Chin Tseng

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

Research Summary

Ph.D. 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. 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**
***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); mean predicted 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

Graphical Perception of Icon Arrays versus Bar Charts for Value Comparisons in Health Risk Communication — **VIS 2025**
Jade Kandel, Jiayi Liu*, Arran Zeyu Wang, **Chin Tseng**, Danielle Albers 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 $\times$ 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

VisuaLab — human–computer interaction, information visualization, graphical perception **UNC Chapel Hill**

Graduate Research Assistant, advised by Prof. Danielle Szafir *Aug. 2021 – May 2026*

- Turned 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 and Nov. 2025
Reviewing	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, Bradley–Terry modeling
Graphics & ML	OpenGL, OpenCV, Unity, scikit-learn, PyTorch