

Chaitanya Ahuja

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Education

Ph.D. in Language Technologies

School of Computer Science, Carnegie Mellon University, 4.02/4.0

Advisor: Prof. Louis-Philippe Morency

Pittsburgh, PA

Aug 2015 – April 2022

B.Tech. in Electrical Engineering

Indian Institute of Technology Kanpur, 9.5/10

Minor: Artificial Intelligence

Kanpur, India

Aug 2011 – May 2015

Research Vision

I work at the intersection of **multimodal generative** modeling and **socially aware AI** companions. I aim to develop cutting-edge techniques that enable AI systems to perceive actions, engage in logical reasoning, and generate realistic reactions in social situations enriched with conversations and interactions.

Experience

Research Scientist, Meta AI

Multimodal Machine Learning

- Developed cutting-edge multimodal (videos, images, and text) content-driven neural networks that enhanced engagement in recommendation systems.
- Successfully scaled these networks to accommodate billions of users and vast amounts of content.
- Designed and implemented personalized user experience systems for billions of users, utilizing rich multimodal content.

Los Angeles, CA

May 2022 – present

Graduate Researcher, Carnegie Mellon University

Advisor: Prof. Louis-Philippe Morency

PhD Thesis - Communication beyond words: Grounding Visual Body Motion with Language

- **Multimodal Grounding:** Developed grounding algorithms that builds a common embedding space for language, acoustics and human body pose for the purposes of co-speech gesture generation.
- **Gesture Style Transfer and Control:** Designed efficient algorithms to transfer idiosyncratic gesture styles of one speaker to another and a many-to-many gesture style transfer set-up.
- **Low-Resource Generative Models:** Designed algorithms to generate co-speech gestures for new speakers with significantly lesser supervision.

Pittsburgh, PA

Aug 2015 – April 2022

Research Intern, Meta Reality Labs (previously Facebook Reality Labs)

Advisor: Shugao Ma

- Designed a neural network model to generate upper body animations in a dyadic conversational setting. These animations are conditioned on avatar's speech, pose history and interlocutor's speech and pose history.
- Used an attention-based model to focus on interpersonal and intrapersonal dynamics as and when indicated by the stimuli to the model.
- Demonstrated the model's effectiveness in generating accurate and natural looking pose sequences via various objective and subjective metrics of evaluation.

Pittsburgh, PA

May 2018 – Aug 2018

Research Intern, Cornell University

Advisor: Prof. Tsuhan Chen

- Designed a system to predict adjectives for a given noun based on an existing set of tags, which increased the vocabulary of the tags while maintaining the sanctity of the noun-adjective pair
- Improved the compatibility of adjectives with respect to nouns based on a probability measure by incorporating a sentence corpus (e.g. British-National-Corpus).

Ithaca, NY

May 2014 – Aug 2014

- o **Undergraduate Researcher, Indian Institute of Technology** **Kanpur, India**
 Advisor: Prof. Rajesh Hegde *May 2013 – May 2015*
 - Worked towards mimicking a ear with digital filters that can help synthesize **Spatial Audio**.
 - Developed methods to construct ear contours generated by spectral notches of Head Related Transfer Functions (or HRTFs), hence mapping HRTFs to the anthropometry of the ear.
 - Explored relationships between structure of a ear and HRTFs.
- o **Undergraduate Researcher, Indian Institute of Technology** **Kanpur, India**
 Advisor: Prof. Vinay Namboodiri *Aug 2014 – May 2015*
 - Proposed and implemented an online system for creating human-centric image summaries of videos.
 - Designed a Kernel-based tracking algorithm for automated live synthesis of video synopsis for human-centric videos.

Honors and Awards

- o [Highlighted Reviewer](#) at ICLR 2022
- o CMU Graduate Research Fellowship, 2015 – 2020
- o Honorable Mention at the LTI Student Research Symposium, 2019
- o Cornell-India summer program at Cornell University, 2014
- o Viterbi-India summer program at the University of Southern California (declined), 2014
- o Summer Undergraduate Research Grant for Excellence ([SURGE](#)) 2013, IIT Kanpur
- o One of the top 7 projects (out of 70) in [SURGE 2013](#)
- o Academic Excellence Awards for distinctive performance, 2011 – 2013, IIT Kanpur
- o All India Rank 231 - Top 0.05% (amongst 4,75,000 students) in IIT-JEE 2011.
- o All India Rank 124 - Top 0.05% (amongst 10,00,000 students) in AIEEE 2011.

Publications

Updated list on [Google Scholar](#)

Pre-prints/Under review

1. Continual Learning for Personalized Co-speech Gesture Generation
Chaitanya Ahuja, Pratik Joshi, Ryo Ishii, Louis-Philippe Morency
Preprint
2. [Multimodal Lecture Presentations Dataset: Understanding Multimodality in Educational Slides](#)
 Dong Won Lee, **Chaitanya Ahuja**, Paul Pu Liang, Sanika Natu, Louis-Philippe Morency
Preprint

Refereed conferences/journals

1. [A Comprehensive Review of Data-Driven Co-Speech Gesture Generation](#)
 Simbarashe Nyatsanga, Taras Kucherenko, **Chaitanya Ahuja**, Gustav Eje Henter, Michael Neff
 Annual Conference of the European Association for Computer Graphics (EUROGRAPHICS 2023)
2. [Communication Beyond Words: Grounding Visual Body Motion with Language](#)
Chaitanya Ahuja
 PhD dissertation, Carnegie Mellon University, 2022
3. [Low-Resource Adaptation for Personalized Co-Speech Gesture Generation](#)
Chaitanya Ahuja, Dong Won Lee, Louis-Philippe Morency
 Conference on Computer Vision and Pattern Recognition (CVPR 2022)
[\[webpage\]](#) [\[code\]](#) [\[supp\]](#)
4. [No gestures left behind: Learning relationships between spoken language and freeform gestures](#)
Chaitanya Ahuja, Dong Won Lee, Ryo Ishii, Louis-Philippe Morency
 Findings of Empirical Methods in Natural Language Processing (Findings of EMNLP, 2020)
 Presented at Natural Language Beyond Text Workshop @EMNLP 2020
[\[code\]](#)[\[video\]](#)
5. [Impact of personality on nonverbal behavior generation](#)
 Ryo Ishii, **Chaitanya Ahuja**, Yukiko I. Nakano, Louis-Philippe Morency
 ACM International Conference on Intelligent Virtual Agents (IVA, 2020)

6. [Style transfer for co-speech gesture animation: A multi-speaker conditional mixture approach](#)
Chaitanya Ahuja, Dong Won Lee, Yukiko I. Nakano, Louis-Philippe Morency
 European Conference on Computer Vision (ECCV, 2020)
[\[code\]](#) [\[demo\]](#) [\[video\]](#) Media: [TechXplore](#)
7. [To react or not to react: End-to-end visual pose forecasting for personalized avatar during dyadic conversations](#)
Chaitanya Ahuja, Shugao Ma, Louis-Philippe Morency, Yaser Sheikh
 ACM International Conference on Multimodal Interaction (ICMI, 2019)
8. [Coalescing Narrative and Dialogue for Grounded Pose Forecasting](#)
Chaitanya Ahuja
 Doctoral Consortium, ACM International Conference on Multimodal Interaction (ICMI 2019)
9. [Language2pose: Natural language grounded pose forecasting](#)
Chaitanya Ahuja, Louis-Philippe Morency
 International Conference on 3D Vision (3DV, 2019)
[\[code\]](#) [\[webpage\]](#) Media: [Scientific American](#), [Synced](#), [VentureBeat](#)
10. [A complex matrix factorization approach to joint modeling of magnitude and phase for source separation](#)
Chaitanya Ahuja, Karan Nathwani, Rajesh M. Hegde
 IEEE International Symposium on Signal Processing and Information Technology (ISSPIT, 2019)
11. [Multimodal machine learning: A survey and taxonomy](#)
 Tadas Baltrušaitis, **Chaitanya Ahuja**, Louis-Philippe Morency
 Transactions on Pattern Analysis and Machine Intelligence (TPAMI, 2018)
12. [Lattice recurrent unit: Improving convergence and statistical efficiency for sequence modeling](#)
Chaitanya Ahuja, Louis-Philippe Morency
 AAAI Conference on Artificial Intelligence (AAAI, 2018)
[\[code\]](#) [\[webpage\]](#)
13. [Fast modelling of pinna spectral notches from HRTFs using linear prediction residual cepstrum](#)
Chaitanya Ahuja, Rajesh M. Hegde
 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP 2014)

Book Chapters

1. [Challenges and applications in multimodal machine learning](#)
 Tadas Baltrušaitis, **Chaitanya Ahuja**, Louis-Philippe Morency
 The Handbook of Multimodal-Multisensor Interfaces: Signal Processing, Architectures, and Detection of Emotion and Cognition-Volume 2, 2018, pp. 17–48

Refereed Workshops

1. [Crossmodal clustered contrastive learning: Grounding of spoken language to gestures](#)
 Dong Won Lee, **Chaitanya Ahuja**, Louis-Philippe Morency
 GENE Workshop 2021 @ACM International Conference on Multimodal Interaction (ICMI, 2021)
2. [Extraction of pinna spectral notches in the median plane of a virtual spherical microphone array](#)
 Ankit Sohni, **Chaitanya Ahuja**, Rajesh M. Hegde
 Joint Workshop on Hands-free Speech Communication and Microphone Arrays (HSCMA, 2014)

Organized Workshops

1. [First Workshop on Crossmodal Social Animation](#)
 International Conference on Computer Vision (ICCV, 2021) Workshop Proceedings
[\[video\]](#)
2. [First Workshop on Multimodal Fact Checking and Hate Speech Detection](#)
 AAAI Conference on Artificial Intelligence (AAAI, 2022) Workshop Proceedings
[\[dataset\]](#) [\[workshop proc.\]](#)

Technical Reports

1. [Training Segmentation Models for Extractive and Generative NLP Tasks with Reinforcement Learning](#)
 Akash Bharadwaj*, **Chaitanya Ahuja***
 Course Project, Deep RL and control at CMU
2. [Topological Data Analysis](#)

Bhuwan Dhingra*, **Chaitanya Ahuja***
Course Project, Statistical Machine Learning at CMU [\[slides\]](#)

3. [Video Captioning](#)

Salvador Medina*, **Chaitanya Ahuja***
Course Project, Advanced Multimodal Machine Learning at CMU

4. [Visual Summarization of foreground object motion using boundary initialization of object tracking](#)

Chaitanya Ahuja*, Pratik Somani*
B.Tech Final Year Project at IIT Kanpur

Student Mentorship

- o Dong Won Lee (CMU BS → CMU MS in Machine Learning → MIT Media Lab): Self-supervised generative models.
- o Pratik Joshi (CMU MS): Continual learning for generative models.
- o Sanika Natu (CMU MS): Understanding multimodality in educational slides
- o Shraddha Sehgal (IIIT Hyderabad B.Tech. → UIUC MS in Computer Science): Evaluation of generative models.
- o Arvin Wu (CMU BS): Social intelligence benchmarking.
- o Nikitha Murikinati (CMU BS): Study of relationships between co-speech gestures and prosody.
- o Sharath Rao (CMU MS → PlayStation): Back-channel prediction in dyadic conversations.
- o Qingtao Hu (CMU MS → Amazon): Unsupervised disentanglement of style and content in images.
- o Anirudha Rayasam (CMU MS → Google): Language grounded pose forecasting.

Teaching

- o Head TA: 11763 [Structured Prediction for language and discrete data](#) by Taylor Berg-Kirkpatrick and Bhiksha Raj, CMU
3 recitations on Viterbi Decoding [\[slides\]](#), ILP and Dependency Parsing [\[slides\]](#) and Neural CRFs [\[slides\]](#) *Spring 2018*
- o Head TA: 11-777 Multimodal Machine Learning by Louis-Philippe Morency, CMU *Spring 2017*

Talks

- o **Communication Beyond Words: Grounding Visual Body Motion with Spoken Language**
KTH Stockholm, Online *April 2021*
- o [Learning Relationships between Spoken Language and Freeform Gestures](#)
EMNLP 2020 Workshop on NLP Beyond Text, Online *November 2020*
- o **Natural Language Grounded Pose Forecasting**
LTI Student Research Symposium, Pittsburgh PA *August 2019*
- o **End-to-End Visual Pose Forecasting for Personalized Avatar during Dyadic Conversations**
ACM International Conference on Multimodal Interaction, Suzhou, China *October 2019*

Resources

- o **PATS Dataset**: Designed and constructed a large benchmark to study the complex multimodal relationships between Body Poses, Audio, Transcripts, and individual gesture Styles
- o [chahuja/aisle](#): Learning relationships between spoken language and freeform gestures
- o [chahuja/mix-stage](#): Style transfer for co-speech gesture generation
- o [chahuja/language2pose](#): Natural language grounded pose forecasting
- o [chahuja/lru](#): Lattice recurrent units

Professional Activities and Service

- o Co-organizer: ICCV 2021 First Workshop on Crossmodal Social Animation
- o Co-organizer: Multimodal Machine Learning Reading Group, CMU, Spring 2020

- o Conference Program Committee: NeurIPS, ICLR, CVPR, ECCV, SIGGRAPH, ACL, EMNLP, ICMI
- o Workshop Program Committee: NeurIPS workshop on Multimodal Machine Learning, ACL Workshop on Multimodal Language, NAACL-HLT Student Research Workshop, ICMI GENE Workshop
- o Grant Reviewer: Army Research Office (ARO)
- o CMU Graduate Applicant Support Program Volunteer: 2020
- o CMU AI Undergraduate Research Mentor: 2020, 2021
- o CMU Graduate Student Association Representative for Language Technologies Institute: 2017

Skills

- o Languages: English (fluent), Hindi (native), Spanish (Limited Working)
- o Programming Languages: Python, C, MATLAB, CSS, HTML, \LaTeX
- o Frameworks: Numpy, Pandas, PyTorch, Scikit-Learn, Scipy, Tensorflow, Theano

Relevant Graduate Coursework

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| o Structured Prediction for Language and Other Discrete Data (CMU 10-763): T. Berg-Kirkpatrick, B. Raj | <i>Spring 2018</i> |
| o Deep Reinforcement Learning (CMU 10-703): R. Salakhutdinov, K. Fragkiadaki | <i>Spring 2017</i> |
| o Statistical Machine Learning (CMU 10-702): L. Wasserman, R. Tibshirani | <i>Spring 2017</i> |
| o Deep Learning (CMU 10-707): R. Salakhutdinov | <i>Fall 2016</i> |
| o Intermediate Statistics (CMU 10-705): L. Wasserman | <i>Fall 2016</i> |
| o Advanced Multimodal Machine Learning (CMU 11-777): L.-P. Morency | <i>Spring 2016</i> |
| o Machine Learning (PhD) (CMU 10-701): T. Mitchell | <i>Spring 2016</i> |
| o Human Communication and Multimodal ML (CMU 11-776): L.-P. Morency | <i>Fall 2015</i> |
| o Algorithms for NLP (CMU 10-702): C. Dyer | <i>Fall 2015</i> |

References

Available on request