

# SIZHU (LINDSAY) CHENG

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## EDUCATION

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### Stanford University

M.S. Computational & Mathematical Engineering

Septembmer 2017 - June 2019

GPA: 3.61

### University of California, Los Angeles

B.S. Applied Mathematics and B.S. Neuroscience.

July 2013 - June 2017

GPA: 3.71

**Honors:** Cum Laude, Deans List, ALD | PES Honor Society, Golden Key International Honor Society

## RELEVANT EXPERIENCE

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### Stanford University School of Medicine, Neurobiology Department

Graduate Research Assistant

April 2019 - Present

Palo Alto

- Represent neural mechanism using deep learning model given electrical step inputs
- Conduct the experiment to reveal the intertwined neural signal information using Recurrent Neural Network model
- Extend the system into a more in-depth dynamics which represented the human neural activities during prediction of environmental changes

### Stanford University, Psychology Department

Graduate Research Assistant

January 2019 - June 2019

Palo Alto

- Studied mathematical cognition and the development of human abilities to obtain mathematical perceptions
- Designed a deep neural network model to study how human learn magnitude comparison and simple addition for one-digit numeral
- Analyzed and interpreted how approximate arithmetic training may affect preschoolers performances in simple math problems

### SAP Labs, LLC

iXp Intern - Applied Data Science and Machine Learning (NLP), Recast Conversational AI

June 2018 - August 2018

Palo Alto

- Helped create a platform for collaborative chatbots satisfying various needs from customers
- Tested 50+ different combinations of encodings and clustering algorithms on data with ground truth
- Applied the best algorithm to cluster the data without ground truth and output the results based on how dense the clusters are, and collaborated with the front-end team so that users can easily visualize the suggested sentences based on intents when creating chatbots
- Incorporated more embeddings and similarity computation methods into the existing algorithms

### UCLA Math Department

Programming in Computing Reader

September 2016 - June 2017

Los Angeles

- Helped instructors create the grading rubrics
- Graded homework in Introduction to Programming (C++) course and provided feedback to students about their algorithm

## PROJECTS

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### Stanford CS 224N (Natural Language Processing with Deep Learning) Final Project

Winter 2019

Simple Mathematical Word Problems Solving with Deep Learning

- Preprocessed the complicated AQUA-RAT dataset and extracted all mathematical equations using regular expressions from the given explanation of multiple choices questions
- Implemented Transformer Network and Bidirectional GRU-LSTM RNN with attention units to conduct seq2seq task, which generates a set of mathematical equations that can solve the given algebraic word mathematical problems with a moderate level of performance

### Stanford CS 221 (Artificial intelligence principles and techniques) Final Project

Fall 2018

AI Agent for the Atari Game Phoenix

- Built an AI agent to play the game Phoenix using Deep Q-learning Network (DQN)
- Coordinated with teammates and implemented the Monte Carlo Tree Search (MCTS) Algorithm as a faster alternative

### Stanford CS 230 (Deep Learning) Final Project

Spring 2018

Video Interpolation of Human Motion

- Constructed the baseline Encoder-Decoder Model to interpolate the intermediate frames when the start and end frames of a video are given
- Designed a 3D Convolutional Neural Networks (CNN) and recurrent CNN (rCNN) and tuned hyperparameters to improve the quality of the frames interpolated

**Stanford CME 307 (Optimization) Final Project**

Winter 2018

*Sensor Network Localization*

- Tackled the Sensor Network Localization (SNL) problem using Second Order Cone, Semidefinite Dual and Least Square methods
- Adopted Alternating Direction Method with Multipliers (ADMM) with certain permutations to speed up the process in solving 3D SNL problems with 10 sensors

**Stanford CS 229 (Machine Learning) Final Project**

Fall 2017

*Fake News Stance Detection*

- Extracted features including N-gram, word sentiments, polarity and cosine similarities from 75385 newspaper articles
- Performed multinomial Bayes, SVM, softmax and multi-layer Neural Network on the above features from training set and dev set
- Chose the best algorithm to predict whether the newspapers headline agrees/disagrees/discusses/is unrelated to its body

**UCLA Math 156 (Machine Learning) Final Project**

Spring 2017

*Gaussian Mixture Models (GMM) for Digit Clustering*

- Conducted Principal Component Analysis (PCA) on MNIST dataset to reduce the data's dimensionality
- Implemented the Expectation Maximization algorithm of GMM using MATLAB, and fed it with 14000 sets of training data
- Tested the algorithm using the testing data, and compared the results to that of the MATLAB-implemented k-means algorithm

**ADDITIONAL EXPERIENCES**

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**Deloitte Enterprise Consulting (Shanghai) Co., Ltd. Shenzhen Branch**

Summer 2016

*Enterprise Risk Service, Financial Service Industry Intern**Shenzhen, China*

- Reviewed the manual of constructing online risk-management systems for companies, and edited the manual according to requests from customers
- Collected risk-management information from annual reports of various securities companies, and organized information for supervisors reference
- Discussed and consulted with group members best modeling strategies for every particular case

**UCLA David Geffen School of Medicine, Neurology Department**

January 2016 - June 2017

*Undergraduate Research Assistant**Los Angeles*

- Studied the pathology of Parkinsons Disease by conducting behavioral experiments on zebrafish with a small team
- Monitored the movements of zebrafish using Viewpoint software to focus on transgenic genes pathological in Parkinsons Disease
- Analyzed the behavior data, including over 10,000 speed data, which reflects instantaneously the motion of the fish above a certain threshold
- Imaged the neuron distributions inside the fish bodies and counted any significant loss of neurons

**SKILLS**

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<b>Programming Languages</b>	C++, Matlab, Python, SQL, HTML, Shell script, LaTeX, Markdown, Julia
<b>Tools</b>	Tensorflow, Pytorch, Keras, Numpy, Scipy, Pandas, PBRT, SLURM
<b>Application software</b>	ImageJ, MS Word, Excel, PowerPoint and Outlook

**PUBLICATIONS**

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**Sizhu Cheng**, Arianna Yuan. *Understanding the Learning Effect of Approximate Arithmetic Training: What is Actually Being Learned?*

Paper accepted for the 17th Annual Meeting of the International Conference on Cognitive Modeling, Montreal, Canada

Sataree Khuansuwan, Lisa M. Barnhill, **Sizhu Cheng**, and Jeff M. Bronstein. *A novel transgenic zebrafish line allows for in vivo quantification of autophagic activity in neurons*, Autophagy 2019

**SERVICE ACTIVITIES**

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**Stanford Women in Math Mentoring, Stanford University**

Fall 2017 - Present

*Mentor**Palo Alto*

- Provides advises to women undergraduates who consider graduate school in mathematical fields
- Assists women undergraduates in arranging their undergraduate studies and facilitates them to find their career goals

**Global Medical Training, UCLA**

Spring 2015 - Spring 2017

*Medical Donation Committee**Los Angeles*

- Contacted past donors, including local hospitals, health centers, and other organizations for medical supplies
- Worked with fundraising team to raise funds to purchase the necessary medications and medical equipment
- Searched and applied for grants to raise funds for the committee and wrote applications when necessary