Jan Kybic

prof. Dr. Ing.

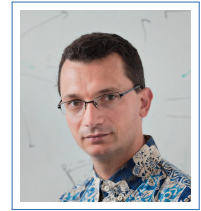*Faculty of Electrical Engineering*
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male, born January 18, 1974

Academic appointments

since 2018	**Head of the Medical electronics and bioinformatics master study programme**, *Faculty of Electrical Engineering (FEE)*, Czech Technical University in Prague (CTU)
since 2018	**Head of the Bioengineering PhD study programme**, *FEE*, CTU
since 2015	**Member of the Scientific Council**, *FEE*, CTU
since 2022	**Member of the Scientific Council**, Charles University
since 2019	**Member of the Scientific Council**, *Faculty of Informatics*, Masaryk University
since 2015	**Professor (prof.)**, *FEE*, CTU
2019–2022	**Member of the faculty Academic Senate**, *FEE*, CTU
2017–2022	**Member of the university Academic Senate**, *CTU*
2013–2017	**Head of the Department of Cybernetics**, *FEE*, CTU
2011–2013	**Vice-dean for information technology**, *FEE*, CTU
since 2011	**Associate professor (doc.)**, *FEE*, CTU
since 2003	**Senior researcher**, *Department of Cybernetics, FEE*, CTU leading a small research group
2001–2003	**Post-doc**, *INRIA*, Sophia-Antipolis, France, with Olivier Faugeras working on inverse problems in MEG and EEG

Education

1998–2001	**PhD**, *EPFL*, Lausanne, Switzerland, with Michael Unser thesis *Elastic Image Registration using Parametric Deformation Models*
1994–1998	**Master *(Ing.)***, *FEE*, CTU thesis *Kalman Filtering and Speech Enhancement*
1994–1996	**Bachelor *(Bc.)***, *FEE*, CTU thesis *Programming Contest Scoring System*

Research and scientific achievements

Research interests	Biomedical image processing algorithms, image registration, image segmentation, computer vision, numerical mathematics, inverse problems, signal processing, algorithms.
Publications	Authored or coauthored 37 international journal articles, 3 Czech journal articles, 102 international peer-reviewed conference publications, 1 book
Citations	2241 (Web of Knowledge (WoS), without autocitations), 5143 (Google Scholar)
h-index	20 (WoS), 23 (Scopus), 31 (Google Scholar)

Professional activities

2019–2021	Member of IEEE BISP Technical Committee
2016	General Co-Chair of the IEEE International Symposium on Biomedical Imaging (ISBI) conference.
2013–2021	Evaluation committee member (P202) of the Czech Science Foundation (GAČR).
2008–2014	Associate Editor for IEEE Transactions on Medical Imaging
2004	Co-chair of the CVAMIA workshop at the ECCV conference in 2004, Prague.
Reviewer (journals)	IEEE Transactions on Medical Imaging, IEEE Transactions on Image Processing, IEEE Transactions on Biomedical Engineering, Medical Image Analysis, IEEE Transactions on Pattern Analysis and Machine Intelligence, Journal of Matematical Imaging and Vision, Physics in Medicine and Biology, and others.
Reviewer (conferences)	Information Processing in Medical Imaging (IPMI), International Symposium on Biomedical Imaging (ISBI), Medical Image Computing and Computer Assisted Intervention (MICCAI), International Conference on Image Processing (ICIP), Asian Conference on Computer Vision (ACCV), International Conference on Pattern Recognition (ICPR), International Eurasip Conference Biosignal, European Medical & Biological Engineering Conference (EMBEC), and others.
Reviewer (PhD)	M. J. Ledesma-Carbayo (UPM, Spain), I. Arganda-Carreras (UPM, Spain), R. Jiřík (VUT Brno), D. Svoboda (MÚ Brno), J. Hubený (MÚ Brno), M. Maška (MÚ Brno), O. Daněk (MÚ Brno), L. Fernandez (UPM, Spain), Bo Xiang (ECP, France), V. Delmont (INSA, France), J. Odstrčilík (VUT Brno), C. Cano (U. Alicante, Spain), F. Alfano (UPM, Spain)
Memberships	IEEE (Senior Member), Czech TeX users group.

Scientific visits

2019	**Chinese University of Hong Kong**, 1 week
2015	**University of Oulu**, 1 week
2010–2011	**CVLAB, EPFL**, *Lausanne, Switzerland*, 1 year visiting researcher, sabbatical leave
2010	**TECNUN, CIMA, University of Navarra**, *San Sebastian, Spain*, 1 week summer school lecturer
2006	**CREATIS, INSA**, *Lyon, France*, 1 month
2006	**INRIA**, *Sophia-Antipolis, France*, 2 weeks
2005	**CREATIS, INSA**, *Lyon, France*, 1 month
2004	**CEMRACS**, *Marseille, France*, 2 weeks

Advising

Post-docs
Sumit Kaushik (2019–2022), Miroslav Hekrdla (2019–2022), Jan Hering (2016–2022), Thomas Dietenbeck (2013), Jan Švihlík (2013), François Varray (2012), Francisco Martínez (2014), Rodrigo Nava (2014)

PhD students (former)
Guorong Yu (2020,visited), Jiří Borovec (2019), Miguel Amável Pinheiro (2017), Juan David García-Arteaga (2013), Marián Uherčík (2011, co-advised), Jef Vandemeule-broucke (2010, co-advised), Martin Barva (2007, co-advised), Jan Petr (2007, co-advised), Martin Dolejší, Jakub Krátký

PhD students (current)
Denis Baručić

Other students
Supervised 20 master and 10 bachelor theses (successfully defended) and 20 other short term student projects, including foreign students.

Teaching

Courses at FEE CTU

from 2016
Algorithms and Programming (B3B33ALP) — lectures

since 2005
Medical Imaging (33ZSL2, X33ZS2, A6M33ZSL) — main lecturer

since 2020
Medical Image Processing (BAM33ZMO) — lectures

since 2021
Reading group (XP33RG2) — coordinator

2014
Optimization — exercises

2005–2014
Medical Image Processing (33ZSL1, X33ZS1, A6M33ZMO) — main lecturer

2003–2008
Digital Image Processing (33DZO) — lectures and exercise classes, with J. Matas

Others

2016
Numerical optimization course, *Oulu University, Finland*, 3 days

2014
Summer school of mathematical biology, *Masaryk University, Brno, Czech Republic*, one day, image segmentation

2011,2020
Advanced methods on biomedical image analysis, *Masaryk University, Brno, Czech Republic*, one day, image registration

2010
Intensive master course, *TECNUN, CIMA, University of Navarra, Spain*, one week, image registration

2006–2009
Microscopy methods in biomedicine, *Institue of Molecular Genetics, Academy of Sciences of the Czech Republic*, one lecture per year, image segmentation

Funding

Standard Czech and European grants

2020-2022
Towards AbloCAM: fundamental approaches to automated ablation-desorption imprinting of focused X-ray laser beams., *Czech Science Foundation*, 20-08452S
co-investigator

2019–2023
Evaluation of stability of atherosclerotic plaque in carotids using digital image analysis of ultrasound images, *Czech Health Research Council*, NV19-08-00362
co-investigator

2017–2019	**Learning local concepts from global training data for biomedical image segmentation and classification**, *Czech Science Foundation (GAČR)*, 17-15361S principal investigator
2014–2016	**Automatic analysis of spatial gene expression patterns**, *Czech Science Foundation (GAČR)*, 14-21421S principal investigator, 7.1 mil Kč
2011–2014	**Automatic analysis of light and electron microscopy neuronal data**, *Czech Science Foundation (GAČR)*, P202/11/0111 principal investigator, 4.5 mil Kč
2006–2010	**Wide Area Research Training in Health Engineering**, *EU FP6 Marie Curie Early Stage Training*, MEST-CT-2005-021024 co-supervising 2 PhD students
2007–2010	**Methods for Visual Recognition of Large Collections of Non-rigid Objects**, *Czech Science Foundation (GAČR)*, 102/07/1317 team member
2004-2007	**Artificial Intelligence Methods in Diagnostics from Medical Images**, *Grant Agency of the Czech Academy of Sciences*, 1ET101050403 principal co-investigator, 1.6 mil Kč
2005–2007	**Detection of Lung Noduli from CT Images**, *Grant Agency of the Czech Ministry of Health*, NR8314-3/2005 principal co-investigator, 400 tis.Kč

Bilateral collaboration

2005–2006	**Multimodal brain imaging**, *Program Barrande, French-Czech collaboration*, 2-06-34 principal co-investigator
2005–2007	**Localization of surgical tools**, *Program Barrande, French-Czech collaboration*, 2005-06-007-1 principal co-investigator

Large scale grants

2018–2023	**Research Center for Informatics**, *Czech Ministry of Education*, 16_019/0000765-01 workpackage leader
2005–2009	**Transdisciplinary Biomedical Engineering Research II**, *Czech Ministry of Education*, MSM6840770012 team member
2005–2009	**Centre for Applied Cybernetics**, *Czech Ministry of Education*, 1M0567 team member
1999-2004	**Transdisciplinary Biomedical Engineering Research**, *Czech Ministry of Education*, MSM210000012 team member

Industrial collaborations

2011–2012	**Elastic image registration for digital pathology**, *industrial collaboration with Flagship Bioscience LLC, U.S.A.*
2004–2006	**Cervical image registration.**, *industrial collaboration with STI Medical Systems, Hawaii, U.S.A.*

| 2003–2004 | **Automatic satellite image registration**, *industrial collaboration with INTA, Spain* |

CTU internal grants

| 2012–2014 | **Registration, segmentation, detection and classification algorithms for biomedical image processing.**, *Czech Technical University in Prague*, SGS12/190/OHK3/3T/13 |

Languages

Native speaker	Czech
Proficient user	English, French, Spanish
Independent user	German, Italian
Basic user	Russian, Portuguese

Miscellaneous

Competitions	Silver medal at the International Olympiad in Informatics in Bonn in 1992. Member of the CTU team in ACM Programming Contest in Zürich in 1995 and 1996 (second place), world finals in San Jose, California, 1997. Organized the Contest at CTU since 1996.
Hobbies	Music (piano,saxophone), photography, travelling, literature, cinema, hiking, biking, volleyball, skiing, sailing (yachtmaster license), remote controlled aircraft models, electronics, do-it-yourself stuff. I used to be a youth group leader (KČT).
Family	Married, two daughters.

Experience abroad (before PhD)

1997–1998	Stay at CIRC/LANOS, EPFL, Switzerland, prof. Hasler, 6 months.
1997	Stay at Budapest Technical University sponsored by CEEPUS (fuzzy interpolation), Prof. Koczy
1996	Global Development Program, organized by Milwaukee School of Engineering and Allen-Bradley, in Milwaukee, Wisconsin.
1995	Technology and financing course by Institut français du petrol, Paris.
1993	CTU delegate at *Youth International Science Forum* in London, invited speaker in 1995.

Work experience (before PhD)

1997	System administrator for Gide-Loyrette-Noel, Prague.
1997	Windows programmer for SIDAT, Prague, on a contract for Siemens, Erlangen.
summer 1995	Software development and system administration , Digitron, AB, in Aarau, Switzerland, organized by IAESTE.
summer 1994	Developing videophone applications at Helsinki University of Technology, Finland, organized by IAESTE
summer 1992	Software development for Continental Microwave Technology, Ltd., England.

Journal publications

[1] M. Černý, J. Kybic, M. Májovský, V. Sedlák, K. Prigl, E. Misiorzová, R. Lipina, and D. Netuka, "Fully automated pipeline for pituitary adenoma segmentation: A convolutional neural network-based model on sparsely annotated MRI," *Neurosurgical Review*, 2023, accepted.

[2] J. Chalupský, V. Vozda, J. Hering, J. Kybic, T. Burian, S. Dziarzhytski, K. Frantálová, V. Hájková, Š Jelínek, L. Juha, B. Keitel, Z. Kuglerová, M. Kuhlmann, B. Petryshak, M. Ruiz-Lopez, L. Vyšín, T. Wodzinski, and E. Plönjes, "Deep learning for laser beam imprinting," *Optics Express*, 2023.

[3] D. Baručić, S. Kaushik, J. Kybic, J. Stanková, P. Džubák, and M. Hajdúch, "Characterization of drug effects on cell cultures from phase-contrast microscopy images," *Computers in Medicine and Biology*, 2022.

[4] S. Kaushik, B. Majtan, R. Holaj, D. Baručić, B. Kološová, J. Widimský, and J. Kybic, "The effect of primary hyperaldosteronism on carotid artery texture in ultrasound images," *Diagnostics*, vol. 12, no. 12, 2022.

[5] J. Borovec, Kybic J., I. Arganda-Carreras, D. V. Sorokin, G. Bueno, A. V. Khvostikov, S. Bakas, E. I. Chang, S. Heldmann, K. Kartasalo, L. Latonen, J. Lotz, M. Noga, S. Pati, K. Punithakumar, P. Ruusuvuori, A. Skalski, N. Tahmasebi, M. Valkonen, L. Venet, Y. Wang, N. Weiss, M. Wodzinski, Y. Xiang, Y. Xu, Y. Yan, P. Yushkevic, S. Zhao, and A. Muñoz-Barrutia, "ANHIR: Automatic non-rigid histological image registration challenge," *IEEE Transactions on Medical Imaging*, , no. 10, pp. 3042–3052, Oct. 2020.

[6] J. Dvořák, J. Švihlík, J. Kybic, B. Radochová, J. Janáček, J. Kukal, J. Borovec, and D. Habart, "Volume estimation from single images: an application to pancreatic islets," *Image Analysis & Stereology*, vol. 37, no. 3, pp. 191–204, 2018.

[7] P. Glowacki, M. A. Pinheiro, A. Mosinska, E. Türetken, D. Lebrecht, R. Sznitman, A. Holtmaat, J. Kybic, and P. Fua, "Reconstructing evolving tree structures in time lapse sequences by enforcing time-consistency," *Trans. Pattern Analysis Machine Intelligence*, vol. 40, no. 3, pp. 755–761, Mar. 2018.

[8] J. Olveres, R. Nava, B. Escalante-Ramirez, E. Vallejo, and J. Kybic, "Left ventricle hermite-based segmentation," *Computers in Biology and Medicine*, vol. 87, pp. 236–249, 2017.

[9] David Habart, Jan Švihlík, Jan Schier, Cahová Monika, Peter Girman, Klára Zacharovová, Zuzana Berková, Jan Kříž, Eva Fabryová, Lucie Kosinová, Zuzana Papáčková, Jan Kybic, and František Saudek, "Automated analysis of microscopic images of isolated pancreatic islets," *Cell Transplantation*, , no. 12, pp. 2145–2156, Dec. 2016.

[10] F. Martínez, J. Kybic, L. Lambert, and Z. Mecková, "Fully-automated classification of bone marrow infiltration in low-dose CT of patients with multiple myeloma based on probabilistic density model and supervised learning," *Computers in Biology and Medicine*, vol. 71, pp. 57–66, Apr. 2016.

[11] Eduard Serradell, Miguel Amável Pinheiro, Raphael Sznitman, Jan Kybic, Francesc Moreno-Noguer, and Pascal Fua, "Non-rigid graph registration using active testing search," *IEEE Transactions on Pattern Analysis and Machine Intelligence*, vol. 37, no. 3, pp. 625–638, Mar. 2015.

[12] L. Fernandez-de Manuel, G. Wollny, J. Kybic, Daniel Jimenez-Carretero, Jose M. Tellado, E. Ramon, M. Desco, A. Santos, J. Pascau, and M. Ledesma-Carbayo, "Organ-focused mutual information for nonrigid multimodal registration of liver CT and Gd-EOB-DTPA-enhanced MRI," *Medical Image Analysis*, vol. 18, no. 1, pp. 22–35, Jan. 2014.

[13] Marian Uhercik, Jan Kybic, Yue Zhao, Christian Cachard, and Herve Liebgott, "Line filtering for surgical tool localization in 3D ultrasound images," *Computers in Biology and Medicine*, vol. 43, no. 12, pp. 2036–2045, Dec. 2013.

[14] J. Vandemeulebroucke, O. Bernard, S. Rit, J. Kybic, P. Clarysse, and D. Sarrut, "Automated segmentation of a motion mask to preserve sliding motion in deformable registration of thoracic CT," *Medical Physics*, vol. 39, no. 2, pp. 1006–1015, 2012.

[15] Jan Kybic and Ivan Vnučko, "Approximate all nearest neighbor search for high dimensional entropy estimation for image registration," *Signal Processing*, vol. 92, no. 5, pp. 1302–1316, 2012.

[16] Juan David García-Arteaga, Jan Kybic, and Wenjing Li, "Automatic colposcopy video tissue classification using higher order entropy based registration," *Computers in Biology and Medicine*, vol. 41, no. 10, pp. 960–970, Oct. 2011.

[17] Jan Kybic and Claudia Nieuwenhuis, "Bootstrap optical flow confidence and uncertainty measure," *Computer Vision and Image Understanding*, vol. 115, no. 10, pp. 1449–1462, June 2011.

[18] J. Vandemeulebroucke, S. Rit, J. Kybic, P. Clarysse, and D. Sarrut, "Spatio-temporal motion estimation for respiratory-correlated imaging of the lungs," *Medical Physics*, vol. 38, no. 1, pp. 166–178, 2011.

[19] I. Arganda-Carreras, C. O. S. Sorzano, P. Thévenaz, A. Muñoz-Barrutia, J. Kybic, R. Marabini, J. M. Carazo, and C. Ortiz-de Solorzano, "Non-rigid consistent registration of 2D image sequences," *Physics in Medicine and Biology*, vol. 55, no. 20, pp. 6215–6242, Sept. 2010.

[20] Marián Uherčík, Jan Kybic, Hervé Liebgott, and Christian Cachard, "Model fitting using RANSAC for surgical tool localization in 3-D ultrasound images," *IEEE Transactions on Biomedical Engineering*, vol. 57, no. 8, pp. 1907–1916, Aug. 2010.

[21] Jan Kybic, "Bootstrap resampling for image registration uncertainty estimation without ground truth," *IEEE Trans. Image Processing*, vol. 19, no. 1, pp. 64–73, Jan. 2010.

[22] Martin Barva, Marián Uherčík, Jean-Martial Mari, Jan Kybic, Jean-René Duhamel, Hervé Liebgott, Václav Hlaváč, and Christian Cachard, "Parallel integral projection transform for straight electrode localization in 3-d ultrasound images," *IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control (UFFC)*, vol. 55, no. 7, pp. 1559–1569, July 2008.

[23] Elisabeth Brusseau, Jan Kybic, Jean-François Déprez, and Olivier Basset, "2-D locally regularized tissue strain estimation from radio-frequency ultrasound images: Theoretical developments and results on experimental data," *IEEE Transactions on Medical Imaging*, vol. 27, no. 2, pp. 145–160, Feb. 2008.

[24] Maureen Clerc and Jan Kybic, "Cortical mapping by Laplace-Cauchy transmission using a boundary element method.," *Journal on Inverse Problems*, vol. 23, pp. 2589–2601, Nov. 2007.

[25] Jan Petr, Jan Kybic, Michael Bock, Sven Müller, and Václav Hlaváč, "Parallel image reconstruction using B-spline approximation (PROBER)," *Magnetic Resonance in Medicine*, vol. 58, no. 9, pp. 582–591, September 2007.

[26] Jan Kybic, Maureen Clerc, Olivier Faugeras, Renaud Keriven, and Théo Papadopoulo, "Generalized head models for MEG/EEG: BEM beyond nested volumes," *Physics in Medicine and Biology*, vol. 51, no. 5, pp. 1333–1346, Feb. 2006, doi:10.1088/0031-9155/51/5/021.

[27] Jan Kybic, Maureen Clerc, Olivier Faugeras, Renaud Keriven, and Théo Papadopoulo, "Fast multipole acceleration of the MEG/EEG boundary element method," *Physics in Medicine and Biology*, vol. 50, no. 19, pp. 4695–4710, October 2005.

[28] Olivier Faugeras, Geoffray Adde, Guillaume Charpiat, Christophe Chefd'Hotel, Maureen Clerc, Thomas Deneux, Rachide Deriche, Gerardo Hermosillo, Renaud Keriven, Pierre Kornprobst, Jan Kybic, Christophe Lenglet, Lucero Lopez-Perez, Théo Papadopoulo, Jean-Philippe Pons, Florent Segonne, Bertrand Thirion, David Tschumperle, Thierry Vieville, and Nicolas Wotawa, "Variational, geometric, and statistical methods for modeling brain anatomy and function," *Neuroimage*, vol. 23S1, pp. S46–S55, 2004, Special issue: Mathematics in Brain Imaging.

[29] Jan Kybic, Maureen Clerc, Touffic Abboud, Olivier Faugeras, Renaud Keriven, and Théo Papadopoulo, "A common formalism for the integral formulations of the forward EEG problem," *IEEE Transactions on Medical Imaging*, vol. 24, no. 1, pp. 12–28, Jan. 2005.

[30] María Jesús Ledesma-Carbayo, Jan Kybic, Manuel Desco, Andrés Santos, Michael Sühling, Patrick Hunziker, and Michael Unser, "Spatio-temporal non-rigid registration for ultrasound cardiac motion estimation," *IEEE Transactions on Medical Imaging*, vol. 24, no. 9, pp. 1113–1126, Sept. 2005.

[31] Jan Kybic and Michael Unser, "Fast parametric elastic image registration," *IEEE Transactions on Image Processing*, vol. 12, no. 11, pp. 1427–1442, November 2003.

[32] Jan Kybic, Thierry Blu, and Michael Unser, "Generalized sampling: A variational approach. Part I — Theory," *IEEE Transactions on Signal Processing*, vol. 50, no. 8, pp. 1965–1976, August 2002.

[33] Jan Kybic, Thierry Blu, and Michael Unser, "Generalized sampling: A variational approach. Part II — Applications," *IEEE Transactions on Signal Processing*, vol. 50, no. 8, pp. 1977–1985, August 2002.

[34] Jan Kybic, Philippe Thévenaz, Arto Nirkko, and Michael Unser, "Unwarping of unidirectionally distorted EPI images," *IEEE Transactions on Medical Imaging*, vol. 19, no. 2, pp. 80–93, February 2000.

For a complete set of publications and additional details, please see `http://cmp.felk.cvut.cz/~kybic`.