Chin Tseng

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Authorized to work in the U.S. — no visa sponsorship required

Research Summary

PhD in Computer Science from UNC Chapel Hill (May 2026; advised by Prof. Danielle Szafir) working at the intersection of **Human-Computer Interaction**, **Information Visualization**, and **Human Perception**. My signature contribution is **transforming empirical results from crowdsourced experiments into computational perceptual models** — predictive models of how people perceive color, shape, and visual structure — that ship as practical, interactive tools (CatPAW, CatPAL, Shape It Up). I drive research end-to-end, from proposal and study design through **rigorous statistical analysis** (mixed-effects models, ANOVA, Bradley–Terry) of experimental and observational data — 20+ studies, 2,000+ participants, and 70 features across 6,947 real-world datasets — grounded in **color science** and graphical perception. This work spans **9 published papers (6 first-authored)** at CHI, VIS, and EuroVis, including **1 Best Paper Award and 2 Honorable Mentions**, plus recent industry experience shipping React + D3 components into Epsilon's production analytics dashboard. I currently focus on bringing AI into web-based tools and **benchmarking model outputs, including LLMs, against human ground truth**.

Education

University of North Carolina at Chapel Hill (UNC) — **Chapel Hill, NC**
Ph.D. in Computer Science (Conferred May 2026). Advised by Prof. Danielle Szafir — *Aug. 2021 – May 2026*

New York University (NYU) — **New York, NY**
M.S. in Computer Science — *Sept. 2018 – May 2020*

National Tsing Hua University (NTHU) — **Hsinchu, Taiwan**
B.S. in Computer Science — *Sept. 2013 – Feb. 2018*

Technische Universität Dresden (TUD) — **Dresden, Germany**
Exchange Student, Computer Science Program — *Sept. 2016 – Sept. 2017*

Publications

** denotes equal contribution.* ★ *indicates awarded papers.*

★ Redundant is Not Redundant: Unifying Color & Shape Encodings with CatPAW — **CHI 2026**
Chin Tseng*, Arran Zeyu Wang, Ghulam Jilani Quadri, Danielle Albers Szafir*

- Ran 4 crowdsourced experiments (N = 366) showing redundant color+shape encodings improve scatterplot accuracy by 4–10% over single-channel encodings, with the largest gains at 5–8 categories
- Built **CatPAW**, a web-based tool that recommends color-only, shape-only, and redundant color+shape palettes from a data-driven model built on 14,850+ pairwise trials; outperforms designer- and user-crafted palettes across 2–10 categories

CatPAL: Task-Aware Learning for Categorical Palette Recommendation — **VIS 2026 (to appear)**
Chin Tseng*, Arran Zeyu Wang, Yunqi Li, Danielle Albers Szafir*

- Proposed a novel 3-stage adaptive pipeline (BT anchor estimation → adaptive pairwise sampling → redundant-gain measurement) spanning a 39-color × 39-shape × 7-task × 9-category design space infeasible to exhaust
- Ran 3 crowdsourced studies (N = 390) across 7 analytical tasks, showing that optimal palette varies with task and category count — single "one-size-fits-all" palettes are suboptimal
- Built **CatPAL**, a task-aware palette recommendation engine outperforming designer palettes (Tableau, D3), existing tools (Colorgorical, IWantHue), and LLMs (Gemini, ChatGPT); top-ranked accuracy 0.95 / 0.97 / 0.89 at k = 3 / 6 / 9 categories

★ Uncovering the Role of Subitizing in Data Visualization — **VIS 2025**
Arran Zeyu Wang, Ghulam Jilani Quadri, Mengyuan Zhu, ***Chin Tseng****, Danielle Albers Szafir*

- Co-designed 3 crowdsourced experiments (N > 500, 2–15 categories, 3 scatterplot tasks) identifying an empirical 6-category "subitizing limit" above which performance significantly degrades
- Grounded results in established cognitive theory (Subitizing, Fechner's Law, Dual-System Theory), providing the first psychological-theory foundation for long-standing categorical-visualization heuristics

Icon Arrays vs. Bar Charts for Value Comparisons in Health Risk Communication — **VIS 2025**
Jade Kandel, Jiayi Liu, Arran Zeyu Wang, ***Chin Tseng****, Danielle Szafir*

- Co-designed studies comparing icon arrays and bar charts for value estimation and decision-making in health-risk communication
- Produced evidence-based recommendations aligning visual perception with health decision behaviors

Uncovering How Scatterplot Features Skew Visual Class Separation **CHI 2025**

Chin Tseng, S. Sandra Bae*, Takanori Fujiwara*, Danielle Albers Szafir*

- Systematically analyzed 70 multi-class scatterplot features across 6,947 real-world datasets to uncover which features drive human perception of Visual Class Separation (VCS)
- Ran a crowdsourced study (N = 150) identifying 37 statistically significant features and exposing systematic misalignment between existing VCS measures and human perception
- Built a 26-feature composite perceptual model predicting VCS performance at 84.2% accuracy — a 16.6-point improvement over the SOTA benchmark (GONG-DIR-CPT, 67.6%); released as open-source code for data-aware visualization systems

Shape It Up: An Empirically Grounded Approach for Designing Shape Palettes **VIS 2024**

***Chin Tseng**, Arran Zeyu Wang, Ghulam Jilani Quadri, Danielle Albers Szafir*

- First systematic empirical investigation of shape palette effectiveness: 4 crowdsourced experiments (N = 544) evaluating 39 shapes across relative-mean judgment, correlation estimation, and expert-preference tasks
- Revealed shape palette effectiveness cannot be explained by conventional type-based heuristics (filled / unfilled / open) — even expert palettes vary widely, motivating a pairwise perceptual-distance model over type-based design guidance
- Built **Shape It Up**, the first empirically grounded shape-palette recommendation tool; outperforms hand-crafted defaults in D3, Tableau, Excel, R, and MATLAB across 2–10 categories

★ Revisiting Categorical Color Perception in Scatterplots **EuroVis 2024**

***Chin Tseng**, Arran Zeyu Wang, Ghulam Jilani Quadri, Danielle Albers Szafir*

- First systematic empirical comparison of 5 color palette design families (categorical, sequential × 3 subtypes, diverging) across 20 colormaps and 2–10 categories (N = 100)
- Multi-hue categorical palettes dominate at 91.4% accuracy vs. 81.1–86.8% for other families; revealed that scalable categorical encoding depends on more than hue variance alone — lightness and structural design also matter

Measuring Categorical Perception in Color-Coded Scatterplots **CHI 2023**

***Chin Tseng**, Ghulam Jilani Quadri, Arran Zeyu Wang, Danielle Albers Szafir*

- Ran crowdsourced studies (N > 300) across 10 industry-standard palettes (ColorBrewer, D3, Tableau) and 450 datasets spanning 2–10 categories
- Challenged prevailing palette-design guidelines: showed lightness and perceptual distance predict accuracy better than hue or name difference alone — the metrics underlying most palette recommendation tools

Data Distribution and Granularity in Colormap Color Semantics **VIS 2023**

*Clementine Zimnicki, **Chin Tseng**, Danielle Albers Szafir, Karen B. Schloss*

- Co-investigated how spatial data distribution and granularity shape color-semantic inferences in colormap visualizations
- Raised new questions about how spatial structure of data influences downstream color interpretation

Honors & Awards

2026: **Best Paper Honorable Mention**, CHI 2026 — *Redundant is Not Redundant: CatPAW*

2025: **Best Paper Honorable Mention**, VIS 2025 — *Subitizing in Data Visualization*

2024: **Best Paper Award**, EuroVis 2024 — *Revisiting Categorical Color Perception in Scatterplots*

Research Experience

Human–Computer Interaction, Information Visualization, Graphical Perception **UNC Chapel Hill**

VisuaLab, Prof. Danielle Szafir *Aug. 2021 – May 2026*

- Published 6 first-author + 3 co-authored empirical studies at CHI, VIS, and EuroVis; work received **1 Best Paper Award and 2 Honorable Mentions**, quantifying how color, shape, and redundant encodings shape scatterplot perception
- Focused on turning empirical findings into practical, actionable tools: shipped 3 open interactive web systems — **CatPAL**, **CatPAW**, and **Shape It Up** — that translate perceptual models into production-ready palette recommendation tools
- Scaled crowdsourced experimentation on MTurk to **2,000+ participants across 20+ studies**, integrating Bradley–Terry modeling, adaptive pairwise sampling, mixed-effects analysis, tool evaluation, and held-out validation
- Exploring how LLMs can serve as perceptually-aware collaborators in visualization design — bridging perceptual science with LLM-driven encoding recommendation and adaptive chart generation

Cluster3D: A Dataset and Benchmark for Clustering Non-Categorical CAD Models **NYU**

Researcher, Geometric Computing Lab, Prof. Daniele Panozzo & Prof. Chen Feng *May 2020 – Aug. 2021*

- Identified a shape ontology suitable for CAD models and built tooling to load, process, and crowdsource-annotate geometry
- Trained and evaluated 3D deep learning methods on the annotated ABC dataset for CAD clustering

Industry Experience

Epsilon — data-driven advertising & marketing analytics **Remote, US**

PhD Research Intern *May 2025 – Aug. 2025*

- Shipped interactive visualization components (React + D3) into Epsilon's production marketing analytics dashboard
- Owned end-to-end design of visualization views aligned with cross-functional marketing analytics workflows
- Analyzed large-scale real-world campaign data to derive actionable insights and evaluate business impact

Spruce — real estate title technology **New York, NY**
Software Engineer Intern, Search Automation *June 2019 – Dec. 2019*

- Built Python + Selenium web-scraping pipelines and an autonomous real-estate title search service, refined with NLP
- Automated manual title search from **3 days to <5 minutes**, contributing an estimated **$4M+ in annual revenue**

GoFreight — freight forwarding software **Taipei, Taiwan**
Software Engineer Intern *Mar. 2018 – Aug. 2018*

- Shipped a React Native warehouse management app (barcode scanning, cargo updates, stock sync); adopted by **1,000+ freight forwarding employees**

VMFive — playable mobile advertising **Taipei, Taiwan**
Android Developer Intern *July 2015 – Aug. 2015*

- Built an Android app integrating playable mobile ads, enabling free trials of Android mobile games without downloads

Invited Talks, Service & Teaching

Invited Talks: "Shape It Up: An Empirically Grounded Approach for Designing Shape Palettes," Vision Science × Visualization, May 2024
"Build Visualizations with D3 and Altair," Visualization Design Methods Class, Mar 2024, November 2025

Reviewing: Reviewer — CHI 2024–2026, IEEE VIS 2024–2026, PacificVis 2025, IEEE TVCG 2026

Teaching: Teaching Assistant, COMP 590-173 / 790-173: Information Visualization, UNC (Spring 2024)

Technical Skills

Languages: Python, JavaScript (ES6+), C++, C#, Java, SQL, OCaml, Scala, MATLAB, HTML/CSS

Visualization & Web: D3, Altair, React, React Native, Node.js, WebGL, RESTful APIs

HCI Methods: Crowdsourced experiments (MTurk), psychophysical study design, pairwise-comparison / forced-choice studies, user study design, IRB protocol design, engagement-check / quality-control design

Quantitative Analysis: Mixed-effects models, ANOVA, statistical analysis, Bradley–Terry modeling

Graphics & ML: OpenGL, OpenCV, Unity, scikit-learn, PyTorch