

# Senthil Chandrasegaran\*

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## Education

PURDUE UNIVERSITY

WEST LAFAYETTE, INDIANA

**PhD, Mechanical Engineering**

May 2016

*Advisor:* Dr. Karthik Ramani, Donald W. Feddersen Professor, Mechanical Engineering

*Thesis:* Tools and Methods to Analyze Multimodal Data in Collaborative Design Ideation

REGIONAL ENGINEERING COLLEGE (*now National Institute of Technology*)

TRICHY, INDIA

**Bachelor of Engineering in Mechanical Engineering**

May 2000

## Research Summary

My research spans engineering design, human-computer interaction (HCI), and visual analytics. Specifically, it focuses on understanding the creative, unstructured process of ideation in product design. I do this through semantic analyses of verbal and sketch data generated in design sessions, and by developing visual analytic tools to analyze and provide context to designer interactions with their team and their computing devices. My overarching research goal is to understand and aid creative processes by applying human-centered design thinking to research in HCI and visualization.

## Research Experience

VISUALIZATION & INTERFACE DESIGN INNOVATION LAB

University of California, Davis, CA

**Postdoctoral Scholar** (Advisor: Dr. Kwan-Liu Ma)

Sep 2017 – Present

Research includes capturing verbal and interaction data in collaboration sessions, and representing this data in context to aid future sessions.

HUMAN-COMPUTER INTERACTION LAB

University of Maryland, College Park, MD

**Postdoctoral Scholar** (Advisor: Dr. Niklas Elmqvist)

Apr 2016 – Aug 2017

Research included understanding and aiding collaboration in design and analysis settings, using qualitative techniques to analyze physical and cognitive actions that occur during design, and aiding qualitative analysis of verbal data using visual analytics. Also mentored Ph.D. students in research projects.

SCHOOL OF MECHANICAL ENGINEERING

Purdue University, West Lafayette, IN

**Grad. Research Assistant** (Advisor: Dr. Karthik Ramani)

Fall 2009 | Jan 2013 – Jan 2016

Research focused on understanding the effects of new collaboration interfaces on design outcome through qualitative and mixed methods and analyze designers' sketching and verbal behavior. Performed semantic analyses of verbal data to understand team approaches to design, and created visual analytic interfaces for sense-making of multimodal design data.

## Teaching Experience

SCHOOL OF MECHANICAL ENGINEERING

Purdue University, West Lafayette, IN

**Graduate Teaching Assistant**

Spring & Fall '10, Spring & Fall '11, Spring & Fall '12

Was lead teaching assistant (TA) for *Computer-Aided Design and Prototyping*, a senior elective. Developed lectures and demonstrations, and conducted lab sessions in parametric design, FE analysis, and rapid prototyping (3D Printing & Laser Cutting). Advised student design projects, and mentored TAs. Received the *excellence in teaching* award in 2012 and 2013.

\*Full Name: Ramaswamy Senthil Kumaran Chandrasegaran

## Professional Experience

- ALCYON ENGINEERING Pune, India  
**Engineer, Knowledge-Based Engineering** *Jan 2006 – Aug 2009*  
 Led and executed projects to automate pressure vessel configuration design for Bharat Heavy Electricals, Larsen & Toubro, and Eagle-Burgmann. Trained client and partner teams on Knowledge-Based Engineering.
- ALCYON ENGINEERING Pune, India  
**Engineer, Structural Analysis** *Aug 2004 – Jan 2006*  
 Performed structural analysis for Heavy Engineering clients including Godrej & Boyce, and automotive clients including Asia Motor Works, and Tata AutoComp Systems.
- TATA AUTOCOMP SYSTEMS Pune, India  
**Design Engineer, Automotive Interior Systems** *Aug 2000 – Aug 2004*  
 Designed interior trim components such as instrument panels and door panels for automotive Tier-I manufacturers including Visteon and Faurecia.

## Journal Publications (peer-reviewed)

- J5 Ramanujan, D., Bernstein, W.Z., Chandrasegaran, S., and Ramani, K. Visual Analytics Tools for Sustainable Lifecycle Design: Current Status, Challenges, and Future Opportunities. *Journal of Mechanical Design*, 139(11), pp.111415, 2017.
- J4 Chandrasegaran, S., Badam, S.K., Kisselburgh, L., Elmqvist, N., and Ramani, K. Integrating Visual Analytics Support for Grounded Theory Practice in Qualitative Text Analysis. *Computer Graphics Forum (Proc. EuroVis)*, 36(3), pp.201–212, 2017. **(27% acceptance rate)**
- J3 Zhou, N., Pereira, N., George, T., Alperovich, J., Booth, J., Chandrasegaran, S., Tew, J., Kulkarni, D., Ramani, K. The Influence of Toy Design Activities on Middle School Students' Understanding of the Engineering Design Processes. *Journal of Science Education and Technology*, pp.1–13, 2017.
- J2 Chandrasegaran, S., Badam, S.K., Kisselburgh, L., Pepler, K., Elmqvist, N., and Ramani, K. VizScribe: A Visual Analytics Approach to Understand Designer Behavior. *International Journal of Human-Computer Studies*, 100, pp.66–80, 2017.
- J1 Chandrasegaran, S., Ramani, K., Sriram, R.D., Horvath, I., Bernard, A., Harik, R.F., and Gao, W. The evolution, challenges, and future of knowledge representation in product design systems. *Computer-Aided Design*, 45(2), pp.204–228, 2013.  
**(Ranked #1 in the journal's most cited articles published since 2012).**

## Conference Publications (peer-reviewed)

- C12 Chandrasegaran, S., Badam, S.K., Zhou, N., Zhao, Z., Kisselburgh, L., Pepler, K., Elmqvist, N., and Ramani, K. Merging Sketches for Creative Design Exploration: An Evaluation of Physical and Cognitive Operations. *Graphics Interface*, pp.115–123, 2017.
- †C11 Piya, C., Vinayak, Chandrasegaran, S., Elmqvist, N., and Ramani, K. Co-3deator: A Collaborative 3D Design Ideation Tool. *The ACM CHI Conference on Human Factors in Computing Systems*, pp.6581–6592, 2017. **(25% acceptance rate)**

†The ACM CHI conference proceedings are regarded as journal-quality in computer science

- C10 Zhou, N., George, T.T., Booth, J.W., Alperovich, J., Chandrasegaran, S., Pereira, N., Tew, J.D., Kulkarni, D.N., and Ramani, K. Developing Middle School Students' Engineering Design Concepts through Toy Design Workshop. Paper presented at the *American Society of Engineering Education Conference & Exposition*, 2016.
- C9 Chandrasegaran, S., Badam, S.K., Zhao, Z., Elmqvist, N., Kisselburgh, L., and Ramani, K. Collaborative Sketching with skWiki: A Case Study. In *Proceedings of the ASME International Design Engineering Technical Conferences and Computers & Information in Engineering Conference*, 2014.
- C8 Badam, S.K., Chandrasegaran, S., Elmqvist, N., and Ramani, K. Tracing and Sketching Performance using Blunt-Tipped Styli on Direct-Touch Tablets. In *Proceedings of the ACM Conference on Advanced Visual Interfaces*, pp.193–200, 2014. **(28.7% acceptance rate)**
- †C7 Benjamin, W., Chandrasegaran, S., Ramanujan, D., Elmqvist, N., Vishwanathan, S., and Ramani, K. Juxtapoze: Supporting Serendipity and Creative Expression in Clipart Compositions. In *Proceedings of the ACM CHI Conference on Human Factors in Computing Systems*, pp.341–350, 2014. **(22.8% acceptance rate)**
- †C6 Zhao, Z., Badam, S.K., Chandrasegaran, S., Park, D.G., Elmqvist, N., Kisselburgh, L., and Ramani, K. skWiki: A Multimedia Sketching System for Collaborative Creativity. In *Proceedings of the ACM CHI Conference on Human Factors in Computing Systems*, pp.1235–1244, 2014. **(22.8% acceptance rate)**
- ‡C5 Kisselburgh, L., Chandrasegaran, S., Foote, J., Gettings, P., Kristensen, T.M., and Ramani, K. The Social Ecologies of Collaborative Design in Visually-Integrated Cyber Enabled Design (V-ICED) Environments. Paper presented to the *National Communication Association*, 2013. **(Top Four Paper Award)**
- C4 Chandrasegaran, S., Kisselburgh, L., and Ramani, K. Understanding Brainstorming through Text Visualization. In *Proceedings of the ASME International Design Engineering Technical Conferences and Computers & Information in Engineering Conference*, 2013.
- C3 Skaloud, B., Chandrasegaran, S., and Ramani, K. A Proposed Platform to Simplify the Integration of Electronics into a Mechanical Engineering Design Course. In *Proceedings of the ASME International Design Engineering Technical Conferences and Computers & Information in Engineering Conference*, 2012.
- C2 Taborda, E., Chandrasegaran, S., Kisselburgh, L., Reid, T., and Ramani, K. Enhancing Visual Thinking in a Toy Design Course using Freehand Sketching. In *Proceedings of the ASME International Design Engineering Technical Conferences and Computers & Information in Engineering Conference*, 2012.
- C1 Taborda, E., Chandrasegaran, S., and Ramani, K. ME 444: Redesigning a Toy Design Course. In *Proceedings of Tools and Methods in Competitive Engineering*, May 7–11, 2012.

## Extended Abstracts

- EA2 Kisselburgh, L., Chandrasegaran, S., and Ramani, K. Knowledge-structuring practices: Using semantic network analysis to assess the influence of design team structure on knowledge emergence. Extended Abstract to be presented at the *International Communication Association, San Diego, CA.*, 2017 (accepted).
- EA1 Kisselburgh, L., Foote, J., Chandrasegaran, S., Zhou, N., Badam, S.K., Elmqvist, N., and Ramani, K. Wearable sociometric sensors for measuring real-time collaboration. Extended Abstract to be presented at the *International Communication Association, San Diego, CA.*, 2017 (accepted).

## Posters

- P2 Kisselburgh, L., Zhou, N., Chandrasegaran, S., Badam, S.K., Elmqvist, N., Pepler, K., and Ramani, K. Creative Collaboration and Flow: Validating the Use of Trace Data to Measure Dynamics of Creative Flow in Collaborative Design Teams. Poster presented at the *International Conference on Computer-Supported Collaborative Learning, Gothenburg, Sweden*, pp. 831–832, 2015.
- P1 Zhou, N., Kisselburgh, L., Chandrasegaran, S., Badam, S.K., Elmqvist, N., Pepler, K., and Ramani, K. Using Real-time Trace Data to Predict Collaboration Quality and Creative Fluency in Design Teams. Poster presented at the *International Conference on Computer-Supported Collaborative Learning, Gothenburg, Sweden*, pp. 837–838, 2015.
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## Awards and Honors

- 🏆 Estus H. and Vashti L. Magoon Award for Excellence in Teaching (2013).
  - 🏆 "Top Four" paper award in the National Communications Association Symposium, Washington, D.C. (2013).
  - 🏆 Estus H. and Vashti L. Magoon Award for Excellence in Teaching (2012).
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## Contributions to Funded Projects

- *V-ICED: Visually-Integrated Cyber Exploratorium for Design*.  
(PI: Ramani, K.; Co-PIs: Elmqvist, N., Kisselburgh, L.) National Science Foundation.  
Designed collaborative sketching interfaces for sharing and extending ideas, developed visual analytic interfaces for sense-making of multimodal design data, and conducted studies with student design teams. Relevant publications: J2, J3, C4, C5, C7–C9.
  - *IDEA-PEN: Interactive Design and Analysis through a Pen-based Interface*.  
(PI: Ramani, K., Co-PI: Cardella, M.) National Science Foundation.  
Developed use-case scenarios to evaluate the outcome of the proposed interface.
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## Service

- Program Committee member, Short Papers, IEEE EuroVis Conference, 2016.
- Reviewer, Journal of Engineering Design, 2017.
- Reviewer, ASME Journal of Computing & Information Science in Engineering, 2017.
- Reviewer, ACM Interaction Design & Children Conference, 2017.
- Reviewer, IEEE Symposium on 3D User Interfaces, 2017.
- Reviewer, iConference 2016, 2017.
- Reviewer, Computer-Aided Design Journal, 2016.
- Reviewer, ASME International Design Engineering Technical Conferences and Computers in Engineering Conference, 2015.
- Reviewer, ASME Journal of Mechanical Design, 2011.
- Conducted Computer-Aided Design workshop for middle-school children as part of the Gifted Education Resource Institute (GERI) program at Purdue, 2015.
- Conducted toy design workshop for middle-school children as part of the Louis Stokes Alliance for Minority Participation program (LSAMP), Summer 2014.

## Press

- NSF Discovery, June 2015. “Tools for real-time visual collaboration: Indiana and Purdue University Professors design cyberlearning system to make sharing ideas easier”.  
*Relevant publications: C7, C9.*
  - Huffington Post, June 2015. “7 Cyberlearning technologies transforming education”.  
*Relevant publications: C7, C9.*
  - ScienceDirect, 2013 and 2014. “Top 25 hottest articles in Computer-Aided Design”.  
*Relevant publication: J1.*
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## Technical Skills

### USER EXPERIENCE

Survey design, Participatory design, Interface design, User Evaluations (formative & summative)

### PROGRAMMING

Python, JavaScript (D3.js and JQuery), HTML, CSS, Processing, Arduino

### PRODUCT DESIGN & DEVELOPMENT

User-centered design, Design for X (manufacturing, assembly, 3D printing), Geometric Dimensioning & Tolerancing, Finite-Element Analysis, Mechatronics

### DESIGN & ANALYSIS APPLICATIONS

PTC Creo, NX, Solid Edge, ANSYS

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## References

### **Niklas Elmqvist, Ph.D**

Associate Professor  
College of Information Studies  
Director, Human-Computer Interaction Lab  
University of Maryland, College Park  
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4130 Campus Drive, College Park  
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### **Karthik Ramani, Ph.D**

Donald W. Feddersen Professor  
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