Kartik Chandra

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[Compiled February 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,* **artificial intelligence**, *computational cognitive science, theory of mind, machine learning, deep learning, neural networks, differentiable programming, gradient-based optimization, probabilistic programming, Bayesian modeling and inference, 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

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 CSAIL Gratitude Book Club Award, for contributions to the CSAIL community	2023
MIT Karmel Writing Prizes, 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 as a junior, top 2% of class at Stanford)	2020
Gunn High School academic awards in Math, Computer Science, Chemistry, Biology, English, and French	2017
Ross Mathematics Program Book Award	2015

Research awards

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 '22
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	spr '22 - spr '23
Gaurav Arya, research assistant; first author on [ICML workshop '23]	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 ($\rightarrow$ UT Austin)	aut '21
Elizabeth Dietrich, graduate application mentee ($\rightarrow$ UC Berkeley)	aut '22
Anirudh Khatry, graduate application mentee	aut '23
Aditya Abhyankar, Biruk Abere, Francisco Unai Caja López, Sara Ansari, SGI project mentees	sum '23

Invited talks

On Inverse Inverse Planning	2023
Gerstenberg Lab (Stanford), Brown Visual Computing Seminar, Saxe Lab (MIT), Fatahalian Lab (Stanford)	
On Gradient Descent: The Ultimate Optimizer	2023
Stanford Software Research Lunch Seminar (2019), AutoML Seminar, Deep Learning: Classics & Trends	

On Designing Perceptual Puzzles   2022
    Probabilistic Computing Project (MIT), McDermott Lab (MIT)
Bay Area Vision Research Day, *Predicting Microsaccades with Machine Learning* (won lightning talk competition)   2021
Berkeley, Snap*!*Shot conference, *Differentiable Snap!*   2020
NVIDIA Research, *RAThE(R-OK): Deep Learning for Denoising!*   2020
Stanford Software Research Lunch Seminar, *Synthesis-based Reasoning for Type Systems*   2018
MIT Scratch Conference, *The Seasoned Scratcher* (led panel session)   2016

Leadership and service

Reviewing
CogSci ('24); SIGGRAPH ('24, '23); SIGGRAPH Asia ('23); workshops at ICML ('23), RSS ('23)

Fixing the "leaky pipeline" through strategic outreach and mentoring
MIT EECS Graduate Application Assistance Program (link)   2022 - present
    Lead mentoring program for underrepresented PhD applicants; team of 12 and 500+ annual participants
MIT Presidential Committee on Distinguished Fellowships, 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
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 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