Bilge Karaçalı, PhD

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Work History

- **2008- İzmir Institute of Technology, İzmir**

  Professor, Electrical and Electronics Engineering Department

  Biomedical Information Processing Laboratory

- **2005-2007 Drexel University, Philadelphia, Pennsylvania**

  Research assistant professor, School of Biomedical Engineering, Science and Health Systems

  Assistant director of bioimaging, Center for Integrated Bioinformatics

- **2002-2005 University of Pennsylvania, Philadelphia, Pennsylvania**

  Postdoctoral research fellow, Department of Radiology, Section of Biomedical Image Analysis

Education

- **North Carolina State University, Raleigh, North Carolina**

  PhD in electrical engineering with a minor in mathematics, December 2002

  MS in electrical engineering, December 1999

- **Bilkent University, Ankara**

  BS in electrical and electronics engineering, June 1997

Teaching

- **İzmir Institute of Technology, İzmir**

  EE101 Introduction to Electrical Engineering (freshman) (Fall, 2008-09, 2009-10)

  EE333 Fundamentals of Probability and Random Processes (junior)

  EE430 Introduction to Systems Biology (senior)

  EE434 Biomedical Signal Processing (senior)

  EE436 Mathematical Foundations of Signal Processing and Control (senior)

  EE549 Biomedical Image Analysis (graduate)

  EE550 Computational Biology (graduate)

- **Drexel University, Philadelphia, Pennsylvania**

  Medical Image Analysis, GPBA Summer Institute, 2006

- **University of Pennsylvania, Philadelphia, Pennsylvania**

  Medical Image Analysis, guest lecturer in Nuclear Medicine, 2004 and 2005

Research

- **Biomedical Information Processing**

  Automatic protein classification

  Computational analysis of genetic sequences

  Molecular phylogeny algorithms

  Biomedical image analysis

  Electroencephalography signal analysis

  Quantitative methods in biomedical data analysis

- **Statistical Learning**

  Statistical learning theory

  Quasi-supervised learning

  Approximation, classification, and detection

  Automatic target recognition and tracking

- **Computer Vision**

  Surface reconstruction, shape-from-shading, photometric stereo

  Multispectral and hyperspectral vision

  Remote sensing

- **Mathematical Methods**

  Vector space methods

  Independent component analysis

  Multivariate ranks

  Wavelets and multiscale analysis

  Extreme value theory

Projects

- *Modeling/Estimating Tissue Deformations in Tumor Patients*, NIH Project, R01-NS042645-04, **postdoctoral fellow**, 2002-2005
- *2+2+2 Workforce Education in Biotechnology and Bioinformatics*, PA DCED Project, **project coordinator**, 2005
- *Elastic Alignment of Multimodality Medical Images using Information Theoretic Point Similarity Measures*, TÜBİTAK, 108E249, **project investigator**, 2009 (completed)
- *Hierarchical Motif Vectors for Protein Alignment and Functional Classification*, European Research Counsel FP7, PIRG-GA-2008-230903, **project coordinator**, 2009 (completed)

Awards

- **1992** Ranked 40th nationwide in University Entrance Examination
- **1997** Ranked 1st nationwide in Graduate Education Examination
- **2007** 2nd prize, GPBA Spring Retreat Poster Competition, general category

Publications

- **Journal articles**

  Karaçalı, B., "An Efficient Algorithm for Large-Scale Quasi-Supervised Learning," Pattern Analysis and Applications, in press

  Bozkurt, B., Karaçalı, B., "A computational analysis of Turkish makam music based on a probabilistic characterization of segmented phrases," Journal of Mathematics and Music, in press

  Bozkurt, B., Karaosmanoğlu, M. K., Karaçalı, B., Ünal, E., "Usul and Makam driven automatic melodic segmentation for Turkish music," Journal of New Music Research, in press

  James C Costello, J. C., L. M., et al., "A community effort to assess and improve drug sensitivity prediction algorithms," Nature Biotechnology, (2014) DOI: 10.1038/nbt.2877 (contributing author as a team member)

  Doğan, T., Karaçalı, B., "Automatic Identification of Highly Conserved Family Regions and Relationships in Genome Wide Datasets Including Remote Protein Sequences," PLoS ONE 8(9), e75458 (2013).

  Önder, D., Sarıoğlu, S., Karaçalı, B., "Automated labelling of cancer textures in colorectal histopathology slides using quasi-supervised learning," Micron, 47, 33–42 (2013).

  Karaçalı, B., "Hierarchical motif vectors for prediction of functional sites in amino acid sequences using quasi-supervised learning," IEEE/ACM Transactions on Computational Biology and Bioinformatics, 9(5), 1432-1441 (2012).

  Karaçalı, B., "Quasi-supervised learning for biomedical data analysis," Pattern Recognition, 43(10), 3674-3682 (2010).

  Gormley, M., Dampier, W., Ertel, A., Karaçalı, B., Tözeren, A., "Prediction potential of candidate biomarker sets identified and validated on gene expression data from multiple datasets," BMC Bioinformatics, 8(415) (2007).

  Karaçalı, B., Vamvakidou, A.P., Tözeren, A., "Automated recognition of cell phenotypes in histology images based on membrane- and nuclei-targeting biomarkers," BMC Medical Imaging, 7(7) (2007).

  Karaçalı, B., Tözeren, A., "Automated detection of regions of interest for tissue microarray experiments: an image texture analysis," BMC Medical Imaging, 7(2) (2007).

  Karaçalı, B., "Information theoretic deformable registration using local image information," International Journal of Computer Vision, (72)3, 219-237 (2007).

  Xue, Z., Shen, D., Karaçalı, B., Stern, J., Rottenberg D., Davatzikos, C., "Simulating Deformations of MR Brain Images for Validation of Atlas-based Segmentation and Registration Algorithms", NeuroImage, 33, 855-866 (2006).

  Karaçalı, B., Davatzikos, C., "Simulation of tissue atrophy using a topology preserving transformation model," IEEE Transactions on Medical Imaging, 25(5), 649-652 (2006).

  Karaçalı, B., Davatzikos, C., "Estimating topology preserving and smooth displacement fields," IEEE Transactions on Medical Imaging, 23(7), 868-880 (2004).

  Karaçalı, B., Snyder, W., "Noise reduction in surface reconstruction from a given gradient field," International Journal of Computer Vision, 60(1), 25-44 (2004).

  Lao, Z., Shen, D., Karaçalı, B., Resnick, S. M., Davatzikos, C., "Morphological classification of brains via high dimensional shape transformations and machine learning methods," NeuroImage, 21(1), 46-57 (2003).

Karaçalı, B., Ramanath, R., Snyder, W., "A comparative analysis of structural risk minimization by support vector machines and nearest neighbor rule," Pattern Recognition Letters, 25(1), 63-71 (2004).

Karaçalı, B., Snyder, W., "Reconstructing discontinuous surfaces from a given gradient field using partial integrability," Computer Vision and Image Understanding, 92(1), 78-111 (2003).

Karaçalı, B., Krim, H., "Fast minimization of structural risk by nearest neighbor method," IEEE Trans. on Neural Networks, 14(1), 127-137 (2003).

- **Conference proceedings**

Karaçalı, B., "Improved Quasi-supervised Learning using Expectation-Maximization," SİU 2013.

Köktürk, B., Karaçalı, B., "Yüksek Çözünürlüklü Histoloji Görüntülerinde Yarıgüdümlü Öğrenme ile Otomatik Olarak Hücresel Bazda Kanser Teşhisi," SİU 2013.

Doğan, T., Karaçalı, B., "2-D Thresholding of the Connectivity Map Following the Multiple Sequence Alignments of Diverse Datasets," Proceedings of the 10th IASTED International Conference on Biomedical Engineering, Innsbruck, 2013.

Karaçalı, B., "Analytical and Predictive Quasi-Supervised Learning for Cancer Recognition in Digital Cytology," SIU 2012.

Köktürk, B., Karaçalı, B., "Automated Labeling of Electroencephalography Data Using Quasi-supervised Learning," SIU 2012.

Karaçalı, B., "Hierarchical Motif Vectors for Amino Acid Sequence Alignment," Proceedings of the 9th IASTED International Conference on Biomedical Engineering, Innsbruck, 2012.

Karaçalı, B., "Identification and Evaluation of Landmarks For Deformable Alignment of Multi-Modality Medical Images," SIU 2011.

Karaçalı, B., "Deformation Field Interpolation Using Rotational Landmarks," BIYOMUT 2010

Önder, D., Karaçalı, B., "Automated Classification of Cancerous Textures in Histology Images Using Quasi-supervised Learning Algorithm," BIYOMUT 2010

Doğan, T., Karaçalı, B., "Evolutionary Relationships Between Gene Sequences via Nonlinear Embedding," BIYOMUT 2010

Önder, D., Karaçalı, B., "Automated clustering of histology slide texture using co-occurrence based grayscale image features and manifold learning," BIYOMUT 2009

Makrogiannis, S., Verma, R., Karaçalı, B., Davatzikos, C., "A joint transformation and residual image descriptor for morphometric image analysis using an equivalence class formulation," Proceedings of the 2006 Conference on Computer Vision and Pattern Recognition Workshop (CVPRW'06), New York, 74-81, IEEE Publications, Piscataway 2006.

Lao, Z., Shen, D., Jawad, A., Karaçalı, B., Liu, D., Melhem, E., Bryan, N., Davatzikos, C., "Automated Segmentation of White Matter Lesions in 3D Brain MRImages, using Multivariate Pattern Classification," Proc. 3rd IEEE International Symposium on Biomedical Imaging: From Nano to Macro, Arlington, 307-310, IEEE Publications, Piscataway 2006.

Xue, Z., Shen, D., Karaçalı, B., Davatzikos, C., "Statistical representation and simulation of high-dimensional deformations: Application to synthesizing brain deformations," Proc. MICCAI 2005, Palm Springs, J. Duncan and G. Gerig (Eds.), LNCS, Vol. 3750, 500-508, Springer, Berlin, 2005.

Karaçalı, B., “Fully elastic multi-modality image registration using mutual information,” Proc. 2nd IEEE International Symposium on Biomedical Imaging, Arlington, 1455-1458, IEEE Publications, Piscataway, 2004.

Davatzikos, C., Shen, D., Lao, Z., Xue, Z., Karaçalı, B., “Morphological classification of medical images using nonlinear support vector machines”, Proc. 2nd IEEE International Symposium on Biomedical Imaging (invited paper), Arlington, 587-590, IEEE Publications, Piscataway, 2004.

Karaçalı, B., Davatzikos, C., “Topology preservation and regularity in estimated deformation fields,” Proc. 18th Information Processing in Medical Imaging, Lecture Notes in Computer Science, Vol. 2732, Ambleside, 426-437, Springer, Berlin, 2003.

Karaçalı, B., Snyder, W., “Partial integrability in surface reconstruction from a given gradient field,” Proc. 9th International Conference on Image Processing, Rochester, Vol. 2, 525-528, IEEE Publications, Piscataway, 2002.

Karaçalı, B., Snyder, W., “Automatic target detection using multispectral imaging,” Proc. 31st Applied Image Pattern Recognition Workshop, Washington D.C., 55-59, IEEE Publications, Piscataway, 2002.

Karaçalı, B., Krim, H.,, Schick, I. C., “Wavelet-based methods in Global Positioning System signal tracking,” Proc. SPIE, Orlando, Vol. 4056, 127-136, SPIE Publications, Bellingham, 2000.