

Prerna Chikersal

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EDUCATION

- AUG 2015 – MAY 2017 **Carnegie Mellon University, Pittsburgh, PA, USA**
MASTER OF SCIENCE IN ROBOTICS
THESIS: “DEEP STRUCTURES OF COLLABORATION”
RESEARCH FOCUS: HUMAN-COMPUTER INTERACTION, MACHINE LEARNING
- MAY 2011 – MAY 2015 **Nanyang Technological University, Singapore**
BACHELOR OF ENGINEERING IN COMPUTER SCIENCE WITH FIRST CLASS HONORS*
AND WITH SPECIALISATION IN INTELLIGENT SYSTEMS
THESIS: “MODELING PUBLIC SENTIMENT IN TWITTER” (GRADE: A+)
- JUL 2014 – AUG 2014 **Columbia University in the City of New York**
SUMMER SCHOOL
Courses: Behavioural Neuroscience, Programming Languages and Translators

RELEVANT COURSES: Introduction to Machine Learning (PhD-level), Human Communication and Multimodal Computation, Experimental Design for Behavioral and Social Sciences, Computer Vision, Natural Language Processing*, Neural Networks*, Intelligent Agents*, Artificial Intelligence*, Introduction to Psychology*

RESEARCH EXPERIENCE

SEP 2015 – PRESENT

Graduate Research Assistant, Human-Computer Interaction Institute, Carnegie Mellon University

PROJECT: DEEP STRUCTURES OF COLLABORATION (MASTERS THESIS)

ADVISOR: PROF. LAURA DABBISH

COLLABORATORS: PROF. ANITA WOOLLEY, PROF. LP MORENCY, DR. MARIA TOMPROU, DR. YOUNG JI KIM

- This project explores the physiological and behavioral underpinnings of collective intelligence (CI), a concept equivalent to IQ in work teams.
- The goal is to develop technologies that predict and respond to low CI, in order to improve collaboration.
- Data from multiple modalities (or sources) was recorded while dyads collaborated via video-conferencing on a test that measured CI.
- Synchrony between participants (indicating coordination) was calculated using Dynamic Time Warping.
- Synchrony in facial expressions positively correlated with CI, while synchrony in electrodermal activity positively correlated with group satisfaction.
- This implies that different processes may drive cohesion (satisfaction) and performance (CI) in groups, thereby emphasizing the need to develop different models for them. This also creates potential for technological interventions that increase CI by augmenting facial expression synchrony. E.g.: amplifying facial expressions or making faces more visible and salient in video conferencing systems.
- Preliminary results from speech analysis show a negative correlation between amount of speech and CI, perhaps due to irrelevant content. In future, relevance of content of speech can be measured by detecting topics from speech transcriptions.
- Next steps include multimodal modeling in which data from all modalities can be combined to improve predictions of CI.

TECHNOLOGIES: *Python, Scikit-learn, Matlab, R, OpenFace, OpenSmile, Microsoft Kinect SDK*

PUBLICATION: http://prernac.com/papers/cscw_2017_camera_ready.pdf

FEB 2016 – APR 2016

Graduate Research Assistant, Human-Computer Interaction Institute, Carnegie Mellon University

PROJECT: PREDICTING NEGOTIATION OUTCOMES FROM BEHAVIORAL DATA

ADVISOR: PROF. LAURA DABBISH

- The goal was to build a computational model that predicts negotiation outcomes.
- Audiovisual data was recorded while dyads worked on a negotiation task via video-conferencing.
- Baseline Linear Support Vector Machines (SVM) trained on audio-only, video-only, and audio+video features gave accuracies of 48.2%, 48.3%, and 53.33%, respectively.
- The limitation of the baseline model was that it ignored inherent differences between audio and visual features by fitting the same function to them.
- So, Multiple Kernel Learning (MKL) for Linear SVM was implemented, to learn different kernels (mathematical functions) for audio and visual features and combine them together.
- Linear SVM with MKL trained on audio+video features gave an accuracy of 63.1%, thereby increasing the accuracy by around 10%.

TECHNOLOGIES: *Python, Scikit-learn, Matlab, OpenFace, OpenSmile*

REPORT: <http://prernac.com/reports/mlnego.pdf>

SEP 2014 – JUNE 2015

President Research Scholar, Undergraduate Research Experience on Campus, NTU Singapore

PROJECT: MODELING PUBLIC SENTIMENT IN TWITTER (BACHELOR THESIS)

SUPERVISOR: PROF. ERIK CAMBRIA

A system was proposed to enhance supervised learning for polarity classification by leveraging on linguistic rules based on conjunctions and conditionals. Additionally, a hybrid classifier was built by adding an unsupervised classification layer to the supervised classifier. The unsupervised classifier applied rules based on commonsense concepts extracted from text.

TECHNOLOGIES: *SenticNet, Python, Scikit-learn, NLTK, Java, and others*

PUBLICATIONS: <http://sentic.net/modelling-public-sentiment-in-twitter.pdf>,

<http://anthology.aclweb.org/S/S15/S15-2108.pdf>

DEMO: <http://tweety.sentic.net/>

AUG 2013 – JAN 2014

Research Intern, Computer Vision Lab, École Polytechnique Fédérale de Lausanne, Switzerland

PROJECT: PERSON RE-IDENTIFICATION USING APPEARANCE IN MULTIPLE PEOPLE TRACKING

SUPERVISORS: HORESH BEN SHITRIT AND PROF. PASCAL FUA

Applied person re-id algorithms on two sports and one pedestrian dataset used by the lab, for re-identification of people using appearance cues like color and texture. 3 methods were implemented and evaluated – (i) dominant colors, (ii) color histograms, and (iii) color invariants.

TECHNOLOGIES: *C++, Qt, OpenCV, Matlab, Computer Vision algorithms, K-means clustering.*

REPORT: http://prernac.com/reports/person_reid_chikersal_2014.pdf

MAY 2013 – AUG 2013

Summer Intern, Computer Graphics Lab, École Polytechnique Fédérale de Lausanne, Switzerland

PROJECT: HAND PERFORMANCE CAPTURE

SUPERVISORS: DR. ANDREA TAGLIASACCHI AND PROF. MARK PAULY

This project aimed to use RGB-D input to track a person's hand in real-time and capture its performance.

– Used RGB-D data to create a 3D mesh of a person's hand in real-time. Multithreading and optimization was used to improve performance. Hand and fingertips were detected from RGB data.

– Extracted structured data describing a rigged hand model from a FBX file.

TECHNOLOGIES: *C++, Qt, OpenCV, OpenGL, OpenNI*

SEP 2012 – MAY 2013

President Research Scholar, Undergraduate Research Experience on Campus, NTU Singapore

PROJECT: CREATION AND ANIMATION OF A TALKING HEAD WITH LIP SYNC AND EXPRESSIONS

SUPERVISOR: PROF. CHNG ENG SIONG

Conducted a literature review and helped develop an animated “Talking Head” of a living person.

TECHNOLOGIES: *C# (basic), MS Speech SDK, FaceGen SDK*

POSTER: <https://dr.ntu.edu.sg/handle/10220/11313> (Won 2nd Prize in URECA Poster Exhibition)

PUBLICATIONS

Conferences

1. P. Chikersal, M. Tomprou, Y. J. Kim, A.W. Woolley, and L. Dabbish, *Deep Structures of Collaboration: Physiological Correlates of Collective Intelligence and Group Satisfaction*, In Proceedings of the 20th ACM Conference on Computer-Supported Cooperative Work and Social Computing (CSCW 2017). **(forthcoming)** (View Paper)
2. P. Chikersal, S. Poria, E. Cambria, A. Gelbukh, and C. E. Siong, *Modelling Public Sentiment in Twitter: Using Linguistic Patterns to Enhance Supervised Learning*, In International Conference on Computational Linguistics and Intelligent Text Processing (pp. 49-65), 2015. **(Long Oral Presentation)** (View Paper)

Workshops

1. P. Chikersal, S. Poria, and E. Cambria, *SeNTU: Sentiment analysis of tweets by combining a rule-based classifier with supervised learning*, In Proceedings of the International Workshop on Semantic Evaluation (SemEval), 2015. (View Paper)

SELECTED TECHNICAL PROJECTS

SEP 2015 – DEC 2015

Eulerian Video Magnification (EVM) as a Psychophysiological Measure for Pain

The goal of this project was to estimate pain by measuring blood flow. Eulerian Video Magnification was implemented in Matlab, to magnify color changes in videos of people with shoulder injuries experiencing pain. Preliminary analysis of blood flow measured using this method and annotated pain levels shows a relation between the two.

TECHNOLOGIES: *Matlab*

POSTER: http://prernac.com/reports/cv_poster.png

SEP 2015 – DEC 2015

Quantifying Gestural Mimicry in Social Interactions

The goal was to measure the chameleon effect, which is described as the tendency of people to unconsciously mimic each other during a social interaction, and examine its relation with self-reported rapport.

- The joint movements of two interacting participants were recorded by a motion sensor (Kinect).
- Unit motions were extracted from each joint's motion trajectories.
- Mimicry was calculated by matching unit motions across partners in the dyad, using cosine similarity between features extracted from the unit motions.
- Preliminary results showed that gestural mimicry calculated using this method has a stronger correlation with rapport than other methods like lagged correlation.

TECHNOLOGIES: *Python*

REPORT: <http://prernac.com/reports/mathproject.pdf>

FEB 2014 – APR 2014

A Hybrid Architecture for a Multiagent System in TileWorld, Optimized using Genetic Algorithms

SUPERVISOR: PROF. MICHAEL HAROLD LEES

Designed a system of 2 utility-based agents, which collaborated using novel communication and exploration strategies. A Genetic Algorithm was used to find parameters for the utility functions.

TECHNOLOGIES: *Java, Mason (Multiagent simulation toolkit), Watchmaker Framework*

REPORT: <http://prernac.com/reports/ga.pdf>

PRESENTATION: <https://youtu.be/JwD7P3WB3SY>

FEB 2014 – APR 2014

Autonomous Robot for Maze Exploration and Finding the Shortest Path

A robot was assembled and programmed. A wall following algorithm was used to explore an unknown maze, while A*star search was used to find the shortest path, while avoiding obstacles.

TECHNOLOGIES: *Arduino, Raspberry Pi, Java.*

PRESENTATION: <https://youtu.be/9b0uVbRyZas>

FEB 2013

Match 'n' Style: a Web-Based Image Processing App for Online Shopping

Uses image processing to help users find accessories that match the picture of the dress they upload or capture using their webcam. Won NTU's TechFest Hackathon 2013.

TECHNOLOGIES: *HTML5 canvas, PHP, HAAR face detection, k-means to find dominant colors*

WEBSITE: <http://prernac.com/mns/>

AWARDS AND ACHIEVEMENTS

- AUG 2013 *Awarded a research scholarship by EPFL for NTU-EPFL's research exchange program.*
- APRIL 2013 *One of the 50 candidates out of 1500, chosen to participate in the Summer@EPFL program.*
- MAR 2013 *2nd Prize in URECA@NTU Poster Competition for "Creation and animation of a Talking Head with lip sync and expressions".*
- FEB 2013 *1st Prize in the NTU's TechFest 30 hours Hackathon 2013 for "Match 'N' Style"*
- OCT 2011 *4th Rank in IEEE-NTU Talent Search, a campus wide quiz competition with over a 100 participants. We were a team of 2 freshmen and the only women to reach the finals!*
- 2009 – 2011 *Gold Medal for Academic Excellence, during high school at D.P.S., R.K. Puram, New Delhi, India for showing good academic performance throughout high school.*
- 2003 – 2009 *Scholar Badge Awardee for 7 consecutive years, throughout middle and high school.*

RELEVANT TEACHING AND LEADERSHIP EXPERIENCE

- AUG 2012 **Vice Chairperson - Internal, IEEE-NTU, Science Symposium Committee**
- MAY 2014 Organised symposiums in which, high students presented papers on practical projects.
- MAR 2013 **Instructor, "Web Development" Workshop, Computer Engineering Club, NTU**
Taught 30-40 school students the basics of HTML and helped them create their first website which was hosted online, during a Community Involvement Program.
- DEC 2012 **Instructor, "Google Search Techniques", Computer Engineering Club, NTU**
Taught 30-40 school students how to perform web searches and filter the results.

TECHNICAL SKILLS, LANGUAGES AND INTERESTS

Proficient in Python, Scikit-learn, NLTK, Matlab, R, C/C++, OpenCV, Qt, Java, PHP, MySQL, HTML5, CSS3, JavaScript, Wordpress, MS Office

Can also use OCaml, Lisp, OpenGL, OpenNI, MASON Multiagent Simulation Toolkit, JSP, jQuery, Arduino

Fluent in Hindi and English. Know some French.

Enjoy Traveling and Photography, Occasional Creative Writing