

# Khairi Reda, PhD

School of Informatics & Computing  
Indiana University-Purdue University Indianapolis  
535 W. Michigan St, IT 581  
Indianapolis, IN 46202

tel: (317)-274-5788  
email: [redak@iu.edu](mailto:redak@iu.edu)  
www: <http://vis.ninja>

## RESEARCH INTERESTS

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My research is at the intersection of **visualization, human-computer interaction, and data science**. I create visual interfaces that enable people to explore and gain insights from data. I also aim to identify technological and human factors impacting our ability to make sense of digital information.

## EDUCATION

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<b>University of Illinois at Chicago</b> <b>Ph.D.</b> , Computer Science	Aug 2014
<b>University of Illinois at Chicago</b> <b>M.S.</b> , Computer Science	Aug 2009
<b>University of Damascus, Syria</b> <b>B.S.</b> , Computer Science	May 2005

## PROFESSIONAL APPOINTMENTS

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<b>Indiana University Purdue University Indianapolis</b> Assistant Professor of Data Science and Human-Computer Interaction School of Informatics & Computing	Aug 2016–Present
<b>Argonne National Laboratory</b> Argonne Scholar Leadership Computing Facility	Sep 2014–Jul 2016
<b>University of Hawaii at Manoa</b> Postdoctoral Fellow Department of Information and Computer Sciences	Sep 2014–Sep 2015
<b>University of Illinois at Chicago</b> Research Assistant Electronic Visualization Laboratory, Department of Computer Science	May 2008–Jul 2014
<b>Argonne National Laboratory</b> Research Assistant Leadership Computing Facility	May 2012–Aug 2014
<b>Science Museum of Minnesota</b> Intern	Summers of 2008 & 2010

**Journal Publications:**

1. **Reda, K.**, Johnson, A., Papka, M., Leigh, J. Modeling and Evaluating User Behavior in Exploratory Visual Analysis. *Information Visualization*. 15(4):325-339, 2016
2. J. Aurisano, **Reda, K.**, Johnson, A., Marai, G. E., Leigh, J. A Large-Scale Comparative Genome Visualization for Big Displays. *BMC Bioinformatics* 16(11):6 (*BioVis '15*), Springer, 2015
3. Nam, S., **Reda, K.**, Renambot, L., Johnson, A., Leigh, J. Multiuser-Centered Resource Scheduling for Collaborative Display Wall Environments. *Future Generation Computer Systems* 45(1):162–175, Elsevier, 2015
4. Knoll, A., Wald, I., Navratil, P., Bowen, A., **Reda, K.**, Papka, M., Gaither, K. RBF Volume Ray Casting on Multicore and Manycore CPUs. *Computer Graphics Forum* 33(3):71–80 (*EuroVis '14*), EuroGraphics Association, 2014
5. **Reda, K.**, Chau, D., Mostafa, Y., Nagrajan, S., Leigh, J., Nishimoto, A., Kahler, E., Demeter, J. Design Guidelines for Multiplayer Video Games on Multi-touch Displays. *Computers in Entertainment* 11(1):1–17, ACM, 2014
6. **Reda, K.**, Febretti, A., Knoll, A., Aurisano, J., Leigh, J., Johnson, A., Papka, M., Hereld, M. Visualizing Large, Heterogenous Data in Hybrid-Reality Environments. *IEEE Computer Graphics and Applications* 33(4): 38–48, IEEE, 2013
7. Offord, C., **Reda, K.**, Mateevitsi, V. Context-Dependent Navigation in a Collectively Foraging Species of Ants, *Messor cephalotes*. *Insectes Sociaux* 60(3): 361–368, Springer, 2013
8. **Reda, K.**, Mateevitsi, V., Offord, C. A Human-Computer Collaborative Workflow for the Acquisition and Analysis of Terrestrial Insect Movement in Behavioral Field Studies. *EURASIP Journal on Image and Video Processing* 2013:48, Springer, 2013
9. **Reda, K.**, Tantipathananandh, C., Johnson, A., Leigh, J., Berger-Wolf, T. Visualizing the Evolution of Community Structures in Dynamic Social Networks. *Computer Graphics Forum* 30(3):1061–1070 (*EuroVis '11*), Eurographics Association, 2011

**Conference Proceedings:**

\* denotes student advisees at the time of publication

10. **Reda, K.**, Nalawade, P. \*, Ansah-Koi, K. \* Graphical Perception of Continuous Quantitative Maps: the Effects of Spatial Frequency and Colormap Design. *Proceedings of the ACM CHI '18: Conference on Human Factors in Computing Systems*. Montreal, QC, Canada (to appear).
11. Fujiwara, T. \*, Malakar, P., **Reda, K.**, Vishwanath, V., Papka, M., Ma, K-L. A Visual Analytics System for Optimizing Communications in Massively Parallel Applications. *Proceedings of IEEE VAST '17: Conference on Visual Analytics Science and Technology*. Phoenix, AZ, October 1-6, 2017 (in press)
12. **Reda, K.**, Johnson, A., Papka, M., Leigh, J. Effects of Display Size and Resolution on User Behavior and Insight Acquisition in Visual Exploration. *Proceedings of the ACM CHI '15 Conference on Human Factors in Computing Systems*, Seoul, Korea, Apr 18–23, 2015, pp. 2759–2768, ACM

13. **Reda, K.**, Knoll, A., Nomura, K., Papka, M., Johnson, A., Leigh, J. Visualizing Large-Scale Atomistic Simulations in Ultra-Resolution Immersive Environments. Proceedings of the IEEE Symposium on Large-Scale Data Analysis and Visualization (*LDAV '13*), Atlanta, GA, Nov 13-14, 2013. pp. 59–65, IEEE

### Refereed Workshop Papers:

14. **Reda, K.**, Johnson, A., Leigh, J., Papka, M. Evaluating User Behavior and Strategy During Visual Exploration. Proceedings of the 5th Workshop on Beyond Time and Errors: Novel Evaluation Methods for Visualization (*BELIV '14*), Paris, France, Nov 10, 2014. pp. 41–45, ACM
15. Knoll, A., Brownlee, C., **Reda, K.**, Haymore, B., Papka, M., Pascucci, V. The Desktop is Dead, Long Live the Workstation! In workshop on the “Death of the Desktop”: Envisioning Visualization without Desktop Computing, Paris, France, Nov 9, 2014
16. **Reda, K.**, Aurisano, J., Febretti, A., Leigh, J., Johnson, A. Visualization Design Patterns for Ultra-Resolution Display Environments. In proceedings of the workshop on Visualization Infrastructure and Systems Technology (*VISTECH '13*), Nov 22, Denver, CO, 2013
17. **Reda, K.**, Johnson, A., Mateevitsi, A., Offord, C., Leigh, J. Scalable Visual Queries for Data Exploration on Large, High-Resolution 3D Displays. In Proceedings of the *SC '12 Companion: High Performance Computing, Networking Storage and Analysis*, Salt Lake City, UT, Nov, 2012. pp. 196–205. IEEE

### Refereed Abstracts:

18. J. Casey, B. Ji, S. Shaoie, A. Mardinoglu, P. Sarathi Sen, O. Jahn, **K. Reda**, J. Leigh, M. J. Follows, J. Nielsen, D. M. Karl. A Prochlorococcus proving ground for constraint-based metabolic modeling and multi-omics data integration. American Geophysical Union, Ocean Sciences Meeting, New Orleans, LA, 2016
19. **Reda, K.**, Gonzalez, A., Leigh, J., Papka, M. Tell Me What Do You See: Detecting and Summarizing Perceptually-Separable Patterns for Exploratory Data Analysis. Argonne National Laboratory Postdoctoral Research Symposium, Argonne, IL, 8, 2015 (**Robert G. Sachs award**)
20. **Reda, K.**, Gonzalez, A., Leigh, J., Papka, M. Tell Me What Do You See: Detecting perceptually-separable visual patterns via clustering of image-spaces features in visualizations. Poster at *IEEE VIS'15*, Chicago, IL, Oct 25–30, 2015
21. Aurisano, J., Kumar, A., Gonzalez, A., **Reda, K.**, Di Eugenio, B., Leigh, J., Johnson, A. “Show Me Data”: Observational study of a conversational interface in visual data exploration. Poster at *IEEE VIS'15*, Chicago, IL, Oct 25–30, 2015 (**Best Poster Honorable Mention**)
22. **Reda, K.**, Offord, C., Johnson, A., Leigh, J. Expanding the Porthole: Leveraging Large, High-Resolution Displays in Exploratory Visual Analysis. In ACM *CHI'14 EA on Human Factors in Computing Systems*, Toronto, ON, Canada, Apr 26–May 1, pp. 2047–2052, ACM
23. Aurisano, J., **Reda, K.**, Johnson, A., Leigh, J. Bacterial Gene Neighborhood Investigation Environment: A Large-Scale Genome Visualization for Big Displays. IEEE Symposium on Large-Scale Data Analysis and Visualization (*LDAV '14*), France, Paris, Nov 9-10, 2014, IEEE (**Best Poster Award**)

24. Aurisano, J., **Reda, K.**, Johnson, A., Leigh, J. Bacterial Gene Neighborhood Investigation Environment: A Large-Scale Genome Visualization for Big Displays. Poster at the 4th Symposium on Biological Data Visualization (*BioVis '14*), 2014
25. Mateevitsi, V., **Reda, K.**, Leigh, J., Johnson, A. HealthBar: A Persuasive Ambient Display to Improve the Office Worker's Well Being. In Proc. of 5th Augmented Human Conference, ACM
26. **Reda, K.**, Tantipathananandh, C., Berger-Wolf, T., Leigh, J., Johnson, A. SocioScape—a Tool for Interactive Exploration of Spatio-Temporal Group Dynamics in Social Networks. Poster at IEEE Information Visualization Conference (*InfoVis '09*), Atlantic City, NJ, 2009

### Technical Reports and non-Refereed Papers:

27. **Reda, K.** Exploratory Visual Analysis in Large, High-Resolution Display Environments. PhD Thesis, University of Illinois at Chicago, 2014
28. **Reda, K.**, Chau, D., Dargad, R. Understanding the Interaction of Visual and Verbal Metaphors from Eye Gaze Behavior. HCI Technical Report, University of Illinois at Chicago, 2011
29. **Reda, K.** An ACT-R Model of Visual Problem Solving. University of Illinois at Chicago, 2009
30. **Reda, K.** SocioScape—Spatio-Temporal Visual Analysis of Group Dynamics in Social Networks. MS Thesis, University of Illinois at Chicago, 2009
31. Kahler, E., Hur, H., **Reda, K.**, Kooima, R., Chau, D., Jagodic, R., Renambot, L., Johnson, A., Leigh, J. Design Challenges in Creating a High Resolution LCD-based Multi-touch Display. Technical report, Electronic Visualization Laboratory, 2009

### GRANTS

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#### **CRII: CHS: Concept-Driven Visual Analysis**

National Science Foundation

Amount: \$190,977

Role: sole PI

Duration: 4/2018 – 4/2020

### FELLOWSHIPS

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#### **Argonne Scholar**

Argonne National Laboratory

Duration: 9/2014 – 7/2016

#### **Postdoctoral Fellow**

University of Hawaii at Manoa

Duration: 8/2014 – 7/2015

### PATENTS

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Chau, D., Johnson, A., Kooima, R., Leigh, J., **Reda, K.**, Renambot, L. Large Format High Resolution Interactive Display. US 20100328306 (patent pending)

## INVITED TALKS & PANELS

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<b>Data Visualization: Design &amp; Critique</b> IUPUI Community Engagement and Professional Development	2018
<b>Data Visualization for Discovery and Learning</b> Natural History Museum of Utah	2016
<b>Understanding the Dynamics of the Natural World through Interactive Visualization (and vice versa)</b> School of Computing, University of Utah	2016
<b>Visual Analysis of Ecological Time Series</b> Division of Environmental Sciences, Argonne National Laboratory	2016
<b>Seeing (Big) Data: Interactive Visualization Tools for Analysis &amp; Communication</b> Institute for Defense Analyses	2016
<b>Seeing the Forest Despite the Trees: Interactive Visualization Tools for Analysis and Storytelling with (Big) Data</b> Department of Computer Science & ACM local chapter, Northern Illinois University	2016
<b>Seeing the Forest Despite the Trees: Interactive Visualization Tools for Analysis and Storytelling with (Big) Data</b> Department of Computer Science, Texas Tech University	2015
<b>Visualizing Large-Scale ‘Omics Data</b> Center for Microbial Oceanography, University of Hawaii	2015
<b>Visualization Instruments for Big Data</b> Center for Cyber-infrastructure and Information Technology, University of Hawaii	2015
<b>Beyond ParaView: Future of visualization for extreme-scale science</b> Panelist at the workshop on Visualization Technology and Systems Infrastructure	2013
<b>Advanced Visualization Environments for Scientific Discovery and Collaboration</b> University of Damascus, Syria, 2010	2010
<b>On Visualizing Dynamic Social Networks and Collaborating with Ecologists</b> Guest lecturer on Visualization & Visual Analytics, University of Illinois at Chicago	2010
<b>Understanding Animal Behavior with Social Network Visualization and Analysis</b> Guest lecturer on Information Aesthetics, University of Illinois at Chicago	2008

## CONTRIBUTED TALKS

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<b>Effects of Display Size and Resolution on User Behavior and Insight Acquisition in Visual Exploration</b> CHI'15: ACM conference on Human Factors in Computing Systems	2015
<b>Evaluating User Behavior and Strategy During Visual Exploration</b> BELIV'14: 5th workshop on Novel Evaluation Methods for Visualizations	2014
<b>Visualizing Large-Scale Atomistic Simulations in Immersive Environments</b> LDAV'13: IEEE Symposium on Large-Scale Data Analysis and Visualization	2013
<b>Visualization Design Patterns for Ultra-Resolution Display Environments</b> SC'13 Workshop on Visualization Technology and Systems Infrastructure	2013

<b>Scalable Visual Queries for Data Exploration on Large, High-Resolution 3D Displays</b> UltraVis'12: 7th workshop on Ultra-Scale Visualization	2012
<b>Visualizing the Evolution of Community Structures in Dynamic Social Networks</b> EuroVis'11: IEEE TVCG / EuroGraphics Visualization Symposium	2011

## SELECTED EXHIBITS & DEMONSTRATIONS

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<b>SIGGRAPH '11</b> Demonstrated several interactive applications for Large, High-Resolution Displays including the <i>Scalable Adaptive Graphics Environment</i> and a 20-foot virtual paint canvas. The exhibit was featured on the first page of the Vancouver Sun Business News.	2011
<b>Field Museum, Royal Ontario Museum, National Museum of Australia</b> <i>RainTable</i> , an interactive visual rain simulation that I co-developed, was exhibited in several prominent museums in North America and Australia.	2009–2011
<b>American Association for the Advancement of Science (AAAS)</b> Demonstrated <i>TacTile</i> , a custom built multi-touch display for collaborative information exploration. This exhibit was part of a showcase for NSF's Major Research Instrumentation (MRI) program.	2009
<b>American Geophysical Union</b> Demonstrated <i>RainTable</i> and <i>TacTile</i> .	2009
<b>Supercomputing '08</b> Demonstrated interactive multitouch visualizations.	2008

## AWARDS & HONORS

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Robert G. Sachs Award for Research Excellence, Argonne National Laboratory	2015
Best Poster Honorable Mention, IEEE Conference on Information Visualization	2015
Argonne Scholar, Argonne National Laboratory	2014–2016
Best Poster Award, IEEE Symposium on Large-Scale Data Analysis and Visualization	2014
Image of Research, University of Illinois at Chicago	2013
Graduate College Presenter Award, UIC	2009
Graduate Student Council Travel Award, UIC	2009
Honor Graduate (top 1% of graduating class), University of Damascus	2005

## TEACHING

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<b>NEWM-N 328 — Visualizing Information, IUPUI</b> An introductory course on the principles of information visualization. This course represents a thoroughly refreshed version of an earlier offering, designed to give undergraduate students skills and experience in creating effective data representations using contemporary visualization tools (Tableau and D3).	Spring 2017
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**INFO-H 517 — Visualization Design, Analysis, and Evaluation, IUPUI** Fall 2017  
*First offering*

Designed a new hands-on, graduate-level course to teach design principles and evaluation methods for information visualization. Topics include: human visual perception, visual data encodes, statistical charts, and interaction techniques. The course prepares students to solve applied data science problems using visual analysis techniques. Data science students also gain exposure to quantitative HCI research methods.

**NEWM-N 328 — Visualizing Information, IUPUI** Spring 2016

**INFO-I 594 — Interactive Visual Analytics, IUPUI** Fall 2016  
*First offering*, elective class for Human-Centered Computing

A graduate-level research course covering fundamentals and research methods in visual analytics.

## MENTORING & ADVISING

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### PhD Students:

Eric Vorm	2017–
Yamini Karanam	2016–
Jeremy Hochstedler	2017–2018
Takanori Fujiwara, Argonne National Lab / UC Davis	2015–2017

### MS Students:

In Kwon Choi	2016–
Shuxian Wu	2018–
Nirmal Kumar Raveendranath	2018–
Pratik Nalawade	2016–2018
Swati Mishra	2016–2018
Kate Ansah-Koi	2016–2017
Adriana Alvarado Garcia	2016–2017
Alberto Gonzalez, University of Hawaii	2014–2016
Dylan Kobayashi, University of Hawaii	2014–2015

### Undergraduate Students:

Kyle Harris	2017–
Caleb Potts	2018–
David Wang, University of Hawaii	2014–2015
Andrew Guagliardo, University of Hawaii	2014–2015

## PhD Thesis Committee Membership:

<b>Eric Vorm</b> PhD thesis in Human-Computer Interaction, IUPUI Behind the Black Box: Transparency and the Human Response to Unexpected Automation Failure	2017–
<b>Yamini Karanam</b> PhD thesis in Human-Computer Interaction, IUPUI Quality of Life Visualization for Brain Injury Patients	2016–

## SCIENTIFIC & PROFESSIONAL SERVICE

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### Program Committee:

IEEE Symposium on Large-Scale Data Analysis and Visualization	2018
Workshop on In-Situ Infrastructure for Extreme-Scale Analysis and Visualization	2015

### Grant Referee:

National Science Foundation, panelist	2017, 2018
Vienna Science and Technology Fund, reviewer	2015

### Journal and Conference Referee Service:

ACM CHI: Conference on Human Factors in Computing Systems Outstanding reviewer recognition: 2017	2015–2017
IEEE VAST: Conference on Visual Analytics Science & Technology	2013–2018
IEEE InfoVis: Conference on Information Visualization	2015–2018
IEEE SciVis: Conference on Scientific Visualization	2015, 2017
EuroVis: IEEE / EuroGraphic Visualization Conference	2013–2016
IEEE PacificVis: Pacific Visualization Conference	2014–2015
ACM DIS: Designing Interactive Systems	2018
IEEE 3DUI: Symposium on 3D User Interfaces	2015
Information Visualization	2017–2018
International Journal of Human-Computer Studies	2015, 2018
ACM Computers in Entertainment	2012

## UNIVERSITY SERVICE

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<b>Faculty Search Committee</b> Library and Information Sciences, Indiana University-Purdue University Indianapolis	2017–2018
<b>Program Review and Assessment Committee</b> Campus-wide committee, IUPUI	2017–2018



<b>Department Colloquia Committee</b> Human-Centered Computing, IUPUI	2017–
<b>Faculty Search Committee</b> Human-Centered Computing, IUPUI	2016–2017
<b>Graduate Curriculum Committee</b> Data Science, IUPUI	2016–
<b>Undergraduate Program Committee</b> School of Informatics and Computing, IUPUI	2016–
<b>Graduate Admissions Committee</b> Department of Human-Centered Computing, IUPUI	2016–

## OUTREACH

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<b>iDEW project, mentor and guest lecturer</b> Local Indianapolis high schools (Arsenal Tech and Pike High) Mentored high-school student teams who were engaged in integrated projects covering topics in ubiquitous computing, Internet of Things, and data visualization. Conducted two interactive workshops to introduce K-12 students to data science and evidence-based reasoning.	2017
<b>“Introduce a Girl to Engineering Day”</b> Argonne National Laboratory Mentored two middle-school students in a full-day interactive event that included personal contact with scientists and engineers, scientific experiments, and tours of labs and facilities at Argonne.	2016
<b>Hour of Code, guest lecturer</b> William K. New Sullivan Elementary School, Chicago, IL Gave a guest lecture on computational science and conducted a workshop designed to introduce young learners to programming and computational thinking.	2015
<b>SPARK Project, mentor</b> Mentored 3 middle-school students in an after-school internship. Students spent 11 weeks at UIC’s Electronic Visualization Lab designing a virtual reality game, and thereby learning what a career in computing research could bring them.	2013
<b>Educational demos</b> Argonne National Laboratory, University of Hawaii, and UIC Conducted and participated in 30+ demonstrations of visualization and display technologies to youth groups, K-12 students, teacher groups, and the general public.	2009–2016

## PROFESSIONAL MEMBERSHIP

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Association for Computer Machinery (ACM), member	since 2014
IEEE Visualization and Graphics Technical Committee (VGTC), member	since 2015
Special Interest Group on Computer-Human Interaction (SIGCHI), member	since 2014

## SELECTED MEDIA COVERAGE

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**CAVE2 brings large-scale virtual reality to life**, NSF press release  
Featured my work on visualizing nano-structured materials.

**“Convention-goers get graphic”**, The Vancouver Sun  
A front-page picture featuring our large-display-based visualizations demoed at SIGGRAPH '11.

**Chicago ideas week**, ABC7 News, Chicago  
A TV report on scientific visualization in CAVE2, featuring some of my visualization work.

**Chicago Computer Scientists Develop Tools to Help Ecologists in Kenya**, Medill Reports  
Featured my work on applying computer vision and visual analysis techniques to understand the dynamics of collectively foraging ants in Kenya.