

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	Senior Software Engineer at GROUPON, INC. 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. <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	Technical Engineer at TERRASTRIDE, INC. 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.
2011–2013	Project Manager at PALMETTO COMPUTER LABS 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 .
2011	Contractor for ELASTIC VISION CONSULTING 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.

Research Experience

2011–2013	Research Assistant funded by AFOSR <i>Materials Volume Segmentation</i> 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.
2010–2011	Research Assistant funded by DARPA <i>Video Event Recognition</i> 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.
2009–2010	NEH Fellow at the CENTER FOR DIGITAL HUMANITIES <i>Digital Collation</i> 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.

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**, Xaio-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>
BEFUNGE.PY	<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](#)