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EDUCATION

Ph.D. in Earth & Atmospheric Sciences, November 2010

University of Alberta, Edmonton, Alberta, Canada
Dissertation: *Application of continuous wavelet analysis to hyperspectral data for the characterization of vegetation.* Advisor: Dr. Benoit Rivard

M. Eng. in Photogrammetry & Remote Sensing, July 2006

Peking University, Beijing, China
Thesis: *Multichannel image texture by multivariate geostatistics for image classification.*
Advisor: Dr. Peijun Li

B. Sc. in Geographic Information System, June 2003

Lanzhou University, Lanzhou, Gansu, China

RESEARCH EXPERIENCE

Postdoctoral researcher, Department of Land, Air and Water Resources, University of California, Davis (2011-present)

- Project: *Multiscale assessment of vegetation water content estimates and its impact on soil moisture for agricultural and natural vegetation.* Sponsor: NASA.
- Project: *Near real time science processing algorithm for live fuel moisture content for the MODIS direct readout system.* Sponsor: NASA.
- Project: *Identification of plant functional types by characterization of canopy chemistry using an automated advanced canopy radiative transfer model (HyspIRI preparatory airborne activities project).* Sponsor: NASA.

Research/teaching assistant, Department Earth & Atmospheric Sciences, University of Alberta, (2006-2010)

- Project: *Use of hyperspectral remote sensing to understand the early signals of mountain pine beetle infestation.* Sponsor: Government of Alberta.

Project: *Development of robust spectral indicators for the estimation of leaf water content for a variety of plant species.* Sponsor: grants to Drs. B.Rivard and A.Sánchez-Azofeifa.

Visiting student, Department of Biophysical & Electronic Engineering, University of Genoa, Italy (2006)

Project: *Multitemporal classification and change detection based on spectral and textural information.*
Sponsor: University of Genoa.

Research assistant, Institute of Remote Sensing & GIS, Peking University, 2003-2006

Project: *Integration of spatial and spectral information from satellite imagery for improved land cover/land use classification and change detection.*

TEACHING EXPERIENCE

Field instructor, *in situ* reflectance measurements, Student Airborne Research Program June 2012

Demonstrated ASD full range spectroradiometer and integrating sphere for airborne imagery calibration and leaf optical measurements, supervised SARP Land Remote Sensing Group students to use an ASD spectroradiometer in the field.

Guest lecturer, Environmental Remote Sensing, University of California, Davis, January 2012

Gave a lecture on *in situ* (field/lab) reflectance measurements.

Laboratory instructor, Digital Remote Sensing (EAS 451), University of Alberta, Winter 2007 & 2008, Fall 2009 & 2010

As sole instructor of ~12 undergraduate and graduate students, gave lectures on laboratory topics, demonstrated ENVI software, marked lab reports and held office hours.

Teaching assistance, Planet Earth (EAS 100), University of Alberta, Fall 2006 and Winter 2010

Collaborated with another TA on undergraduate laboratory sections, assisted students in introductory Earth science laboratories, marked lab assignments.

RESEARCH INTERESTS

- Hyperspectral remote sensing for ecological studies
- Vegetation mapping and monitoring
- Retrievals of canopy chemistry
- Radiative transfer modeling (e.g., PROSPECT+SAIL)
- Plant species discrimination and stress/disturbance detection
- Feature extraction using wavelet analysis
- Land use/land cover classification and change detection

PUBLICATIONS

ResearcherID: <http://www.researcherid.com/rid/B-4807-2010>

Google Scholar: <http://scholar.google.com/citations?user=uOGtKrcAAAAJ>

In preparation:

2. **Cheng, T.**, Rivard, B., Sánchez-Azofeifa, G. A., Féret, J. B., Jacquemoud, S. & Ustin, S. L. A wavelet approach to robust estimation of leaf mass per area from leaf reflectance spectra.
1. **Cheng, T.**, Riaño, D. & Ustin, S. L. Mapping canopy water content in agricultural vegetation using continuous wavelet analysis of airborne imaging spectroscopy data.

Peer-reviewed papers:

8. **Cheng, T.**, Riaño, D., Koltunov, A., Whiting, M. L., Ustin, S. L. & Rodriguez, J. Detection of diurnal variation in orchard canopy water content using MODIS/ASTER airborne simulator (MASTER) data. (2013). *Remote Sensing of Environment*. 132, 1-12. (SCI, IF=4.574)
7. **Cheng, T.**, Rivard, B., Sánchez-Azofeifa, G. A., Féret, J. B., Jacquemoud, S. & Ustin, S. L. (2012). Predicting leaf gravimetric water content from foliar reflectance across a range of plant species using continuous wavelet analysis. *Journal of Plant Physiology*, 169, 1134-1142. (SCI, IF=2.791)
6. Jin, H., Li, P., **Cheng, T.** & Song, B. (2012). Land cover classification using CHRIS/PROBA images and multi-temporal texture. *International Journal of Remote Sensing*, 33, 101-119. (SCI, IF=1.117)
5. McKellar, R., Wolfe, A., Muehlenbachs, K., Tappert, R., Engel, M., **Cheng, T.**, & Sánchez-Azofeifa, A. (2011). Insect outbreaks produce distinctive carbon isotope signatures in defensive resins and fossiliferous ambers. *Proceedings of the Royal Society B: Biological Sciences*. doi: 10.1098/rspb.2011.0276. (SCI, IF=5.415)
6. **Cheng, T.**, Rivard, B., & Sánchez-Azofeifa, G. A. (2011). Spectroscopic determination of leaf water content using continuous wavelet analysis. *Remote Sensing of Environment*, 115, 659-670. (SCI, IF=4.574)
3. **Cheng, T.**, Rivard, B., Sánchez-Azofeifa, G. A., Feng, J. & Calvo-Polanco, M. (2010). Continuous wavelet analysis for the detection of green attack damage due to mountain pine beetle infestation. *Remote Sensing of Environment*, 114, 899-910. (SCI, IF=4.574)
2. Li, P., Yu, H., & **Cheng, T.** (2009). Lithologic mapping using ASTER imagery and multivariate texture. *Canadian Journal of Remote Sensing*, 35, S117-S125. (SCI, IF=0.560)
1. Li, P., **Cheng, T.** & Guo, J. (2009). Multivariate image texture by multivariate variogram for multispectral image classification. *Photogrammetric Engineering & Remote Sensing*, 75, 147-157. (SCI, IF=1.048)

Conference proceedings:

6. **Cheng, T.**, Riaño, D., Koltunov, A., Whiting, M. L. & Ustin, S. L. (2011). Remote detection of water stress in orchard canopies using MODIS/ASTER airborne simulator (MASTER) data. *Proceedings of SPIE* 8156, August 21-25, 2011, San Diego, California. (Oral)
5. **Cheng, T.**, Rivard, B., & Sánchez-Azofeifa, G. A. Spectroscopic determination of leaf water content using continuous wavelet analysis. *Proceedings of International Geoscience and Remote Sensing Symposium (IGARSS)*, July 25-30, 2010, Honolulu, Hawaii. (Poster)
4. Li, P., **Cheng, T.**, Moser, G., Serpico, S.B. & Ma, D. (2007). Multitemporal change detection by spectral and multivariate texture information. *Proceedings of International Geoscience and Remote Sensing Symposium (IGARSS)*, July 23-27, 2007, Barcelona, Spain, pp. 1922-1925.
3. Li, P., **Cheng, T.**, Hu, H., & Xiao, X. (2006). High-resolution multispectral image classification over urban areas by image segmentation and extended morphological profile. *Proceedings of International Geoscience and Remote Sensing Symposium (IGARSS)*, July 31-August 4, 2006, Denver, Colorado, pp. 3252-3254.
2. Li, P. & **Cheng, T.** (2005). Multitemporal image classification by multichannel texture and Support Vector Machines (SVM). *Proceedings of the 9th International Symposium on Physical Measurements and Signature in Remote Sensing (ISPMSRS)*, October 17-19, 2005, Beijing, China, pp. 235-237.
1. **Cheng, T.** & Li, P. (2005). Multivariate variogram-based multichannel image texture for image classification. *Proceedings of International Geoscience and Remote Sensing Symposium (IGARSS)*, July 25-29, 2005, Seoul, Korea, pp. 3830-3832. (Poster)

Abstracts:

7. Alsina, M. M., **Cheng, T.**, Riaño, D., Whiting, M., Ustin, S. & Smart, D. Water status detection in California Table Grapes: from leaf to airborne. *9th European Conference on Precision Agriculture*, July 7th-11th, 2013, Lleida, Catalonia, Spain.
6. **Cheng, T.**, Riaño, D. & Ustin, S. L. Continuous wavelet analysis applied to imaging spectroscopy data for mapping canopy water content in agricultural vegetation. *35th International Symposium on Remote Sensing of Environment*, April 22-26, 2013, Beijing, China. (Accepted for oral presentation)
5. **Cheng, T.**, Riaño, D. & Ustin, S. L. Exploring the relationship between water flux and vegetation water status using time series data of evapotranspiration and MODIS vegetation indices. *AGU 2012 Fall Meeting*, December 3-7, 2012, San Francisco, CA. (Poster)
6. **Cheng, T.**, Riaño, D. & Ustin, S. L. Analysis of seasonal and diurnal variation in vegetation canopy water content using AVIRIS-derived liquid water products from ACORN. *2012 HypIRI workshop*, October 16-18, 2012, Washington, D. C. (Poster)
3. Ustin, S., Kefauver, S., Rodriguez, J., **Cheng, T.** & Riaño, D. Use of optical and thermal infrared imagery from AVIRIS/MASTER to estimate evapotranspiration. *2011 HypIRI workshop*, August 23-25, 2011, Washington, D.C.

2. **Cheng, T.**, Rivard, B., Sánchez-Azofeifa, G. A., & Jacquemoud, S. Wavelets: a useful tool to derive vegetation properties from hyperspectral data. *FLUXNET Workshop*, June 7-9, 2011, Berkeley, California.(Poster)
1. **Cheng, T.**, Rivard, B., & Sánchez-Azofeifa, G. A. Identification of boreal tree species in northern Alberta with airborne hyperspectral imagery. *GIS Day*, November 15, 2007, University of Alberta, Edmonton, Alberta, Canada. (Poster)

PRESENTATIONS

5. Remotely sensed fuel moisture using leaf and imaging spectroscopy. ASPRS Northern California Region Technical Session “*Remote Sensing of Fire and Ecosystem Impacts*”, August 8th, 2012. McClellan, CA.
4. Detection of diurnal variation in orchard canopy water content using MODIS/ASTER airborne simulator (MASTER) data. “*Multiscale assessment of vegetation water content estimates and its impact on soil moisture for agricultural and natural vegetation*” Project meeting, March 21, 2012, University of California, Davis, CA.
3. Estimating leaf fuel moisture content from reflectance spectra using continuous wavelet analysis. “*Near Real Time Science Processing Algorithm for Live Fuel Moisture Content for the MODIS Direct Readout System*” Project kick-off meeting, October 25, 2011, University of California, Davis, CA.
2. Continuous wavelet analysis for the detection of green attack due to mountain pine beetle infestation. *Earth Observation Science Day*, March 4, 2010, University of Alberta, Edmonton, Alberta, Canada.
1. Continuous wavelet analysis for the detection of green attack due to mountain pine beetle infestation. *ATLAS Symposium*, April 8-9, 2010, University of Alberta, Edmonton, Alberta, Canada.

AWARDS& HOUNORS

UC Davis Postdoctoral Scholars Association (PSA) Travel Grant (2013)	\$400
Nominee for the Award for Excellence in Postdoctoral Research, UC Davis (2012)	
Professional Development Grant, University of Alberta, Canada (2010)	\$500
J Gordin Kaplan Graduate Student Award, University of Alberta, Canada (2010)	\$1,300
Visiting student scholarship, University of Genoa, Genoa, Italy (2006)	€4,500
Outstanding graduate, Lanzhou University, Lanzhou, China (2003)	

PROFESSIONAL ACTIVITIES

Reviewer for journals:

Oecologia
IEEE Transactions on Geoscience and Remote Sensing
ISPRS Journal of Photogrammetry and Remote Sensing

Remote Sensing
International Journal of Remote Sensing
Journal of Applied Remote Sensing
Canadian Journal of Remote Sensing
Sensor letters
Journal of Multimedia

Membership:

American Geophysical Union (2010-present)

GRANT WRITING EXPERIENCE

- **NASA, ROSES, HypsIRI Preparatory Airborne Activities and Associated Science and Applications Research (01/01/2013-12/31/2015) \$316, 435 (Declined)**
“Monitoring spatio-temporal variation in vegetation water content across plant functional types along climatic gradients in California through HypsIRI Preparatory Airborne Activities”
PI: Tao Cheng, Co-I: David Riaño

FIELD EXPERIENCE

June, August 2007: needle reflectance, pine forest, Swan Hills, Alberta, Canada
May-October 2008: needle reflectance, pine forest, Grande Prairie, Alberta, Canada
May, June, November 2011: canopy water content, leaf area index (LAI), orchard, Lost Hills, CA
June, 2012: leaf reflectance and transmittance spectra, vineyard, Delano, CA (In support of the 2012 NASA Student Airborne Research Program)
August, 2012: water reflectance, Lake Tahoe, CA (In support of vicarious calibration for NASA’s MASTER airborne instrument)

TECHNICAL SKILLS

Professional analysis: ENVI, ERDAS Imagine, ArcGIS, HemiView.
Programming: IDL, Matlab, R.
Statistical analysis: R, SPSS, JMP.
Instrument: ASD FieldSpec[®] Full-range spectroradiometer, GER 1500 spectroradiometer, LI-1800 Integrating Sphere, Fisheye photography, Trimble[®] GPS, Fluke 512 Infrared Thermometer.
Laboratory procedures: leaf pigment concentration, leaf water content.

References for Dr. Tao Cheng:

Dr. Susan L. Ustin (Postdoctoral co-advisor)

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Dr. David Riaño (Postdoctoral co-advisor)

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