

# TIANYI YAN

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Los Angeles, CA 90007

## EDUCATION

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### University of Southern California

August 2020 – Present (Exp. May 2024)

- Major: Computer Science (B.S.)
- GPA: **3.98/4.00**
- Coursework: Natural Language Processing, Machine Learning, Statistics, Probability Theory, Calculus, Computing Algorithms, Data Structure, Internetworking
- Activities: Research Assistant at LUKA Lab and Tsinghua AIR; Teaching assistant for CSCI467 (Intro to Machine Learning) and CSCI270 (Intro to Algorithms and Theory of Computations); USC CSSA Career Development (Leader of Mentorship Program)

## PUBLICATION

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- **Yan, T.**, Wang, F., Huang, J. Y., Zhou, W., Yin F., Galstyan A., Yin W., Chen, M. Contrastive Instruction Tuning (Paper under submission)
- Wang, F.\*, Huang, J. Y.\*, **Yan, T.**, Zhou, W., & Chen, M. (2023). Robust Natural Language Understanding with Residual Attention Debiasing. ACL 2023 Findings.

## RESEARCH EXPERIENCE

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### Language Understanding and Knowledge Acquisition (LUKA) Lab

September 2022 – Present

*Student Research Assistant, Supervisor: Prof. Muhao Chen*

Contrastive Instruction Tuning (Paper under submission)

- Leveraged contrastive learning to enhance large language models (LLMs)' robustness to instruction perturbation by maximizing the similarity between hidden representations of semantically equivalent instruction-input pairs
- Consistently improved LLMs' performance to variations in instructions across character, word, sentence, and semantic levels with an average of +2.5% accuracy
- Paper link: <https://arxiv.org/abs/2402.11138>

Robust Natural Language Understanding with Residual Attention Debiasing

- Developed one-stage product-of-experts and residual attention learning techniques by assembling top-level predictions and low-level attention scores to directly address biases in attention patterns of NLU models
- Employed PyTorch and Huggingface to adapt the BERT model framework, visualized attention score distributions, and resulted in a 0.25% reduction in attention to potentially biased tokens
- Significantly enhanced model's performance on out-of-distribution datasets (HANS, FEVER-Symmetric, PAWS) with improvements of 12.9%, 11.0%, and 2.7%, respectively
- Accepted at ACL 2023 (<https://arxiv.org/abs/2305.17627>)

### Institute for AI Industry Research, Tsinghua University

May 2023 – Present

*Student Research Assistant, Supervisor: Prof. Hao Zhou*

Conditional Latent Diffusion for Target-Specific Molecule Generation (Paper in preparation)

- Implemented an end-to-end pipeline that jointly trained EGNN-based variational autoencoder (VAE) and diffusion models to enhance the affinity of generated ligands given protein pockets
- Pretrained unconditional VAE with reconstruction and KL divergence loss using a large-scale ligand-only generation dataset to address the scarcity of paired pocket-ligand data

Joint Modeling of Target-specific Molecule Generation and Docking (Paper in preparation)

- Utilized PyTorch to implement a diffusion-based model that iteratively generates ligands based on current docking position and utilizes grid search to identify optimal docking positions
- Conducted pilot studies for sampling and finding better docking positions in given proteins for docking 250k ZINC molecules

## WORK EXPERIENCE

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## SWE Student Explore Internship

June 2022 – August 2022

### Microsoft M365 Deployment

- Applied React to add a dashboard page to centralize global deployment issues from scattered alert emails and visualize them in multiple dimensions
- Monitored and collected real-time issue data from deployment workflow to Cosmos NoSQL database
- Developed endpoints using C# and ASP.NET to filter issues based on threshold values at runtime and forwarded data to frontend

## Full Stack Software Engineering Intern

May 2021 – January 2022

### Talkilla Education

- Used Vue.js and JSP to add a frontend module for employed teachers to create student reports
- Implemented automatic email notifications and English-to-Chinese translation for sending and editing reports
- Added a module for sending automatic notifications via WeChat Service Account when student reports are available
- Applied Java Spring Framework, Maven, MySQL, and MyBatis to develop backend
- Utilized Jenkins and Gitlab for deployment

## PROJECTS

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### Textual Dialog-Based Meme Recommendation

April 2023

#### 2022-2023 Google Research ExploreCSR

- Implemented contrastive learning using PyTorch and HuggingFace to align hidden representations of text and image inputs from fine-tuned ViLT and EmoRoBERTa models based on emotion
- Jointly trained models with cross-entropy loss for sentiment classification and contrastive loss
- Used Pandas to create a multimodal dataset containing 8,000 tweets with emotion keywords and associated images
- Fine-tuned ViLT model on the Memotion dataset for meme sentiment classification to gain domain knowledge
- GitHub: [github.com/Lorenayannnnn/Ememe-2023\\_Spring-google\\_explorecsr](https://github.com/Lorenayannnnn/Ememe-2023_Spring-google_explorecsr)

### Cofounder, Leader, and Developer of Ctrl+F

August 2021 – August 2022

- Developed an online platform for USC that allows students and professors to centralize on-campus research and internship opportunities from different departments online
- Incorporated Java multithreading to enable real-time position application status tracking and update
- Utilized Vue.js, Webpack, and Axios for frontend; Java Spring, Maven, and Firebase for backend
- Successfully led the team, orchestrated weekly meetings, and won \$1000 USC ABC Innovation First Prize

## TEACHING EXPERIENCES & VOLUNTEER

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### Teaching Assistant at USC Viterbi School of Engineering

January 2022 – Present

- Worked as a teaching assistant for CSCI467 (Intro to Machine Learning) and CSCI270 (Intro to Algorithms and Theory of Computations)
- Explained challenging topics in machine learning (transformers, expectation maximization, etc.) and algorithm concepts (DP, NP-hardness reduction, etc.) and guided students to correct answers
- Assisted professor in designing and grading homework and exams
- Held office hours and monitored online forum to answer students' questions

### USC CSSA Career Development

February 2021 – May 2023

- Leader of Mentorship Program:
  - Organized resume and interview workshops for USC undergraduates
  - Led the team and coordinated various resources: planning proposals, propaganda articles, information sessions, mixers, etc.
- Participating in organizing large-scale activities such as the 2022 California Chinese Entrepreneurship Conference and the Mega Hackathon Web 3 competition

## SKILLS

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- Programming languages: Python, Java, C++, C#, HTML, CSS, JS, TS, SQL
- Tools: PyTorch, Huggingface, Git, Vue.js, React.js, Axios, Node.js, Java Spring, MyBatis, Postman, Figma

## INTERESTS

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- Language: Mandarin, English
- Interests: Cooking, Flute, Piano, Volleyball