



Qingqing Cao

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EDUCATION

Stony Brook University Aug. 2015 - May 2021 (expected)
Ph.D. in Computer Science

Wuhan University Sept. 2011 - June 2015
B.Eng. in Computer Science & Tech

HIGHLIGHTS

I have 5+ years of research experience in **natural language processing**, **mobile computing**, and **machine learning systems**. I have focused on building efficient and practical NLP systems for both edge devices and the cloud, such as on-device question answering (MobiSys 2019), faster Transformer models (ACL 2020), and accurate energy estimation of NLP models.

EXPERIENCE

Research Assistant @ Stony Brook University, US Jun. 2016 - Present
Advisors: Prof. Aruna Balasubramanian & Prof. Niranjan Balasubramanian

Research Intern @ Microsoft Research Redmond, US Jun. 2018 - Aug. 2018
Mentor: Oriana Riva Topic: dynamic business web queries

Research Intern @ Bell Labs Cambridge, UK Jul. 2017 - Sept. 2017
Mentor: Nicholas Lane Topic: mobile deep learning accelerators

PUBLICATIONS

- [under review] **Qingqing Cao**, Yash Lal, Harsh Trivedi, Aruna Balasubramanian, Niranjan Balasubramanian, “Accurate and Interpretable Energy Estimation for Transformer-based NLP Models”.
- [SustaiNLP@EMNLP 2020] **Qingqing Cao**, Aruna Balasubramanian, Niranjan Balasubramanian, “Towards Accurate and Reliable Energy Measurement of NLP Models”. Paper: <https://awk.ai/assets/sustainlp.pdf>
Summary: Accurate energy measurement is critical for choosing and training large NLP models and deploying to battery-powered mobile devices. Existing utilization-based software methods do not address issues like power lag, tail energy issues. Non-utilization behaviors such as data movement in GPUs also cause energy. Resource profiling should avoid high overhead. I use a hardware power meter to measure energy accurately and quantify the error (>20%) of existing software measurements. I find current software measurements without calibration are inaccurate and cause misleading design choices.
- [ACL 2020] **Qingqing Cao**, Harsh Trivedi, Aruna Balasubramanian, Niranjan Balasubramanian, “DeFormer: Decomposing Pre-trained Transformers for Faster Question Answering”. Paper: <https://awk.ai/assets/deformer.pdf>
Summary: Pre-training large Transformers is expensive and the inference in them is prohibitively slow. I design DeFormer that decomposes pre-trained Transformers to enable faster inference for QA without repeating the pre-training. DeFormer achieves >**3.1x** speedup

inference speedup and **>65%** memory reduction with minimal ($\sim 1\%$) accuracy loss.

4. [**MobiSys 2019**] **Qingqing Cao**, Niranjan Balasubramanian, Aruna Balasubramanian, “DeQA: On-device Question Answering”. Paper: <https://awk.ai/assets/deqa.pdf>
Summary: DeQA is an on-device question answering system to help mobile users find information more efficiently without privacy issues. Deep learning-based QA models are slow and unusable on mobile. I design the latency- and memory- optimizations for the QA models to run locally on mobile devices. DeQA effectively reduces the memory footprint and improves the QA latency **6 ~ 13x** with minimal accuracy drop ($< 1\%$).
5. [**EMDL@MobiSys 2017**] **Qingqing Cao**, Niranjan Balasubramanian, Aruna Balasubramanian, “MobiRNN: Efficient Recurrent Neural Network Execution on Mobile GPU” Paper: <https://awk.ai/assets/mobirnn.pdf>
6. [**MobiCom 2017**] Jian Xu (co-primary), **Qingqing Cao (co-primary)**, Aditya Prakash, Aruna Balasubramanian, and Don Porter. “UIWear: Easily Adapting User Interfaces for Wearable Devices”. Paper: <https://awk.ai/assets/uiwear.pdf>
7. [**MobiCom 2017 demo**] Jian Xu (co-primary), **Qingqing Cao (co-primary)**, Aditya Prakash, Aruna Balasubramanian, and Don Porter. “UIWear: Easily Adapting User Interfaces for Wearable Devices”. Demo video: <https://youtu.be/YEQ3HNeQnts>

AWARDS

CDAC Rising Stars in Data Science, University of Chicago	2021
MobiSys Student Travel Grant, ACM SIGMOBILE	2017
Special CS Department Chair Fellowship, Stony Brook University	2015
Meritorious Winner in the Mathematical Contest in Modeling, COMAP	2014
National Scholarship (top 0.2%), China Ministry of Education	2013
National Endeavor Fellowship (top 3%), China Ministry of Education	2012, 2014

SERVICE

Program Committee: ACL 2021, NAACL 2021, Eurosys 2021 (shadow), ACL 2020 (demo), MobiSys 2018 (PhD forum), IEEE Transactions on Mobile Computing (reviewer).

Editorial Board: Student member for the Journal of Systems Research

Volunteering Service: Student volunteer for MobiSys 2017 and ACL 2020, mentor for Stony Brook CS Grad Buddies Program.

SKILLS

Programming: Python, C, Java.

Machine Learning: TensorFlow, PyTorch, Scikit-learn, Numpy, XGBoost.

COURSES

Computer Systems: Analysis of Algorithms (CSE548), Operating Systems (CSE506), Fundamentals of Computer Networks (CSE534).

Machine Learning: Machine Learning (CSE512), Artificial Intelligence (CSE537).