensorfaces, in *Proceeding of the European Conference on Computer Vision* (2002), pp. 447–460
558. T. Kolda, B.W. Bader, Tensor decompositions and applications. *SIAM Rev.* **51**(3), 455–500 (2009)
559. T. Hazan, S. Polak, A. Shashua, Sparse image coding using a 3D non-negative tensor factorization, in *Proceeding of the Tenth IEEE International Conference on Computer Vision*, vol. 1, pp. 50–57 (2005)
560. G. Bartzokis, P.H. Lu, J. Mintz, Human brain myelination and amyloid beta deposition in alzheimer's disease. *Alzheimer's & Dementia* **3**(2), 122–125 (2007)
561. D.F. Plusquellic, K. Siegrist, E.J. Heilweil, O. Esenturk, Applications of terahertz spectroscopy in biosystems. *ChemPhysChem* **8**(7), 2412–2431 (2007)
562. S.J. Oh, J. Choi, I. Maeng, J.Y. Park, K. Lee, Y.M. Huh et al., Molecular imaging with terahertz waves. *Opt. Express* **19**(5), 4009–4016 (2011)
563. D. Tao, X. Li, X. Wu, W. Hu, S. Maybank, Supervised tensor learning. *Knowl. Inf. Syst.* **13**(1), 1–42 (2007)
564. M. Signoretto, L. Lathauwer, J. Suykens, A kernel based framework to tensorial data analysis. *Neural Netw.* **24**(8), 861–874 (2011)
565. L. He, X. Kong, P.S. Yu, A.B. Ragin, Z. Hao, X. Yang, DuSK: A dual structure-preserving kernel for supervised tensor learning with applications to neuroimages, in *Proceedings of SIAM International Conference on Data Mining 2014, SDM 2014*, vol. 1. Society for Industrial and Applied Mathematics Publications, (Philadelphia, United States, 2014), pp. 127–135
566. X. Han, Y. Zhong, L. He, P.S. Yu, L. Zhang, The unsupervised hierarchical convolutional sparse auto-encoder for neuroimaging data classification, in *Proceedings of 8th International Conference on Brain Informatics and Health*, vol. 9250 (Springer Verlag, (London, United Kingdom), 2015), pp. 156–166
567. C. Habeck, Y. Stern, Alzheimer's Disease Neuroimaging Initiative, Multivariate data analysis for neuroimaging data: Overview and application to alzheimer's disease. *Cell Biochem. Biophys.* **58**(2), 53–67 (2010)
568. D.Y. Tsao, W.A. Freiwald, T.A. Knutsen, J.B. Mandeville, R.B.H. Tootell, Faces and objects in macaque cerebral cortex. *Nat. Neurosci.* **6**, 989–995 (2003)
569. T.A. Carlson, P. Schrater, S. He, Patterns of activity in the categorical representations of objects. *J. Cogn. Neurosci.* **15**(5), 704–717 (2003)
570. S. Bray, C. Chang, F. Hoeft, Applications of multivariate pattern classification analyses in developmental neuroimaging of healthy and clinical populations. *Front. Hum. Neurosci.* **3**(32), 1–12 (2009)
571. J. Cummings, M.S. Mega, *Neuropsychiatry Behav. Neurosci.* (Oxford University Press, Oxford, New York, 2003)
572. W.C. Drevets, Neuroimaging studies of mood disorders. *Biol. Psychiatry* **48**(8), 813–829 (2000)
573. C.H.-Y. Fu, J. Mourao-Miranda, S.G. Costafreda, A. Khanna, A.F. Marquand, S.C.-R. Williams, M.J. Brammer, Neuroimaging studies of mood disorders. *Biol. Psychiatry* **63**(7), 656–662 (2008)
574. B. Cao, X. Kong, P.S. Yu, A review of heterogeneous data mining for brain disorder identification. *Brain Inf.* **2**(4), 253–264 (2015)
575. I. Davidson, S. Gilpin, O. Carmichael, P. Walker, Network discovery via constrained tensor analysis of fMRI data, in *KDD'13, Proceedings of the 19th ACM SIGKDD International Conference on Knowledge Discovery and Data Mining* (2013), pp. 194–202
576. S. Vega-Pons, F.B. Kessler, P. Avesani, Network discovery via constrained tensor analysis of fMRI data, in *2013 International Workshop on Pattern Recognition in Neuroimaging (PRNI)* (2013), pp. 136–139
577. B. Jie, D. Zhang, C.-Y. Wee, D. Shen, Topological graph kernel on multiple thresholded functional connectivity networks for mild cognitive impairment classification. *Hum. Brain Mapp.* **35**(7), 2876–2897 (2014)

578. N. Shervashidze, P. Schweitzer, E. van Leeuwen, K. Mehlhorn, K. Borgwardt, Weisfeiler-lehman graph kernels. *J. Mach. Learn. Res.* **12**, 2539–2561 (2011)
579. S.N. Vishwanathan, N.N. Schraudolph, R. Kondor, K.M. Borgwardt, Graph kernels. *J. Mach. Learn. Res.* **11**, 1201–1242 (2010)
580. K.M. Borgwardt, C.S. Ong, S. Schönauer, S.V.N. Vishwanathan, A.J. Smola, H.-P. Kriegel, Protein function prediction via graph kernels. *Bioinformatics* **21**(Suppl. 1), i47–i56 (2005)
581. T. Gärtner, P. Flach, S. Wrobel, Hardness results and efficient alternatives, in *Proceedings of Sixteenth Annual Conference on Computational Learning Theory and Seventh Kernel Workshop*. LNAI 2777, (Springer-Verlag, (Berlin, Heidelberg), 2003), pp. 129–143
582. H. Kashima, K. Tsuda, A. Inokuchi, Marginalized kernels between labeled graphs, in *Proceedings of the 20th International Conference on Machine Learning (ICML)* (2003)
583. T. Horváth, T.G. Gärtner, S. Wrobel, Cyclic pattern kernels for predictive graph mining, in *Proceedings of the ACM SIGKDD Conference on Knowledge Discovery and Data Mining* (2004), pp. 158–167
584. N. Shervashidze, K.M. Borgwardt, Fast subtree kernels on graphs, in *Proceedings of the Conference on Advances in Neural Information Processing Systems*, eds. by Y. Bengio, D. Schuurmans, J. Lafferty, C.K.I. Williams, A. Culotta (Curran, 2009), pp. 1660–1668
585. G. Camps-Valls, N. Shervashidze, K. Borgwardt, Spatiospectral remote sensing image classification with graph kernels. *IEEE Geosci. Remote Sens. Lett.* **7**, 741–745 (2010)
586. Q. Yu, E.B. Erhardt, J. Sui, Y. Du, H. He, D. Hjelm, M.S. Cetin, S. Rachakonda, R.L. Miller, G. Pearlson, V.D. Calhoun, Assessing dynamic brain graphs of time-varying connectivity in fMRI data: application to healthy controls and patients with schizophrenia. *NeuroImage* **107**, 345–355 (2015)
587. K.M. Borgwardt, H.-P. Kriegel, Shortest-path kernels on graphs, in *Proceeding ICDM'05 Proceedings of the Fifth IEEE International Conference on Data Mining* (2005), pp. 74–81
588. F. Pereira, T. Mitchell, M. Botvinick, Machine learning classifiers and fMRI: a tutorial overview. *Neuroimage* **45**(1, Subpl), S199–S209 (2008)
589. J. Richiardi, S. Achard, H. Bunke, D.V.D. Ville, Machine learning with brain graphs: predictive modeling approaches for functional imaging in systems neuroscience. *IEEE Signal Process. Mag.* **30**(3), 58–70 (2013)
590. N.U.F. Dosenbach, B. Nardos, A.L. Cohen, D.A. Fair, J.D. Power, J.A. Church et al., Machine learning with brain graphs: predictive modeling approaches for functional imaging in systems neuroscience. *Science* **329**(5997), 1358–1361 (2010)
591. N.K. Logothetis, J. Pauls, M. Augath, T. Trinath, A. Oeltermann, Neurophysiological investigation of the basis of the fMRI signal. *Nature* **412**, 150–157 (2001)
592. N.K. Logothetis, B.A. Wandell, Interpreting the BOLD signal. *Annu. Rev. Physiol.* **66**, 735–769 (2004)
593. N.K. Logothetis, J. Pfeuffer, On the nature of the BOLD fMRI contrast mechanism. *Magn. Reson. Imaging* **22**, 1517–1531 (2004)
594. N.K. Logothetis, What we can do and what we cannot do with fMRI. *Nature* **453**, 869–878 (2008)
595. N.K. Logothetis, The neural basis of the blood-oxygen-level-dependent functional magnetic resonance imaging signal. *Philos. Trans. R. Soc. B* **357**, 1003–1037 (2002)
596. B. Haider, A. Duque, A.R. Hasenstaub, D.A. McCormick, Neocortical network activity in vivo is generated through a dynamic balance of excitation and inhibition. *J. Neurosci.* **26**, 4535–4545 (2006)
597. B. Krekelberg, G.M. Boynton, R.J. van Wezel, Adaptation: from single cells to BOLD signals. *Trends Neurosci.* **29**, 250–256 (2006)
598. A. Viswanathan, R.D. Freeman, Neurometabolic coupling in cerebral cortex reflects synaptic more than spiking activity. *Nat. Neurosci.* **10**, 1308–1312 (2007)
599. R.J. Douglas, K.A. Martin, Neuronal circuits of the neocortex. *Annu. Rev. Neurosci.* **27**, 419–451 (2004)
600. A. Vedaldi, V.G.M. Varma, A. Zisserman, Multiple kernels for object detection, in *2009 IEEE 12th International Conference on Computer Vision (ICCV)* (2009), pp. 606–613

601. A. Vedaldi, A. Zisserman, Efficient additive kernels via explicit feature maps. *IEEE Trans. Pattern Anal. Mach. Intell.* **34**, 480–492 (2012)
602. K. Simonyan, A. Vedaldi, A. Zisserman, Learning local feature descriptors using convex optimisation. *IEEE Trans. Pattern Anal. Mach. Intell.* **36**, 1573–1585 (2014)
603. J. Revaud, P. Weinzaepfel, Z. Harchaoui, C. Schmid, Deepmatching: hierarchical deformable dense matching. *Int. J. Comput. Vision* **120**(3), 300–323 (2016)
604. A.W. Harley, An interactive node-link visualization of convolutional neural networks, in *International Symposium on Visual Computing* (2015), pp. 867–877
605. B. Fulkerson, A. Vedaldi, S. Soatto, Class segmentation and object localization with superpixel neighborhoods, in *2009 IEEE 12th International Conference on Computer Vision (ICCV)* (2009), pp. 670–677
606. M.C.S. Maji, I. Kokkinos, A. Vedaldi, Deep filter banks for texture recognition, description, and segmentation. *Int. J. Comput. Vision* **118**, 65–94 (2016)
607. R.-R. Jorge, B.-C. Eduardo, Medical image segmentation, volume representation and registration using spheres in the geometric algebra framework. *Pattern Recognit.* **40**(1), 171–188 (2007)
608. G. Cybenko, Approximation by superposition of a sigmoidal function. *Math. Control Signals Syst.* **2**(4), 303–314 (1989)
609. K. Hornik, Multilayer feedforward networks are universal approximators. *Neural Netw.* **2**(5), 359–366 (1989)
610. K. Tachibana, E. Hitzer, Tutorial note on GA neural networks, in *Proceeding of The 3rd International Conference on Applied Geometric Algebras in Computer Science and Engineering* (2008), pp. 1–20
611. E. Bayro Corrochano, S. Buchholz, Geometric neural networks, visual and motor signal neurocomputation, in *Algebraic Frames for the Perception-Action Cycle*, eds. by G. Sommer, Y.Y. Zeevi, vol. 1315 (Springer-Verlag, Heidelberg, New York, 2005), pp. 379–394
612. Y. Bengio, Learning deep architectures for AI. *Found. Trends Mach. Learn.* **2**(1), 1–127 (2009)
613. G.E. Hinton, S. Osindero, Y. Teh, A fast learning algorithm for deep belief nets. *Neural Comput.* **18**(7), 1527–1554 (2006)
614. G.E. Hinton, R. Salakhutdinov, Reducing the dimensionality of data with neural networks. *Science* **313**(5786), 504–507 (2006)
615. Y. Bengio, Y. LeCun, Scaling learning algorithms towards AI, in *Large Scale Kernel Machines*, ed. by L. Bottou, O. Chapelle, D. DeCoste, J. Weston (MIT Press, Cambridge, MA, 2007)
616. Y. Bengio, P. Lamblin, D. Popovici, H. Larochelle, Greedy layer-wise training of deep networks, in *Advances in Neural Information Processing Systems*, eds. by J.P.B. Schalkopf, T. Hoffman, vol. 19 (MIT Press, Cambridge, MA, 2007), pp. 153–160
617. H. Larochelle, D. Erhan, A. Courville, J. Bergstra, Y. Bengio, An empirical evaluation of deep architectures on problems with many factors of variation, in *Proceedings of the Twenty-fourth International Conference on Machine Learning*, ed. by Z. Ghahramani (Canada, ACM, Montreal (Qc), 2007), pp. 473–480
618. H. Lee, R. Grosse, R. Ranganath, A. Y. Ng, Convolutional deep belief networks for scalable unsupervised learning of hierarchical representations, in *Proceedings of the Twenty-sixth International Conference on Machine Learning*, ed. by L. Bottou, M. Littman (Canada, ACM, Montreal (Qc), 2009), pp. 609–616
619. M. Ranzato, Y.-L. Boureau, Y. LeCun, Sparse feature learning for deep belief networks, in *Advances in Neural Information Processing Systems*, eds. by J. Platt, D. Koller, Y. Singer, S. Roweis, vol. 20 (MIT Press, Cambridge, MA, 2008), pp. 1185–1192
620. R. Salakhutdinov, G.E. Hinton, Using deep belief nets to learn covariance kernels for gaussian processes, in *Advances in Neural Information Processing Systems*, eds. by J. Platt, D. Koller, Y. Singer, S. Roweis, vol. 20 (MIT Press, Cambridge, MA, 2008), pp. 1249–1256
621. S. Osindero, G.E. Hinton, Modeling image patches with a directed hierarchy of markov random field, in *Advances in Neural Information Processing Systems*, eds. by J. Platt, D. Koller, Y. Singer, S. Roweis, vol. 20 (MIT Press, Cambridge, MA, 2008), pp. 1249–1256

622. M. Ranzato, F. Huang, Y. Boureau, Y. LeCun, Unsupervised learning of invariant feature hierarchies with applications to object recognition, in *Proceedings of the Computer Vision and Pattern Recognition Conference* (IEEE Press, 2007), pp. 1–8
623. I. Levner, *Data Driven Object Segmentation*, Ph.D. Thesis, (Department of Computer Science, University of Alberta, Edmonton, Canada, 2008)
624. L. Breiman, J.H. Friedman, R.A. Olshen, C.J. Stone, *Classif. Regres. Trees* (Wadsworth International Group, Belmont, CA, 1984)
625. D.E. Rumelhart, G.E. Hinton, R.J. Williams, Learning representations by back-propagating errors. *Nature* **323**, 533–536 (1986)
626. G. Taylor, G.E. Hinton, S. Roweis, Modeling human motion using binary latent variables, in *Advances in Neural Information Processing Systems*, eds. by J.P.B. Schölkopf, T. Hoffman, vol. 19 (MIT Press, Cambridge, MA, 2007), pp. 1345–1352
627. G.E. Hinton, Products of experts, in *Proceedings of the Ninth International Conference on Artificial Neural Networks*, vol. 1, pp. 1–6 (1999)
628. J. Baxter, A bayesian/information theoretic model of learning via multiple task sampling. *Mach. Learn.* **28**(1), 7–40 (1997)
629. N. Intrator, S. Edelman, How to make a low-dimensional representation suitable for diverse tasks. *Connect. Sci. (Spec. Issue Transf. Neural Netw.)* **8**, 205–224 (1996)
630. S. Thrun, Is learning the n-th thing any easier than learning the first?, in *Human Motion*, eds. by D. Touretzky, M. Mozer, M. Hasselmo, vol. 8 (MIT Press, Cambridge, MA, 1996), pp. 640–646
631. R. Raina, A. Battle, H. Lee, B. Packer, A.Y. Ng, Self-taught learning: transfer learning from unlabeled data, in *Proceedings of the Twenty-fourth International Conference on Machine Learning*, ed. by Z. Ghahramani (Canada, ACM, Montreal (Qc), 2007), pp. 759–766
632. R. Collobert, J. Weston, A unified architecture for natural language processing: Deep neural networks with multitask learning, in *Proceedings of the Twenty-fourth International Conference on Machine Learning*, ed. by W.W. Cohen, A. McCallum, S.T. Roweis (Canada, ACM, Montreal (Qc), 2008), pp. 160–167
633. H. Bourlard, Y. Kamp, Auto-association by multilayer perceptrons and singular value decomposition. *Biol. Cybern.* **59**(4), 291–294 (1988)
634. P. Vincent, H. Larochelle, Y. Bengio, P.-A. Manzagol, Extracting and composing robust features with denoising autoencoders, in *Proceedings of the Twenty-fifth International Conference on Machine Learning*, ed. by W.W. Cohen, A. McCallum, S.T. Roweis (Canada, ACM, Montreal (Qc), 2008), pp. 1096–1103
635. Y. Freund, R.E. Schapire, Experiments with a new boosting algorithm, in *Machine Learning: Proceedings of Thirteenth International Conference* (ACM, USA, 1999), pp. 148–156
636. D.H. Wolpert, Stacked generalization. *Neural Netw.* **5**, 241–249 (1992)
637. L. Breiman, J.H. Friedman, R.A. Olshen, C.J. Stone, *Classification and Regression Trees* (Wadsworth International Group, Belmont, CA, 1984)
638. L. Rokach, O. Maimon, Top-down induction of decision trees classifiers—a survey. *IEEE Trans. Syst. Man Cybern. Part C Appl. Rev.* **35**(4), 476–487 (2005)
639. A. Khazaei, A. Ebrahimzadeh, A. Babajani-Feremi, Application of pattern recognition and graph theoretical approaches to analysis of brain network in Alzheimer’s disease. *J. Med. Imaging Health Inf.* **5**(6), 1145–1155 (2015)
640. W.M. Wells, W.L. Grimson, R. Kikinis, F.A. Jolesz, Adaptive segmentation of MRI data. *IEEE Trans. Med. Imaging* **15**(4), 429–442 (1996)
641. S.P. Lloyd, Least squares quantization in PCM. *IEEE Trans. Inf. Theory* **28**(2), 129–137 (1982)
642. P.S. Bradley, U. Fayyad, Refining initial points for K-means clustering, in *Proceedings 15th International Conference Machine Learning* (1998), pp. 91–99
643. O. Irsoy, O.T. Yildiz, E. Alpaydin, Soft decision trees, in *Proceeding of 21nd International Conference on Pattern Recognition* (2012), pp. 1819–1822
644. O. Irsoy, O.T. Yildiz, E. Alpaydin, Budding trees, in *Proceeding of 22nd International Conference on Pattern Recognition* (2014), pp. 3582–3587

645. Y. Yoo, T. Brosch, A. Traboulsee, B.K.-B. Li, R. Tam, Deep learning of image features from unlabeled data for multiple sclerosis lesion segmentation, in *Proceeding of MLMI 2014*, eds. by G. Wu et al., vol. 8679 (Springer International Publishing, Switzerland, 2014), pp. 117–124
646. R. Kafieh, H. Rabbani, S. Kermani, A review of algorithms for segmentation of optical coherence tomography from retina. *J. Med. Signals Sens.* **3**(1), 45–60 (2013)
647. R.K.H. Galvão, J.P. Matsuura, J.R. Colombo Jr., S. Hadjiloucas, Detecting compositional changes in dielectric materials simulated by three-dimensional RC network models. *IEEE Trans. Dielectr. Electr. Insul.* **24**(2), 1141–1152 (2017)

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