# Vibhaalakshmi Sivaraman

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## Education

- **Massachusetts Institute of Technology** — **Sep 2019 - Dec 2023**
  Ph.D. in Computer Science
  Advisor: Mohammad Alizadeh
- **Massachusetts Institute of Technology** — **Sep 2019**
  S.M. in Computer Science
  Advisor: Mohammad Alizadeh
- **Princeton University** — **Jun 2017**
  B.S.E. in Computer Science, *Summa Cum Laude*

## Awards and Honors

- EECS Rising Stars — **2023**
- MIT Pillar AI Collective Grant — **2023**
- MIT Graduate Women of Excellence Honoree — **2023**
- Meta Fellowship Finalist — **2021, 2020**
- MIT Jacobs Presidential Fellowship — **2017 - 2018**
- Princeton University Computer Science Department Service Award — **2017**

## Research Summary

- **Video Conferencing**
  - An end-to-end neural compression system for low-bandwidth video conferencing that uses GAN-based face reconstruction from low-resolution video frames, and is optimized for efficient computation on user devices.
    Code: `https://github.com/geminovc`
  - New super-resolution technique for novel pose reconstruction using attention that leverages multiple reference frames.
  - Token-based transformer model to recover from packet loss during video conferences that nearly eliminates all freezes during lossy network conditions.
  - A measurement tool to capture video-conferencing experience in the wild using measurement from a single client's perspective.
  - New rate control mechanism for real-time video that responds to bandwidth fluctuations faster by adding padding traffic during video 'off' periods, and controlling the enconder target bitrate on short timescales.
- **Video Streaming**
  - *SRVC*, a new codec design that augments existing codecs with a small, content-adaptive super-resolution model that significantly boosts video quality.
    Code: `https://github.com/AdaptiveVC/SRVC`
  - *Minerva*, an end-to-end transport protocol optimized for QOE fairness across users streaming video over a shared bottleneck.
- **Credit Network Throughput**
  - *Spider*, a new network architecture and routing protocol, inspired by traditional data networks, that achieves high-throughput routing in credit networks.
    Code: `https://github.com/spider-pcn`

  - Theoretical understanding of the effect of topology on credit network throughput and practical guidance for topology design.

- **Heavy Hitter Detection**
  *Hashpipe*, an algorithm that uses a pipeline of hash tables to detect large flows in a network at line-rate on commodity switch hardware.
  Code: `https://github.com/vibhaa/hashpipe`

**Pre-prints**

- **Multi-Resolution Multi-Reference Talking Head Synthesis via Implicit Warping**
  **Vibhaalakshmi Sivaraman**, Xuan Luo, Anne Menini, Mohammad Alizadeh, Rahul Garg
  `https://people.csail.mit.edu/vibhaa/files/gemino_attn.pdf`
- **Vidaptive: Efficient and Responsive Rate Control for Real-Time Video on Variable Networks**
  Pantea Karimi, Sadjad Fouladi, **Vibhaalakshmi Sivaraman**, Mohammad Alizadeh
  `https://arxiv.org/abs/2309.16869`
- **Reparo: Loss-Resilient Generative Codec for Video Conferencing**
  Tianhong Li, **Vibhaalakshmi Sivaraman**, Lijie Fan, Mohammad Alizadeh, Dina Katabi
  `https://arxiv.org/abs/2305.14135`

**Publications**

- **Gemino: Practical and Robust Neural Compression for Video Conferencing**
  **Vibhaalakshmi Sivaraman**, Pantea Karimi, Vedantha Venkatapathy, Mehrdad Khani, Sadjad Fouladi, Mohammad Alizadeh, Frédo Durand, Vivienne Sze
  USENIX NSDI 2024

- **Efficient Video Compression via Content-Adaptive Super-Resolution**
  Mehrdad Khani, **Vibhaalakshmi Sivaraman**, Mohammad Alizadeh.
  IEEE ICCV 2021

- **The Effect of Network Topology on Credit Network Throughput**
  **Vibhaalakshmi Sivaraman**, Weizhao Tang, Shaileshh Bojja Venkatakrishnan, Giulia Fanti, Mohammad Alizadeh.
  IFIP Performance 2021

- **High Throughput Cryptocurrency Routing in Payment Channel Networks**
  **Vibhaalakshmi Sivaraman**, Shaileshh Bojja Venkatakrishnan, Kathleen Ruan, Parimarjan Negi, Lei Yang, Radhika Mittal, Giulia Fanti, Mohammad Alizadeh.
  USENIX NSDI 2020

- **End-to-End Transport for Video QOE Fairness**
  Vikram Nathan, **Vibhaalakshmi Sivaraman**, Ravichandra Addanki, Mehrdad Khani, Prateesh Goyal, Mohammad Alizadeh.
  ACM SIGCOMM 2019

- **Routing Cryptocurrency with the Spider Network**
  **Vibhaalakshmi Sivaraman**, Shaileshh Bojja Venkatakrishnan, Mohammad Alizadeh, Giulia Fanti, Pramod Viswanath.
  ACM HotNets 2018

- **Heavy-Hitter Detection Entirely in the Data Plane**
  **Vibhaalakshmi Sivaraman**, Srinivas Narayana, Ori Rottenstreich, S.Muthukrishnan and Jennifer Rexford.
  ACM SOSR 2017

**Industry Internships**

- **Google Labs (Teleportation Team)** **Oct 2022 - Nov 2023**
  Developing alternative neural networks for novel pose reconstruction without optical flow by using attention for super-resolution; model leverages a succinct set of facial feature banks condensed from multiple reference frames in different poses without the overheads of computing attention across all frames; initial evaluation in TensorFlow shows upto 2 dB improvement in PSNR.
- **Microsoft (Apps and Services Team)** **Summer 2015**
  Added features and functionality for tables in Excel's Windows app with more touch-friendly User Interfaces than the Desktop version; implemented UI to append total rows to Excel tables, extended the UI to change table styles; extensively tested features and pushed it to production code
- **AT&T Labs** **Summer 2014**
  Designed and implemented a standalone fraud-blocking module with a REST interface that looks up call parameters in a fraud database before placing calls; designed to be independently compatible with all AT&T application servers that process calls

**Presentations**

- **Gemino: Practical and Robust Neural Compression for Video Conferencing**
  - UC Berkeley NetSys, Berkeley, February 2023
  - Stanford Systems Seminar, Palo Alto, February 2023
  - Microsoft Research, Redmond, November 2022
- **Designing Credit Networks for High Throughput**
  - UC Berkeley Systems Seminar, Berkeley, April 2021
  - Rutgers University Systems Seminar, New Brunswick, March 2021
- **High-Throughput Cryptocurrency Routing in Payment Channel Networks**
  - USENIX NSDI, Santa Clara, February 2020
  - The Lightning Conference, Berlin, October 2019
  - MIT Digital Currency Initiative, Cambridge, October 2019
  - Carnegie Mellon CyLab Distinguished Seminar, Pittsburgh, September 2019
  - ACM Workshop on Hot Topics in Networks, Redmond, November 2018
- **Heavy Hitter Detection Entirely in the Data Plane**
  - ACM Symposium on SDN Research, Santa Clara, April 2017
  - Cornell University, Ithaca, February 2017
  - New England Networking and Systems Day, Boston, October 2016

**Teaching Experience**

- **Teaching Assistant,** MIT EECS **Spring 2019**
  6.858: Computer Systems Security
  Overall Rating: 6.3/7.0

- **Undergraduate Lab Teaching Assistant,** Princeton University **2015 - 2017**
  COS 126: General Computer Science
  COS 226: Algorithms and Data Structures
  COS 217: Introduction to Programming Systems
  Received Student Teaching Award from the Computer Science Department

- **Peer Tutor,** Princeton University **2015 - 2017**
  MAT 201: Multivariable Calculus
  MAT 202: Linear Algebra
  COS 126: General Computer Science
  Tutored as a peer tutor under the McGraw Center for Teaching and Learning

**Service Experience**

- MIT EECS Resource for Easing Friction and Stress **2020 - Present**
- Hall Councilor for Sidney Pacific Graduate Dorm **2018 - 2021**
- MIT Graduate Women in Course 6 (GW6) Co-President **2018**
- Princeton Women in Computer Science (PWiCS) Co-President **2016 - 2017**