

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 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

- **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.
- **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

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

Publications

Updated list on [Google Scholar](#)

Refereed conferences/journals.....

1. [Continual Learning for Personalized Co-speech Gesture Generation](#)
Chaitanya Ahuja, Pratik Joshi, Ryo Ishii, Louis-Philippe Morency
International Conference on Computer Vision (ICCV 2023)
[\[webpage\]](#)
2. [Multimodal Lecture Presentations Dataset: Understanding Multimodality in Educational Slides](#)
 Dong Won Lee, **Chaitanya Ahuja**, Paul Pu Liang, Sanika Natu, Louis-Philippe Morency
International Conference on Computer Vision (ICCV 2023)
[\[code\]](#)
3. [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)
4. [Communication Beyond Words: Grounding Visual Body Motion with Language](#)
Chaitanya Ahuja
 PhD dissertation, Carnegie Mellon University, 2022
5. [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)
[\[webpage\]](#) [\[code\]](#) [\[supp\]](#)
6. [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
[\[code\]](#)[\[video\]](#)
7. [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)

8. [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](#)
9. [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)
10. [Coalescing Narrative and Dialogue for Grounded Pose Forecasting](#)
Chaitanya Ahuja
Doctoral Consortium, ACM International Conference on Multimodal Interaction (ICMI 2019)
11. [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](#)
12. [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)
13. [Multimodal machine learning: A survey and taxonomy](#)
Tadas Baltrušaitis, **Chaitanya Ahuja**, Louis-Philippe Morency
Transactions on Pattern Analysis and Machine Intelligence (TPAMI, 2018)
14. [Lattice recurrent unit: Improving convergence and statistical efficiency for sequence modeling](#)
Chaitanya Ahuja, Louis-Philippe Morency
AAAI Conference on Artificial Intelligence (AAAI, 2018)
[\[code\]](#) [\[webpage\]](#)
15. [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
GENEA 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 Shradha 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 GENEVA 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

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

References

Available on request