Gustavo Botelho de Souza

Personal Information

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Academic Information

Formal Education/Degrees

- **Ph.D. in Computer Science -** Federal University of São Carlos – UFSCar (2015-2019);
- **Short-Term Scholar -** Michigan State University – MSU (2017);
- **M.Sc. in Computer Science** – São Paulo State University – UNESP (2011-2013);
- **Bachelor in Computer Science** – São Paulo State University – UNESP (2007-2010);
- **IT Technician** – São Paulo State University – UNESP (2004-2007).

Main Research Projects

- **Spoofing Detection in Biometric Systems Based on Deep Learning Architectures (on going):**
  Given the widespread usage of the biometric systems, spoofing (attack) techniques have been developed to break their security (using fake fingers, facial photographs, etc.). In this on going project, new spoofing detection methods, also known as presentation attack detection techniques, are proposed based on a new Machine Learning paradigm: Deep Learning. Results recently reported in the literature indicate that methods that use deep structures for learning present better accuracies than the so considered state-of-the-art techniques.

- **Multimodal Biometric Recognition for Smart Surveillance (on going)**:
  Good results have been reported in the literature regarding multibiometric systems based on the fusion of biometric features like fingerprint, palm vein, iris, etc. However, these biometric features require user collaboration and do not allow identification at distance, which is a requirement in applications such as surveillance. For this purpose, soft biometric traits, such as height, weight, gender, hair and skin color, among other, seems to be more suitable since they can be extracted in a silent way. In this project, a multibiometric system designed for people identification through a surveillance application is developed. The system is based on soft and traditional biometric traits.

- **Contextual Image Segmentation Based on Graphs (on going):**
  Image segmentation plays an important role in object tracking, scene evaluation and image understanding. In this project we propose novel approaches based on the Graphs Theory for an effective, i.e., accurate and efficient, image segmentation.

- **2D Shape Analysis: A New Approach Based on the Hough Transform (past work)**:
  In this project, we proposed a new shape descriptor based on the Hough Transform, called HTS (Hough Transform Statistics), which presented good results on 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 present in the human skull with individual shape for each person, using the HTS descriptor.

- People Recognition Based on Soft Biometric Features (past work):
  In general, biometric systems are based on traditional (strong) features such as fingerprint, iris, face, etc. Recently, soft biometric features such as height, sex, weight, hair and skin color have also been considered. Despite of presenting low unicity, these features, can improve the accuracies of traditional biometric systems or even enable more efficient searches for templates in the databases, being captured in a silent (non-intrusive) way. In this project, algorithms that estimate the height and skin color of people in video images were proposed and evaluated, presenting good results.

Main Publications

SOUZA, G. B.; PAPA, J. P.; MARANA, A. N. On the Learning of Deep Local Features for Robust Face Spoofing Detection. In: Conference on Graphics, Patterns and Images - SIBGRAPI, 2018, Foz do Iguaçu (Brazil).

SOUZA, G. B. SANTOS, D. F. S.; PIRES, R. G.; MARANA, A. N.; PAPA, J. P. Deep Texture Features for Robust Face Spoofing Detection. IEEE Transactions on Circuits and Systems II - Express Briefs, v. 64, p. 1397-1401, 2017.

SOUZA, G. B.; SANTOS, D. F. S.; PIRES, R. G.; MARANA, A. N.; PAPA, J. P. Deep Boltzmann Machines for Robust Fingerprint Spoofing Attack Detection. In: International Joint Conference on Neural Networks – IJCNN, 2017, Anchorage (Alaska).

SOUZA, G. B.; MARANA, APARECIDO NILCEU. HTS and HTSn: New shape descriptors based on Hough transform statistics. Computer Vision and Image Understanding, v. 127, p. 43-56, 2014.

Awards

2018 – Qualified in Big Data/Analytics at Banco do Brasil;
2017 – IEEE CIS Student Travel Grant Award (IJCNN 2017), IEEE Computational Intelligence Society;
2016 – 2nd place - Face Recognition Challenge at 13th International Summer School for Advanced Studies on Biometrics for Secure Authentication - University of Sassari, IAPR, IEEE (Italy);
2016 – One of the best works at WPPGCC 2016 (Graduate Program Workshop) – UFSCar (São Carlos);
2015 – Winner of the first Hackathon (marathon of innovation) of Banco do Brasil - Best idea;
2014 – First place in the Workshop of Thesis and Dissertations (M.Sc. category) at SIBGRAPI 2014 (XXVII 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 best works at WPPGCC 2013 (Graduate Program Workshop) – UNESP (Rio Claro);
2012 – One of the best works at WPPGCC 2012 (Graduate Program Workshop) – UNESP (S. J. Rio Preto);
2010 - Academic Merit – Brazilian Computer Society (Bachelor in Computer Science);
2010 - Young Talent on Pattern Recognition at CIARP (Iberoamerican Congress on Pattern Recognition) – USP (São Paulo);
2010 - Academic Merit – Faculty of Sciences (São Paulo State University - UNESP).

Professional Information

- IT Analyst (Artificial Intelligence) at Banco do Brasil (since June/2019);
- Researcher at Banco do Brasil (2015-2019);
- Administrative Assistant at Banco do Brasil (2008-2015);
- IT Intern at São Paulo State University – UNESP (2007 a 2008);
- IT Intern at Prefeitura Municipal de Bauru (2006 a 2007).

Detailed information available at (portuguese): http://lattes.cnpq.br/2368834665313763