Gustavo Botelho de Souza

Personal Information

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Academic Information

Formal Education/Degrees

- **Short-Term Scholar** at Michigan State University (July to December 2017);
- **Ph.D. candidate in Computer Science** at Federal University of São Carlos (since 2015);
- **M.Sc. in Computer Science** – São Paulo State University (2011-2013);
- **Bachelor in Computer Science** – São Paulo State University (2007-2010);
- **IT Technician** – São Paulo State University (2004-2007).

Main Research Projects

- **Liveness Detection for Biometric Systems Using New Machine Learning Techniques**:
  Given the widespread usage of the biometric systems, spoofing (attack) techniques have been developed to break their security. In this on going doctorate research project, new spoofing detection methods have been proposed based on a new Machine Learning paradigm: Deep Learning. Results recently reported in the literature and obtained in initial experiments indicate that methods that use deep structures for learning present better accuracies than the so considered state-of-the-art techniques. We are also interested in adapting biometric and antispoofing techniques for mobile environments.

- **Multimodal Biometric Recognition for Smart Surveillance**:
  In order to increase the population coverage and improve the identification rates, the multibiometric recognition has been proposed and adopted. Despite of the good results reported, the multibiometric systems usually require much user collaboration and do not allow identification at distance (which is indispensable for smart and silent surveillance applications). In this sense, soft biometric traits, such as height, weight, gender, hair and skin color, which can be extracted at distance with an acceptable accuracy, in a covert and non-intrusive way, have been used in addition to the traditional biometric features. In this work, a multibiometric system designed for people identification in a surveillance application was developed and assessed. The system uses information from the face, height and skin color in order to recognize people, presenting good results.

- **2D Shape Analysis: A New Approach Based on the Hough Transform**:
  In this work, a new shape descriptor based on the Hough Transform, called HTS (Hough Transform Statistics), was proposed, which presented good results while recognizing objects in digital images by their shapes. The proposed descriptor was also assessed in the biometric recognition context, in a forensic application. Using a database with some frontal radiographic images of human skulls, the people of the images were recognized with good accuracy through the analysis of the shape of their frontal sinus cavities, which present individual shape for each person, using the HTS descriptor.

- **Graph-Based Contextual Image Segmentation**:
  In this project, some works have been developed in order to segment different kinds of digital images with high precision using contextual information and algorithms from graph theory in order to model them and classify their pixels in an accurate way.

Main Publications

G. B. Souza, D. F. S. Santos, R. G. Pires, A. N. Marana and J. P. Papa, "Deep Boltzmann Machines for Robust Fingerprint Spoofing Attack Detection", *Proc. of International Joint Conference on Neural Networks (IJCNN)*, Anchorage/AK, 2017.

G. B. Souza, D. F. S. Santos, R. G. Pires, A. N. Marana and J. P. Papa, "Deep Texture Features for Robust Face Spoofing Detection", *Proc. of IEEE International Symposium on Circuits and Systems (ISCAS)*, Baltimore/MD, 2017.

G. B. Souza, D. F. S. Santos, R. G. Pires, A. N. Marana and J. P. Papa, "Detecção de Ataques em Sistemas de Reconhecimento Facial: Uma Abordagem Baseada nas Máquinas de Boltzmann Restritas", *Proc. Of Regional Meeting on Computational and Applied Mathematics (ERMAC)*, Bauru, 2017.

G. B. Souza, G. M. Alves, A. L. M. Levada, P. E. Cruvinel and A. N. Marana, "A Graph-Based Segmentation Approach for Contextual Image Segmentation", *Proc. Conference on Graphics, Patterns and Images (SIBGRAPI)*, São José dos Campos, 2016.

L. A. Ramos, G. B. Souza and A. N. Marana, "Shape Analysis Using Multiscale HTS", *Proc. Iberoamerican Congress on Pattern Recognition (CIARP)*, vol. 9423, pp. 452-459, Montevideo, 2015.

G. B. Souza and A. N. Marana, "HTS and HTSn: New Shape Descriptors Based on Hough Transform Statistics", *Computer Vision and Image Understanding*, vol. 127, pp. 43-56, 2014.

G. B. Souza and A. N. Marana, "Shape Analysis: a New Approach Based on the Hough Transform", *Proc. Workshop of Thesis and Dissertations - Conference on Graphics, Patterns and Images (SIBGRAPI)*, Rio de Janeiro, 2014. (Best M.Sc. Work)

G. B. Souza and A. N. Marana, "HTS: A New Shape Descriptor Based on Hough Transform", *Proc. IEEE International Symposium on Circuits and Systems (ISCAS)*, pp. 974-977, Beijing, 2013. (Finalist of the Best Student Paper Contest)

G. B. Souza and A. N. Marana, "Frontal Signus Recognition: A Comparison Among Different Shape Descriptors", *Proc. Computer Vision Workshop (WVC)*, Rio de janeiro, 2013.

Awards

2017 – IEEE Computational Intelligence Society Student Travel Grant Award;
2016 – One of the five best works at WPPGCC 2016 (Graduate Program Workshop) – São Carlos;
2016 – 2nd Place at the Face Recognition Challenge (13th Summer School for Advanced Studies on Biometrics – Alghero/Italy);
2015 - Winner of the first Hackathon (Marathon of Innovation) at Banco do Brasil - Best idea proposed;
2015 - Student selected to receive the travel grant to CIARP 2015 (based on curriculum analysis);
2014 - First place in the Workshop of Thesis and Dissertations (M.Sc. category) at SIBGRAPI 2014 (Conference on Graphics, Patterns and Images) – Rio de Janeiro;
2013 - Finalist of the Best Student Paper Contest at ISCAS 2013 (IEEE International Symposium on Circuits and Systems) - Beijing;
2013 - One of the eight best works at WVC 2013 (Computer Vision Workshop) – Rio de Janeiro;
2013 - One of the three best works at WPPGCC 2013 (Graduate Program Workshop) – Rio Claro;
2012 - One of the three best works at WPPGCC 2012 (Graduate Program Workshop) – S. J. do Rio Preto;
2010 - Academic Merit by the Brazilian Computer Society (Bachelor in Computer Science);
2010 - Young Talent on Pattern Recognition at CIARP 2010 (Iberoamerican Congress on Pattern Recognition) – São Paulo;
2010 - Academic Merit (best academic performance) by the São Paulo State University;
2007 - Second place **-** Student to Business Program (Microsoft) – Development of IT Systems.

Professional Information

- **Researcher** at Banco do Brasil (since June/2015);
- **Administrative Assistant** at Banco do Brasil (2008-2015);
- **IT Intern** at City Government of Bauru (2006-2007) and at São Paulo State University (2007-2008).

Other Relevant Information

- Reviewer of the journal **IEEE Transactions on Circuits and Systems II – Express Briefs** and of the **Workshop of Applied Deep Learning Methods for Medical Image Analysis** since 2017;
- Overall score of **600 points** in the English proficiency test - TOEFL ITP (date - September 13th, 2015);
- During the M.Sc. and Ph.D. (in progress) courses, I have obtained the best concept/grade (**concept "A" – Excellent Performance**) in all disciplines.