

# Michał Kawulok

Associate Professor

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## Education

- 2015 **D.Sc. in Computer Science.**  
Title: Analysis of the local features similarity in digital images, applied to human skin detection and image colorization
- 2007 **Ph.D. in Computer Science**, *Silesian University of Technology, Faculty of Automatic Control, Electronics and Computer Science*, Gliwice, Poland.  
Thesis: Selected methods for improving automatic face recognition  
Supervisor: Prof. Bogdan Smolka
- 2003 **M.Sc. in Computer Science**, *Silesian University of Technology, Institute of Informatics*, Gliwice, Poland.

## Appointments

### Academic

- 2018–present **Associate Professor**, *Silesian University of Technology, Institute of Informatics*, Gliwice, Poland.
- 2007–2018 **Assistant Professor**, *Silesian University of Technology, Institute of Informatics*, Gliwice, Poland.
- 2003–2007 **Ph.D. Student**, *Silesian University of Technology, Institute of Informatics*, Gliwice, Poland.
- 2001 **Research Student (Internship)**, *Nottingham Trent University*, Nottingham, UK.

### Industrial

- 2011–present **Research Scientist**, *Future Processing*, Gliwice, Poland.  
Computer vision
- 2006–2011 **Project Manager**, *Future Processing*, Gliwice, Poland.  
Medical imaging projects
- 2002–2006 **Software Engineer**, *Future Processing*, Bytom, Poland.  
R&D on face recognition

## Publications

### Books

- [1] M. Kawulok, M. E. Celebi, and B. Smolka, Eds., *Advances in Face Detection and Facial Image Analysis*, Springer International Publishing, 2016.

### Journal Articles

- [2] J. Nalepa and M. Kawulok, "Selecting training sets for support vector machines: a review," *Artificial Intelligence Review*, Jan 2018.
- [3] J. Nalepa and M. Kawulok, "Adaptive memetic algorithm enhanced with data geometry analysis to select training data for SVMs," *Neurocomputing*, vol. 185, pp. 113–132, 2016.
- [4] M. Kawulok, J. Kawulok, J. Nalepa, and B. Smolka, "Hybrid adaptation for detecting skin in color images," *Intelligent Data Analysis*, vol. 20, no. s1, pp. S121–S139, 2016.
- [5] T. Grzejszczak, M. Kawulok, and A. Galuszka, "Hand landmarks detection and localization in color images," *Multimedia Tools and Applications*, vol. 75, no. 23, pp. 16363–16387, 2016.
- [6] M. Kawulok, J. Kawulok, J. Nalepa, and B. Smolka, "Self-adaptive algorithm for segmenting skin regions," *EURASIP Journal on Advances in Signal Processing*, vol. 2014, no. 170, 2014.
- [7] M. Kawulok, J. Kawulok, and J. Nalepa, "Spatial-based skin detection using discriminative skin-presence features," *Pattern Recognition Letters*, vol. 41, pp. 3–13, 2014.
- [8] M. Kawulok, J. Kawulok, and B. Smolka, "Discriminative textural features for image and video colorization," *IEICE Transactions on Information and Systems*, vol. 95-D, no. 7, pp. 1722–1730, 2012.
- [9] M. Kawulok and J. Szymanek, "Precise multi-level face detector for advanced analysis of facial images," *Image Processing, IET*, vol. 6, no. 2, pp. 95–103, 2012.
- [10] M. Kawulok and B. Smolka, "Texture-adaptive image colorization framework," *EURASIP Journal on Advances in Signal Processing*, vol. 2011, no. 99, 2011.
- [11] M. Kawulok, J. Wu, and E. R. Hancock, "Supervised relevance maps for increasing the distinctiveness of facial images," *Pattern Recognition*, vol. 44, no. 4, pp. 929–939, 2011.
- [12] M. Kawulok, "Energy-based blob analysis for improving precision of skin segmentation," *Multimedia Tools and Applications*, vol. 49, no. 3, pp. 463–481, 2010.

### Book Chapters

- [13] M. Kawulok, J. Nalepa, and J. Kawulok, "Skin detection and segmentation in color images," in *Advances in Low-Level Color Image Processing*, M. E. Celebi and B. Smolka, Eds., vol. 11 of *Lecture Notes in Computational Vision and Biomechanics*, pp. 329–366. Springer Netherlands, 2014.
- [14] K. A. Cyran, J. Kawulok, M. Kawulok, M. Stawarz, M. Michalak, M. Pietrowska, P. Widlak, and J. Polanska, "Support vector machines in biomedical and biometrical applications," in *Emerging Paradigms in Machine Learning*, S. Ramanna, L. C. Jain, and R. J. Howlett, Eds., vol. 13 of *Smart Innovation, Systems and Technologies*, pp. 379–417. Springer Berlin Heidelberg, 2013.

## Conference Proceedings

- [15] M. Kawulok, P. Benecki, D. Kostrzewa, and L. Skonieczny, "Evolving imaging model for super-resolution reconstruction," in *Proc. Genetic and Evolutionary Computation Conference (GECCO 2018) Companion*. ACM, 2018, in print.
- [16] K. Pawelczyk, M. Kawulok, and J. Nalepa, "Genetically-trained deep neural networks," in *Proc. Genetic and Evolutionary Computation Conference (GECCO 2018) Companion*. ACM, 2018, in print.
- [17] M. Walczak, J. Nalepa, M. Kawulok, W. Dudzik, and B. Smolka, "Evolutionary cortical surface segmentation," in *Proc. SPIE 10670, Real-Time Image and Video Processing 2018*, 2018, vol. 10670, p. 106700D.
- [18] B. Smolka, J. Nalepa, M. Kawulok, and B. Cyganek, "Robust enhancement technique for color images corrupted by impulsive noise," in *Proc. SPIE 10670, Real-Time Image and Video Processing 2018*, 2018, vol. 10670, p. 1067003.
- [19] M. Kawulok, P. Benecki, D. Kostrzewa, and L. Skonieczny, "Towards evolutionary super-resolution," in *Applications of Evolutionary Computation*, K. Sim and P. Kaufmann, Eds., Cham, 2018, pp. 480–496, Springer International Publishing.
- [20] J. Nalepa, G. Mrukwa, and M. Kawulok, "Evolvable deep features," in *Applications of Evolutionary Computation*, K. Sim and P. Kaufmann, Eds., Cham, 2018, pp. 497–505, Springer International Publishing.
- [21] M. Kawulok, P. Benecki, J. Nalepa, D. Kostrzewa, and L. Skonieczny, "Towards robust evaluation of super-resolution satellite image reconstruction," in *Intelligent Information and Database Systems*, N. T. Nguyen, D. H. Hoang, T.-P. Hong, H. Pham, and B. Trawiński, Eds., Cham, 2018, pp. 476–486, Springer International Publishing.
- [22] J. Kawulok and M. Kawulok, "Environmental metagenome classification for soil-based forensic analysis," in *Proceedings of the 11th International Joint Conference on Biomedical Engineering Systems and Technologies - Volume 4: BIOINFORMATICS*, 2018, pp. 182–187.
- [23] M. Kawulok, D. Kostrzewa, P. Benecki, and L. Skonieczny, "Optimizing super-resolution reconstruction using a genetic algorithm," in *Proc. International Conference on Agents and Artificial Intelligence, ICAART 2018*, 2018, pp. 599–605.
- [24] J. Nalepa, M. Kawulok, and W. Dudzik, "Tuning and evolving support vector machine models," in *Man-Machine Interactions 5*, A. Gruca, T. Czachórski, K. Harezlak, S. Kozielski, and A. Piotrowska, Eds., Cham, 2018, pp. 418–428, Springer International Publishing.
- [25] M. Walczak, I. Burda, J. Nalepa, and M. Kawulok, *Segmenting Lungs from Whole-Body CT Scans*, pp. 403–414, Springer International Publishing, Cham, 2017.
- [26] K. Pawelczyk, M. Kawulok, J. Nalepa, M. P. Hayball, S. J. McQuaid, V. Prakash, and B. Ganeshan, *Towards Detecting High-Uptake Lesions from Lung CT Scans Using Deep Learning*, pp. 310–320, Springer International Publishing, Cham, 2017.
- [27] P. R. Lorenzo, J. Nalepa, M. Kawulok, L. S. Ramos, and J. R. Pastor, "Particle swarm optimization for hyper-parameter selection in deep neural networks," in *Proc. GECCO*, New York, NY, USA, 2017, pp. 481–488, ACM.

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- [29] M. Kawulok, J. Nalepa, and W. Dudzik, *An Alternating Genetic Algorithm for Selecting SVM Model and Training Set*, pp. 94–104, Springer International Publishing, Cham, 2017.
- [30] M. Kawulok, J. Nalepa, K. Nurzynska, and B. Smolka, "In search of truth: Analysis of smile intensity dynamics to detect deception," in *IBERAMIA 2016*, M. Montes y Gómez, H. J. Escalante, A. Segura, and J. d. D. Murillo, Eds., vol. 10022 of *LNCS*, pp. 325–337. Springer International Publishing, 2016. (**Best Paper Award**)
- [31] J. Nalepa and M. Kawulok, "The smaller, the better: Selecting refined svm training sets using adaptive memetic algorithm," in *Proc. Genetic and Evolutionary Computation Conference (GECCO 2016) Companion*. ACM, 2016, pp. 165–166.
- [32] M. Papiez, M. Kawulok, and J. Nalepa, "Manifold learning for hand pose recognition: Evaluation framework," in *Beyond Databases, Architectures and Structures*, S. Kozielski, D. Mrozek, P. Kasprowski, B. Malysiak-Mrozek, and D. Kostrzewa, Eds., vol. 613 of *Communications in Computer and Information Science*, pp. 704–715. Springer International Publishing, 2016.
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- [35] J. Nalepa, K. Siminski, and M. Kawulok, "Towards parameter-less support vector machines," in *Proc. Asian Conference on Pattern Recognition, ACPR 2015*, 2015.
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- [37] T. Herud, M. Kawulok, and B. Smółka, "Emotion recognition from facial images using binary face relevance maps," *Studia Informatica*, vol. 36, no. 4, pp. 29–41, 2015.
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- [40] M. Kawulok and J. Nalepa, "Dynamically adaptive genetic algorithm to select training data for SVMs," in *Advances in Artificial Intelligence – IBERAMIA 2014*, A. L. Bazzan and K. Pichara, Eds., vol. 8864 of *Lecture Notes in Computer Science*, pp. 242–254. Springer International Publishing, 2014.
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- [42] K. Radlak, M. Kawulok, B. Smolka, and N. Radlak, "Gaze direction estimation from static images," in *Proc. IEEE International Workshop on Multimedia Signal Processing (MMSP)*, Sept 2014, pp. 1–4.
- [43] K. Pawelczyk and M. Kawulok, "Head pose estimation relying on appearance-based nose region analysis," in *Computer Vision and Graphics*, L. Chmielewski, R. Kozera, B.-S. Shin, and K. Wojciechowski, Eds., vol. 8671 of *Lecture Notes in Computer Science*, pp. 510–517. Springer International Publishing, 2014.
- [44] J. Nalepa and M. Kawulok, "A memetic algorithm to select training data for support vector machines," in *Proc. Conference on Genetic and Evolutionary Computation (GECCO '14)*. 2014, pp. 573–580, ACM.
- [45] J. Nalepa and M. Kawulok, "Fast and accurate hand shape classification," in *Beyond Databases, Architectures, and Structures*, S. Kozielski, D. Mrozek, P. Kasprowski, B. Malysiak-Mrozek, and D. Kostrzewa, Eds., vol. 424 of *Communications in Computer and Information Science*, pp. 364–373. Springer, 2014.
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- [47] J. Nalepa and M. Kawulok, "Adaptive genetic algorithm to select training data for support vector machines," in *Applications of Evolutionary Computation*, A. I. Esparcia-Alcazar and A. M. Mora, Eds., *Lecture Notes in Computer Science*, pp. 514–525. Springer Berlin Heidelberg, 2014.
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- [49] J. Nalepa, T. Grzejszczak, and M. Kawulok, "Wrist localization in color images for hand gesture recognition," in *Man-Machine Interactions 3*, D. A. Gruca, T. Czachórski, and S. Kozielski, Eds., vol. 242 of *Advances in Intelligent Systems and Computing*, pp. 79–86. Springer International Publishing, 2014.
- [50] M. Kawulok, J. Kawulok, J. Nalepa, and M. Papież, "Skin detection using spatial analysis with adaptive seed," in *Proc. IEEE International Conference on Image Processing (ICIP 2013)*, Sept 2013, pp. 3720–3724.

- [51] T. Grzejszczak, J. Nalepa, and M. Kawulok, "Real-time wrist localization in hand silhouettes," in *Proc. 8th International Conference on Computer Recognition Systems CORES 2013*, R. Burduk, K. Jackowski, M. Kurzynski, M. Wozniak, and A. Zolnierok, Eds., vol. 226 of *Advances in Intelligent Systems and Computing*, pp. 439–449. Springer International Publishing, 2013.
- [52] M. Papiez and M. Kawulok, "Adaptive skin detection in colour images using error signal space," *Studia Informatica*, vol. 34, no. 2A, pp. 365–377, 2013.
- [53] M. Kawulok, "Fast propagation-based skin regions segmentation in color images," in *Proc. IEEE International Conference on Automatic Face and Gesture Recognition*, 2013, pp. 1–7.
- [54] M. Kawulok and J. Nalepa, "Support vector machines training data selection using a genetic algorithm," in *Structural, Syntactic, and Statistical Pattern Recognition*, G. Gimel'farb, E. Hancock, A. Imiya, A. Kuijper, M. Kudo, S. Omachi, T. Windeatt, and K. Yamada, Eds., vol. 7626 of *Lecture Notes in Computer Science*, pp. 557–565. Springer Berlin Heidelberg, 2012.
- [55] M. Kawulok, "Skin detection using color and distance transform," in *Computer Vision and Graphics*, L. Bolc, R. Tadeusiewicz, L. Chmielewski, and K. Wojciechowski, Eds., vol. 7594 of *Lecture Notes in Computer Science*, pp. 449–456. Springer Berlin Heidelberg, 2012.
- [56] M. Czupryna and M. Kawulok, "Real-time vision pointer interface," in *Proc. International Symposium ELMAR 2012*, 2012, pp. 49–52.
- [57] M. Kawulok, "Texture analysis for skin probability maps refinement," in *Pattern Recognition*, J. A. Carrasco-Ochoa, J. F. Martinez-Trinidad, J. A. Olvera Lopez, and K. L. Boyer, Eds., vol. 7329 of *Lecture Notes in Computer Science*, pp. 75–84. Springer Berlin Heidelberg, 2012.
- [58] M. Kawulok, "Skin region detection in digital images using discriminative textural features," *Studia Informatica*, vol. 33, no. 2B, pp. 37–48, 2012.
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- [74] M. Kawulok and B. Smolka, "Application of color information in human face recognition," in *Proc. 11th International Conference on Medical Informatics and Technology, MIT 2006*, 2006, pp. 395–400.
- [75] M. Kawulok and B. Smolka, "Improvement of face recognition effectiveness based on color information," in *Proc. 13th International Workshop on Systems, Signals and Image Processing (IWSSIP 2006)*, 2006, pp. 69–73.
- [76] A. Duszenko and M. Kawulok, "Automatyczne rozpoznawanie twarzy jako istotny element multimedialnych baz danych," in *Bazy danych. Struktury, algorytmy, metody: Wybrane technologie i zastosowania*, S. Kozielski, Ed., vol. 2, pp. 377–384. WKL, Warszawa, 2006.
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- [79] M. Kawulok and S. Kozielski, "Wykorzystanie aplikacji bazodanowych do efektywnego zarządzania dużymi budynkami," in *Bazy danych. Modele, technologie, narzędzia: Analiza danych i wybrane zastosowania*, S. Kozielski, Ed., vol. 2, pp. 301–308. WKL, Warszawa, 2005.
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## Professional Activities

### Research Projects

- 2018–2020 Deep Evolvable Support Vector Machine Architectures (DEEVA-SVM), *Principal Investigator*, Polish National Science Centre Grant
- 2017–2018 Satellite Image Spatial Resolution Enhancement (SISPARE), *Principal Investigator*, European Space Agency (Task Force PL-ESA)
- 2016–2019 Enhancing the diagnostic efficiency of dynamic contrast-enhanced imaging in personalised oncology by extracting new and improved biomarkers (ECONIB), *Researcher*, Polish National Centre for Research and Development Grant
- 2013–2017 Detection and Recognition of Nonverbal Indicators of Deception, *Researcher*, Polish National Science Centre Grant
- 2013–2015 Evolutionary methods for support vector machines training set optimization, *Principal Investigator*, Iuventus Plus Grant, IP2012 026372
- 2012–2014 Hand detection and pose estimation for creating human-computer interaction, *Principal Investigator*, Iuventus Plus Grant, IP2011 023071
- 2009–2011 Image and video sequences colorization system, *Researcher*, Polish Ministry of Science and Higher Education Grant no. N N516 374736

### Journal Reviews

- 1) Ain Shams Engineering Journal
- 2) Computer Methods and Programs in Biomedicine
- 3) Computer Vision and Image Understanding
- 4) EURASIP Journal on Advances in Signal Processing
- 5) IEEE Transactions on Image Processing
- 6) IEEE Transactions on Multimedia
- 7) IET Image Processing
- 8) Information Sciences
- 9) International Journal of Image Processing
- 10) International Journal of Pattern Recognition and Artificial Intelligence
- 11) Foundations of Computing and Decision Sciences



- 12) Journal of Electronic Imaging
- 13) Journal of Real-Time Image Processing
- 14) Journal of Visual Communication and Image Representation
- 15) KSII Transactions on Internet and Information Systems
- 16) Mathematical Methods in the Applied Sciences
- 17) Multimedia Tools and Applications
- 18) Neurocomputing
- 19) Optica Applicata
- 20) Optical Engineering
- 21) Pattern Recognition
- 22) Pattern Recognition Letters
- 23) Signal Processing
- 24) Textile Research Journal
- 25) Theoretical and Applied Informatics
- 26) Visual Computer

#### Conference Reviews

- 1) International Conference on Image Analysis and Processing (ICIAP 2017)
- 2) Beyond Databases Architectures and Structures (BDAS), since 2008
- 3) 2016 IEEE International Conference on Image Processing (ICIP), since 2009
- 4) International Conference on Man-Machine Interactions (ICMMI), 2013, 2015
- 5) 18th International Conference on Knowledge-Based and Intelligent Information & Engineering Systems (KES 2014)
- 6) 8th International Conference on Computer Recognition Systems (CORES 2013)
- 7) The IEEE International Symposium on Multimedia (ISM 2012)
- 8) The 17th Online World Conference on Soft Computing in Industrial Applications (WSC17)
- 9) International Conference on Bio-inspired Systems and Signal Processing (Biosignals 2012)
- 10) 3rd Workshop on Soft Computing in Image Processing and Computer Vision (SCIPCV 2011)
- 11) IADIS Multi Conference on Computer Science and Information Systems 2010
- 12) European Signal Processing Conference (EUSIPCO), 2008, 2009, 2011

#### Program Committee Membership

- 1) 2014 IEEE International Conference on Image Processing (ICIP 2014)
- 2) Second IEEE International Ph.D. Workshop on Multimedia Computing Research 2013
- 3) IADIS Multi Conference on Computer Science and Information Systems 2010
- 4) 6th International Symposium on Visual Computing (ISVC10)

## — Research Interests

Face and Gesture Recognition, Image Processing, Pattern Recognition, Medical Imaging