Yun-Wei Chu

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EDUCATION

Purdue University *2021 - Present*
Ph.D. in Electrical & Computer Engineering

National Chiao Tung University *2015 - 2017*
M.S. in Electrical & Control Engineering

National Chi Nan University *2011 - 2015*
B.S. in Electrical Engineering

RESEARCH EXPERIENCE

Research Assistant. Purdue University 2021 - Present
Advisor: Christopher Brinton *West Lafayette, IN*

◦ **Machine learning for eLearning**
- Customized student models for online learners with different demographic variables to improve fairness; Employed federated learning to personalize prediction model for student subgroups and improved 10.8% AUC versus baseline model. (Publication [C1])
- Analyzed online learners' video-watching behavior to their in-video quiz performance; Designed a meta-learning-based training algorithm to guide the prediction model and reflect similarities within student behavioral clusters. (Publication [C3])

Research Intern. Microsoft 2022 Summer
Advisor: Silviu Cucerzan, Michael Gamon, Nirupama Chandrasekaran *Redmond, WA*

◦ **Entity-Centric Headline Generation**
- Collected a news dataset from Bing based on user intensively searched entity; Implemented BERT-based models and conducted quantitative analysis and human evaluation to motivate entity-centric headline generation task.

Research Co-op. HP Labs 2021 - 2022
Advisor: Jerry Liu *Palo Alto, CA*

◦ **Mining and Modeling Computer Application Usage Behavior**
- Mined, modeled, and visualized users' computer application usage behavior. Presented high-dimensional data in low dimensions to a user and provided machine learning methods to compare intents of different users.

NLP Research Assistant. Academia Sinica 2019 - 2021
Advisor: Lun-Wei Ku *Taipei, Taiwan*

◦ **Visual Storytelling**
- Proposed the first reference-free auto-evaluation metric for Visual Storytelling. The metric aligns to human judgement and better rank the quality of stories than other metrics. (Publication [C2])
- Implemented knowledge graphs to enrich the story content and planned a storyline using relation extraction model; Employed Transformer Language Model with a human-like discriminator to refine visual stories. Produced visual stories that are superior in terms of diversity, coherence, and humanness, per both automatic and human evaluations. (Publication [C4])
- Proposed a Length-Controlled Transformer to generate prolong visual stories with better focus and detail; designed a website to demonstrate the ability to prolong stories. (Publication [C5])
- Integrated visual storytelling framework into vision-to-question task to generate response-provoking questions; Developed websites in MTurk for human evaluations on story quality. (Publication [C6])

- **Video Dialogue Question Answering**
  - Developed multi-step joint-modality attention network based on recurrent neural network for dynamic scenes reasoning and improved 20.8% CIDEr score versus baseline model. (Publication [J1], [C7]; Grant [a])
- **Multiview Items Recommendation**
  - Introduced an user-oriented module on graph neural network to aggregate features and enhance personalized recommendations. (Publication [C8])

Research Assistant. National Chiao Tung University 2015 - 2017
Advisor: Bing-Fei Wu *Hsinchu, Taiwan*

- **Image-based Heart Rate Detection**
  - Constructed an Adaptive Neural Network Model to dynamically select personalized model and eliminate facial luminance variation noise from rPPG signal; Reduced 70% MAE compared with baselines on heart rate detection in outdoor driving scenarios. (Publication [J2], [C9]; Grant [b])
  - Re-designed C++-based algorithm into JAVA-based heart rate detection APP; Implemented APP on SiME smart glasses to determine targets' tension. (Patent [P1], [P2], [P3]; Grant [c], [d])

PUBLICATIONS

Journal Papers

[J1] **End-to-end Recurrent Cross-Modality Attention for Video Dialogue. Y.-W. Chu**, K.-Y. Lin, C.-C. Hsu, L.-W. Ku. *IEEE Transactions on Audio, Speech and Language Processing*, 2021. [Paper]

[J2] **Neural Network Based Luminance Variation Resistant Remote-Photoplethysmography for Driver's Heart Rate Monitoring.** B.-F. Wu, **Y.-W. Chu**, P.-W. Haung, M.-L. Chung. *IEEE Access*, 2019. [Paper]

Conference Papers

[C1] **Mitigating Biases in Student Performance Prediction via Attention-Based Personalized Federated Learning. Y.-W. Chu**, S. Hosseinalipour, E. Tenorio, L. Cruz, K. Douglas, A. Lan, C. Brinton. *CIKM*, 2022. [Paper]

[C2] **Learning to Rank Visual Stories From Human Ranking Data. Y.-W. Chu***, C.-Y. Hsu*, V. Chen, K.-C. Lo, C. Chen, T.-H. Huang and L.-W. Ku. *ACL-IJCNLP*, 2022. [Paper]

[C3] **Clustering Guided Meta-Learning for Click-Based Student Performance Prediction. Y.-W. Chu**, E. Tenorio, L. Cruz, K. Douglas, A. Lan, C. Brinton. *IEEE BigData*, 2021. [Paper]

[C4] **Plot and Rework: Modeling Storylines for Visual Storytelling. Y.-W. Chu***, C.-Y. Hsu*, T.-H. Huang and L.-W. Ku. *Findings of ACL-IJCNLP*, 2021. [Paper]

[C5] **Stretch-VST: Getting Flexible With Visual Stories. Y.-W. Chu***, C.-Y. Hsu*, T.-L. Yang, T.-H. Huang and L.-W. Ku. *ACL-IJCNLP Demo*, 2021. [Paper]

[C6] **Let's Talk! Striking Up Conversations via Conversational Visual Question Generation.** S.-H. Chan, T.-L. Yang, **Y.-W. Chu**, C.-Y. Hsu, T.-H. Huang, Y.-S. Chiu and L.-W. Ku. *AAAI workshop on Reasoning and Learning for Human-Machine Dialogues*, 2021. [Paper]

[C7] **Multi-step Joint-Modality Attention Network for Audio Visual Scene-Aware Dialog System. Y.-W. Chu**, K.-Y. Lin, C.-C. Hsu, L.-W. Ku. *AAAI workshop on Dialog System Technology Challenge*, 2020. [Paper]

[C8] **MVIN: Learning multi-view items for recommendation.** C.-Y. Tai, M.-R. Wu, **Y.-W. Chu**, S.-Y. Chu, L.-W. Ku. *International ACM SIGIR Conference*, 2020. [Paper]

[C9] **A Motion Robust Remote-PPG Approach to Driver's Health State Monitoring.** B.-F. Wu, **Y.-W. Chu**, P.-W. Haung, M.-L. Chung. *ACCV workshop on Computer Vision Technologies for Smart Vehicle*, 2016. [Paper]

Patents

[P1] **Non-contact Heartbeat Rate Measurement System, Method and Apparatus Thereof.** B.-F. Wu, M.-L. Chung, T.-Y. Tsou, **Y.-W. Chu**, K.-H. Chen, P.-W. Huang, Y.-Y. Lin. *US Patent #10835135*, Issued Nov 2020.

[P2] **Non-contact Heartbeat Rate Measurement Apparatus.** B.-F. Wu, M.-L. Chung, T.-Y. Tsou, **Y.-W. Chu**. *Taiwan Patent #I667635*, Issued Aug 2019.

[P3] **Monitoring System and Monitoring Method for Infant.** B.-F. Wu, M.-L. Chung, T.-Y. Tsou, Y.-W. Chu. *Taiwan Patent #I658815*, Issued May 2019.

GRANTS & AWARDS

[a] **2020 Travel Grant ($3000)**, For attending AAAI Conference, Academia Sinica
[b] **2016 Research Scholarship for Graduate Student ($7000)**, MOST Taiwan
[c] **2016 Venture Capital ($650k)**, MOST Taiwan
[d] **2016 Outstanding Team of Talentrepreneur Innovation Competition**, NCTU Taiwan