Sildomar Takahashi Monteiro

1 Lomb Memorial Drive
Rochester, NY 14623
Office: (585) 475-6008
sildomar.monteiro@rit.edu
https://people.rit.edu/stmeee

RESEARCH INTERESTS

I am broadly interested in artificial intelligence, machine learning and optimization algorithms. I have been applying machine learning methods to problems in robotics and remote sensing. My recent work has focused on deep learning, structured prediction, and Bayesian nonparametric methods for extracting information from hyperspectral, LIDAR, SAR, and color imagery.

EXPERIENCE

Published over 50 refereed papers. Advised 1 Postdoc, 5 PhD students, 4 MSc students and 12 BSc students. Taught courses in artificial intelligence, C++ programming, controls systems, and computer vision.

Rochester Institute of Technology **Rochester, NY**
Assistant Professor, Electrical Engineering *August 2013 – present*
Program faculty in the Center for Imaging Sciences, and faculty member in the Digital Imaging and Remote Sensing Laboratory.

University of Sydney **Sydney, Australia**
Research Fellow, Australian Centre for Field Robotics *March 2008 – July 2013*
Worked on machine learning and robot perception for mining automation supervised by Dr. Hugh Durrant-Whyte.

Tokyo Institute of Technology **Tokyo, Japan**
JSPS Postdoctoral Researcher *April 2007 – February 2008*
Worked on neural networks and evolutionary optimization algorithms for the analysis of imaging spectroscopy data.

Toshiba, Corporate Research & Development Center **Tokyo, Japan**
Research Assistant Intern, Human Centric Laboratory *June 2004 – May 2005*
Developed navigation and mapping algorithms for the ApriAlpha, an indoor mobile robot.

Tokyo Institute of Technology **Tokyo, Japan**
Research Assistant, Mechano-Micro Engineering *April 2003 – March 2007*

EDUCATION

Tokyo Institute of Technology **Tokyo, Japan**
Ph. D. in Engineering *March, 2007*
Thesis: Computational intelligence for optimization and analysis of high dimensional spectral imagery. Advisor: Dr. Yukio Kosugi.

Technological Institute of Aeronautics (ITA) **Sao Jose dos Campos, Brazil**
M. Sc. in Computer Science *June, 2002*
Thesis: Study of performance of learning algorithms under conditions of sensorial ambiguity. Advisor: Dr. Carlos Ribeiro.

University of Amazonas (UFAM) **Manaus, Brazil**
B. S. in Electrical Engineering *October, 1999*

PUBLICATIONS

Books

B1. S.T. Monteiro. *Automatic Hyperspectral Data Analysis: A machine learning approach to high dimensional feature extraction.* Saarbrucken: VDM Verlag, May 2010. ISBN: 978-3639255164.

Journal Articles

J1. T. Peynot, S.T. Monteiro, A. Kelly, and M. Devy. Editorial: Special issue on Alternative Sensing Techniques for Robot Perception. *Journal of Field Robotics*, vol. 32(1), pp. 1-2, 2015.

J2. N. Ahsan, S. Scheding, S.T. Monteiro, R. Leung, C. McHugh and D. Robinson. Adaptive sampling applied to blast-hole drilling in surface mining. *International Journal of Rock Mechanics and Mining Sciences*, vol. 75, pp. 244-255, 2015.

J3. R. J. Murphy, S. Schneider, and S.T. Monteiro. Mapping layers of clay in a vertical geological surface using hyperspectral imagery: Variability in parameters of SWIR absorption features under different conditions of illumination. *Remote Sensing*, vol. 6, no. 9, pp. 9104-9129, 2014.

J4. R.J. Murphy, S. Schneider and S.T. Monteiro. Consistency of measurements of wavelength position from hyperspectral imagery: Use of the ferric iron crystal field absorption at ~900 nm as an indicator of mineralogy. *IEEE Transactions on Geoscience and Remote Sensing*, v. 52(5), pp. 2843–2857, 2014.

J5. R.J. Murphy and S.T. Monteiro. Mapping the abundance of ferric iron on a vertical mine wall using derivative analysis of hyperspectral imagery. *ISPRS Journal of Photogrammetry and Remote Sensing,* Elsevier Press, 75, pp. 29–39, 2013.

J6. R.J. Murphy, S.T. Monteiro and S. Schneider. Evaluating classification techniques for mapping vertical geology using field-based hyperspectral sensors. *IEEE Transactions on Geoscience and Remote Sensing,* 50(8), pp. 3066–3080, 2012.

J7. A. Kadkhodaie-Ilkhchi, S.T. Monteiro, F. Ramos and P. Hatherly. Rock recognition from MWD data: a comparative study of boosting, neural networks and fuzzy logic. *IEEE Geoscience and Remote Sensing Letters*, 7(4), pp. 680–684, 2010.

J8. T. Edanaga, Y. Minekawa, S.T. Monteiro and Y. Kosugi. Studies on human skin extraction from hyperspectral data using particle swarm optimization. *Journal of the Japan Society of Photogrammetry and Remote Sensing*, 47(3), pp. 23–36, 2008.

J9. S.T. Monteiro and Y. Kosugi. Particle swarms for feature extraction of hyperspectral data. *IEICE Transactions on Information and Systems*, Oxford University Press, E90-D(7), pp. 1038–1046, 2007.

J10. S.T. Monteiro, Y. Minekawa, Y. Kosugi, T. Akazawa and K. Oda. Prediction of sweetness and amino acid content in soybean crops from hyperspectral imagery. *ISPRS Journal of Photogrammetry and Remote Sensing*, Elsevier Press, 62(1), pp. 2–12, 2007.

J11. S.T. Monteiro, K. Uto, Y. Kosugi, N. Kobayashi and E. Watanabe. Optimization of infrared spectral manipulation for surgical visual aid. *Journal of Japan Society of Computer Aided Surgery*, 8(1), pp. 33–38, 2006.

J12. S.T. Monteiro, K. Uto, Y. Kosugi, N. Kobayashi, E. Watanabe and K. Kameyama. Feature extraction of hyperspectral data for under spilled blood visualization using particle swarm optimization. *International Journal of Bioelectromagnetism*, 7(1), pp. 232–235, 2005.

J13. S.T. Monteiro and C.H.C. Ribeiro. Performance of reinforcement learning algorithms in mobile robotics under conditions of sensorial ambiguity. *Brazilian Journal of Control and Automation*, 15(3), pp. 320–338, 2004.

Conference and Workshop Papers

C1. Y. Liu, S.T. Monteiro, and E. Saber. Dense semantic labeling of very-high-resolution aerial imagery and LiDAR with fully-convolutional neural networks and higher-order CRFs. *CVPR workshop on Large Scale Computer Vision for Remote Sensing Imagery*, 2017.

C2. Y. Liu, S.T. Monteiro, and E. Saber. Semantic segmentation of remote sensing data using Gaussian processes and higher-order CRFs. *IEEE International Geoscience and Remote Sensing Symposium (IGARSS)*, 2017.

C3. U.B. Gewali and S.T. Monteiro. Applying Bayesian optimization to jointly tune the classifier and the random field for spatial-spectral hyperspectral classification. *IEEE International Geoscience and Remote Sensing Symposium (IGARSS)*, 2017.

C4. U.B. Gewali and S.T. Monteiro. A novel covariance function for predicting vegetation biochemistry from hyperspectral imagery with Gaussian processes. *IEEE International Conference on Image Processing (ICIP)*, pp. 2216–2220, 2016.

C5. Y. Hu, S.T. Monteiro, N. D. Cahill and E. Saber. Super pixel based classification using conditional random fields for hyperspectral images. *IEEE International Conference on Image Processing (ICIP)*, 2016.

C6. Y. Liang, S.T. Monteiro, and E. Saber. Gaussian Processes for Object Detection in High Resolution Remote Sensing Images. *IEEE International Conference on Machine Learning and Applications (ICMLA)*, 2016.

C7. Y. Liu, S.T. Monteiro, and E. Saber. Vehicle detection from aerial color imagery and airborne LiDAR data. *IEEE International Geoscience and Remote Sensing Symposium (IGARSS)*, 2016.

C8. U.B. Gewali and S.T. Monteiro. Spectral Angle Based Unary Energy Functions for Spatial-Spectral Hyperspectral Classification using Markov Random Fields. *IEEE Workshop on Hyperspectral Image and Signal Processing: Evolution in Remote Sensing (WHISPERS)*, 2016.

C9. U.B. Gewali and S.T. Monteiro. Multitask Learning of Vegetation Biochemistry from Hyperspectral Data. *IEEE Workshop on Hyperspectral Image and Signal Processing: Evolution in Remote Sensing (WHISPERS)*, 2016.

C10. Y. Liang, S.T. Monteiro, and E. Saber. Transfer learning for high resolution aerial image classification. *Applied Imagery Pattern Recognition Annual Workshop (AIPR)*, 2016.

C11. T.M. Sands, D. Tayal, M.E. Morris, S.T. Monteiro. Robust stock value prediction using support vector machines with particle swarm optimization. *IEEE Congress on Evolutionary Computation (CEC)*, pp. 3327-3331, Sendai, Japan, 2015.

C12. Y. Hu, N.D. Cahill, S.T. Monteiro, E. Saber, D.W. Messinger. Low-dimensional representations of hyperspectral data for use in CRF-based classification. *SPIE Remote Sensing*, pp. 96430L-96430L-8, Toulouse, France, 2015.

C13. Y. Liu, S.T. Monteiro, E. Saber. An approach for combining airborne LiDAR and high-resolution aerial color imagery using Gaussian processes. *SPIE Remote Sensing*, pp. 96430Z-96430Z-9, Toulouse, France, 2015.

C14. Y. Hu, E. Saber, S.T. Monteiro, N. Cahill, and D. Messinger. Classification of hyperspectral images based on conditional random fields. *SPIE Image Processing, Machine Vision Applications VIII*, vol. 940510, San Francisco, CA, 2015.

C15. S.H. Lee, S.T. Monteiro and S.J. Scheding. Submodular volume simplex analysis: a greedy algorithm for hyperspectral unmixing. *IEEE Workshop on Hyperspectral Image and Signal Processing (WHISPERS)*, pp. 1–4, Gainesville, FL, 2013.

C16. O.M. Cliff and S.T. Monteiro. Evaluating techniques for learning a feedback controller for low-cost manipulators. *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS),* pp. 704–709, Tokyo, Japan, 2013.

C17. T. Jasinski, S.T. Monteiro, I. Antipov and G. Brooker. W-band maritime target classification using high resolution range profiles. *International Conference on Radar (RADAR)*, pp. 356–361, Adelaide, Australia, 2013.

C18. S.T. Monteiro**,** J. Nieto, R.J. Murphy, R. Ramakrishnan and Z. Taylor. Combining strong features for registration of hyperspectral and lidar data from field-based platforms. *IEEE International Geoscience and Remote Sensing Symposium (IGARSS),* pp. 1210–1213, Melbourne, Australia, 2013.

C19. H. Zhou, P. Hatherly, S.T. Monteiro, F. Ramos, F. Oppolzer and E. Nettleton. Automatic rock recognition from drilling performance data. *IEEE International Conference on Robotics and Automation (ICRA)*, pp. 3407–3412, St. Paul, MN, 2012.

C20. S.T. Monteiro, F. Ramos and P. Hatherly. Learning 3D geological structure from drill-rig sensors for automated mining. *International Joint Conference on Artificial Intelligence (IJCAI),* pp. 2500–2506, Barcelona, Spain, 2011. *(Acceptance rate: 17%)*

C21. A.S.J. Tjiong and S.T. Monteiro. Feature selection with PSO and kernel methods for hyperspectral classification. *IEEE Congress on Evolutionary Computation (CEC)*, pp. 1762–1769, New Orleans, MS, 2011.

C22. S.T. Monteiro and R.J. Murphy. Embedded feature selection of hyperspectral bands with boosted decision trees. *IEEE International Geoscience and Remote Sensing Symposium (IGARSS)*, pp. 2361–2364, Vancouver, Canada, 2011.

C23. H. Zhou, S.T. Monteiro, P. Hatherly, F. Ramos, E. Nettleton and F. Oppolzer. Automated rock recognition with wavelet feature space projection and Gaussian process classification. *IEEE International Conference on Robotics and Automation (ICRA)*, pp. 4444–4450, Anchorage, AK, 2010.

C24. S.T. Monteiro and R.J. Murphy. Calibrating probabilities for hyperspectral classification of rock types. *IEEE International Geoscience and Remote Sensing Symposium (IGARSS)*, *pp. 2800–2803,* Honolulu, HI, 2010.

C25. J. Nieto, D. Viejo and S.T. Monteiro. 3D geological modelling using laser and hyperspectral data. *IEEE International Geoscience and Remote Sensing Symposium (IGARSS)*, pp. 4568–4571, Honolulu, HI, 2010.

C26. S.T. Monteiro, F. Ramos and P. Hatherly. Learning CRF models from drill rig sensors for autonomous mining. *NIPS Workshop on Learning from Multiple Sources with Applications to Robotics*, pp. 1–4, Whistler, Canada, 2009.

C27. S.T. Monteiro, F. Ramos and P. Hatherly. Conditional random fields for rock characterization using drill measurements. *International Conference on Machine Learning and Applications (ICMLA)*, pp. 366–371, Miami, FL, 2009.

C28. S.T. Monteiro, R.J. Murphy, F. Ramos and J. Nieto. Applying boosting for hyperspectral classification of ore-bearing rocks. *IEEE International Workshop on Machine Learning for Signal Processing (MLSP)*, pp. 1–6, Grenoble, France, 2009.

C29. S. Schneider, R.J. Murphy, S.T. Monteiro and E. Nettleton. On the development of a hyperspectral library for autonomous mining systems. *Australasian Conference on Robotics and Automation (ACRA)*, pp. 1–10, Sydney, Australia, 2009.

C30. H. Zhou, S.T. Monteiro, P. Hatherly, F. Ramos, E. Nettleton and F. Oppolzer. Spectral feature selection for automated rock recognition using Gaussian process classification. *Australasian Conference on Robotics and Automation (ACRA)*, pp. 1–7, Sydney, Australia, 2009.

C31. S.T. Monteiro, K. Uto, Y. Kosugi, K. Oda, Y. Iino and G. Saito. Hyperspectral image classification of grass species in Northeast Japan. In *Proc. IEEE International Geoscience and Remote Sensing Symposium (IGARSS)*, v. 4, pp. 399–402, Boston, MA, 2008.

C32. Y. Kosugi, D. Guillaume, Y. Takabayashi, S.T. Monteiro, M. Yamaki, K. Uto and G. Saito. Low-altitude hyperspectral imaging of Naruko integrated field for the interpretation of high-altitude observations. *International Symposium on Integrated Field Science*, v. 6, pp. 135–136, Sendai, Japan, 2008.

C33. S.T. Monteiro and Y. Kosugi. A particle swarm optimization-based approach for hyperspectral band selection. *IEEE Congress on Evolutionary Computation (CEC)*, pp. 3335–3340, Singapore, 2007.

C34. S.T. Monteiro and Y. Kosugi. Applying particle swarm intelligence for feature selection of spectral imagery. *International Conference on Intelligent Systems Design and Applications (ISDA)*, pp. 933–938, Rio de Janeiro, Brazil, 2007.

C35. S.T. Monteiro, Y. Minekawa, Y. Kosugi, T. Akazawa, and K. Oda. High resolution hyperspectral imagery for estimating sweetness content in soybean crops. *Conference of the Institute of Electronics, Information and Communication Engineers (IEICE)*, BS-6-13, SE-24, Tokyo, Japan, 2006.

C36. S.T. Monteiro, Y. Minekawa, Y. Kosugi, T. Akazawa, and K. Oda. Prediction of sweetness and nitrogen content in soybean crops from high resolution hyperspectral imagery. *IEEE International Geoscience and Remote Sensing Symposium (IGARSS)*, vol. 5, pp. 2263–2266, Denver, CO, 2006.

C37. S.T. Monteiro, H. Nakamoto, H. Ogawa, and N. Matsuhira. Robust mobile robot map building using sonar and vision. *JSME Conference on Robotics and Mechatronics (ROBOMEC)*, 2P1-N-052, pp. 1–4, Kobe, Japan, 2005.

C38. S.T. Monteiro, K. Uto, Y. Kosugi and E. Watanabe. Towards a surgical tool using hyperspectral imagery as visual aid. *MICCAI Workshop on Augmented Environments for Medical Imaging and Computer-aided Surgery*, pp. 97–103, Rennes, France, 2004.

C39. S.T. Monteiro, K. Uto, Y. Kosugi, and E. Watanabe. Towards applying hyperspectral imagery as an intraoperative visual aid tool. *IASTED International Conference on Visualization, Imaging and Image Processing (VIIP)*, pp. 483–488, Marbella, Spain, 2004.

C40. S.T. Monteiro and C.H.C. Ribeiro. Learning of mobile robot navigation from autonomously acquired maps, *National Meeting on Artificial Intelligence (ENIA)*, pp.1–10, Campinas, Brazil, 2003.

C41. S.T. Monteiro and C.H.C. Ribeiro. Acquisition of cognitive maps for the Magellan Pro mobile robot. *Brazilian Automation Conference (CBA)*, pp.1543–1548, Natal, Brazil, 2002.

Patents

P1. *Means and equipment for surgical viewing aid*. Japan 2006-085688. US patent application 2004/604,743

HONORS AND AWARDS

- Journal article [J6] featured on the cover of the IEEE Transactions on GRS, 2012.
- Interviewed by Japanese cable TV channel about robotics research and industry collaboration, 2007.
- Postdoctoral research fellowship*,* Japan Society for the Promotion of Science (JSPS), 2007 – 2008. (17% acceptance rate).
- Doctoral research full scholarship*,* Japan's Ministry of Education, Culture, Sports, Science and Technology (MONBUSHO), 2003 – 2007.
- Master's research full scholarship*,* Brazil's Research Support Foundation of the Sao Paulo State (FAPESP), 2000 – 2002.

SERVICE

- Vice-chair, Western New York Chapter of the IEEE Geoscience and Remote Sensing Society, 2016 – present.
- Guest editor, Journal of Field Robotics special issue on "Alternative sensing techniques for robot perception," 2015.
- Co-organizer, IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) workshop on robot perception, 2015
- Co-organizer, Robotics Science and Systems (RSS) conference workshop on robot perception, 2012.
- Program Co-Chair, Australasian Conference on Robotics and Automation (ACRA), 2009.
- Member, IEEE GRSS Technical Committee on Image Analysis and Data Fusion, 2012 – present.
- Reviewer for several journals and conferences including: IEEE TGRS, IEEE GRSL, IEEE JSTARS, IEEE TIP, IEEE TEVC, IEEE RAM, Remote Sensing, JFR, RAS, IJACSP, ICRA, IROS, DICTA, CEC, WHISPERS, SSCI, UAV.