# Wei-Hung **Weng**

MACHINE LEARNING · BIOMEDICAL INFORMATICS · MEDICINE/PATHOLOGY

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## **Edu**cation

**Massachusetts Institute of Technology (MIT)**  *Cambridge, MA, USA*
PH.D. IN COMPUTER SCIENCE AND ARTIFICIAL INTELLIGENCE  *Sep. 2017 -*

**Harvard Medical School**  *Boston, MA, USA*
MASTER OF MEDICAL SCIENCE (MMSC) IN BIOMEDICAL INFORMATICS  *Sep. 2015 - May 2017*

**Chang Gung University**  *Taoyuan, Taiwan*
DOCTOR OF MEDICINE (M.D.)  *Sep. 2004 - Jun. 2011*
- Harvard Medical School, Exchange Student (Massachusetts Eye and Ear Infirmary) (Jun 2011)

## **Res**earch Experience

**Google**  *Mountain View, CA*
RESEARCH INTERN (DR. CAMERON CHEN)  *May 2019 - Aug 2019*
- Multimodal multitask representation learning for pathology metadata prediction

**Computer Science and Artificial Intelligence Laboratory (CSAIL), MIT**  *Cambridge, MA*
GRADUATE RESEARCH ASSISTANT IN CLINICAL DECISION MAKING GROUP (PROF. PETER SZOLOVITS)  *Sep. 2017 -*
- Learning natural language representations for cross-domain and multimodal machine learning in medicine

**MIT Critical Data**  *Cambridge, MA*
INSTRUCTOR, MENTOR  *Jul. 2017 -*
- Lectured and mentored the course, conducted datathons and workshops for collaborative data science in medicine

**Laboratory of Computer Science, Massachusetts General Hospital**  *Boston, MA*
POSTDOCTORAL RESEARCH FELLOW IN LABORATORY OF COMPUTER SCIENCE AND DEPARTMENT OF NEUROLOGY (DRS. HENRY CHUEH, BRANDON WESTOVER)  *Sep. 2015 - May 2017*
- Deep learning, natural language processing and knowledge representation for clinical triage, undiagnosed disease identification, and clinical prediction

**Division of Clinical Informatics Solutions and Services, Philips Research North America**  *Cambridge, MA*
RESEARCH INTERN (DR. SANDEEP DALAL)  *Jun. 2016 - Aug. 2016*
- Proposed the anatomy term extraction method for radiology reports using natural language processing and knowledge representation

**Molecular Imaging Center, National Taiwan University**  *Taipei, Taiwan*
RESEARCH ASSOCIATE (PROF. CHI-KUANG SUN)  *May 2014 - Apr. 2015*
- Developed the qualitative and deep learning methods to identify skin melanocytes in microscopic imaging
- Proposed a go-to market strategy of virtual biopsy microscopy for skin cancer detection

**Kidney Research Center / Cancer Molecular Diagnostics Lab / Department of Psychology, Chang Gung Memorial Hospital**  *Taoyuan, Taiwan*
RESEARCH INTERN (PROFS. LEE-YUNG SHIH, YA-CHUNG TIAN, CHIN-YEN CHEN)  *Jun. 2008 - May 2011*
- Investigated cytokines effects on polyomavirus BK infection
- Clinical data analysis of concomitance of essential thrombocythemia and chronic myeloid leukemia
- Investigated the relationship between sleepiness scale and heart rate variability in medical students

**Cancer Immunology and Gene Therapy Lab, Johns Hopkins Medical Institute**  *Baltimore, MD*
RESEARCH INTERN (PROF. TZYY-CHOOU WU)  *Jul. 2009 - Aug. 2009*
- Immunology/molecular cell biology techniques training and review writing

## **Cli**nical Experience

### Chang Gung Memorial Hospital
*Taoyuan, Taiwan*
RESIDENT PHYSICIAN IN PATHOLOGY AND GENERAL MEDICINE
*Aug. 2012 - Apr. 2014*
- Supervised more than 10 medical clerks, interns and residents
- Selected as visiting scholar to Department of Pathology, University of Tokyo Hospital, Tokyo, Japan

### Republic of China Army
*Taoyuan, Taiwan*
MEDICAL OFFICER OF HEALTH, SECONDARY LIEUTENANT
*Aug. 2011 - Jul. 2012*
- Managed a medical clinic, and a shelter for soldiers with psychiatric diseases
- Volunteered in Mbanane Government Hospital in Swaziland, for critical ward care and rural outreaches

## Honors & Awards

| | | |
|---|---|---|
| 2019 | **NeurIPS Travel Award**, NeurIPS 2019 | *Vancouver, Canada* |
| 2019 | **GSC Travel Grant**, MIT | *Cambridge, MA* |
| 2019 | **NSF Travel Award**, KDD 2019 | *Anchorage, AK* |
| 2017 | **Rolf G. Locher Graduate Fellowship**, MIT | *Cambridge, MA* |
| 2017 | **Travel Award**, NIPS Machine Learning for Health 2017 | *Long Beach, CA* |
| 2015 | **Scholarship of Harvard University Alumni Association (HAA) in Taiwan**, HAA in Taiwan | *Taipei, Taiwan* |
| 2015 | **Wang Yuan-Chun Memorial Medical Contribution Scholarship**, HAA in Taiwan | *Taipei, Taiwan* |
| 2015 | **Semifinalist (TxNet - Education app for kidney transplant patients)**, BWH Startup Program | *Boston, MA* |
| 2015 | **First Prize Award (Fetal heart beat detector)**, HIT Biomedical Innovation Hackathon | *Taipei, Taiwan* |
| 2011 | **Objective Structured Clinical Examination (OSCE) Award**, Taiwan Association of Medical Education | *Kaohsiung, Taiwan* |
| 2011 | **Second Prize**, Medical Record Writing Competition | *Kaohsiung, Taiwan* |
| 2011 | **Great Honor**, Taiwan Medical Development Awards for Outstanding Writings | *Taipei, Taiwan* |
| 2009 | **Research Funding**, Medical Foundation in Memory of Dr. Deh-Ling Cheng | *Kaohsiung, Taiwan* |
| 2006-08 | **Presidential Award**, CGU Medicine (top 5% students) | *Taoyuan, Taiwan* |

## Publications

### CONFERENCES/WORKSHOPS

1. **Weng WH**, Cai Y, Lin A, Tan F, Chen PHC. Multimodal Multitask Representation Learning for Metadata Prediction in Pathology. NeurIPS ML4H 2019 / Medical Imaging Meets NeurIPS 2019.

2. Ma R, Chen PHC, Li G, **Weng WH**, Lin A, Gadepalli K, Cai Y. Investigate BERT on Pathology Report Classification for Accelerating Human Annotation. NeurIPS ML4H 2019.

3. Mao H, Narayan A, Negi P, Wang H, Yang J, Wang H, Khani M, He S, Addanki R, Marcus R, Cangialosi F, **Weng WH**, Han S, Kraska T, Alizadeh M. Park: An Open Platform for Learning Augmented Computer Systems. ICML 2019 Reinforcement Learning for Real Life Workshop, NeurIPS 2019.

4. Hu SY, **Weng WH**, Lu SL, Cheng YH, Xiao F, Hsu FM, Lu JT. Multimodal Volume-Aware Detection and Segmentation for Brain Metastases Radiosurgery. MICCAI AIRT 2019.

5. **Weng WH**, Szolovits P. Representation Learning for Electronic Health Records. Preprint 2019.

6. **Weng WH**. Machine Learning for Clinical Predictive Analytics. Preprint 2019.

7. **Weng WH**, Alsentzer E, Jin D, Min SY, Raghavan P, Szolovits P. Logical Form Information for Clinical Question Answering. KDD DSHealth 2019.

8. **Weng WH**, Chung YA, Szolovits P. Unsupervised Clinical Language Translation. KDD 2019. (oral) [press]

9. Chung YA, **Weng WH**, Tong S, Glass J. Towards Unsupervised Speech-to-Text Translation. ICASSP 2019. (oral)

10. Alsentzer E, Murphy JR, Boag W, **Weng WH**, Jin D, Naumann T, McDermott M. Publicly Available Clinical BERT Embeddings. NAACL-HLT 2019 Clinical NLP Workshop. (oral)

11. Liu G, Hsu TM, McDermott M, Boag W, **Weng WH**, Szolovits P, Ghassemi M. Clinically Accurate Chest X-Ray Report Generation. MLHC 2019.

12. Hsu TM, **Weng WH**, Boag W, McDermott M, Szolovits P. Unsupervised Multimodal Representation Learning across Medical Images and Reports. Machine Learning for Health Workshop at NeurIPS 2018.

13. Girkar U, Uchimito R, Lehman LH, Celi LA, Szolovits P, **Weng WH** (corresponding). Predicting Blood Pressure Response to Fluid Bolus Therapy Using Attention-Based Neural Networks. Machine Learning for Health Workshop at NeurIPS 2018.

14. **Weng WH**, Szolovits P. Mapping Unparalleled Clinical Professional and Consumer Languages with Embedding Alignment. 2018 KDD Machine Learning for Medicine and Healthcare. (oral)

15. Chung YA, **Weng WH**, Tong S, Glass J. Unsupervised Cross-Modal Alignment of Speech and Text Embedding Spaces. NIPS 2018. (spotlight) [press]

16. McDermott M, Vide S, Alenyà M, Tróconiz IF, Valencia JF, Borrat X, **Weng WH**, Szolovits P, Gambús PL. Continuous Prediction of Sedation Levels Based on Signal Inputs: Evaluation of Different Modeling Approaches Including Machine Learning. ISAP 2018.

17. **Weng WH**, Gao M, He Z, Yan S, Szolovits P. Representation and Reinforcement Learning for Personalized Glycemic Control in Septic Patients. NIPS Machine Learning for Health 2017.

18. **Weng WH**, Chung YA. Learning Image Representations using Deep Siamese CNNs for Content-Based Medical Image Retrieval. Medical Imaging meets NIPS 2017 / NIPS Machine Learning for Health 2017.

19. **Weng WH**, Wagholikar KB, Chueh HC. Computing Performance Analysis on Clinical Document-level Classification. AMIA 2017.

20. **Weng WH**, Wagholikar KB, Chueh HC. Classifiers for Identifying the Medical Specialty of Clinical Documents. 2017 AMIA CRI.

21. Sun CK, Wei ML, Su YH, **Weng WH**, Liao YH. Molecular imaging of melanin distribution in vivo and quantitative differential diagnosis of human pigmented lesions using label-free harmonic generation biopsy. SPIE Photonics West 2017.

22. **Weng WH**. Predictive Analytics Pipeline for Clinical Narrative Document Classification. Artificial Intelligence in Medicine 2016.

23. **Weng WH**. Medical Domain Classification with Sequential Label-Embedded Neural Concept Embedding Model. Artificial Intelligence in Medicine 2016.

24. **Weng WH**, Khatri A, Wagholikar KB, Cohen AB, Chueh HC. Improving the Workflow of Curbside Consultation by Using Unstructured Clinical Notes - a Natural Language and Machine Learning-based Approach. AMIA 2016.

25. **Weng WH**, Wagholikar KB. Supervised Clinical Document Classification Pipeline. AMIA 2016 NLP WG Pre-Symposium.

26. **Weng WH**, Wagholikar KB. Classifying Clinical Documents into Medical Domains. AMIA 2016 NLP WG Pre-Symposium.

27. **Weng WH**, Liao YH, Tsai MR, Huang HY, Sun CK. Differentiating intratumoral melanocytes from Langerhans cells in non-melanocytic pigmented skin tumors in vivo by using third harmonic generation microscopy. Focus on Microscopy Conference 2016.

28. Huang HF, **Weng WH**, Hsu WH, Sun CK. Automated Detection of Noninvasive Imaging of Basal Cell Carcinoma by Convolutional Neural Network. NIPS 2015 Workshop on Machine Learning in Healthcare.

29. **Weng WH**, Tsai MR, Liao YH, Sun CK. Differentiating pigmented skin tumors by the tumor-associated melanocytes based on in vivo third harmonic generation microscopy. SPIE Photonics West 2015.

30. Lee SY, **Weng WH**, Sun CK. Super resolution brain imaging by using a two-photon fluorescence microscopy with harmonic modulation. SPIE Photonics West 2015.

31. Chou YH, Hung SY, Lee GG, **Weng WH**, Liao YH, et al. Nuclei location enhancement based on improved efficient ellipse hough transform for third harmonic generation microscopy imaging. IEEE ChinaSIP 2015.

32. Liao YH, **Weng WH**, Sun CK. Characterization of dendritic cells in pigmented skin tumors by harmonic generation microscopy. 23rd World Congress of Dermatology 2015.

33. Lee GG, Cai CS, Liao YH, **Weng WH**, Sun CK, et al. Quantitative Gabor feature analysis of collagen fibers in harmonically generated microscopy (HGM) imaging. OMICS International Global Summit and Expo on Multimedia and Applications ETMN Pre-conference Workshop 2015.

34. **Weng WH**, Tsai MR, Liao YH, Sun CK. Identifying melanocyte in pigmented skin lesions based on in vivo third harmonic generation microscopy. Biomedical Molecular Imaging 2014.

35. **Weng WH**, Liu WM, Tsai MR, Liao YH, Sun CK. In vivo quantification of melanin mass density in human by using third harmonic generation microscopy. Biomedical Molecular Imaging 2014.

36. **Weng WH**, Tian YC. Interleukin-1 beta Inhibits BK virus gene expression and replication in human renal proximal tubular epithelial cells. Taiwan Medical Development Awards for Outstanding Writings 2010.

37. **Weng WH**, Tian YC. IL-1 has suppressive effect on BKV replication. Summer Student Study for Infectious Disease 2009.

## Journals

1. Hombal V, Dalal S, **Weng WH**, Mankovich G, Fuller JT, Mabotuwana T, Gunn ML, Hall CS. Determining Follow-Up Imaging Study Using Radiology Reports. Journal of Digital Imaging. 2019.

2. Li X, Qin Y, Tan X, Chen YC, Chen Q, **Weng WH**, Wang X, Fan X. Ultrasound Modulated Droplet Lasers. ACS Photonics. 2019.

3. Chen YC, Li X, Zhu H, **Weng WH**, Tan X, Chen Q, Wang X, Fan X. Laser Recording of Subcellular Neuron Activities. bioRxiv. 2019 Jan 1:584938.

4. **Weng WH**, Wagholikar KB, McCray AT, Szolovits P, Chueh HC. Medical subdomain classification of clinical notes using machine learning-based natural language processing approach. BMC Medical Informatics and Decision Making. 17(1):155.

5. **Weng WH**, Liao YH, Tsai MR, Wei ML, Huang HY, Sun CK. Differentiating intratumoral melanocytes from Langerhans cells in nonmelanocytic pigmented skin tumors in vivo by label-free third-harmonic generation microscopy. Journal of biomedical optics. 2016 Jul;21(7):076009.

6. Liu CH, Tang WR, **Weng WH**, Lin YH, Chen CY. The process of coping with stress by Taiwanese medical interns: a qualitative study. BMC medical education. 2016 Dec;16(1):10.

7. Lin YH, Chen CY, Lin SH, Liu CH, **Weng WH**, Kuo TB, Yang CC. Gender differences in cardiac autonomic modulation during medical internship. Psychophysiology. 2013 Jun;50(6):521-7.

8. **Weng, WH**, Shih LY. Occurrence of BCR-ABL1-positive chronic myeloid leukemia following essential thrombocythemia. Acta haematologica. 2011;126(4):220-3.

9. Hung CF, Monie A, **Weng WH**, Wu TC. DNA vaccines for cervical cancer. American journal of translational research. 2010;2(1):75.

# Talks and Workshops

| | | |
|---|---|---|
| 2019/10 | **Speaker and workshop moderator**, Bhutan Datathon Workshop | *Thimphu, Bhutan* |
| 2019/09 | **Speaker and workshop moderator**, 2019 TMU-MIT Healthcare Datathon | *Taipei, Taiwan* |
| 2019/08 | **Invited mentor**, Aarhus Critical Care Datathon 2019 | *Aarhus, Denmark* |
| 2019/03 | **Workshop moderator**, 2nd Big Data Machine Learning in Healthcare in Japan | *Tokyo, Japan* |
| 2018/07 | **Workshop moderator**, in Big Data for Health workshops and conference | *Manila, Philippines* |
| 2018/07 | **Workshop moderator**, ealthcare AI Datathon - Technical Workshop | *Singapore* |
| 2018/07 | **Invited mentor**, Healthcare AI Datathon | *Singapore* |
| 2017/11 | **Invited mentor**, Chinese PLA General Hospital-MIT Health Data Conference and Workshop | *Beijing, China PRC* |
| 2017/07 | **Speaker and workshop moderator**, in UP-MIT-Stanford-AeHIN Big Data for Health Conference and Workshops for Asia-Pacific | *Cebu, Philippines* |
| 2017/06 | **Speaker**, in NUS-MIT Healthcare Analytics Datathon | *Singapore* |
| 2016/10 | **Invited panelist**, Deconstructing the Hype around Big Data and Precision Medicine | *Taipei, Taiwan* |
| 2016/09 | **Invited panelist, mentor and judge**, MIT-TMU Internet of Things Hackathon | *Taipei, Taiwan* |

# Professional Activities

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|---|---|---|
| | **Conference / Journal Reviewer**, NeurIPS (2019), NeurIPS Machine Learning for Health Workshop (2017, 2018), Machine Learning for Healthcare (2019), AMIA Joint Summits (2018, 2019), AMIA Annual Symposium (2018), Journal of the American Medical Informatics Association (journal), Journal of Biomedical Informatics (journal), PLoS One (journal), IEEE Transactions on Industrial Informatics (journal), International Journal of Medical Informatics (journal) | |
| 2018- | **Consultant**, Vysioneer (Startup: machine learning for medical imaging) | *Cambridge, MA* |
| 2018- | **Consultant**, HoloEducation (Startup: AI for medical education) | *Cambridge, MA* |
| 2018 | **Organizing Committee and Moderator**, Boston Taiwanese Biotechnology Symposium 2018 | *Cambridge, MA* |
| 2018 | **TBI Year-in-Review Workgroup Member**, AMIA Joint Summits on Translational Science (2017, 2018) | *San Francisco, CA* |
| 2017 | **Scientific Program Committee**, AMIA 2017 Annual Symposium | *Washington, DC* |

# Academic Activities

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|---|---|---|
| 2019 | **Graduate Admissions Student Committee**, MIT EECS | *Cambridge, MA* |
| 2018, 2019 | **Collaborative Data Science in Medicine**, Instructor, HST.953, MIT | *Cambridge, MA* |
| 2016 | **Lab of Introduction of Biomedical Informatics**, Instructor, BMI701, Harvard Medical School | *Boston, MA* |

# Skills

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|---|---|
| **Domain** | Machine learning, Deep learning, Natural language processing, Computer vision, Graphic design, Medicine, Pathology |
| **PL / Tools** | Python, R, Linux, LaTeX, HTML5, Git, Tensorflow, PyTorch, Keras, Scikit-learn, Bioconductor, cTAKES, MetaMap, UMLS, MIMIC, Photoshop, InDesign |
| **Languages** | English, Chinese, Japanese |
| **Medicine** | Board Certificate of Medical Doctor, Advanced Cardiovascular Life Support, Certificate of Clinical Trial |