Changwei **Hu**

(US Permanent Resident, no employer sponsorship needed)

(+1) 919-943-3384 | ch237duke@gmail.com | https://ch237.github.io | LinkedIn | Google Scholar | New York, NY

Education

Ph.D. & MS, Electrical & Computer Engineering, Duke University — *Durham, NC*

Research: Natural Language Processing, Bayesian Statistics, Machine Learning, Deep Learning — *Feb 2017*

MS (Physics) & BS (Software Engineering), Xiamen University — *Xiamen, China*

Research: Convex Optimization, Signal/Image Processing, Computational Medical Imaging — *Jun 2012*

Research Expertise

- Bayesian statistics
- NLP and its applications in advertising, content moderation & user profiling
- Computational advertising
- Autonomous driving, behavior/trajectory prediction
- Time series analysis & forecasting

Employment

Amazon Ads (Sponsored products) — *New York, NY*

Senior Applied Scientist — *Aug 2022 - Present*

- Science lead for Trending Ingress, especially for LLM based pill generation.
- Science lead for launching SP-Nile base page explanation (S-team goal) project, and develop Rufus Aspect Miner (RAM), a multi-task fine-tuned three-tower transformer model, to extract review aspects from Rufus conversation in <200ms. RAM powers sponsored Ads recommendation and explanation when shoppers transit from Rufus (Amazon's LLM-powered shopping assistant) to search page.
- Lead and drive the launch of the Trending Softlines thematic widget in search page.
- Lead development of three out of five prompts for Q&A search widget, including two attribute prompts and one mostly bought prompt.

XPeng Motors — *Remote*

Staff Engineer — *Oct 2021 - Jul 2022*

- Developed vector-based and rasterization-based deep learning models for vehicle trajectory prediction by leveraging various map and agent features.
- Developed visualization tool and implemented metrics for evaluation of behavior prediction.

Yahoo! Research — *New York, NY*

Senior Research Scientist — *Jan 2020 - Oct 2021*

- Developed NLP models/algorithms in multiple ad creative optimization projects,for both Yahoo Gemini Native and Dynamic Product Ads, that impact all Verizon Media's advertisers. The efforts lead to the launch of title strength indicator (TSI, see releasing on *Ad Age*) in two new ad creative optimization platforms–one adopted by the internal ads team, and another by the external advertisers. Pushed the extending of creative optimization from English locales to non-English locales, which resulted in the launch of a creative assistant API for Taiwan and Hong Kong ads team.
- Led and productionized the textual content moderation project, developed machine learning algorithms, such as NBLR and BERT, for hate speech detection. The proposed models have been Incorporated to the SMP (standard moderation platform) to moderate all user comments in Yahoo! media properties, such as Yahoo! News, Yahoo! Finance and Yahoo! sports.

Yahoo! Research — *New York, NY*

Research Scientist — *Apr 2017 - Dec 2019*

- Developed a pip installable python library, Sibyl, for time series forecasting and anomaly detection. Sibyl is a probabilistic structural time series model, which captures the trend, seasonality and events. It was applied to the billing forecast of Verizon Media's use of AWS services and showed big improvement compared with Facebook's Prophet model. The library was later used by the Tumblr team for anomaly detection.
- Led and productionized the Tumblr user profiling project, in which I proposed a ML method combining network embedding, label propagation and deep neural nets, for user age and gender prediction for hundreds of millions of Tumblr users.
- Led and productionized the BKD (Best Known Demo) project with URS (User Record Store) team, in which I proposed to use the first name to infer gender for registered users. BKD is extremely impactful to the company–the inferred gender information is used by both recommendation and ads targeting by both Yahoo! and AOL.
- Designed machine learning algorithms and extract useful features for epay fraud detection to reduce transaction traffics going to human review.

Accenture

Bangalore & Mumbai, India

Team Lead: Duke Students' Computer Vision Team — *Jun 2016 - Jul 2016*

- Provided machine learning solutions to Accenture as the leader of the computer vision project, which was funded under an alliance between Accenture and Duke.
- Deployed deep learning-based object detection and labeling method to identify counterfeit product images for Accenture's e-commerce customer, which significantly improved accuracy (80%+) and reduced manual labor inputs for counterfeit detection.

Accenture & Duke University

Durham, NC

Accenture Fellow: Accenture-Duke Analytics Research Program — *Sep 2015 - Jun 2016*

- Developed two computationally scalable models, deep Poisson factor model and Bayesian Poisson tensor factorization, to learn diabetes phenotypes and predict associated diseases, by analyzing heterogeneous and unstructured electronic health records (EHR) data.
- Achieved more accurate prediction for 13 diseases associated with diabetes compared with LASSO and UK prospective diabetes study (UKPDS) outcomes model.

Oracle Labs ((formerly Sun Microsystems Laboratories)

Burlington, MA

Research Intern — *May 2015-Aug 2015*

- Built a computationally-efficient Bayesian tensor factorization model for context-based topic learning to discover topic-to-topic correlations as well as analyze co-occurrence pattern of English words.
- Model was inferred using Gibbs sampling and parallel online Gibbs sampling, implemented using Java.
- Applied the model to large-scale Wikipedia dataset by updating parameters in parallel.

Creative Technologies Laboratory @ Adobe

San Francisco, CA

Research Intern — *May 2014 - Aug 2014*

- Worked on ***talent search/recommendation*** project for *Behance*, a social media platform acquired by Adobe to enhance its creative cloud community. The project aimed to recommend talented creatives and high-quality projects to users and company recruiters.
- The recommendation system was accomplished by using a hierarchical regression model, which scaled to large data containing about 2 million users, 8 million projects, and 400 million appreciation records. The model was implemented using Python and run on Amazon EC2.

Selected Publications

Ad Recommendation

1. **C Hu**, P Anumanchupallik, S Mishra, K Atul, et al. RAM: Rufus Aspect Miner to Power Search Page Recommendations and Explanations, AMLC Workshop on Gen AI, Personalization Algorithms, and Recommender Systems, 2024. (Oral presentation)
2. S Mishra, K Atul, **C Hu**, A Kishore, et al. Sponsored Pills in LLM based Shopping Assistants, AMLC Workshop, 2024.
3. **C Hu**, P Anumanchupallik, S Mishra, Y Hu, A Sengupta. Shop-Falcon: Falcon Tuned with Constrained Self-instruct for Product Attribute Q&A, AMLC, 2023.
4. **C Hu***, S Mishra*, K Yen, Y Hu, M Sviridenko. TSI: an Ad Text Strength Indicator using Text-to-CTR and Semantic-Ad-Similarity,CIKM, 2021.(**Best external paper award of 2022 Yahoo! Research Day**)
5. **C Hu**, S Mishra, K Li. Ad Text Optimization 2.0, Techpulse 2022.(**Best internal talk award of 2022 Yahoo! Research Day**)
6. **C Hu**, S Mishra, K Yen, Y Hu, M Sviridenko. Creative Assistant: BERT based Ad Text Analyzer, Techpulse 2020. (**Selected talk**)

Natural Language Processing

1. F Tan, Y Hu, K Yen, **C Hu**. BERT-β: A Proactive Probabilistic Approach to Text Moderation, EMNLP, 2021.
2. F Tan, **C Hu**, Y Hu, K Yen, Z Wei, A Pappu, S Park, K Li. MGEL: Multi-Grained Representation Analysis and Ensemble Learning for Text Moderation, IEEE Transactions on Neural Networks and Learning Systems, 2021.
3. Y Hu, **C Hu**, T Tran, T Kasturi, E Joseph, M Gillingham. What's in a Name? – Gender Classification of Names with Character Based Machine Learning Models, Data Mining and Knowledge Discovery, 2021.
4. K Li, K Yen, S Misra, Y Hu, **C Hu**, M Verma. BAN: Large Scale Brand ANonymization for Creative Recommendation via Label Light Adaptation, IEEE International Conference on Big Data (Big Data), 2021.
5. F Tan, Y Hu, **C Hu**, K Li, K Yen. TNT: Text Normalization based Pre-training of Transformers for Content Moderation, EMNLP 2020.
6. T Tran, Y Hu, **C Hu**, K Yen, F Tan, K. Lee, S. Park. HABERTOR: An Efficient and Effective Deep Hatespeech Detector, EMNLP 2020.
7. B An, J Lyu, Z Wang, C Li, **C Hu**, F Tan, R Zhang, Y Hu, C Chen. Repulsive Attention: Rethinking Multi-head Attention as Bayesian Inference, EMNLP 2020.
8. Y Zhang, **C Hu**, Y Hu, T Kasturi, M Gillingham, S Ramasamy, K Yamamoto. Large-scale Gender/Age Prediction of Tumblr Users, IEEE International Conference on Machine Learning and Applications (ICMLA) 2019, Boca Raton, Florida, US.
9. **C Hu**, P Rai, L Carin. Deep Generative Models for Relational Data with Side Information, ICML 2017, Sydney, Australia.
10. **C Hu**, P Rai, L Carin. Non-negative Matrix Factorization for Discrete Data with Hierarchical Side-Information, AISTATS 2016, Cadiz, Spain.
11. **C Hu**, P Rai, L Carin. Topic-Based Embeddings for Learning from Large Knowledge Graphs, AISTATS 2016, Cadiz, Spain.

12. **C Hu**, P Rai, L Carin. Transfer Learning for Hierarchically Supervised Topic Models, 2015 NIPS Workshop in Transfer and Multi-task Learning, Montreal, Canada.
13. P Rai, **C Hu**, R Henao, L Carin. Large-Scale Bayesian Multi-Label Learning via Topic-Based Label Embeddings, NIPS 2015, Montreal, Canada. (**Spotlight Presentation**)
14. **C Hu**, P Rai, C Chen, M Harding, L Carin. Scalable Bayesian Non-Negative Tensor Factorization for Massive Count Data, ECML-PKDD 2015, Porto, Portugal. (**Best Student Paper**)
15. **C Hu**, P Rai, L Carin. Zero-Truncated Poisson Tensor Factorization for Massive Binary Tensors, UAI 2015, Amsterdam, The Netherlands. (**Plenary Oral Presentation**)
16. P Rai, **C Hu**, M Harding, L Carin. Scalable Probabilistic Tensor Factorization for Binary and Count Data, IJCAI 2015, Buenos Aires, Argentina.
17. **C Hu**, P Rai, L Carin. Transfer Learning for Hierarchically Supervised Topic Models, 2015 NIPS Workshop in Transfer and Multi-task Learning, Montreal, Canada.
18. P Rai, **C Hu**, R Henao, L Carin. Large-scale Bayesian Multi-label Learning via Positive Labels Only, ICML workshop 2015, Lille, France.
19. **C Hu**, E Ryu, D Carlson, Y Wang, L Carin. Latent Gaussian Models for Topic Modeling, AISTATS 2014, Reykjavik, Iceland.

Time Series Analysis: Forecasting & Anomaly Detection

1. M Verma, D Manickam, Y Hu, **C Hu**, A Gupta. Time series prediction and anomaly detection in Monitoring platforms, Techpulse 2020. (**Selected talk**)
2. **C Hu**, Y Hu, S Seo. A Deep Structural Model for Analyzing Correlated Multivariate Time Series, IEEE International Conference on Machine Learning and Applications (ICMLA) 2019, Boca Raton, Florida, US.
3. M Verma, Y Hu, **C Hu**, T Kasturi, P Silva, P Thairu. AWS Billing Costs Anomaly Detection, Techpulse 2019, California, US.
4. **C Hu**, S Seo, Y Hu, T Kasturi, P Thairu. A Deep Multivariate Structural Time Series Model for Oath's AWS Billing Forecasting, Techpulse 2018, California, US. (**Selected talk for the Science Track**)

Signal/Image Processing & Machine Learning

1. B Ning, X Qu, D Guo, **C Hu**, Z Chen. Magnetic Resonance Image Reconstruction using Trained Geometric Directions in 2D Redundant Wavelets Domain and Non-convex Optimization, Magnetic Resonance Imaging, 31(9):1611-1622, 2013.
2. Z Chen, **C Hu**, X Qu, L Bao, S Cai. Improving Edge Recovery in Undersampled MRI Reconstruction, International Society for Magnetic Resonance in Medicine 20th Scientific Meeting 2012, Melbourne, Australia.
3. **C Hu**, X Qu, D Guo, L Bao, Z Chen. Wavelet-based Edge Correlation Incorporated Iterative Reconstruction for Undersampled MRI, Magnetic Resonance Imaging, 29(7):907-915, 2011.
4. **C Hu**, X Qu, D Guo, L Bao, S Cai, Z Chen. Undersampled MRI Reconstruction using Edge-weighted L1 Norm Minimization, International Society for Magnetic Resonance in Medicine 19th Scientific Meeting 2011, Montreal, Canada.
5. X Qu, **C Hu**, D Guo, L Bao, Z Chen. Gaussian Scale Mixture-based Joint Reconstruction of Multicomponent MR Images from Undersampled k-space Measurements, International Society for Magnetic Resonance in Medicine 19th Scientific Meeting 2011, Montreal, Canada.
6. L Bao, W Liu, **C Hu**, X Qu, S Cai, Z Chen. Three Dimensional Restoration of Cardiac Magnetic Resonance Diffusion Weighted Images based on Sparse Denoising, International Society for Magnetic Resonance in Medicine 19th Scientific Meeting 2011, Montreal, Canada.
7. X Qu, X Cao, D Guo, **C Hu**, Z Chen. Compressed Sensing MRI with Combined Sparsifying Transforms and Smoothed l0 Norm Minimization, ICASSP 2010, Dallas, Texas.
8. X Qu, X Cao, D Guo, **C Hu**, Z Chen. Combined Sparsifying Transforms for Compressed Sensing MRI, Electronics Letters 46 (2), 121-123, 2010.
9. X Qu, **C Hu**, J Yan. Image Fusion Algorithm based on Orientation Information Motivated Pulse Coupled Neural Networks, 7th WCICA 2008, Chongqing, China.

Others

1. K Li, Y Hu, M Verma, F Tan, **C Hu**, T Kasturi, K Yen. Hadoop-MTA: a system for Multi Data-center Trillion Concepts Auto-ML atop Hadoop, IEEE International Conference on Big Data (Big Data), 2021.
2. **C Hu**, Y Hu, T Kasturi, S Mayasula, K Sriram, A Jayakumar, B Muttineni. Improving Payments Fraud Detection: Unifying Machine Learning and Visualization, Techpulse 2019, California, US.
3. **C Hu**, R Henao, T Frank, S Bhardwaj, P Rai, L Carin. Computational Phenotyping via Scalable Bayesian Tensor Factorization, 2015 NIPS Workshop on Machine Learning in Healthcare, Montreal, Canada.

Defensive Publications & Patents

Patents

1. Computer-implemented Methods utilizing Machine Learning to Generate A Question and Answer Pair for A Conversational Agent, 2024 (filing submitted).
2. RAM: Rufus Aspect Miner to Power Search Page Recommendations and Explanations, 2024 (filing submitted).
3. Performance Metric Prediction and Content Item Text Suggestion based upon Content Item Text, 2024.
4. Computerized System and Method for Automatic Moderation of Online Content, 2023.
5. System and Method for Text Moderation via Pretrained Transforms, 2022.

Defensive Publications

1. **C Hu**, S Mishra, I Tian, J Lin, K Zasadzinski, H Tsai, A Wang, M Beech, A Chukka, M Sviridenko, Y Hu, M Verma, K Yen. Creative Assistant: Ad Text Strength Indicator and Recommendations, 2021.
2. F Tan, **C Hu**, Yifan Hu. A Multi-grained Joint Learning based News Article Popularity Forecaster, 2021.
3. **C Hu**, Y Hu. Sibyl: A Deep Framework for Multivariate Time Series Forecasting with Uncertainty, 2020.
4. F Tan, K Yen, **C Hu**, K Li, Y Hu. TNT: Text Normalization based Pre-training of Transformers for Text Moderation, 2020.
5. **C Hu**, Y Zhang, T Kasturi, Y Hu. Large-scale Gender/Age Prediction, 2019.
6. Y Hu, **C Hu**, T Kasturi, Thanh Tran. Gender Classification of Names with Character Based Machine Learning Models, 2019.
7. F Tan, **C Hu**, Y Hu. Byte-level Representation Scheme for Multi-byte Characters Enriched Text, 2019.

Professional Activities

Reviewer

- IEEE PAMI; ACL-IJCNLP; NeurIPS; AAAI; ICMLA; Techpulse; IJCAI; SMARTCOMP; UAI; IEEE Transaction on Knowledge and Data Engineering (TKDE); Knowledge and Information Systems (KAIS); IEEE Access

Program Committee Member

- EMNLP; AAAI; International Conference on Deep Learning and Machine Learning in Emerging Applications (DEEP-ML); ICMLA; SMARTCOMP; SmartMM

Skills

Programming Experience with Python, PyTorch, Tensorflow, scikit-learn, Tensorflow probability, Keras, Hadoop, Scala, Spark, Java