Hong (Herbert) Cai

Contact Information

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Summary

Extensive (6+ years) experience in artificial intelligence, machine learning and deep learning, computer vision, robotics, and optimization, with research papers (8 first-authored) in top venues (e.g., RSS, T-RO, CVPR, MobiCom) and real-world implementations. Practical experience in Matlab, Python, PyTorch, TensorFlow, Caffe, Google Cloud, Crowdsourcing via Amazon MTurk. Strong mathematical background.

Education

University of California, Santa Barbara July 2015 – Sept. 2020
Ph.D., Electrical and Computer Engineering
- Advisor: Dr. Yasamin Mostofi

University of California, Santa Barbara Sept. 2013 – July 2015
M.S., Electrical and Computer Engineering

Hong Kong University of Science and Technology Sept. 2009 – July 2013
B.Eng., Electronic Engineering (Honors Research Track)

Research Experience

Graduate Student Researcher (UCSB) Apr. 2014 – Sept. 2020

- **Robotic Visual Understanding and Decision Optimization**
  - ∗ Predicting human visual performance for human-robot collaboration
    - *Proposed Deep CNN-based human visual performance prediction*
    - *Crowdsourced human performance data via Amazon MTurk*
  - ∗ Exploiting correlation among visual inputs to improve accuracy
    - *Extracted visual similarity information from DCNN features*
    - *Used Markov random field for visual correlation modeling and joint labeling*
  - ∗ Optimization of robot actions for visual recognition (e.g., path planning)
    - *Proposed Knapsack-based fast solution for large-scale decision optimization*
    - *Extended path planning methods (e.g., RRT*, TSP) for visual sensing tasks*
- **Deep Learning Based Image Quality Assessment**
  - ∗ Novel pairwise-structured deep CNN to learn image quality
  - ∗ Large-scale training/test datasets collected via Amazon MTurk
- **Vision-WiFi Cross-Modal Gait-Based Person Identification**
  - ∗ Simulating WiFi for walking person in video via 3D shape reconstruction
  - ∗ Extracting time-frequency features to capture a person's gait signature
  - ∗ Identifying a person across video and WiFi using machine learning
- **Optimization of Robot Actions in Wireless Environment**
  - ∗ Co-optimization of robot path planning and data transmission
    - *Utilized optimal control, Monte-Carlo tree search, integer optimization, etc.*
  - ∗ Distributed decision-making and coordination for multiple robots

Programming and Software

Matlab, Python, C/C++, PyTorch, Caffe, TensorFlow

Publications

1. **H. Cai** and Y. Mostofi, "Exploiting Object Similarity for Robotic Visual Recognition," IEEE Transactions on Robotics (T-RO), 2020.
2. B. Korany*, C. R. Karanam*, **H. Cai***, and Y. Mostofi, "XModal-ID: Using WiFi for Through-Wall Person Identification from Candidate Video Footage," ACM

International Conference on Mobile Computing and Networking (MobiCom), 2019. [acceptance rate: 19.0%]

3. **H. Cai** and Y. Mostofi, "Human-Robot Collaborative Site Inspection under Resource Constraints," IEEE Transactions on Robotics (T-RO), 2018.
4. E. Prashnani*, **H. Cai***, Y. Mostofi, and P. Sen, "PieAPP: Perceptual Image-Error Assessment through Pairwise Preference," IEEE Conference on Computer Vision and Pattern Recognition (CVPR), 2018. [acceptance rate: 29.6%]
5. U. Ali, **H. Cai**, Y. Mostofi, and Y. Wardi, "Motion-Communication Co-Optimization with Cooperative Load Transfer in Mobile Robotics: An Optimal Control Perspective," IEEE Transactions on Control of Network Systems (TCNS), 2018.
6. **H. Cai** and Y. Mostofi, "When Human Visual Performance is Imperfect – How to Optimize the Collaboration between One Human Operator and Multiple Field Robots," Trends in Control and Decision-Making for Human-Robot Collaboration Systems (Y. Wang and F. Zhang (Eds.)), Springer, 2017
7. **H. Cai** and Y. Mostofi, "Asking for Help with the Right Question by Predicting Human Visual Performance," Robotics: Science and Systems (RSS), 2016. [acceptance rate: 20.6%]
8. **H. Cai** and Y. Mostofi, "A Human-Robot Collaborative Traveling Salesman Problem: Robotic Site Inspection with Human Assistance," American Control Conference (ACC), 2016.
9. U. Ali, **H. Cai**, Y. Mostofi and Y. Wardi, "Motion and Communication Co-Optimization with Path Planning and Online Channel Prediction," American Control Conference (ACC), 2016.
10. **H. Cai** and Y. Mostofi, "To Ask or Not to Ask: A Foundation for the Optimization of Human-Robot Collaborations," American Control Conference (ACC), 2015.

** indicates joint first authors.*

Academic Service

- Reviewer of ICML, T-RO, RA-L, RSS, ICRA, IROS, L-CSS, TSP, TMC, J-SAC, IEEE Access, CDC, ACC, CASE, SMC, ITSC, IV, Globecom, CoDIT
- Received top reviewer recognition for ICML 2020
- Co-organized and chaired for invited session "Human-Robot Collaborations: Opportunities and Challenges" at ACC 2016