

Jarrell WAGGONER

Biographical

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Research Interests

computer vision, segmentation, document image analysis, event recognition, image processing, artificial intelligence, pattern recognition & machine learning, data science, functional programming, GIS, Clojure

Education

AUG. 2013 Doctor of COMPUTER SCIENCE & ENGINEERING **University of South Carolina**
Advisor: Dr. Song WANG
Dissertation: "Multi-Label Segmentation Propagation for Materials Science Images
Incorporating Topology and Interactivity"

MAY 2009 Master of Engineering in COMPUTER SCIENCE **University of South Carolina**
magna cum laude

Industry Experience

2017—
PRESENT **Architect** at [RALLY HEALTH, INC.](#)
Seasoned engineering leader responsible for overseeing technical design and engineering decisions across Rally's entire data organization of 50+ engineers, analysts, and data scientists.

- Architected complete rewrite of the data platform for the whole company, moving from a fixed **Cloudera** cluster to a self-service platform using **Databricks** and **Redshift** fed by **Spark** ETLs written in **Scala** and scheduled with **Airflow** atop **Kubernetes**. Built consensus on new architecture and delivered working system within a year while growing the team from only myself to an independent platform team of 10 engineers.
- Member of the Rally Engineering Technical Staff, responsible for making cross-cutting engineering decisions, evaluating potential acquisitions, signing off on major company-wide architectural changes, and organizing technical interest groups.
- Heavily involved in defining team structure and hiring, conducting over 100 interviews for IC and management roles to scale the data organization from 4 engineers to over 50 engineers.
- Fostered good design practices across the data organization by auditing design documents, leading architecture meetings for multiple teams to grow design aptitude, and spearheading the standardization of best-practices on the team including code review, documented on-call workflow, CI/CD, monitoring/alerting, idempotent ETL workflows, and reproducible EDW layout.
- Coordinated with over 16 internal and external teams across an extensive range of projects including productionalized ML workflows, frontend/mobile event tracking, real time data processing, data anonymization, security/compliance/privacy requirements, data ingestion APIs, data quality validation, and self-service internal product analytics.

2016—2017 **Software Engineer** at [DRW HOLDINGS, LLC](#)
Member of the Trading Infrastructure team, developing the internal platform used by every trading desk at DRW. Built greenfield high-performance service-oriented systems using **Clojure** and **Java** while maintaining legacy applications in **Ruby** and **C#** among a catalog of over 50 microservices.

- Contributed to a **Ruby**-based reconciliation tool used to balance cash flows for high-volume trading

	<ul style="list-style-type: none"> – Extended a research workflow tool used for computing the value and settle price of options, futures, equities, and other financial instruments, written in Clojure. – Developed and extended multiple UI frontends for internal tools using React and Reagent.
2013–2016	<p>Senior Software Engineer at GROUPON, INC.</p> <p>Contributed to three engineering teams: The Flux team building Data Science pipelines, the Project Genesis strike team integrating scraped web data into Salesforce, and served as Tech Lead of the Supply Intelligence team creating internal sales tools to optimize Groupon’s supply funnel.</p> <ul style="list-style-type: none"> – Built a PostgreSQL-backed high-performance caching and write management system in Clojure around the Salesforce API that hits 10K req/min. – Managed critical business automation of the sales lead assignment process that previously required an estimated 80 sales managers to conduct manually; led the effort to rearchitect this legacy system from an ad-hoc job scheduling platform written in Ruby and Bash to a multi-staged Hadoop pipeline written in Clojure to handle over 6M accounts. – Coordinated with product and business teams to ETL 250K leads in Salesforce from scraped web data. – Built out an ETL management and machine learning platform using Python, Clojure, Hive, and Spark to run mission-critical Decision Tree Learning models to predict customer attrition, lifetime customer value, and merchant value. – Mentored interns and junior developers, established best practices, and led multiple major technical initiatives on a team of 5 developers.
2012–2014	<p>Technical Engineer at TERRASTRIDE, INC.</p> <p>Software developer in an agile startup environment creating the huntstand.com web application. Written using Python, Django, and Backbone.js; deployed to AWS. Responsible for curating full technology stack and coordinating with 5 developers.</p>
2011–2013	<p>Project Manager at PALMETTO COMPUTER LABS</p> <p>Created and taught workshops on git, the Linux command line, Android development, and open source software for hundreds of students, developers, and government officials at IT-oLOGY. Managed the OPEN IT LAB and associated projects. Assisted in planning POSSCON.</p>
2011	<p>Contractor for ELASTIC VISION CONSULTING</p> <p>Built a parser and generator for XML medical records formats (CCR and CCD) in a Java web application. Written using JDOM, Xerces, and Hibernate, and run on an Axis2+Jetty6 driven server.</p>

Research Experience

2011–2013	<p>Research Assistant funded by AFOSR</p> <p><i>Materials Volume Segmentation</i></p> <p>Developed segmentation methods for materials image volumes in <i>Python+NumPy/SciPy</i> and <i>MATLAB</i> at the COMPUTER VISION LAB at USC. Managed the lab computer network and organized weekly lab meetings. Created GUI interface using wxWidgets for assisted segmentation, and conducted large-scale evaluations on multiple datasets for metallic and biological materials.</p>
2010–2011	<p>Research Assistant funded by DARPA</p> <p><i>Video Event Recognition</i></p> <p>Explored segmentation methods for video event recognition. Attended P.I. meetings in San Diego (2010) and Colorado (2011). Developed algorithms in <i>Scheme</i> to process a corpus of thousands of videos extracted into over 3 million frames using a high-performance computing cluster.</p>
2009–2010	<p>NEH Fellow at the CENTER FOR DIGITAL HUMANITIES</p> <p><i>Digital Collation</i></p> <p>Created a DIGITAL COLLATION application to handle automatic differencing of sub-textual inconsistencies among multiple copies of <i>The Faerie Queene</i> by EDMUND SPENSER in <i>MATLAB</i> to process tens of thousands of book page images.</p>

Teaching Experience

2008–2009	<p>GK-12 Fellow at CRAYTON MIDDLE SCHOOL <i>8th Grade Science</i></p> <p>Served in Crayton Middle School, coordinating with the classroom instructor to enhance the science curriculum and activities in an 8th grade science classroom. Subsequently coordinated and taught at the GK-12 INSTITUTE FOR TEACHERS, presenting the activities developed and delivered in the classroom.</p>
2007–2008, 2011	<p>Graduate Teaching Assistant at USC <i>Web Development</i></p> <p>Supervised CSCE 145 labs, covering software development with JAVA, and taught CSCE 102, covering JAVASCRIPT, HTML, and CSS. Taught CSCE 211 covering digital logic design.</p>
SPRING 2007	<p>Instructor for CSCE 204 at USCL <i>Introductory Programming</i></p> <p>Hired as special faculty. Taught introductory Visual Basic for majors and non-majors. Selected textbooks, developed all course material, graded all assignments. Worked with Dr. Noni M. Bohonak</p>
FALL 2006	<p>Camp Instructor for USCL ARTS AND SCIENCES ADVENTURE CAMP <i>5th-8th Grade Students</i></p> <p>Worked in collaboration with Dr. Dwayne Brown. One of two instructors teaching Math and Computer Science to grade school students.</p>
2003–2007	<p>Professional Tutor at USCL ACADEMIC SUCCESS CENTER <i>High School and College Students</i></p> <p>Student and graduate tutor for college-level Mathematics, Computer Science, Physics, and English classes.</p>

Publications

- [1] Derrick. C. Spell, Ling-Yong Wang, Richard T. Shomer, Bahador Nooraei, **Jarrell Waggoner**, Xiaio-Han T. Zeng, Jae Y. Chung, Kai-Chen Cheng, and Daniel Kirsche. QED: Groupon's ETL management and curated feature catalog system for machine learning. In *IEEE International Conference on Big Data*, pages 1639–1646, Dec 2016. [\[Link\]](#).
- [2] **Jarrell Waggoner**, Youjie Zhou, Jeff Simmons, Marc De Graef, and Song Wang. Topology-preserving multi-label image segmentation. In *IEEE Workshop on Applications of Computer Vision (WACV)*, pages 1084–1091, Waikoloa Beach, HI, 2015. [\[PDF\]](#).
- [3] **Jarrell Waggoner**, Youjie Zhou, Jeff Simmons, Marc De Graef, and Song Wang. Graph-cut based interactive segmentation of 3D materials-science images. *Machine Vision and Applications*, 25:1615–1629, 2014. [\[PDF\]](#).
- [4] Youjie Zhou, Lili Ju, Yu Cao, **Jarrell Waggoner**, Yuewei Lin, Jeff Simmons, and Song Wang. Edge-weighted centroid voronoi tessellation with propagation of consistency constraint for 3D grain segmentation in microscopic superalloy images. In *CVPR Workshop on Perception Beyond the Visible Spectrum (PBVS)*, 2014. [\[PDF\]](#).
- [5] Dhaval Salvi, **Jarrell Waggoner**, Andrew Temlyakov, and Song Wang. A graph-based algorithm for multi-target tracking with occlusion. In *IEEE Workshop on Applications of Computer Vision (WACV)*, 2013. [\[PDF\]](#).
- [6] Dhaval Salvi, Jun Zhou, **Jarrell Waggoner**, and Song Wang. Handwritten text segmentation using average longest path algorithm. In *IEEE Workshop on Applications of Computer Vision (WACV)*, 2013. [\[PDF\]](#).
- [7] Andrew Temlyakov, Pahal Dalal, **Jarrell Waggoner**, Dhaval Salvi, and Song Wang. Shape and image retrieval by organizing instances using population cues. In *IEEE Workshop on Applications of Computer Vision (WACV)*, 2013. [\[PDF\]](#).
- [8] **Jarrell Waggoner**. *Multi-Label Segmentation Propagation for Materials Science Images Incorporating Topology and Interactivity*. Dissertation, University of South Carolina, 2013. [\[PDF\]](#).

- [9] **Jarrell Waggoner**, Jeff Simmons, Marc De Graef, and Song Wang. 3D materials image segmentation by 2D propagation: A graph-cut approach considering homomorphism. *IEEE Transactions on Image Processing*, 22, 2013. [PDF].
- [10] **Jarrell Waggoner**, Youjie Zhou, Jeff Simmons, Ayman Salem, Marc De Graef, and Song Wang. Interactive grain image segmentation using graph cut algorithms. In *Proceedings of SPIE (Computational Imaging XI)*, Burlingame, CA, 2013. [PDF].
- [11] Andrei Barbu, Alexander Bridge, Zachary Burchill, Dan Coroian, Sven Dickinson, Sanja Fidler, Aaron Michaux, Sam Mussman, Siddharth Narayanaswamy, Dhaval Salvi, Lara Schmidt, Jiangnan Shangguan, Jeffrey Mark Siskind, **Jarrell Waggoner**, Song Wang, Jinlian Wei, Yifan Yin, and Zhiqi Zhang. Video in sentences out. In *Conference on Uncertainty in Artificial Intelligence*, pages 102–112, 2012. [PDF].
- [12] Andrei Barbu, Alexander Bridge, Dan Coroian, Sven Dickinson, Sam Mussman, Siddharth Narayanaswamy, Dhaval Salvi, Lara Schmidt, Jiangnan Shangguan, Jeffrey Mark Siskind, **Jarrell Waggoner**, Song Wang, Jinlian Wei, Yifan Yin, and Zhiqi Zhang. Large-scale automatic labeling of video events with verbs based on event-participant interaction. Technical report, 2012. [PDF].
- [13] **Jarrell Waggoner**, Jeff Simmons, Marc De Graef, and Song Wang. Graph cut approaches for materials segmentation preserving shape, appearance, and topology. In *International Conference on 3D Materials Science*, pages 147–152, Seven Springs, PA, 2012. [PDF].
- [14] **Jarrell Waggoner**, Jeff Simmons, and Song Wang. Combining global labeling and local relabeling for metallic image segmentation. In *Proceedings of SPIE (Computational Imaging X)*, volume 8296, Burlingame, CA, 2012. [PDF].
- [15] Zhiqi Zhang, Sanja Fidler, **Jarrell Waggoner**, Yu Cao, Sven Dickinson, Jeffrey Mark Siskind, and Song Wang. Superedge grouping for object localization by combining appearance and shape information. In *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, pages 3266–3273, Providence, RI, 2012. [PDF].
- [16] Song Wang, **Jarrell Waggoner**, and Jeff Simmons. Graph-cut methods for grain boundary segmentation. *JOM Journal of the Minerals, Metals and Materials Society*, 63:49–51, 2011. [PDF].
- [17] Andrew Temlyakov, Brent C. Munsell, **Jarrell Waggoner**, and Song Wang. Two perceptually motivated strategies for shape classification. In *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, pages 2289–2296, 2010. [PDF].
- [18] Zhiqi Zhang, Yu Cao, Dhaval Salvi, Kenton Oliver, **Jarrell Waggoner**, and Song Wang. Free-shape subwindow search for object localization. In *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, pages 1086–1093, San Francisco, CA, 2010. [PDF].

Posters/Presentations

- [P1] Project athena: Rally’s next-generation data platform. *Optum/UHG/UHC Analytics Conference*. Eden Prairie, MN. September 2019.
- [P2] Rules engines: Logic as data structure. *Palmetto Open Source Software Conference*. Columbia, SC. April 2015. [Slides].
- [P3] Python for computer vision. *All Things Open*. Raleigh, NC. October 2013. [Slides].
- [P4] Interactive grain image segmentation using graph cut algorithms. *USC Graduate Student Day*. Columbia, SC. April 2013. [Slides].
- [P5] Computer science: Research, industry, and entrepreneurship. *Careers in Science Lecture Series*. Lancaster, SC. March 2013. [Slides].
- [P6] Extending django. *Palmetto Open Source Software Conference*. Columbia, SC. March 2013. [Slides].
- [P7] Interactive grain image segmentation using graph cut algorithms. *SPIE (Computational Imaging XI)*. Burlingame, CA. February 2013. [Slides].

- [P8] Android application development workshop. *Appathon Contest*. Columbia, SC. November 2012.
- [P9] Homeomorphic multi-structure propagation for metallic image segmentation. *Gamecock Computing Research Symposium*. Columbia, SC. October 2012.
- [P10] Open source and education. *SC Municipal Technology Association (SCMTA) Conference*. Charleston, SC. September 2012.
- [P11] Open source and higher education. *SC Technical College System (SCTCS) Conference*. Columbia, SC. September 2012.
- [P12] Introduction to android development. *Digital Humanities High Performance Computing (DHHPC) Workshop*. Columbia, SC. August 2012.
- [P13] Combining global labeling and local relabeling for metallic image segmentation. *SPIE (Computational Imaging X)*. Burlingame, CA. January 2012.
- [P14] Open source and government. *SC Government Management Information Systems (SCGMIS) Software Developers Workshop*. Columbia, SC. January 2012.
- [P15] Superpixel contour completion. *DARPA Mind's Eye PI Meeting*. Denver, CO. January 2011.

Honors/Awards

First Place	»	Gamecock Computing Research Symposium Poster Session	2012
First Place	»	Graduate Student Day Presentation	2012
Second Place	»	Graduate Student Day Presentation	2011
Honorable Mention	»	Graduate Student Day Presentation	2010
Inductee	»	Upsilon Pi Epsilon	2009
Recipient	»	Clara P. Hammond Award	2004
Recipient	»	Science and Mathematics Award	2004
Recipient	»	Highest Academic Average Award	2004

Classes Taught

IT-oLogy			
	2012–2013	» Open Source 101	Open Source Software
	2012–2013	» Version Control 101	git, github
	2012–2013	» Command Line 101	Linux, BASH
USC			
	Fall 2011	» CSCE 211	Digital Logic Design
	Summer II 2008	» CSCE 102	HTML/CSS/JavaScript
	Spring 2008	» CSCE 145 Lab	Java
	Fall 2007	» CSCE 145 Lab	Java
USCL			
	Spring 2007	» CSCE 204	Visual Basic
	Spring 2007	» Math 241 & Math 242	Maple

Service

MENTOR	»	Groupon internship program	2014
BOOK REVIEWER	»	Practical Data Analysis , Packt Publishing	2013
WEBMASTER	»	Winter Vision Meetings	2013

WEBMASTER »	Workshop on the Applications of Computer Vision	2013
JUDGE »	Discovery Day — Undergraduate Research Presentations	2012
REVIEWER »	Pattern Recognition Letters	2011–2012
REVIEWER »	IEEE Transactions on Pattern Analysis and Machine Intelligence	2012
SYSADMIN »	Computer Vision Lab	2009–2012

Personal and Open Source Projects

MATSCISEG	<p>Framework for propagated 3D volume segmentation, used in my dissertation work. Algorithms created in Python and C++ and exposed as a web API using Django. Includes a web application that consumes the API created in JavaScript, and jQuery.</p> <p>github.com/malloc47/matsciseq</p>
RATIO CONTOUR	<p>Maintainer and contributor for the Ratio Contour project, a salient object detection and segmentation method used for computer vision applications. Developed in C and MATLAB.</p> <p>github.com/malloc47/ratio-contour</p>
DIGITAL COLLATION	<p>Research project to “collate” high-resolution documents by using image registration, accomplished using the SIFT feature detector and a thin plate spline warping technique, written in MATLAB.</p> <p>github.com/malloc47/digital-collation</p>
MATSCICUT	<p>An energy minimization framework for segmenting 3D materials volumes. Prototype of dissertation work, created in C++ using OpenCV libraries, with assorted MATLAB helper utilities.</p> <p>github.com/malloc47/matscicut</p>
BEFUNGEPY	<p>Complete Befunge interpreter written in Python. Implements the Befunge 93 specification, and is one of the closest Python equivalents to the C reference implementation.</p> <p>github.com/malloc47/befunge.py</p>

Skills & Languages

• • • Bash	• • • git	• • JavaScript	• • • PostgreSQL
• • C/C++	• • • GNU/Linux	• • \LaTeX	• • • Python
• • • Clojure	• • • Hadoop	• • MATLAB	• • • Scala
• • Django	• Haskell	• • • NumPy/SciPy	• • • Scheme
• • Emacs Lisp	• • • Java	• • • OpenCV	• • • Spark

• Small-scale or personal projects

• • Used in production

• • • Used in large-scale production systems

Activities

open source software, GIS visualization, Linux, [music composition](#)