MUSTAFA ÜMİT ÖNER

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ACADEMIC APPOINTMENT

Bahcesehir University **Since Jan 2022**
Assistant Professor, Artificial Intelligence Engineering

EDUCATION

National University of Singapore **Aug 2017 - Dec 2021**
Ph.D. in Computer Science
Thesis: Novel Multiple Instance Learning Models for Digital Histopathology
Thesis Advisors: Hwee Kuan Lee and Wing-Kin Sung

Middle East Technical University **Sep 2013 - Sep 2016**
M.S. in Electrical and Electronics Engineering
Thesis: Metastasis Detection and Localization in Lymph Nodes by Using Convolutional Neural Networks
Thesis Advisor: Uğur Halıcı

Middle East Technical University **Sep 2008 - Jun 2013**
B.S. in Electrical and Electronics Engineering (GPA: 3.74 / 4.00)
B.S. in Industrial Engineering - Double Major (GPA: 3.00 / 4.00)

RESEARCH INTERESTS

I am interested in developing *(i) novel machine learning models* and *(ii) machine learning-based information systems for digital histopathology and integrative multi-omics* to support diagnostic and therapeutic decision-making in cancer. Currently, I focus on the intersection of digital histopathology and genomics in cancer research. Specifically, my current research is to develop novel machine learning models that predict genomics features from digital histopathology images.

RESEARCH EXPERIENCE

Assistant Professor | Artificial Intelligence Engineering, Bahcesehir University **Jan 2022 - Present**

- Developing self-supervised learning based deep learning models for computational pathology.
- Developing deep learning models extracting structured data from pathology reports.
- Developing deep learning models predicting prognosis of Oral Squamous Cell Carcinoma from digital histopathology slides in collaboration with researchers in The University of Hong Kong.
- Developing a machine learning system to predict HER2 expression from H&E stained slides in breast cancer. Got approval from the Bahcesehir University Clinical Research Ethics Committee for collecting human tissue samples from a local cohort of 600 cases.
- Set up the Medical AI Research Laboratory together with medical doctors in Bahcesehir University.
- Developed machine learning models detecting inter-turn short circuit faults in electrical machines 10 times faster than traditional methods in collaboration with researchers in defense industry, wrote a manuscript, and submitted it to a renown journal in the field.

Graduate Student | Bioinformatics Institute, A*STAR, Singapore | Computer Science, NUS, Singapore **Aug 2017 - Dec 2021**
Advisors: Hwee Kuan Lee and Wing-Kin Sung

- Developed a novel machine learning model predicting tumor purity from digital histopathology slides in 8 different The Cancer Genome Atlas (TCGA) cohorts and a local Singapore cohort in collaboration with scientists and medical doctors from different research institutes and hospitals in Singapore.

- Designed data collection, annotation, processing, and validation protocols/tools; and developed machine learning models in collaboration with pathologists for automated detection and grading of prostate cancer on H&E stained core needle biopsies collected from a cohort of 200 patients in Singapore.
- Supervised three interns and one trainee on different research projects resulting in two research papers.
- Conducted first stage talent recruitment interviews of 100+ candidates for Ph.D., research assistant, and internship positions; and participated in technical interviews of 50+ candidates for Postdoc, Ph.D., and research assistant positions over the past three years.

This work resulted in one ICLR paper, two Cell Patterns paper, and one paper under review. This work was funded through a Singapore International Graduate Award Ph.D. scholarship.

Graduate Student | Electrical and Electronics Engineering, METU, Turkey **Sep 2013 - Sep 2016**
Advisor: Uğur Halıcı

- Developed a deep learning-based algorithm detecting and localizing breast cancer metastases in underarm lymph nodes to reduce pathologists' workload and improve the diagnosis of the patients.

This algorithm was the 4^{th} ranked algorithm in CAMELYON16 ISBI challenge on cancer metastases detection in lymph nodes, which was the first challenge ever using whole-slide-images. This work also contributed to CAMELYON16 consortium paper published in JAMA.

AWARDS & HONORS

- **Singapore International Graduate Award (SINGA), 2017 - 2021**
  This is a Ph.D. scholarship program with an acceptance rate of $\sim 3\%$ for international students.
- **7^{th} ranked team member in HEROHE ECDP2020 Challenge, 2020**
  The aim was to identify overexpression of HER2 protein in Breast Cancer from H&E-stained whole-slide-images. Team members: Mustafa Umit Oner, Hwee Kuan Lee and Wing-Kin Sung
- **4^{th} ranked team member in CAMELYON16 ISBI Challenge, 2016**
  This challenge on cancer metastasis detection in lymph nodes was the first challenge ever using whole-slide-images. Team members: Mustafa Umit Oner, Uğur Halıcı and Rengül Çetin Atalay.
- **Graduate Fellowship, TUBITAK , 2013 - 2015**
- **Technology and Innovation Based Entrepreneurship Fund, TUBITAK-1512, 2013**

PUBLICATIONS

Papers at Highly Selective Journals and Conferences (Peer reviewed)

4. **Mustafa Umit Oner**, Mei Ying Ng, Danilo Medina Giron, Cecilia Ee Chen Xi, Louis Ang Yuan Xiang, Malay Singh, Weimiao Yu, Wing-Kin Sung, Chin Fong Wong, and Hwee Kuan Lee. An ai-assisted tool for efficient prostate cancer diagnosis in low-grade and low-volume cases. *Patterns*, 3(12):100642, 2022
3. **Mustafa Umit Oner**, Jianbin Chen, Egor Revkov, Anne James, Seow Ye Heng, Arife Neslihan Kaya, Jacob Josiah Santiago Alvarez, Angela Takano, Xin Min Cheng, Tony Kiat Hon Lim, et al. Obtaining spatially resolved tumor purity maps using deep multiple instance learning in a pan-cancer study. *Patterns*, 3(2):100399, 2022
2. **Mustafa Umit Oner**, Hwee Kuan Lee, and Wing-Kin Sung. Weakly supervised clustering by exploiting unique class count. In *International Conference on Learning Representations*, 2020
1. Babak Ehteshami Bejnordi, Mitko Veta, Paul Johannes van Diest, Bram van Ginneken, Nico Karssemeijer, Geert Litjens, Jeroen A. W. M. van der Laak, and the CAMELYON16 Consortium [including **Mustafa Umit Oner**]. Diagnostic Assessment of Deep Learning Algorithms for Detection of Lymph Node Metastases in Women With Breast Cancer. *JAMA*, 318(22):2199–2210, 12 2017

Papers Under Review and In Manuscript Preparation

1. **Mustafa Umit Oner**, İlker Şahin, and Ozan Keysan. Neural networks detect inter-turn short circuit faults using inverter switching statistics. *[Under Review]*, 2022. [Available at TechRxiv: `https://doi.org/10.36227/techrxiv.19145444.v2`]

Preprints (Not peer reviewed)

2. **Mustafa Umit Oner**, Jared Marc Song Kye-Jet, Hwee Kuan Lee, and Wing-Kin Sung. Studying the effect of mil pooling filters on mil tasks. *arXiv preprint arXiv:2006.01561*, 2020

1. **Mustafa Umit Oner**, Yi-Chih Cheng, Hwee Kuan Lee, and Wing-Kin Sung. Training machine learning models on patient level data segregation is crucial in practical clinical applications. *medRxiv*, 2020

Abstracts at Conferences (Peer reviewed)

2. **Mustafa Umit Oner**, Jianbin Chen, Weiwei Zhai, Wing-Kin Sung, and Hwee Kuan Lee. Predicting genetic intra-tumor heterogeneity from digital histopathology slides. In *European Congress on Digital Pathology*, 2021

1. **Mustafa Umit Oner**, Hwee Kuan Lee, and Wing-Kin Sung. A fully automated pipeline for human epidermal growth factor receptor 2 expression prediction in invasive breast cancer. In *European Congress on Digital Pathology*, 2020

TEACHING & MENTORING EXPERIENCE

Assistant Professor | Bahcesehir University **Jan 2022 - Present**

- AIN3002 / ARI5004: Deep Learning (Spring 2023, Fall 2022, Spring 2022)
  - Designed the course from scratch considering its equivalents in the top universities.
  - Covered both theoretical and practical aspects of basic concepts (e.g. multi-layer perceptron, convolutional neural networks and recurrent neural networks) and advanced concepts (e.g. attention and transformers).
  - Created the slides and prepared weekly quizzes and assignments.
  - Had a course project providing students with a unique experience in implementing and analyzing a research idea and reporting their results in a paper style format.

- AIN2002: Introduction to Data Science (Spring 2023)
  - Designed the course content and structure to help students: (i) understand the data science lifecycle; (ii) develop critical thinking skills and learn asking the right questions for data-driven decision making; and (iii) understand ethical considerations (e.g., data privacy, security, and bias) and their impact in the practice of data science.
  - Made use of the Kaggle and HackerRank certificates to help students build a foundation for a career in data science.
  - Had a course project based on a real-world task of stroke prediction providing students with a solid hands-on experience in data science.

- AIN2001: Introduction to Artificial Intelligence (Fall 2022)
  - Designed the course content and structure to help students: (i) acquire the fundamental knowledge on principles of artificial intelligence; (ii) develop problem solving skills on various artificial intelligence problems; and (iii) implement basic algorithms and related applications.
  - Used weekly quizzes to enhance students' learning.
  - Utilized in-class demos and programming assignments to develop students' hands-on skills.

- CMP 4992: Capstone Project II (Spring 2022)
  - Co-supervised five groups of 32 students from different departments in the context of interdisciplinary graduation projects.

Mentor to Interns and Trainees | Bioinformatics Institute, A*STAR, Singapore Sep 2018 - Present

- I mentored 3 interns and 1 trainee on different research projects. I encouraged and motivated them to learn critical and inventive thinking, develop strong technical and communication/collaboration skills.
  - **Louis Ang** (Intern, Republic Polytechnic, Sep 2018 - Feb 2019)
    Cecilia Ee (Intern, Republic Polytechnic, Mar 2019 - Jan 2020)
    Handling sensitive medical data, collecting and annotating digital pathology slides, and learning the basics of image processing, machine learning, and coding in Python. (*Paper under review*)
  - **Jared Song** (Intern, Hwa Chong Institution, Dec 2019 - Mar 2020): Designing and running experiments for basic deep learning research. (*Paper under review*)
  - **Mei Ying Ng** (Trainee, SG United, Sep 2020 - Sep 2021): Annotating digital pathology slides and developing machine learning-based information systems to support pathologists in diagnosing early-stage prostate cancer from prostate core needle biopsies. (*Paper under review*)

Graduate Teaching Assistant | Computer Science, NUS, Singapore Jan 2018 - Dec 2018

- CS 5242: Neural Networks and Deep Learning (Fall 2018)
  - 111 registered students and 104 hours of teaching assistantship
  - Conducted tutorials and discussion sessions
  - Prepared course material
  - Prepared and marked the homeworks and the project
- CS 5330: Randomized Algorithms (Spring 2018)
  - 32 registered students and 45 hours of teaching assistantship
  - Conducted discussion sessions
  - Marked homeworks

PREVIOUS WORK EXPERIENCE

Graduate Research Assistant | CanSyL, METU, Turkey Mar 2017 - Jul 2017
Supervisors: Aybar Can Acar and Rengül Çetin Atalay

- Setup the computation infrastructure of the lab together with Aybar Can Acar. This included determining specifications of the machines, purchasing of the machines and setting up the system.
- Maintained servers of the lab providing compute resources to 20+ researchers and 50+ graduate students.

Research Engineer | Enekom Energy, Turkey Dec 2014 - Mar 2017

- Developed algorithms and embedded software for acoustic based broken rail detection systems and fuzzy heat control systems.

Co-founder | Balista Electronics, Turkey Apr 2013 - Dec 2014

- Founded a startup company to develop a radiosonde collecting meteorological data at different altitudes of the atmosphere to be used for weather forecasting and correcting ballistic trajectory calculations. This startup was funded by Technology and Innovation Based Entrepreneurship Fund, TUBITAK-1512.

SEMINARS AND TALKS

How strong are the weak labels in digital histopathology?

1. Seminar, Department of Artificial Intelligence, Universiti Malaya, Kuala Lumpur, Malaysia, Online **(Jan 2022)**
2. Seminar, Department of Artificial Intelligence Engineering, Bahcesehir University, Istanbul, Turkey, Online **(Nov 2021)**
3. Seminar, KUIS AI Center, Koc University, Istanbul, Turkey, Online **(Oct 2021)**

4. Seminar, Center for Virology and Vaccine Research, Harvard Medical School, Boston, MA, USA, Online **(Sep 2021)**

   Deep Learning To Improve Cancer Diagnosis

5. Poster Presentation, Bioinformatics Institute, A*STAR, Singapore, Online **(Sep 2021)**

   Exploiting Coarse Level Labels of Tissue Images Using Deep Learning To Improve Cancer Diagnosis

6. Seminar, Artificial Intelligence, Analytics And Informatics (AI3), Singapore, Online **(Sep 2021)**

   Predicting Genetic Intra-tumor Heterogeneity From Digital Histopathology Slides

7. Poster Presentation, European Congress on Digital Pathology, Online **(Jun 2021)**

   Novel Multiple Instance Learning Models for Digital Histopathology

8. Thesis Defense, School of Computing, National University of Singapore, Singapore **(Nov 2021)**
9. Seminar, Computer Engineering, TOBB ETU, Ankara, Turkey, Online **(Aug 2021)**
10. Doctoral Seminar, School of Computing, National University of Singapore, Singapore **(Apr 2021)**

    Predicting Tumor Purity from Histopathology Slides in a Pan-cancer Study

11. Scientific Progress Review Meeting, Bioinformatics Institute, A*STAR, Singapore **(Jan 2021)**
12. National Cancer Centre Singapore, Singapore **(Sep 2020)**

    Weakly Supervised Clustering By Exploiting Unique Class Count

13. eko.ai Pte. Ltd., Singapore **(May 2020)**
14. International Conference on Learning Representations, Online **(Apr 2020)**
15. Institute for Infocomm Research, A*STAR, Singapore **(Apr 2020)**
16. Ph.D. Student Symposium, Bioinformatics Institute, A*STAR, Singapore **(Jan 2020)**

    Intra-tumor Heterogeneity Through The Lens of Image Analysis

17. Scientific Progress Review Meeting, Bioinformatics Institute, A*STAR, Singapore **(Jun 2018)**
18. Genome Institute of Singapore, A*STAR, Singapore **(Jan 2018)**