Ting-Wei Wu

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Research Interests in *deep learning, natural language processing, vision & text understanding.*
Looking for *Research/Software/Data Scientist Internship Position.*

EDUCATION

Georgia Institute of Technology   Atlanta, GA
Ph.D. in Machine Learning; GPA: 3.83   *Aug. 2019 - 2023 (Expected)*
Advised by Dr. Biing-Hwang Juang

University of California, Berkeley   Berkeley, CA
M.Eng. in Bioengineering; GPA: 3.83   *Aug. 2017 – May. 2018*
Advised by Dr. Aaron Streets

National Taiwan University   Taipei, Taiwan
B.S. & M.S. in Electrical Engineering; GPA: B.S. 3.82 (3.93/4.3); M.S. 4.00 (4.22/4.3)   *Sep. 2012 – Jul. 2017*

SKILLS

Languages: **Python**, **C & C++**, **MATLAB**, **SQL**, Verilog, VBA, Java
Technologies: Pytorch, Tensorflow, Data Science, Docker, GPU, Flask, AWS, Linux OS, Git, AutoCAD, Photoshop, COMSOL
Coursera Certificates: Advanced ML (DL, Bayesian, RL, NLP), Deep Learning Specialization, Machine Learning
Courses: Math foundation of Machine Learning, Probabilistic Graphical Model, Computational Data Analysis, Deep Learning, Deep Learning for texts, Digital Image Processing, Data Structures and Programming, Computer Programming, Operating Systems

PROFESSIONAL EXPERIENCE

- **Machine Learning Research Intern, VMware Inc.**   Palo Alto, CA
  Storage IO & Performance Engineering team **(pytorch, transformers, nltk, mysql, gensim)**   *May. - Nov. 2020*
  - Causality Extraction: Devised a new two-stream attention BiLSTM-CRF model on causality inference and paragraph-level pairing, published in internal conference **VML'20** and submitted to **KDD'21**, creating new benchmark F1 score 0.74.
  - Knowledge Graph: Established an end-to-end nlp pipeline for inter/intra sentence causality retrieval to extract 2300 useful causal relations out of 20000 problem requests within seconds to construct knowledge network for troubleshoot diagnosis.
  - Few-shot Learning: Introduced new ProtoNet structure in causal tagging to leverage few labeled data boosting F1 by 11%.

- **Graduate Researcher, Speech & Spoken Language Processing Lab**   Atlanta, GA
  Task-oriented dialog understanding, advised by **Dr. Biing H, Juang** (IEEE Fellow, NAE member)   *Aug. 2019 - now*
  - Multi-intent: Developed zero-shot intent mapping BERT-based framework for multi-intent understanding in dialogue turns.
  - State tracking: Devised new multi-turn dialogue context encoder mechanism for multi-task training and state tracking.
  - Machine Introspection: Fine-tuned modified BERT-based dialogue history encoder on response prediction tasks of MultiWOZ/DSTC8 dialogue datasets to rethink and score machine responses to reinforce downstream tasks within dialogues.

- **Graduate Teaching Assistant, Signal Processing & Electronic Device Innovation**   Atlanta & Taipei
  Intro to Signal Processing (ECE 2026) & Device Innovation at NTU **(matlab, SP-First)**   *2016-2017, 2019*
  - Matlab Sessions: Supervised and lectured in lab & recitation sessions with matlab programming on digital signal processing. Provided signal processing (FT, DTFT, DFT, z-transform) and matlab skills for undergraduate teaching.
  - Entrepronership Development: Led discussions & project management for 3 courses in Device Innovation and meetings with 100+ industry experts and students to develop new business models and research technology transfer, incubating 2 AI startups.

- **Research & Development Intern, Getac Technology Corp.**   Taipei, Taiwan
  Intelligent Baby Monitoring System **(python, raspberry pi, gpiozero)**   *Jul. 2014-Sep. 2014*
  - Project Management: Led 10+ person multi-disciplinary project team with senior engineers to design a wireless monitoring device using a raspberry pi controller for observing infant behavior.
  - Raspberry Pi: Controlled GPIO ports with python and designed chip layouts and exterior design using SolidWorks, AutoCAD.

HIGHLIGHTED PROJECTS

- **Machine Translation Quality Estimation**   *Natural Language Processing*
  Deep Learning (CS7643) Research Project advised by Facebook AI *(pytorch, transformers, polyglot)*   *Jan.-May. 2020*
  - Transfer Learning: Exploited predictor-estimator model with new transformer structure to pretrain large quality-labeled translation corpus in common languages and adapt to other scarce language QE data with semi-supervised self training.
  - Ensembling: Ensembled different predictions from fine-tuning an estimator and various pretained predictors in several languages like English, Chinese, German to Estonian, Nepali with XGBoost Model, where Pearson score beats baseline 0.11 by 2 times.

- **StackBoxer: chatroom with bilingual AI chatbots - *https://chatbox.cc***   *Natural Language Processing*
  Full-stack online plaform for functional and trained chatbots *(Pytorch, Django, Docker, PostgreDB)*   *Jan.-Mar. 2019*
  - StackBot: Modeled intent/tag identifier from tfidf features and Starspace embeddings for matching Stackoverflow queries.
  - Movie Bot, ChickBot, YourFbBot: Established a customized 2-layer seq2seq model with attention mechanism and self-designed reward mechanism with policy gradient reinforcement set up in Django+Docker+nginx backend environment.

- **DeepEyeNet: Image Captioning with keyword-driven report generation**   *Image Captioning & NLP*
  Research Project collaborated with Gatech, UvA, KAUST *(keras, tensorflow, pandas)*   *Feb.-Nov. 2019*
  - Dataset Preparation and evaluator: Prepared 15,709 images annotated by experienced ophthalmologists and designed a new evaluator and measure for our caption generator jointly in adversarial training. Work published in **WACV'21**.
  - Transfuser: Devised new image-keyword self-attention embedding algorithms for keyword-driven image captioning model. The performance increases about 35% in BLEU-avg and 155% in CIDEr than baseline models. Work submitted to **AAAI'21**.

- **Novelty Intervention in Hunter-Gatherer Game of Polycraft**   *Reinforcement Learning*
  Research project in DQN funded by DARPA *(pytorch, gym, socket)*   *Apr.-Nov. 2020*
  - Target-DQN: Designed a vision-based DQN agent to perform tasks of navigation and localization in Polycraft simulation.
  - Novelty: Introduced adaptation mechanism to new environments with novelty intervention and measure success of actions.

- **Cellspectra: unsupervised cell image segmentation**   *Computer Vision*
  Graduate Lab Researcher advised by Prof. Peng Qiu at Gatech *(keras, tensorflow, MATLAB)*   *Jan.-May. 2020*
  - Bacterial segmentation: Developed CNN-based unsupervised object segmentation modules for cell counting and tracking.
  - Raman spectra clustering: Exploited deep embedding clustering on raman vectors from 1-d autoencoder for segmentation.

- **PillNet: A pill recognition search tool in mobile device**   *Computer Vision*
  Entrepreneurship Startup Team with Ministry of Science and Technology in Taiwan *(tensorflow, opencv, c++)*   *Apr.-Jul. 2019*
  - SSD-MobileNet: Developed a pharmaceutical pill identification module in real-time mobile camera to identify pill location with single shot detection model in tensorflow trained with FDA pill image database.
  - Recognization: trained siamese network by minimizing triplet loss to recognize pills and retreive relevance information.

- **Integrated Cell-sorting Sensor System**   *Data Science*
  UC Berkeley Streets Lab and NTU CMOS Biotechnology Lab Graduate Researcher *(python, sklearn, R)*   *2014-2016, 2018*
  - Platform: Devised new flow cytometry approach to collect impedance data and classify cell properties with frequency analysis.
  - ML Data Analysis: Utilized clustering methods (Naive-Bayes, GMM, K-means, NN) and MATLAB to extract impedance data for library creation. Published work in **MicroTAS'17, IEEE NEMS'17, IMCS'16.**
  - Chip Design: Expedited high-throughput droplet grabbing hydrogel beads with parameters by ML optimization.

  Other cs-related projects:
  Comics generation from wGAN, Chinese lyrics generation by charRNN, Fire event data management with selenium, pandas, SQL, Malaria cell prediction, Kaggle Sales prediction competition, Circuit Fraig and Simulation with C++.

SELECTED PUBLICATIONS

- **Ting-Wei Wu**, Chien-Chun Hung, Chien-Chia Chen, Razvan Cheveresan, Rajesh Somasundaran, "Document Causality Extraction based on Attention BiLSTM-CRF with vBERT and knowledge graph inference." *3rd VMware Machine Learning Conference (VML)*, Oct 2020. Submitted to *27th ACM Conference on Knowledge Discovery and Data Mining (KDD)*, Aug 2021.

- **Ting-Wei Wu**, Jia-Hong Huang, Chao-Han Yang, Elbert Liu, Hiromasa Morikawa, J. N. Tegner, "TransFuser: Keyword-driven Medical Report Generation for Retinal Images" submitted to *2021 Annual Conference of the North American Chapter of the Association for Computational Linguistics (NAACL)*, Jun 2021.

- J. H. Huang, C. H. Yang, F. Liu, M. Tian, Y. C. Liu, **T. W. Wu**, I. H. Lin, K. Wang, H. Morikawa, H. H. Chang J. N. Tegner, "DeepOpht: Medical Report Generation for Retinal Images via Deep Models and Visual Explanation" *The 2021 IEEE Winter Conference on Applications of Computer Vision (WACV)*, Jan 2021.

- **Ting-Wei Wu**, Chia-Hong Gao, Yi-Zhan Huang, Ting-Wei Lin and Chih-Ting Lin, "Electrode Spatial Design for a New Microfluidics Impedance Cytometer," *The 21st International Conference on Miniaturized Systems for Chemistry and Life Sciences (MicroTAS)*, October 2017.

- **Ting-Wei Wu**, Chia-Hong Gao, Fan-En Chen and Chih-Ting Lin, "Impedance Spectroscopy for Microfluidic Particle-analyzing Device with Spatial-Coplanar Electrode Design," *The 12th Annual IEEE International Conference on Nano/Micro Engineered and Molecular Systems (IEEE NEMS)*, April 2017.

- **Ting-Wei Wu**, Chia-Hong Gao and Chih-Ting Lin, "A microfluidic cell counting device based on impedance sensing," *16th International Meeting on Chemical Sensors (IMCS)*, July 2016.

HONORS & AWARDS

• **Graduate Honor Fellowship**, UC Berkeley Fung Institute of Engineering	*2018*
• **Member**, UC Berkeley Golden Key International Honor Society	*2018*
• **Graduate Honor Fellowship**, National Taiwan University Graduate Institute of Electronics Engineering	*2017*
• **Travel Award**, IMCS 2016	*2016*
• **Delegate**, Taiwan Model APEC 2014	*2014*
• **School Delegate**, AIESEC Asia-Pacific Exchange and Leadership Development Seminar Symposium	*2010*
• **Nominee of Representative of Taiwan**, Global Yong Leaders Conference	*2010*