Kartik Chandra
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[Compiled June 2024; up-to-date version at cs.stanford.edu/~kach]

**Education**

**Massachusetts Institute of Technology** (Cambridge, MA)
PhD in Electrical Engineering and Computer Science  (started Sept 2021)
SM in Electrical Engineering and Computer Science  Sept 2021 - June 2023
advised by Jonathan Ragan-Kelley and Joshua Tenenbaum

**Stanford University** (Palo Alto, CA), GPA 4.13 / 4.0, graduated with distinction  Sept 2017 - June 2021
BS in Computer Science with Honors, thesis advised by Gregory Valiant;  
BA in English Literature; and Minor in Physics

**Henry M. Gunn High School** (Palo Alto, CA), GPA 4.49 / 4.0  Nov 2013 - June 2017

**Expertise and skills**

- Visual computing systems
- Computer graphics
- Human visual perception
- Cognitive science
- Theory of mind
- Bayesian modeling
- Artificial intelligence
- Machine learning
- Deep learning
- Neural networks
- Differentiable programming
- Gradient-based optimization
- Probabilistic programming
- PyTorch
- JAX
- Programming language design
- Compilers
- Parsers
- Type systems
- Verification
- SMT solvers
- Program synthesis
- Web programming
- JavaScript
- Education
- Open-source project management
- Public speaking
- Science outreach
- Mentorship
- Writing

**Languages:** English (native), Hindi (native), French (intermediate), Russian (intermediate)

**Industry positions**

**NVIDIA Research**, Research intern (Santa Clara, CA)  June 2020 - Sept 2020
Adapted DLSS 2.0 deep learning system to denoise pathtraced images in real time

**Facebook (now Meta)**, Software engineering intern with Erik Meijer (Menlo Park, CA)  June 2019 - Sept 2019
Researched novel methods for gradient-based hyperparameter optimization [NeurIPS '22]

**Selected open-source contributions**

**Nearley parser generator**, original author and lead developer (nearley.js.org)  Jan 2014 - present
JS parsing toolkit, 10M+ downloads/month, 100K+ dependents on Github, npm “staff pick”
Used by AirBnb, Amazon, Adobe, LinkedIn, NBC, and research labs at UW, CMU, and others

**Berkeley Snap!**, contributor (snap.berkeley.edu)  Oct 2014 - July 2016
Blocks-based visual programming language used by 1,500+ high schools and CS 10 at Berkeley
Designed paint editor; led panel session on CS education at Scratch@MIT Media Lab 2016

**Publications**

(Note: * denotes equal contribution and † denotes undergraduate advisees.)

- **topiCS 2023**  *Storytelling as Inverse Inverse Planning*
  Kartik Chandra, Tzu-Mao Li, Jonathan Ragan-Kelley, Josh Tenenbaum
  @ Best of Papers from the 2023 CogSci Society Conference

- **NeurIPS 2023**  *Inferring the Future by Imagining the Past (spotlight)*
  Kartik Chandra*, Tony Chen*, Tzu-Mao Li, Jonathan Ragan-Kelley, Josh Tenenbaum

- **2023**  *Inverse Inverse Graphics*
  Kartik Chandra
  @ MIT - SM thesis

- **SIGGRAPH 2023**  *Acting as Inverse Inverse Planning*
  Kartik Chandra, Tzu-Mao Li, Joshua Tenenbaum, Jonathan Ragan-Kelley
NeurIPS 2022  *Gradient Descent: The Ultimate Optimizer* *(Outstanding Paper Award)*
Kartik Chandra*, Audrey Xie†, Jonathan Ragan-Kelley, Erik Meijer

SIGGRAPH 2022  *Designing Perceptual Puzzles by Differentiating Probabilistic Programs*
Kartik Chandra, Tzu-Mao Li, Joshua Tenenbaum, Jonathan Ragan-Kelley

2021  *An Unexpected Challenge in Using Fwd-Mode Automatic Differentiation for Low-Memory Deep Learning*
Kartik Chandra
@ Stanford University - undergraduate honors thesis

ACL 2021  *Beyond Laurel/Yanny: An Autoencoder-Enabled Search for Polyperceivable Audio*
Kartik Chandra, Chuma Kabaghe, Gregory Valiant

NeurIPS 2019  *SPoC: Search-based Pseudocode to Code*
Sumith Kulal, Panupong Pasupat, Kartik Chandra, Mina Lee, Oded Padon, Alex Aiken, Percy Liang

POPL 2018  *Bonsai: Synthesis-Based Reasoning for Type Systems*
Kartik Chandra, Rastislav Bodík

SNAPL 2017  *Domain-Specific Symbolic Compilation*
Rastislav Bodík, Kartik Chandra, Phitchaya Phothilimthana, Nathaniel Yazdani

**Workshop papers and non-archival conferences**

ACL 2024  *WatChat: Explaining perplexing programs by debugging mental models*
Kartik Chandra, Tzu-Mao Li, Rachit Nigam, Joshua Tenenbaum, Jonathan Ragan-Kelley
@ Workshop on Natural Language Reasoning and Structured Explanations

SPP 2024  *Explanation as Rational Communication*
Kartik Chandra, Tony Chen, Tzu-Mao Li, Jonathan Ragan-Kelley, Joshua Tenenbaum

CogSci 2024  *Intervening on Emotions by Planning Over a Theory of Mind*
Tony Chen, Sean Houlihan, Kartik Chandra, Joshua Tenenbaum, Rebecca Saxe

CogSci 2024  *Cooperative Explanation as Rational Communication*
Kartik Chandra, Tony Chen, Tzu-Mao Li, Jonathan Ragan-Kelley, Joshua Tenenbaum

PLATEAU 2024  *From 'Why?' to 'WAT!': Explaining perplexing programs by debugging mental models*
Kartik Chandra, Tzu-Mao Li, Rachit Nigam, Joshua Tenenbaum, Jonathan Ragan-Kelley

NECV 2023  *Inferring the Future by Imagining the Past* *(oral presentation; Best Poster Award)*
Kartik Chandra*, Tony Chen*, Tzu-Mao Li, Jonathan Ragan-Kelley, Joshua Tenenbaum
@ New England Computer Vision Workshop

NeurIPS 2023  *How to Guess a Gradient*
Utkarsh Singhal*, Brian Cheung*, Kartik Chandra*, Jonathan Ragan-Kelley, Joshua Tenenbaum, Tomaso Poggio, Stella Yu
@ Optimization for Machine Learning Workshop

ICML 2023  *Differentiating Metropolis-Hastings to Optimize Intractable Densities*
Gaurav Arya†, Ruben Seyer, Frank Schäfer, Kartik Chandra, Alexander Lew, Mathieu Huot, Vikash Mansinghka, Jonathan Ragan-Kelley, Christopher Rackauckas, Moritz Schauer
@ Differentiable Almost Everything Workshop

RSS 2023  *Inferring the Future by Imagining the Past* *(spotlight presentation)*
Kartik Chandra*, Tony Chen*, Tzu-Mao Li, Jonathan Ragan-Kelley, Joshua Tenenbaum
@ Workshop on Social Intelligence in Humans and Robots

ICML 2023  *Inferring the Future by Imagining the Past* *(oral presentation; Best Paper Award)*
Kartik Chandra*, Tony Chen*, Tzu-Mao Li, Jonathan Ragan-Kelley, Joshua Tenenbaum
@ Workshop on Theory of Mind in Communicating Agents

CogSci 2023  *Storytelling as Inverse Inverse Planning* *(Marr Prize for best student paper)*
Kartik Chandra, Tzu-Mao Li, Joshua Tenenbaum, Jonathan Ragan-Kelley

NECV 2022  *Designing Perceptual Puzzles by Differentiating Probabilistic Programs* *(oral presentation)*
Kartik Chandra, Tzu-Mao Li, Joshua Tenenbaum, Jonathan Ragan-Kelley
@ New England Computer Vision Workshop
ICML 2022  *Designing Perceptual Puzzles by Differentiating Probabilistic Programs* (spotlight talk)
Kartik Chandra, Tzu-Mao Li, Joshua Tenenbaum, Jonathan Ragan-Kelley
@ Workshop on Beyond Bayes: Paths Towards Universal Reasoning Systems

NEPLS 2018  *Designing a Strongly Typed DSL for Executable Legal Contracts*
Jerome Simeon, Joseph Bambara, Kartik Chandra, Matt Roberts
@ New England PL/Systems Symposium at Harvard

SPLASH 2016  *Automatically Finding Scala Soundness Bugs*
Kartik Chandra, Rastislav Bodík
@ Scala Symposium

PNW 2016  *Verification of Type Systems via Symbolic Execution*
Kartik Chandra, Rastislav Bodík
@ Pacific Northwest PL Meetup at UW-Seattle

**Awards**

**Fellowships and scholarships**
- Public Voices Fellow with the Op-Ed Project 2023
- MIT EECS Great Educators Fellowship 2021
- Paul & Daisy Soros Fellowship for New Americans 2021
- Hertz Foundation Fellowship 2021
- National Defense Science and Engineering Graduate Fellowship (NDSEG) – declined 2021
- NSF Graduate Research Fellowship (GRFP) 2021
- Goldwater Scholarship 2020
- National Merit Scholar 2017

**Academic honors**
- MIT Obermayer Prize for Writing for the Public, first prize 2024
- MIT Vera List Prize for Writing on the Visual Arts, second place 2024
- MIT CSAIL Gratitude Book Club Award, for contributions to the CSAIL community 2023
- MIT Vera List Prize for Writing on the Visual Arts, first place 2023
- Stanford Terman Award for Scholastic Achievement (awarded to 30 seniors in engineering) 2021
- Stanford Sterling Award for Scholastic Achievement (awarded to 25 seniors in humanities & sciences) 2021
- Phi Beta Kappa (awarded for seniors in humanities & sciences) 2020
- Gunn High School academic awards in Math, Computer Science, Chemistry, Biology, English, and French 2017
- Ross Mathematics Program Book Award 2015

**Research awards**
- Symposium on Geometry Processing, Conference Registration Award 2024
- New England Computer Vision Workshop, Best Poster Presentation 2023
- ICML Theory of Mind Workshop, Best Paper Award 2023
- CogSci, Marr Prize (awarded to best student paper of 535 accepted papers) 2023
- NeurIPS, Outstanding Paper Award (awarded to 13 of 2,672 accepted papers) 2022
- NeurIPS, Scholar Award 2022
- Bay Area Vision Research Day (BAVRD), Lightning Talk Competition Winner 2021
- Intel Excellence in Computer Science Award, Synopsys Science Fair 2016

**Teaching**
- CS 106 (intro to CS), Stanford University, senior section leader via CS 198 program spr ’18, aut ’19, win ’20, spr ’21
- Chemistry (honors), Gunn High School, teaching assistant aut ’15, spr ’16
- “AI and Literature,” 6-week course for under-resourced high schoolers via MIT Cascade aut ’23
- “Reading Beloved,” 6-week online course for high schoolers via MIT HSSP spr ’23
- Misc. 1-day high school classes via MIT Splash aut ’21, aut ’22, spr ’23, aut ’23
- Misc. 1-day high school classes via Stanford Splash aut ’17, spr ’18, aut ’18, spr ’19, aut ’19
Undergraduate advisees

**Audrey Xie**, research assistant; co-first-author on [NeurIPS ’22]; Goldwater Scholar ’23  
spr ’22 - spr ’23

**Gaurav Arya**, research assistant; first author on [ICML workshop ’23]; Gerstle UROP Award ’24  
aut ’22 - spr ’23

**Ram Goel**, research assistant  
aut ’23 - win ’23

**Peggy Yin**, research assistant  
aut ’23 - present

**Matthew Caren**, research assistant  
spr ’23 - present

**Sloke Shrestha**, graduate application mentee (→ UT Austin)  
aut ’21

**Elizabeth Dietrich**, graduate application mentee (→ UC Berkeley)  
aut ’22

**Anirudh Khatry**, graduate application mentee (→ UT Austin)  
aut ’23

**Aditya Abhyankar, Biruk Abere, Francisco Unai Caja López, Sara Ansari**, SGI project mentees  
sum ’23

Invited research talks

**On Inverse Inverse Planning**  
Computation & Decision-Making Lab (Stevens U), Fatahalian Lab (Stanford), Variation Lab (Harvard), Stanford Intelligent Systems Lab, Gerstenberg Lab (Stanford), [Brown Visual Computing Seminar](#), Saxe Lab (MIT)  
2024

**On Gradient Descent: The Ultimate Optimizer**  
Stanford Software Research Lunch Seminar (2019), [AutoML Seminar](#), [Deep Learning: Classics & Trends](#)  
2023

**On Designing Perceptual Puzzles**  
Probabilistic Computing Project (MIT), Graphics seminar (MIT), McDermott Lab (MIT), Stanford Graphics Café  
2022

Lifelong Kindergarten Group (MIT)  
2024

Bay Area Vision Research Day, [*Predicting Microsaccades with Machine Learning*](#) (won lightning talk competition)  
2021

Snap!Shot conference (Berkeley), [*Differentiable Snap!*](#)  
2020

NVIDIA Research, [RATH(E)-R-OK)](#): Deep Learning for Denoising!  
2020

Stanford Software Research Lunch Seminar, [*Synthesis-based Reasoning for Type Systems*](#)  
2018

Scratch Conference (MIT), [*The Seasoned Scratcher*](#) (led panel session)  
2016

Leadership and service

**Reviewing**  
Open Mind (’24); CogSci (’24); SIGGRAPH (’24 technical papers & posters, ’23 technical papers & posters); SIGGRAPH Asia (’23 technical papers); workshops at ICML (’23) and RSS (’23)

**Fixing the “leaky pipeline” through strategic outreach and mentoring**  
**MIT EECS Graduate Application Assistance Program** (link), president  
2022 - present

Led mentoring program for underrepresented PhD applicants; grew to team of 12 and 500+ annual participants

**MIT Presidential Committee on Distinguished Fellowships** (link), graduate student representative  
2023 - present

Advise applicants for Rhodes/ Marshall/ Fulbright and conduct mock interviews (led to several winners)

**Stanford Undergraduate Admissions Office**, alumni interviewer  
2022 - present

**Stanford Space Initiative** (SSI), organized K-12 programs at the Maker Faire & Exploratorium  
2018 - 2021

**Stanford Splash** (link), trained 100+ teachers for a program serving 1,000+ students  
2018 - 2020

**GunnHacks** (link), founded a prominent educational hackathon, still running annually a decade later  
2014 - 2017

**Potpourri**  
**Jazz pianist**, played with several ensembles at Stanford and MIT  
2014 - present

**Down with Gravity** (link), juggler, performed and taught lessons for local children  
2017 - 2020

Public scholarship

**Writing**  
List Arts Center, [*A strange thing happens when you live with a work of art*](#)  
2024

The Messenger, [*In the AI era, try lending students art*](#) [archive]  
2023

Inside Higher Ed, [*What’s a word worth in the AI era?*](#) [archive]  
2023
Speaking
MIT Museum, *M. C. Escher: Amazing Images* 2024
MIT List Arts Center, *On history as hypnosis* 2023
Stanford Phi Beta Kappa Ceremony, selected student speaker 2022
SAP Young Thinkers Learning Festival, Berkeley/virtual 2021
TEDxGunnHighSchool 2018
Gunn High School Engineering Night 2019
Baccalaureate Address, Gunn High School 2017
TEDxGunnHighSchool 2017
Gunn High School Engineering Night 2015

Selected press
AIhub, *NeurIPS 2022 Outstanding Paper: Gradient Descent: the Ultimate Optimizer* [archive] 2022
Synced, *MIT & Meta Enable Gradient Descent Optimizers to Automatically Tune Hyperparameters* [archive] 2022
The Indian Express, *Shabdle to Tamil Aadal: New-age creators add desi flair to Wordle* [archive] 2022
Stanford Report, *Grad wins fellowships to pursue bold innovation at MIT* [archive] 2021
Scratch Foundation, *Meet the Scratcher: Kartik C.* 2015
The Hindu, *School notes (“A young cyber talent...”)* [archive] 2012