

Kartik Chandra

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[Compiled December 2023; 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

Workshops papers and non-archival conferences

- 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 \(Marr Prize\)](#)
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) — <i>declined</i>	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 <i>Beloved</i> ,” 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 mentees

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 '23 - spr '23
Sloke Shrestha , graduate application mentee (→ UT Austin)	aut '21
Elizabeth Dietrich , graduate application mentee (→ UC Berkeley)	aut '22
Aditya Abhyankar, Biruk Abere, Francisco Unai Caja López, Sara Ansari , SGI project mentees	sum '23

Selected talks

<i>Inferring the Future by Imagining the Past</i> , New England Computer Vision (won best presentation award)	2023
<i>Inverse inverse planning</i> , SIGGRAPH, CogSci, Gerstenberg Lab, Brown Visual Computing Seminar , Saxe Lab	2023
<i>On history as hypnosis</i> , MIT List Arts Center	2023
<i>Gradient Descent: The Ultimate Optimizer</i> , AutoML Seminar , Deep Learning: Classics & Trends	2023
<i>Designing Perceptual Puzzles by Differentiating Probabilistic Programs</i>	2022
SIGGRAPH , ICML Beyond Bayes workshop (spotlight), New England Computer Vision (oral)	
<i>Islands and Continent</i> , Stanford Phi Beta Kappa ceremony student speaker	2022
<i>Predicting Microsaccades with Machine Learning</i> , Bay Area Vision Research Day (won lightning talk competition)	2021

<i>Beyond Laurel/Yanny</i> , Association for Computational Linguistics (ACL)	2021
<i>Finding Your Superpower</i> , SAP Young Thinkers Learning Festival, Berkeley/virtual	2021
<i>Differentiable Snap!</i> , Snap!Shot ignite talk, Berkeley/virtual	2020
<i>RAThE(R-OK): Deep Learning for Denoising!</i> , NVIDIA Research/virtual	2020
<i>Learning to learn by gradient descent by gradient descent</i> , Stanford Software Research Lunch	2019
Gunn High School Engineering Night	2019
<i>Designing a Strongly Typed DSL for Executable Legal Contracts</i> , New Eng PL/Sys Symposium, Harvard	2018
<i>A jazz performance with Kartik and Doug</i> , TEDxGunnHighSchool	2018
<i>BONSAI: Synthesis-Based Reasoning for Type Systems</i> , Principles of Programming Languages (POPL)	2018
<i>Synthesis-based Reasoning for Type Systems</i> , Stanford Software Research Lunch	2018
Baccalaureate Address, Gunn High School	2017
<i>Why Curiosity Still Matters</i> , TEDxGunnHighSchool	2017
<i>Automatically Finding Scala Soundness Bugs</i> , Scala Symposium, co-located with SPLASH	2016
<i>Verification of Type Systems via Symbolic Execution</i> , University of Washington, Seattle	2016
<i>The Seasoned Scratcher</i> (led panel session), Scratch CS Education Conference, MIT	2016
Gunn High School Engineering Night	2015

Activities, leadership, and service

Reviewer for SIGGRAPH '23 (tertiary, technical papers and posters); SIGGRAPH Asia '23 (tertiary, technical papers); ICML '23 (Theory of Mind workshop); RSS '23 (Social Intelligence Workshop)	
MIT EECS Graduate Application Assistance Program (GAAP)	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	2023 - present
MIT graduate residences , hall councillor, build community and mediate disputes in graduate housing	2022 - present
Jazz pianist , coordinate rehearsals/concerts; compose and arrange original music	2014 - present
Stanford Space Initiative (SSI) , outreach chair, organized K-12 programs at Maker Faire & Exploratorium	2018 - 2021
Stanford Splash (link), teacher dev chair, trained 100+ teachers for program serving 1,000+ students	2018 - 2020
Down with Gravity (link), juggler, performed and taught lessons for local children	2017 - 2020
GunnHacks (link), president and founder of a prominent 24-hour hackathon with 100+ attendees per year	2014 - 2017

Selected press, interviews, and public writing

The Messenger, <i>In the AI era, try lending students art</i> [archive]	2023
Inside Higher Ed, <i>What's a word worth in the AI era?</i> [archive]	2023
Alhub, <i>NeurIPS 2022 Outstanding Paper: Gradient Descent: the Ultimate Optimizer</i> [archive]	2022
Synced, <i>MIT & Meta Enable Gradient Descent Optimizers to Automatically Tune their own Hyperparameters</i> [archive]	2022
The Indian Express, <i>Shabdle to Tamil Aadal: New-age creators add desi flair to Wordle</i> [archive]	2022
Stanford Report, <i>Grad wins fellowships to pursue bold innovation at MIT</i> [archive]	2021
Scratch Foundation, <i>Meet the Scratcher: Kartik C.</i>	2015
The Hindu, <i>School notes ("A young cyber talent...")</i> [archive]	2012