BehzadBozorgtabar

Research Scientist – Machine Learning & Medical Imaging & Computer Vision|Patents Expert

date

4th of November, 2020

personal details

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languages

English (Fluent)
Persian(Mothertongue)

marital status

Single (no children)

programming

Python
Java, C++
MATLAB
HTML5

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summary

I am a senior scientist at the Centre for Biomedical Imaging (CIBM), with a main affiliation with the Signal Processing Lab (LTS5) of the Swiss Federal Institute of Technology (EPFL), Lausanne, Switzerland. I am also affiliated with the Lausanne University Hospital (CHUV), Department of Radiology. At the CIBM and EPFL-LTS5, I am the leader of machine learning (ML) for medical imaging group. I have been actively involved in Horizon 2020 project in the field of Advanced Driver Assistance Services and in writing grants. My previous role as a postdoctoral Researcher at IBM has seen me lead developments of novel deep learning based methods in medical image analysis leading to peer-reviewed scientific articles and patents.

Throughout my career at EPFL and IBM, I have had the opportunity to mentor and advise a number of talented students at Ph.D., masters, and undergraduate levels. I have taught a number of master's courses at EPFL. I regard it as a privilege to inspire students through their zeal for life-long learning. I have more than 50 research articles to my credit which are published in highly reputed journals and conferences. I have also been a peer reviewer for several conferences, journals and transactions published in IEEE and Elsevier.

expertise and area of interests

- **Machine Learning** (self-supervised learning, domain adaptation, generative adversarial networks, meta-learning)
- **Medical Imaging** (anomaly detection, semantic segmentation, disease classification, predictive models, survival analysis)
- **Computer Vision** (object tracking, multi-target tracking, action recognition, event detection, superresolution, 3D vision, depth and ego-motion estimation)
- **Affective Computing** (video-based, real-time facial expression recognition)
- **Natural Language Processing** (transformers)

My research interests lie in the general area of machine learning, medical imaging and computer vision, particularly in deep representation learning, as well as their applications in **domain adaptation** and **self-supervised learning**, which I consider as major avenues for innovation and impact in medical image analysis.

The ultimate goal of my research is to develop robust deep image representations that capture and understand the world as well as our human eye and mind do. Those representations will form the basic building block of downstream tasks in medical image analysis and many other applications.

academic qualifications

since 2019 **Senior Scientist** The Centre for Biomedical Imaging (CIBM), with main affiliations with the Signal Processing Lab (LTS5) of the École polytechnique fédérale de Lausanne (EPFL) and the Lausanne University Hospital (CHUV), Department of Radiology

since 2017 **Scientist** EPFL, LTS5
Project Title: ADAS&ME

2012–2016 **Ph.D. in Information Science and Engineering** University of Canberra, Faculty of Education, Science, Technology & Mathematics (ESTeM)
Thesis Title: Vision-based Tracking for Sports Performance Analysis

2008–2011 **M.Sc. in Electrical Engineering-Electronics** Iran University of Science and Technology (IUST), Faculty of Electrical Engineering
Thesis Title: Improved PCA Feature Extraction for Face Recognition

2004–2008 **B.Sc. in Electrical Engineering-Electronics** University of Mazandaran
Specialized Project: Licence Plate Recognition Using Feed-forward Neural Network

work experience & professional activities

2016–2017 **IBM Research - Australia, Melbourne** Postdoctoral Fellow
Skin cancer project
Schizophrenia project (face expression analysis)
Supervised PhD students

2012–2015 **University of Canberra, Faculty of ESTeM** Guest Lecturer
PhD research project and consulting projects
Guest lecturer in Computer Vision and Image Analysis

2014–2016 **University of Canberra, Faculty of ESTeM** Research Assistant
Terrain Park Project (Visual Tracking of Skiers)

skills

deep learning libraries:

- PyTorch
- Tensorflow
- Caffe
- Theano
- Keras

additional softwares:

- IBM CPLEX
- Eclipse
- SQL
- Latex
- Microsoft Office
- Adobe Photoshop

teaching experience

2019–2020 **EPFL|École polytechnique fédérale de Lausanne** Lecturer
Image Analysis and Pattern Recognition
Flipped teaching, teaching in large class (> 100 students)

2019–2020 **EPFL|École polytechnique fédérale de Lausanne** Lecturer
Lab in signal and image processing

2018 **EPFL|École polytechnique fédérale de Lausanne** Head TA, lab coordinator
Lab in signal and image processing

2013–2015 **University of Canberra, Faculty of ESTeM** TA - Introduction to Information Technology (IIT)
Shared responsibilities for exams/homework assignments and grades
Lab demonstrator-preparation for tutorials and computer laboratory class

I have given lectures at EPFL, invited talks at multiple universities and summits, and mentored students ranging from undergraduates to PhDs. My teaching philosophy centers around the idea of **engagement** and **simplicity**. To keep students inspired, I try to provide a wider context for the material, pointing out a problem that is currently unsolved or explaining how these ideas relate to the real-world applications. I usually try to accomplish the simplicity by focusing my lectures on simple examples which illustrate the core ideas and to teach general strategies to break difficult problems into more tractable subproblems. I have given lectures as a lecturer at EPFL, I am teaching, together with Prof. Thiran, two courses at the master level:

Image analysis and pattern recognition (EE-451-4 ECTS- Bozorgtabar & Thiran):
This course explores the basic methods of digital image analysis and pattern recognition: pre-processing, image segmentation, shape representation and classification. These concepts are illustrated by applications in computer vision and medical image analysis.

Lab in signal and image processing (EE-490(f)-4 ECTS- Bozorgtabar & Thiran):
This course and lab sessions are designed as a practical companion to the course ”Image Analysis and Pattern Recognition”. The main objective is to learn how to use some important image processing libraries, namely OpenCV, for performing image analysis tasks such as object detection and object tracking.

media coverage

1. ABC TV Catalyst Program research on developing a diagnostic aid for depression
2. IBM's Watson Supercomputer in Early Detection of Melanoma

projects

since 2019 **Predicting risk stratification for colorectal cancer patients** EPFL, CIBM

Computational pathology aims to diagnose cancer and distinguish tissue components (e.g. nuclei, tumour) which has seen great improvements in recent years due to the advancement of convolutional neural networks (CNN) based diagnosis systems. However, most of the tumor microenvironments used to describe patterns of aggressive tumor behavior are ignored. The goal of this project is to develop a computer-aided diagnosis (CAD) system to identify histopathological patterns within cancerous tissue regions that can be used to improve prognostic stratification for colorectal cancer.

since 2019 **Anomaly detection for X-Ray images** EPFL, CIBM

Anomaly detection (AD) methods find extensive use in radiology related fields. The recent advances in deep learning, has shaken up this area of research. However, the success of such supervised systems hinges on a large amount of annotations by radiologists, which is often prohibitively very time consuming and expensive to acquire. Moreover, these supervised systems are tailored to closed set scenarios, e.g. trained models suffer from overfitting to previously seen rare anomalies at training. A promising approach to AD relies on a fully unsupervised or self-supervised training scheme. The goal of this project is to develop a computer-aided diagnosis (CAD) system that can automatically identify abnormal X-rays by learning only from normal ones during the training phase.

2017-2019 **ADAS&ME Project** EPFL

Advanced driver-assistance systems (ADAS) are one of the fastest-growing safety application in the automotive industry. The objective of this project was to incorporate driver state, situational context and adaptive interaction, to automatically transfer control between vehicle and driver and thus ensure safety and comfort in driving for all vehicle types. Among ADAS solutions, the most demanding examples are related to monitoring systems, where the driver centric behaviour and its related analysis such as automatic face and gesture analysis are the focus of interest. Here, the goal is to leverage and analysis of the facial data to better understand the user experience of the car driver and to avoid potentially unsafe manoeuvres by alerting drivers. I have been actively involved in the Horizon 2020 project (ADAS&ME Project). In particular, my duties included:

- Supervising team for the ADAS&ME project
- Developing software methods for online facial expression monitoring
- Hardware integration for different use cases

2016-2017 **Skin Analysis Project** IBM, Australia

Melanoma is the most aggressive type of skin cancer, which causes a majority of skin cancer deaths. The aim of this project was to design a platform for automatic analysis of dermoscopic images, which can assist dermatologists in clinical decision making. To perform automatic analysis of dermascopic images, segmentation of skin lesions from surrounding normal regions is usually the first step. I proposed several deep models for skin lesion segmentation, which achieved state-of-the-art results on many skin datasets.

Self-supervised learning for anomaly detection on X-Rays:
An end-to-end deep self-supervised methodology has been proposed for anomaly detection on X-Ray images. The proposed method is based on an optimization strategy in which a deep neural network is encouraged to represent local prototypical patterns of the normal data in the embedding space. The rationale behind our approach is using contrastive learning built to produce representation in the embedding space which brings together similar images and pushes apart dissimilar images. We present extensive experiments on the challenging chest X-rays and musculoskeletal radiographs, which indicate that our algorithm improves state-of-the-art methods by a wide margin. In particular, our anomaly detection system is ranked first on the NIH Chest X-rays benchmark among all other methods.

B. Bozorgtabar, D. Mahapatra, G. Vray and J.-Ph. Thiran. *SALAD: Self-Supervised Aggregation Learning for Anomaly Detection on X-Rays*. 23th International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI), 2020.
A. Spahr, **B. Bozorgtabar** and J.-Ph. Thiran.
Anonymous. IEEE Transactions on Medical Imaging (TMI), 2020 (under review).

2016-2017 **Retinal Image Analysis** IBM, Australia
I have developed a novel image super-resolution, which can reconstruct detailed images from unbelievably small, blurry images to help an accurate localization of pathologies in retinal images and has impact in the commercial space.

2016 **Schizophrenia Project** IBM, Australia
I was involved in the face analysis project and had the opportunity to mentor and advise a PhD student. This project was aimed to estimate the emotional state through analysis of facial expressions for the patients with schizophrenia.

2015 **Terrain Park Project:** University of Canberra, Australia
I have developed an accurate visual tracking system for position tracking of skiers to estimate different jump patterns of the skiers.

2015 **SportCipher:** University of Canberra, Australia
Developed in collaboration with coaches and sports performance analysts from a range of team sports such as soccer, rugby, hockey, a project in team sports performance analysis has been conducted to provide a scalable, affordable solution to assist coaches in close-to-real-time analysis of dynamic match situations, post-match analysis, and the prediction of injury likelihoods. The research outcome of this project led to successful application for research grant DTF.2.0 (Discovery Translation Fund 2.0).

Self-supervised system to predict risk stratification for colorectal cancer patients:
Deep learning applied to complex images has the potential to revolutionize pathology, but databases of well-annotated images used to train algorithms on, especially those with clinical data are extremely rare which hinders development in this field. We proposed a self-supervised learning method that jointly learns a representation of tissue regions as well as a metric of the clustering to obtain their underlying patterns. These histopathological patterns are then used to represent the interaction between complex tissues and predict clinical outcomes directly. Histomorphological clusters obtained by our method are evaluated by training survival models. The experimental results demonstrate statistically significant patient stratification and our approach outperformed state-of-the-art methods.

C. Abbet, I. Zlobec, **B. Bozorgtabar** and J.-Ph. Thiran. *Divide-and-Rule: Self-Supervised Learning for Survival Analysis in Colorectal Cancer*. 23th International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI), 2020.

additional activities at IBM

Led projects in multiple domains pertaining to healthcare:
My key Achievements at IBM:
• Led deep learning reading group at IBM Research Australia
• Developed a key component of skin analytic demo at IBM Research Australia
• Mentored PhD students for facial expression project in the machine learning domain
• Implemented new software methods of deep learning and other algorithms of image analysis using Python and Matlab

honors and awards

- 2019 FG 2019 Workshop Organizer on Face Analysis for Advanced Driver Assistance Systems (FA4ADAS)
- 2018 Editor of Frontiers Journal, Special Issue on Computational Pathology
- 2017 IBM First Patent Award
- 2017 IBM Research Division Image Award
- 2016 Invited Speaker: The Emerging Sensing Technologies Summit 2016 (ESTS'16)
- 2015 Invited lecturer in Computer Vision and Image Analysis (University of Canberra)
- 2014 Imagine Cup, Australian Finals, Microsoft, Sydney, Australia
- 2012 International Postgraduate Research Scholarship (IPRS)

grants

- 2018-2019 PHRT Grant (co-PI and main author)
- 2018 Swiss Cancer Foundation Grant (co-PI and main author)
- 2015 Discovery Translation Fund (DTF 2.0) (co-PI and main author)

External funding is important to conduct research and support graduate students. During my career at EPFL, I have been actively involved in writing grants. I got major grants including PHRT grant (three years PhD support) and Swiss Cancer Research funded. I was involved in writing application proposals and collaboration with the institute of pathology in Bern.

membership

IEEE 2012-present

invited peer-reviews

I am a peer reviewer of:

- 2019-present International Conference on Computer Vision and Pattern Recognition (CVPR)
- 2019-present International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI)
- 2019-present IEEE Transactions on Medical Imaging (TMI)
- 2016-present IEEE Transactions on Image Processing (TIP)
- 2017-present Journal of Computer Vision and Image Understanding (Elsevier)
- 2016-present IEEE Transactions on Cybernetics
- 2016-present The Journal of the Pattern Recognition

publications

Journals

- **B. Bozorgtabar**, D.Mahapatra, I. Zlobec, T. Rau and J.-Ph. Thiran. *Computational Pathology*. Frontiers in Medicine 7, 2020.
- D. Tomar, M. Lortkipanidze, **B. Bozorgtabar** and J.-Ph. Thiran. *Anonymous*. IEEE Transactions on Medical Imaging (T-MI), 2020 (under review).
- D. Mahapatra, **B. Bozorgtabar**, S. Kanwal, J.-Ph. Thiran and L. Shao. *Anonymous*. IEEE Transactions on Medical Imaging (T-MI), 2020 (under review).
- **B. Bozorgtabar**, D.Mahapatra and J.-Ph. Thiran. *ExprADA: Adversarial Domain Adaptation for Facial Expression Analysis*. Pattern Recognition. Special Issue on Domain Adaptation for Visual Understanding, 2020.
- **B. Bozorgtabar**, D.Mahapatra , J.-Ph. Thiran and M. Reyes. *Informative sample generation using class aware generative adversarial networks for classification of chest Xrays*. Journal of Computer Vision and Image Understanding (CVIU). Special Issue on Adversarial Learning in Computer Vision, 2019.
- D. Mahapatra, **B. Bozorgtabar**, S. Hewavitharanage and R. Garnavi. *Image Super Resolution Using Progressive Generative Adversarial Networks for Medical Image Analysis*. The Elsevier Journal on Computerized Medical Imaging and Graphics, 2019.

- **B. Bozorgtabar**, S. Rad, H. Kemal, and J.-Ph. Thiran. *Learn to Synthesize and Synthesize to Learn*. Journal of Computer Vision and Image Understanding (CVIU). Special Issue on Adversarial Learning in Computer Vision, 2019.
- S. Bagher Salimi, **B. Bozorgtabar**, P. Schmid-Saugeon, H. Kemal, and J.-Ph. Thiran. *DermoNet: Densely Linked Convolutional Neural Network for Efficient Skin Lesion Segmentation*. EURASIP Journal on Image and Video Processing, 2019.
- S. Rad, **B. Bozorgtabar**, H. Kemal, and J.-Ph. Thiran. *Segment and Super Resolve: Benefiting from Multitask Learning to Improve Single Image Super-Resolution*. Journal of Neurocomputing. Special Issue on Deep Learning for Image Super-Resolution, 2018.
- **B. Bozorgtabar** and R. Goecke. *MSMCT: Multi-State Multi-Camera Tracker*. IEEE Transactions on Circuits and Systems for Video Technology. September 2017.
- **B. Bozorgtabar**, S. Sedai, P.Roy and R.Garnavi. *Skin Lesion Segmentation Using Deep Convolution Networks Guided by Local Unsupervised Learning*. IBM Journal of Research and Development. 2017.
- **B. Bozorgtabar** and R. Goecke. *Efficient Multi-Target Tracking via Discovering Dense Subgraphs*. Journal of Computer Vision and Image Understanding (CVIU). Special Issue on Individual and Group Activities in Video Event Analysis, vol. 144, Issue C, pages 205-216, Elsevier, DOI:10.1016/j.cviu.2015.11.013, March 2016.
- H. Azami, K. Mohammadi and **B. Bozorgtabar**. *An Improved Signal Segmentation Using Moving Average and Savitzky-Golay Filter*. Journal of Signal and Information Processing, 2012.
- **B. Bozorgtabar**, H. Azami, and F. Noorian. *Illumination Invariant Face Recognition Using Fuzzy LDA and FFNN*. Journal of Signal and Information Processing, 3(01), page 45, 2012.
- **B. Bozorgtabar** and G. Rezai Rad. *A Genetic Programming-PCA Hybrid Face Recognition Algorithm*. Journal of Signal and Information Processing, 2011.
- H. Azami, **B. Bozorgtabar**, and M. Shiroie. *Automatic Signal Segmentation Using the Fractal Dimension and Weighted Moving Average Filter*. Journal of Electrical & Computer science, 11(6), pages 8-15, 2011.
- **B. Bozorgtabar** and G. Rezai Rad. *An Efficient Illumination Normalization Method with Fuzzy LDA Feature Extractor for Face Recognition*. International Journal of Modern Engineering Research (IJMER), vol.2, Issue.1, pages 60-65, 2011.

Conferences

- S. Rad, T. Yua, C. Musat, H. Kemal, **B. Bozorgtabar** and J.-Ph. Thiran. *Benefitting from Bicubically Down-Sampled Images for Learning Real-World Image Super-Resolution*. The Winter Conference on Applications of Computer Vision (WACV), 2021.
- **B. Bozorgtabar**, D. Mahapatra, G. Vray and J.-Ph. Thiran. *SALAD: Self-Supervised Aggregation Learning for Anomaly Detection on X-Rays*. 23th International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI), 2020.
- C. Abbet, I. Zlobec, **B. Bozorgtabar** and J.-Ph. Thiran. *Divide-and-Rule: Self-Supervised Learning for Survival Analysis in Colorectal Cancer*. 23th International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI), 2020.
- D. Mahapatra, **B. Bozorgtabar**, J.-Ph. Thiran and L. Shao. *Structure Preserving Stain Normalization of Histopathology Images Using Self Supervised Semantic Guidance*.

23th International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI), 2020.

- D. Mahapatra, **B. Bozorgtabar**, J.-Ph. Thiran and L. Shao. *Pathological Retinal Region Segmentation From OCT Images Using Geometric Relation Based Augmentation*. The Conference on Computer Vision and Pattern Recognition (CVPR), 2020.
- **B. Bozorgtabar**, S. Rad, D.Mahapatra and J.-Ph. Thiran. *SynDeMo: Synergistic Deep Feature Alignment for Joint Learning of Depth and Ego-Motion*. The International Conference on Computer Vision (ICCV), 2019.
- S. Rad, **B. Bozorgtabar**, H. Kemal and J.-Ph. Thiran. *SROBB: Targeted Perceptual Loss for Single Image Super Resolution*. The International Conference on Computer Vision (ICCV), 2019.
- A. Nicoleta Ciubotaru, A. Devos, **B. Bozorgtabar** and J.-Ph. Thiran. *Revisiting Few-Shot Learning for Facial Expression Recognition*. arXiv preprint arXiv:1912.02751, 2019.
- **B. Bozorgtabar**, S. Rad, H. Kemal and J.-Ph. Thiran. *Using Photorealistic Face Synthesis an Domain Adaptation to Improve Facial Expression Analysis*. The 14th IEEE International Conference on Automatic Face and Gesture Recognition (FG), 2019.
- O. Abdollahi Aghdam, **B. Bozorgtabar**, H. Kemal and J.-Ph. Thiran. *Exploring Factors for Improving Low Resolution Face Recognition*. The 2019 Computer Vision and Pattern Recognition Workshop on Biometrics (CVPRW), 2019.
- T. Albrici, **B. Bozorgtabar**, M. Fasounaki, S. Bagher Salimi, G. Vray, H. Kemal and J.-Ph. Thiran. *G2-VER: Geometry Guided Model Ensemble for Video-based Facial Expression Recognition*. The FG 2019 Workshop on Face Analysis for Advanced Driver Assistance Systems (FA4ADAS), 2019.
- Guillaume Jaume, **B. Bozorgtabar**, J.-Ph. Thiran and Maria Gabrani. *Image Level Attentional Context Modeling Using Nested Graph Neural Network*. NeurIPS Workshop on Relational Representation Learning, 2018.
- D.Mahapatra, **B. Bozorgtabar**, J.-Ph. Thiran and M. Reyes. *Efficient Active Deep Learning with Informative and Conditional Generative Sample Selection*. 21th International Conference on Medical Image Computing and Computer Assisted Intervention 2018, MICCAI 2018.
- D.Mahapatra, **B. Bozorgtabar** and R. Garnavi. *Image Super Resolution Using Generative Adversarial Networks and Local Saliency Maps for Retinal Image Analysis*. 20th International Conference on Medical Image Computing and Computer Assisted Intervention 2017, MICCAI 2017.
- **B. Bozorgtabar**, Z. Ge, R. Chakravorty, M.Abedini, S.Demyanov and R. Garnav. *Investigating Deep Side Layers For Skin Lesion Segmentation*. IEEE International Symposium on Biomedical Imaging, ISBI 2017, pages 256-260, 2017.
- S.Demyanov, R. Chakravorty, Z. Ge, **B. Bozorgtabar**, A. Bowling and R. Garnav. *Tree-Loss Function for Training Neural Networks on Weakly-Labeled Datasets*. IEEE International Symposium on Biomedical Imaging, ISBI 2017, pages 287-291, 2017.
- Z. Ge, **B. Bozorgtabar**, M.Abedini, S.Demyanov, R. Chakravorty, A. Bowling and R. Garnavi. *Exploiting Local and Generic Features for Skin Lesions Classification*. IEEE International Symposium on Biomedical Imaging, ISBI 2017, pages 986-990, 2017.
- **B. Bozorgtabar**, M.Abedini and R. Garnavi. *Sparse Coding Based Skin Lesion Segmentation Using Dynamic Rule-Based Refinement*. In International Workshop on Machine Learning in Medical Imaging (MLMI), pages 254-261. Springer International Publishing, Oct 2016.

- **B. Bozorgtabar** and R. Goecke. *Multi-level Action Detection via Learning Latent Structure*. Proceedings of the International Conference on Image Processing (ICIP 2015), Quebec, Canada, pages 27-30, Sept 2015.
- **B. Bozorgtabar** and R. Goecke. *Dominant Interaction Group Detection in Team Sports*. KDD Workshop on Large-Scale Sports Analytics, Sydney, Australia, 10 Aug 2015.
- **B. Bozorgtabar** and R. Goecke. *Enhanced Laplacian Group Sparse Learning with Lifespan Outlier Rejection for Visual Tracking*. Proceedings of the Asian Conference on Computer Vision (ACCV 2014), Singapore, pages 564-578, 1-5 Nov 2014.
- **B. Bozorgtabar** and R. Goecke. *Joint Sparsity-Based Robust Visual Tracking*. Proceedings of the International Conference on Image Processing (ICIP 2014), Paris, France, pages 4927-4931, 27-30 Oct 2014.
- **B. Bozorgtabar** and R. Goecke. *Robust Visual Tracking via Rank-Constrained Sparse Learning*. Proceedings of the International Conference on Digital Image Computing: Techniques and Applications (DICTA 2014), Wollongong, Australia, pages 1-7, 25-27 November 2014.
- **B. Bozorgtabar** and R. Goecke. *Discriminative Multi-Task Sparse Learning for Robust Visual Tracking Using Conditional Random Field*. Proceedings of the International Conference on Digital Image Computing: Techniques and Applications (DICTA 2014), Wollongong, Australia, pages 1-8, 25-27 November 2014.
- **B. Bozorgtabar** and R. Goecke. *Robust Visual Vocabulary Tracking Using Hierarchical Model Fusion*. Proceedings of International Conference on Digital Computing, Techniques and Applications (DICTA 2013), Hobart, Australia, pages 1-8, 26-28 November 2013.
- Co-Author in. *The Visual Object Tracking VOT2013 Challenge Results*. 2013 IEEE International Conference on Computer Vision Workshops (ICCVW), Sydney, Australia, pages 98-111, 2013.
- **B. Bozorgtabar** and R. Goecke. *Adaptive Multiple Component Metric Learning for Robust Visual Tracking*. Proceedings of International Conference on Neural Information Processing (ICONIP 2013), Daegu, Korea, pages 566-575, 3-7 November 2013.
- **B. Bozorgtabar** and R. Goecke. *An Improved Neural Network Training Scheme Using a Two Stage LDA Features for Face Recognition*. Proceedings of the 19th International Conference on Neural Information Processing (ICONIP 2012), Lecture Notes in Computer Science (LNCS) 7667, Part V, pages 662-671, Doha, Qatar, 12-15 Nov 2012.
- **B. Bozorgtabar**, F. Noorian and G. Rezai Rad. *A Genetic Programming approach to face recognition*. IEEE GCC Conference and Exhibition, pages 194-197, 2011.
- **B. Bozorgtabar**, F. Noorian and G. Rezai Rad. *Comparison of different PCA based Face Recognition algorithms using Genetic Programming*. IEEE Telecommunications (IST), 5th International Symposium on Telecommunications, pages 801-805, 2010.

patents

Published

- **US10373312B2**, [Automated Skin Lesion Segmentation Using Deep Side Layers], Published with United States Patent and Trademark office as patent number US10373312B2, lead inventor: **B.Bozorgtabar**.

- **US10176574B2**, [Structure-Preserving Composite Model for Skin Lesion Segmentation], Published with United States Patent and Trademark office as patent number US10176574B2, lead inventor: **B.Bozorgtabar**.
- **US10283221B2**, [Risk Assessment Based on Patient Similarity Determined Using Image Analysis], Published with United States Patent and Trademark office as patent number US10283221B2.
- **US20180365841A1**, [Searching Trees: A New System for Live Time-lapse Cell Tracking and Cell Progression], Published with United States Patent and Trademark office as patent number US20180365841A1, lead inventor: **B. Bozorgtabar**.
- **US20190328300A1**, [Real-Time Annotation of Symptoms in Telemedicine], Published with United States Patent and Trademark office as patent number US20190328300A1, lead inventor: **B. Bozorgtabar**.

Filed

- **YOR8-2016-1660**, [Superpixel Flow: Label Propagation System Helps Deep Learning for Accurate Segmentation], Filed with United States Patent and Trademark office as docket YOR8-2016-1660, lead inventor: **B. Bozorgtabar**.
- **YOR8-2016-2258**, [Automatic Pattern Discovery for Skin Disease Classification], Filed with United States Patent and Trademark office as docket YOR8-2016-2258.
- **YOR8-2016-2652**, [Second Face: Combating Depression through Virtual Reality], Filed with United States Patent and Trademark office as docket YOR8-2016-2652, lead inventor: **B. Bozorgtabar**.
- **YOR820162998CN01**, [Quantifying the Symptoms of Brain Disorders Via Facial, Body Posture and Language Analytics], Filed in China (CNIPA) as docket YOR820162998CN01, lead inventor: **B. Bozorgtabar**.

personal pages

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