Ting-Ju (Carol) Chen

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Summary

A human-computer interaction (HCI) research professional with 4+ years of hands-on experience specializing in the design of intelligent and intuitive human-computer interfaces/workflows, user behavior elicitation, engineering design processes, and web development. My research is highly interdisciplinary with many fields of research, including engineering design methodologies, cognitive science, and computer science.

Education

Texas A&M University — *College Station, TX, USA*

Doctor of Philosophy (Ph.D) in Mechanical Engineering — *Sep. 2014 - PRESENT*

- Dissertation: Collaboration Workflow for Information-Based Ideation

National Chiao Tung University — *HsinChu, Taiwan*

Bachelor of Science (B.S.) in Mechanical Engineering — *Jun. 2011*

Projects

Mixed Initiative Design Lab • TAMU — *College Station, TX, USA*

Graduate Researcher. Advisor: Dr. Vinayak R. Krishnamurthy — *Sep. 2016 - PRESENT*

Information exploration in mixed-reality space

- Lead the development of virtual 3D environment using Magic Leap (MR)/ HTC Vive (VR) for knowledge graph navigation in physical space with the intent to understand designers' behavior in navigating vast and complex information networks. Also, how designers can identify and reason about design problems through physical navigation.

Establishment of intelligent information systems & novel interaction workflows for design ideation

- Lead the development of intelligent meeting systems that capture the natural conversation in a design group meeting. Explore multi-modal computer support to enable the synthesis of new ideas based on real-time meeting summarization and context-aware information retrieval.
- Led the protocol study of human-human collaborative behavior (patterns, strategies, inhibitions, etc.) during brainstorming activities to provide guidelines on the development of information-based computer-support in exploratory tasks. **[C3]**
- Designed and developed human-computer interaction workflow using contextual query expansions enabled by ConceptNet (a common-sense semantic network) to explore the context of mixed-initiative co-creativity in unstructured tasks. **[J1,C2]**
- Implemented a novel question-query workflow for computer-facilitated mind-mapping with JavaScript to enhance users' thinking and creativity by considering the temporal and topological evolution of a graph in real-time. **[C4]**
- Constructed unsupervised neural networks (e.g. AE, VAE, CNN, etc.) to map data-sets (MNIST, fashionMNIST, etc.) into latent space to capture the inherent geometry structure. Performed non-linear interpolation in the latent space for providing image-based creative stimulation in design.

Recognition of user's intent in mid-air gesture-free sketching tasks

- Analyzed mid-air drawing behaviors using hand postures and a haptic device to understand a user's intention to draw or not to draw (stroke or hover) in conditional and rule-free scenario. **[C1]**
- Investigated and trained machine-learning based classifiers (e.g. random forest) using motion profiles (speed, acceleration, etc.) and local geometric properties (curvature, angular velocity, etc.) of the recorded 3D sketching data with timestamp. **[C1]**

Bring Back the CAD! — *College Station, TX, USA*

MEEN 601 - Advanced Product Design Course. Instructor: Dr. Vinayak R. Krishnamurthy — *Sep. 2018 - Dec. 2018*

- Designed a Computer Aided Design course prototype (including syllabus, sample lectures, policies, etc.) for students who do not have a solid background in CAD or manufacturing means and methods through the process of brainstorming (mind-mapping), needs definition, market survey, concepts selection (KJ method/ voting scheme), and risk assessment.

PlanUp: Visual Analytics Tool for Crowdfunding Projects — *College Station, TX, USA*

VIZA 689 - Data Visualization Course. Instructor: Dr. Eric Ragan — *Jan. 2018 - May. 2018*

- Developed an interactive visual analytics web application (including word cloud, world map, zoomable sunburst diagram, etc.) for analysis of previous trends of kickstarter projects from Kaggle website (15 types of data and 378662 entries) and helping project creators plan wisely.

A Machine Learning Approach to Wind Turbine Power Prediction

College Station, TX, USA

ISEN 619 - Analysis and Prediction Course. Instructor: Dr. Yu Ding — *Jan. 2018 - May. 2018*

- Implemented, trained and tested multiple regression models (linear regression/ gaussian process regression/ neural network/ CART) for improving wind-power output accuracy for wind-mills (30997 entries).

Balance Control of Humanoid Robot using Simple Biped Model

College Station, TX, USA

MEEN 612 - Mechanics of Robot Manipulators Course. Instructor: Dr. Pilwon Hur — *Sep. 2015 - Dec. 2015*

- Implemented and compared four control approaches (PID/ inverse dynamics/ sliding mode/ passive based) and an online learning method to achieve control goals for a balancing system to handle any levels of perturbation.

Time-Frequency Control of Parameter Perturbed Chaos in Power System

College Station, TX, USA

Individual Researcher. Advisor: Dr. Steve Suh — *Sep. 2014 - May. 2015*

- Designed and implemented real-time control by using wavelet and filtered-x least mean square algorithm in a chaotic nonlinear power system.

Work Experience

TAMU • Graduate Teaching Assistant

College Station, TX, USA

MEEN 210 - Geometric Modelling by Dr. Vinayak R. Krishnamurthy & Dr. Waqar Mohiuddin — *Jan. 2020 - May. 2020*

- CSG Solid modeling (SolidWorks). Assist students to come up with innovative designs and prototypes for the course project.

TAMU • Graduate Teaching Assistant

College Station, TX, USA

MEEN 602 - Modeling and Analysis of Mechanical Systems by Dr. Douglas Allaire & Juan P. Gomez — *Sep. 2019 - Dec. 2019*

- Duties including preparation of lecture notes and grading of quizzes, homework and exams.

TAMU • Graduate Research Assistant

College Station, TX, USA

Mixed Initiative Design Lab in TAMU. Advisor: Dr. Vinayak R. Krishnamurthy — *Sep. 2016 - May. 2019*

- Conducted human-centered research that strives to understand how computer support can facilitate idea exploration processes through navigating large knowledge databases so as to augment designers' ability to creatively synthesize new ideas.
- Trained and certified for human subject research by Human Research Protection Program in TAMU.
- Duties including maintenance of lab devices, mentor to new student researchers.

Journal Publications

[J2] **Ting-Ju Chen**, Vinayak R. Krishnamurthy. **A Study on Human-Human Collaborative Workflow for Digital Mind-mapping: Free-Form and Sequential.** ASME. (2020). ***Under Preparation for*** the Journal of Mechanical Design. (***Impact Factor: 2.8***)

[J1] **Ting-Ju Chen**, Vinayak R. Krishnamurthy. **Investigating a Mixed-Initiative Workflow for Digital Mind-Mapping.** ASME. (2020). *To Appear in the Proceedings of* the Journal of Mechanical Design. (***Impact Factor: 2.8***)

Conference Publications

[C4] **Ting-Ju Chen**, Sai Ganesh Subramanian, Vinayak R. Krishnamurthy. **QCue: Cues and Queries for Computer Facilitated Mind-Mapping.** ACM. (2020). *To Appear in the Proceedings of* the 46th Annual Conference on Graphics Interface.

[C3] **Ting-Ju Chen**, Ronak R. Mohanty, Miguel A. Hoffmann Rodriguez, Vinayak R. Krishnamurthy. **Collaborative Mind-Mapping: A Study of Patterns, Strategies, and Evolution of Maps Created by Peer-Pairs.** ASME. (2019). 32nd International Conference on Design Theory and Methodology in International Design Engineering Technical Conferences & Computers and Information in Engineering Conference. DOI: `https://doi.org/10.1115/DETC2019-98125` (***Nominated for the Best Paper Award***)

[C2] **Ting-Ju Chen**, Sai Ganesh Subramanian, Vinayak R. Krishnamurthy. **Mini-Map: Mixed-Initiative Mind-Mapping via Contextual Query Expansion.** AIAA. (2019). AI and HMI in Engineering Design (Invited) Conference in American Institute of Aeronautics and Astronautics Scitech Forum. DOI: `https://doi.org/10.2514/6.2019-2347`

[C1] Umema Bohari, **Ting-Ju Chen**, Vinayak. **To Draw or Not to Draw: Recognizing Stroke-Hover Intent in Non-Instrumented Gesture-Free Mid-Air Sketching.** ACM. (2018). 23rd International Conference on Intelligent User Interfaces. DOI: `https://doi.org/10.1145/3172944.3172985` (***23% Acceptance Rate***)

Poster Presentation

[P1] **Ting-Ju Chen**, Sai Ganesh Subramanian, Vinayak R. Krishnamurthy. **Mini-Map: Mixed-Initiative Mind-Mapping with AI-Collaborator.** ASME. (2019). 25th Design for Manufacturing and the Life Cycle Conference (Design Tool Showcase) in International Design Engineering Technical Conferences & Computers and Information in Engineering Conference.

Honors & Awards

2019 **Mechanical Engineering Graduate Program Scholarship**, Continuing Student Fellowship
2019 **Mechanical Engineering Graduate Student Travel Award**, AIAA Scitech Forum
2017 **NSF Scholarship**, Summer School for ESD Research Methods at Clemson University
2014 **Simmang Thompson Caddess Schol Fellowship in Mechanical Engineering**, Admission Offer

Outreach Activities

Educational Outreach

YAP (Youth Adventure Program) *College Station, TX, USA*

Volunteer *Jul. 2018*

- Assisted Dr. Krishnamurthy in conducting a one-day workshop in collaboration with the Youth Adventure Program at Texas A&M University for introducing high-school students to brainstorming, idea generation, mid-air modeling and hand-held 3D printing.

Rock Prairie Elementary School *Bryan, TX, USA*

Volunteer *Feb. 2018*

- Assisted Dr. Krishnamurthy in demonstrating interactive modeling software zPots developed by him and hand-held 3D printing pen to students at the Annual Discovery Night organized by Rock Prairie Elementary School.

Social Outreach

Taiwanese Students Association at Texas A&M University *College Station, TX, USA*

Public Relations *Aug. 2015 - May. 2016*

- Held the responsibility for marketing, advertising, and publicity. Assisted upcoming Taiwanese students in getting acquainted with the environment and collaborated with other TSA officers to hold meetings for the general membership during the semester.