REFERENCES

- M. Papademetriou, "RICE PRODUCTION IN THE ASIA-PACIFIC REGION: ISSUES AND PERSPECTIVES," [Online]. Available: http://www.fao.org/3/x6905e/x6905e04.htm. [Accessed 04 August 2019].
- [2] Rice Research & Development Institute (RRDI), Bathalagoda, "Rice Cultivation," [Online]. Available: https://www.doa.gov.lk/rrdi/index.php?option=com_sppagebuilder&view=pag e&id=42&lang=en. [Accessed 04 August 2019].
- [3] S. Madurangi, D. Ratnasekera, S. S. Senanayake, and P. Hemachandra, "Evaluation of brown planthopper Nilaparvata lugens (stal) resistance in Oryza nivara wild rice accessions found in Sri Lanka," in *Proceedings of International Forestry and Environment Symposium*, vol. 15, 2010.
- [4] Department of Census and Statistics, "Rice Yield Estimations Sri Lanka,"
 [Online]. Available: http://www.statistics.gov.lk/agriculture/Paddy%20Statistics/PaddyStats.htm.
 [Accessed 04 August 2019].
- W. G. Bastiaanssen, D. J. Molden, and I. W. Makin, "Remote sensing for irrigated agriculture: examples from research and possible applications," *Agricultural water management*, vol. 46, no. 2, pp. 137--155, 2000.
- [2] C. Atzberger, "Advances in remote sensing of agriculture: Context description, existing operational monitoring systems and major information needs," *Remote Sensing*, vol. 5, no. 2, pp. 949--981, 2013.
- [3] S. Balaselvakumar and S. Saravanan, *Remote sensing techniques for agriculture survey*, 2006.
- [4] M. S. Moran, Y. Inoue, and E. Barnes, "Opportunities and limitations for image-based remote sensing in precision crop management," *Remote sensing of Environment*, vol. 61, no. 3, pp. 319--346, 1997.
- [5] M. Lewis, "Discriminating vegetation with hyperspectral imagery-what is possible?," 2001.
- [6] N. Torbick, D. Chowdhury, W. Salas, and J. Qi, "Monitoring rice agriculture across myanmar using time series Sentinel-1 assisted by Landsat-8 and PALSAR-2," *Remote Sensing*, vol. 9, no. 2, p. 119, 2017.
- [11] planet.com, "PLANET IMAGERY PRODUCT SPECIFICATION: PLANETSCOPE and RAPIDEYE," October 2016. [Online]. Available: https://www.planet.com/products/satelliteimagery/files/1610.06_Spec%20Sheet_Combined_Imagery_Product_Letter_E

NGv1.pdf. [Accessed 04 06 2019].

- [12] A. Gatti, A. Galoppo, "Sentinel-2 Products," 14 March 2018. [Online]. Available: https://sentinel.esa.int/documents/247904/685211/Sentinel-2-Products-Specification-Document. [Accessed 04 06 2019].
- [13] European Space Agency, "Sentinel-1 Operations," [Online]. Available: https://www.esa.int/Our_Activities/Operations/Sentinel-1_operations. [Accessed 04 06 2019].
- [14] D. K. Bolton and M A. Friedl, "Forecasting crop yield using remotely sensed vegetation indices and crop phenology metrics," *Agricultural and Forest Meteorology*, vol. 173, pp. 74--84, 2013.
- [15] S. S. Panda, D. P. Ames, and S. Panigrahi, "Application of vegetation indices for agricultural crop yield prediction using neural network techniques," *Remote Sensing*, vol. 2, no. 3, pp. 673--696, 2010.
- [16] B.D. Wardlow, S.L. Egbert, J.H. Kastens, "Analysis of time-series MODIS 250 m vegetation index data for crop classification in the US Central Great Plains," *Remote Sensing of Envrionment*, vol. 108, no. 3, pp. 290--310, 2007.
- [17] B. D. Wardlow, S. L. Egbert, "Large-area crop mapping using time-series MODIS 250 m NDVI data: An assessment for the US Central Great Plains," *Remote sensing of environment*, vol. 112, no. 3, pp. 1096--1116, 2008.
- [18] B. Zheng, S. W. Myint, P. S. Thenkabail, and R. M.Aggarwal, "A support vector machine to identify irrigated crop types using time-series Landsat NDVI data," *International Journal of Applied Earth Observation and Geoinformation*, vol. 34, pp. 103--112, 2015.
- [19] Y. Shao, R. S. Lunetta, J. Ediriwickrema, and J. Iiames, "Mapping cropland and major crop types across the Great Lakes Basin using MODIS-NDVI data," *Photogrammetric Engineering & Remote Sensing*, vol. 76, no. 1, pp. 73--84, 2010.
- [20] P. C. Doraiswamy, A. J. Stern, and B. Akhmedov, "Crop classification in the US Corn Belt using MODIS imagery," in 2007 IEEE International Geoscience and Remote Sensing Symposium, 2007.
- [21] R. Massey, T. T. Sankey, R. G. Congalton, K. Yadav, P. S. Thenkabail, M. Ozdogan, and A. J. S. Meador, "MODIS phenology-derived, multi-year distribution of conterminous US crop types," *Remote Sensing of Environment*, vol. 198, pp. 490--503, 2017.
- [22] K. Chandrasekar, M. Sesha Sai, P. Roy, and R. Dwevedi, "Land Surface Water Index (LSWI) response to rainfall and NDVI using the MODIS Vegetation Index product," *International Journal of Remote Sensing*, vol. 31, no. 15, pp.

3987--4005, 2010.

- [23] B.-C. Gao, "NDWI—A normalized difference water index for remote sensing of vegetation liquid water from space," *Remote sensing of environment*, vol. 58, no. 3, pp. 257--266, 1996.
- [24] D. Chen, J. Huang, and T. J. Jackson, "Vegetation water content estimation for corn and soybeans using spectral indices derived from MODIS near-and shortwave infrared bands," *Remote Sensing of Environment*, vol. 98, no. 2-3, pp. 225--236, 2005.
- [25] X. Xiao, S. Boles, J. Liu, D. Zhuang, S. Frolking, C. Li, W. Salas, and B. Moore III, "Mapping paddy rice agriculture in South and Southeast Asia using multi-temporal MODIS images," *Remote sensing of environment*, vol. 100, no. 1, pp. 95--113, 2006.
- [26] L. Tingting and L. Chuang, "Study on extraction of crop information using time-series MODIS data in the Chao Phraya Basin of Thailand," *Advances in Space Research*, vol. 45, no. 6, pp. 775--784, 2010.
- [27] J. Schmidhuber, "Deep learning in neural networks: An overview," *Neural networks*, vol. 61, pp. 85--117, 2015.
- [28] M. Russwurm, M. Korner, "Temporal vegetation modelling using long shortterm memory networks for crop identification from medium-resolution multispectral satellite images," in *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition Workshops*, 2017.
- [29] Z.C. Lipton, J Berkowitz, C. Elkan, "A critical review of recurrent neural networks for sequence learning," *arXiv preprint arXiv:1506.00019*, 2015.
- [30] Hu, F., Xia, G., Hu, J. and Zhang, L. "Transferring deep convolutional neural networks for the scene classification of high-resolution remote sensing imagery," *Remote Sensing*, vol. 7, no. 11, pp. 14680--14707, 2015.
- [31] N. Srivastava, G. Hinton, A. Krizhevsky, I. Sutskever, R. Salakhutdinov, "Dropout: a simple way to prevent neural networks from overfitting," *The Journal of Machine Learning Research*, vol. 15, no. 1, pp. 1929--1958, 2014.
- [32] N. Kussul, M. Lavreniuk, S. Skakun, A. Shelestov, "Deep learning classification of land cover and crop types using remote sensing data," *IEEE Geoscience and Remote Sensing Letters*, vol. 14, no. 5, pp. 778--782, 2017.
- [33] O. Abdeljaber, O. Avci, S. Kiranyaz, M. Gabbouj, D.J. Inman, "Real-time vibration-based structural damage detection using one-dimensional convolutional neural networks," *Journal of Sound and Vibration*, vol. 388, pp. 154--170, 2017.

- [34] B. Zheng, S.W. Myint, P.S. Thenkabail, R.M. Aggarwal, "A support vector machine to identify irrigated crop types using time-series Landsat NDVI data," *International Journal of Applied Earth Observation and Geoinformation*, vol. 34, pp. 103--112, 2015.
- [35] F. Löw, U. Michel, S. Dech, C. Conrad, "Impact of feature selection on the accuracy and spatial uncertainty of per-field crop classification using support vector machines," *ISPRS journal of photogrammetry and remote sensing*, vol. 85, pp. 102--119, 2013.
- [36] B. Zheng, S.W. Myint, P.S. Thenkabail, R.M. Aggarwal, "A support vector machine to identify irrigated crop types using time-series Landsat NDVI data," *International Journal of Applied Earth Observation and Geoinformation*, vol. 34, pp. 103--112, 2015.
- [37] Y. Shao Y, R.S. Lunetta, "Comparison of support vector machine, neural network, and CART algorithms for the land-cover classification using limited training data points," *ISPRS Journal of Photogrammetry and Remote Sensing*, Vols. 78--87, p. 70, 2012.
- [38] N. Kussul, M. Lavreniuk, S. Skakun, A. Shelestov, "Deep learning classification of land cover and crop types using remote sensing data," *IEEE Geoscience and Remote Sensing Letters*, vol. 14, no. 5, pp. 778--782, 2017.
- [39] Z.Y. Liu, J.J. Shi, L.W. Zhang, J.F. Huang, "Discrimination of rice panicles by hyperspectral reflectance data based on principal component analysis and support vector classification," *Journal of Zhejiang University SCIENCE B*, vol. 11, no. 1, pp. 71--78, 2010.
- [40] M. Bruke, D.B. Lobell, "Satellite-based assessment of yield variation and its determinants in smallholder African systems," *Proceedings of the National Academy of Sciences*, vol. 114, no. 9, pp. 2189--2194, 2017.
- [41] N.A. Quarmby, J.R. Townshend, J.J. Settle, K.H. White, M. Milnes, T.L. Hindle, N. Silleos, "Linear mixture modelling applied to AVHRR data for crop area estimation," *International journal of remote sensing*, vol. 13, no. 3, pp. 415--425, 1992.
- [42] F. Gao, J. Masek, M. Schwaller, F. Hall, "On the blending of the Landsat and MODIS surface reflectance: Predicting daily Landsat surface reflectance," *IEEE Transactions on Geoscience and Remote sensing*, vol. 44, no. 8, pp. 2207--2218, 2006.
- [43] T. Hilker, M. A. Wulder, N. C. Coops, J. Linke, G. McDermid, J. G. Masek, F. Gao, and J. C. White, "A new data fusion model for high spatial-and temporal-resolution mapping of forest disturbance based on Landsat and MODIS," *Remote Sensing of Environment*, vol. 113, no. 8, pp. 1613--1627, 2009.

- [44] M. Immitzer, F. Vuolo, C. Atzberger "First experience with Sentinel-2 data for crop and tree species classifications in central Europe," *Remote Sensing*, vol. 8, no. 3, p. 116, 2016.
- [45] X. Blaes, L. Vanhalle, P. Defourny, "Efficiency of crop identification based on optical and SAR image time series," *Remote sensing of environment*, vol. 96, no. 3-4, pp. 352--365, 2005.
- [46] D.B. Michelson, B.M. Liljeberg, P. Pilesjö, "Comparison of algorithms for classifying Swedish landcover using Landsat TM and ERS-1 SAR data," *Remote Sensing of Environment*, vol. 71, no. 1, pp. 1--15, 2000.
- [47] K. Jia, Q. Li, Y. Tian, B. Wu, F. Zhang, J. Meng, "Crop classification using multi-configuration SAR data in the North China Plain," *International Journal* of Remote Sensing, vol. 33, no. 1, pp. 170--183, 2012.
- [48] Z. a. Z. M. Qin, "Detection of rice sheath blight for in-season disease management using multispectral remote sensing," *International Journal of Applied Earth Observation and Geoinformation*, vol. 7, no. 2, pp. 115--128, 2005.
- [49] M. Zhang, Z. Qin, X. Liu, S.L. Ustin, "Detection of stress in tomatoes induced by late blight disease in California, USA, using hyperspectral remote sensing," *International Journal of Applied Earth Observation and Geoinformation*, vol. 4, no. 4, pp. 295--310, 2003.
- [50] T. Kobayashi, E. Kanda, K. Kitada, K. Ishiguro, Y. Torigoe, "Detection of rice panicle blast with multispectral radiometer and the potential of using airborne multispectral scanners," *Phytopathology*, vol. 91, no. 3, pp. 316-323, 2001.
- [51] G. A. Carter, "Responses of leaf spectral reflectance to plant stress," *American Journal of Botany*, vol. 80, no. 3, pp. 239--243, 1993.
- [52] Z.Y. Liu, H.F. Wu, J.F. Huang, "Application of neural networks to discriminate fungal infection levels in rice panicles using hyperspectral reflectance and principal components analysis," *Computers and Electronics in Agriculture*, vol. 72, no. 2, pp. 99--106, 2010.
- [53] Z. Yang, M. Rao, N. Elliott, S. Kindler, and T. Popham, "Differentiating stress induced by greenbugs and Russian wheat aphids in wheat using remote sensing," *Computers and Electronics in Agriculture*, vol. 67, no. 1-2, pp. 64--70, 2009.
- [54] C.-M. Yang, C.-H. Cheng, and R.-K. Chen, "Changes in spectral characteristics of rice canopy infested with brown planthopper and leaffolder," *Crop science*, vol. 47, no. 1, pp. 329--335, 2007.
- [55] N. Prasannakumar, S. Chander, and R. Sahoo, "Characterization of brown

planthopper damage on rice crops through hyperspectral remote sensing under field conditions," *Phytoparasitica*, vol. 42, no. 3, pp. 387--395, 2014.

- [56] C.S. De Silva, E.K. Weatherhead, J.W. Knox, J.A. Rodriguez-Diaz, "Predicting the impacts of climate change—A case study of paddy irrigation water requirements in Sri Lanka," *Agricultural water management*, vol. 93, no. 1-2, pp. 19--29, 2007.
- [57] F. Chollet, "Keras," [Online]. Available: http://keras.io/. [Accessed 25 07 2019].
- [58] Google Brain Team, "Tensorflow," Google, 09 November 2015. [Online]. Available: https://www.tensorflow.org/. [Accessed 25 July 2019].
- [59] A. McVittie, "SENTINEL-1 Flood mapping tutorial," SkyWatch Space Applications Inc., Feb 2019. [Online]. Available: http://step.esa.int/docs/tutorials/tutorial_s1floodmapping.pdf. [Accessed 22 05 2019].
- [60] S.M. Ahmed, F.A Eldin, A.M. Tarek, "Speckle noise reduction in SAR images using adaptive morphological filter," in 2010 10th International Conference on Intelligent Systems Design and Applications, 2010.
- [61] J.-S. Lee, L. Jurkevich, P. Dewaele, P. Wambacq, and A. Oosterlinck, "Speckle filtering of synthetic aperture radar images: A review," *Remote sensing reviews*, vol. 8, no. 4, pp. 313--340, 1994.
- [62] D. Small, "Flattening gamma: Radiometric terrain correction for SAR imagery," *IEEE Transactions on Geoscience and Remote Sensing*, vol. 49, no. 8, pp. 3081--3093, 2011.
- [63] L. Jia, Z. Zhou, and B. Li, "Study of SAR image texture feature extraction based on GLCM in Guizhou Karst mountainous region," in 2012 2nd International Conference on Remote Sensing, Environment and Transportation Engineering, 2012.
- [64] R. M. Haralick, K. Shanmugamet al., "Textural features for image classification," *IEEE Transactions on systems, man, and cybernetics*, no. 6, pp. 610--621, 1973.
- [65] K. Sõgawa and M. Pathak, "Mechanisms of brown planthopper resistance in Mudgo variety of rice (Hemiptera: Delphacidae)," *Applied Entomology and Zoology*, vol. 5, no. 3, pp. 145--158, 1970.
- [66] E. A. Backus, M. S. Serrano, and C. M. Ranger, "Mechanisms of hopperburn: an overview of insect taxonomy, behavior, and physiology," *Annu. Rev. Entomol.*, vol. 50, pp. 125--151, 2005.

- [67] K. Sogawa, "The rice brown planthopper: feeding physiology and host plant interactions," *Annual review of entomology*, vol. 27, no. 1, pp. 49--73, 1982.
- [68] C. Kudagamage and L. Nugaliyadde, "Present status and future direction of insect pest management in rice," *Rice congress Sri Lanka*, pp. 39--54, 1995.
- [69] J. Xue, X. Zhou, C.-X. Zhang, L.-L. Yu, H.-W. Fan,Z. Wang, H.-J. Xu, Y. Xi, Z.-R. Zhu, W.-W. Zhouet al., "Genomes of the rice pest brown planthopper and its endosymbionts reveal complex complementary contributions for host adaptation," *Genome Biology*, vol. 15, no. 12, p. 521, 2014.
- [70] Z.Y. Liu, J.J. Shi, L.W. Zhang, J.F. Huang, "Discrimination of rice panicles by hyperspectral reflectance data based on principal component analysis and support vector classification," *Journal of Zhejiang University SCIENCE B*, vol. 11, no. 1, pp. 71--78, 2010.
- [71] C.-M. Yang, C.-H. Cheng, and R.-K. Chen, "Changes in spectral characteristics of rice canopy infested with brown planthopper and leaffolder," *Crop science*, vol. 47, no. 1, pp. 329--335, 2007.
- [72] N. Prasannakumar, S. Chander, and R. Sahoo, "Characterization of brown planthopper damage on rice crops through hyperspectral remote sensing under field conditions," *Phytoparasitica*, vol. 42, no. 3, pp. 387--395, 2014.
- [73] J. A. Gamon, C. B. Field, M. L. Goulden, K. L. Griffin, A. E. Hartley, G. Joel, J. Penuelas, and R. Valentini, "Relationships between NDVI, canopy structure, and photosynthesis in three Californian vegetation types," *Ecological Applications*, vol. 5, no. 1, pp. 28--41, 1995.