Melih Can Yesilli

mcanyesilli@gmail.com | +1-517-775-5578 | www.melihcanyesilli.com

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EDUCATION

Michigan State University, East Lansing, MI   August 2018 − May 2022
Doctor of Philosophy, Department of Mechanical Engineering
Thesis Title: Topological Data Analysis and Machine Learning Framework for Studying Time Series and Image Data
Advisor: Dr. Firas Khasawneh

Middle East Technical University, Ankara, Turkey   September 2013 − June 2018
Bachelor of Science, Department of Mechanical Engineering

WORK EXPERIENCE

KLA Corporation   Ann Arbor, MI
Algorithm Engineer   May 2022 − present
- Developed an approach that can differentiate healthy laser lamps from early replaced or failed lamps
- Developed turn point detection algorithm for time series data
- Built a predictive pipeline that can estimate when a parameter will reach to its specification limit

Michigan State University   East Lansing, MI
Graduate Research Assistant   August 2018 − May 2022
Chatter Detection in Machining Using Machine Learning
- Developed an approach that can classify unstable and stable time series with 96% accuracy using Topological Data Analysis and machine learning
- Developed the machine learning module of Python package named teaspoon
- Diagnosed chatter in machining signals with 98% accuracy using similarity measures of time series and K-Nearest Neighbor algorithm
- Achieved 95% accuracy using transfer learning approach for detecting unstable machining signals

Surface Texture Analysis Using Machine Learning
- Reduced the time needed to compute surface modes by 99.6% by developing an automatic threshold selection algorithm for Discrete Cosine Transform
- Obtained 95% classification accuracy for surface texture classification using information theory and image processing
- Classified surface images with 96% accuracy using Topological Data Analysis

Tool Wear Identification
- Developed an automatic algorithm that selects sensitive frequencies in Fourier spectrum for feature extraction with Discrete Wavelet Transform
- Developed Topological Data Analysis based approach for tool wear analysis
- Proved that usage of expensive force sensors is redundant

Roketsan   Ankara, Turkey
Engineering Trainee   November 2017 − April 2018
- Focused on navigation of aerial vehicles and Inertial Measurement Units (IMU)
- Developed Kalman Filter based Attitude and Heading Reference System
Intern   June 2017 − July 2017
- Designed complimentary filter based Attitude and Heading Reference System
- Conducted experiments using gyroscope and accelerometer

TEI - TUSAS Engine Industries   Eskisehir, Turkey
Intern   July 2016 − August 2016
- Conducted cost analysis for two aircraft parts named as front rotating air seal and spool of a jet engine
- Inspected manufacturing processes applied in the factory such as milling, turning, shot peening, welding, deburring, and heat treatment

TEACHING EXPERIENCE

Michigan State University   East Lansing, MI
Graduate Teaching Assistant   August 2018 − May 2022
- ME451L - Control Systems Laboratory (Spring 2019, Spring 2020, Spring 2022)
  − Supervised laboratory sessions and graded students' assignments
- ME461 - Mechanical Vibrations (Fall 2020)

– Graded students' assignments and assisted with teaching materials
- ME422 - Introduction to Combustion - (Fall 2019)
  – Graded students' assignments
- ME416 - Computer Assisted Design of Thermal Systems - (Fall 2019)
  – Graded students' assignments

PUBLICATIONS
Journal Papers
- **M. C. Yesilli**, F. A. Khasawneh, B. P. Mann, "Transfer Learning for Autonomous Chatter Detection in Machining," *Journal of Manufacturing Processes,* 2022, `https://doi.org/10.1016/j.jmapro.2022.05.037`
- **M. C. Yesilli**, J. Chen, F. A. Khasawneh and Y. Guo, "Automated Surface Texture Analysis via Discrete Cosine Transform and Discrete Wavelet Transform," *Precision Engineering,* 2022, `https://doi.org/10.1016/j.precisioneng.2022.05.006`
- **M. C. Yesilli**, F. A. Khasawneh, and A. Otto, "Chatter Detection in Turning Using Machine Learning and Similarity Measures of Time Series via Dynamic Time Warping," *Journal of Manufacturing Processes,* 2022, `https://doi.org/10.1016/j.jmapro.2022.03.009`
- **M. C. Yesilli**, F. A. Khasawneh, and A. Otto, "Topological feature vectors for chatter detection in turning processes," *The International Journal of Advanced Manufacturing Technology,* 2022, `https://doi.org/10.1007/s00170-021-08242-5`
- **M. C. Yesilli**, F. A. Khasawneh, and A. Otto, "On transfer learning for chatter detection in turning using wavelet packet transform and ensemble empirical mode decomposition,"*CIRP Journal of Manufacturing Science and Technology,* 2019, `https://doi.org/10.1016/j.cirpj.2019.11.003`

Preprints
- M. Chumley, **M. C. Yesilli**, J. Chen, F. A. Khasawneh and Y. Guo, "Pattern Characterization Using Topological Data Analysis: Application to Piezo Vibration Striking Treatment,", 2022, arXiv preprint arXiv:2210.06333 (*Under Review*)
- **M. C. Yesilli**, R. Khawarizmi, P. Kwon, F. A. Khasawneh,"Tool Wear Identification Using Persistent Homology and Machine Learning," 2022 (*In submission*)
- A. Myers, **M. C. Yesilli**, F. A. Khasawneh, "On Time Series Methods for Chaos Detection: Application to Large Scale Double Pendulum Simulation," 2021 (*Under Review*)

Conference Papers
- **M. C. Yesilli**, M. Chumley, J. Chen, F. A. Khasawneh and Y. Guo, "Exploring Surface Texture Quantification in Piezo Vibration Striking Treatment (PVST) Using Topological Measures. In International Manufacturing Science and Engineering Conference", MSEC2022, `https://doi.org/10.1115/MSEC2022-86659`.
- **M. C. Yesilli** and F. A. Khasawneh "Data-driven and Automatic Surface Texture Analysis Using Persistent Homology," In 2021 *20th IEEE International Conference on Machine Learning and Applications,* IEEE, `https://doi.org/10.1109/ICMLA52953.2021.00219`
- **M.C., Yesilli**, F. A. Khasawneh, "Data-driven Model Identification for a Chaotic Pendulum with Variable Interaction Potential". IDETC 2020, `https://doi.org/10.1115/DETC2020-22597`
- **M. C. Yesilli**, F. A. Khasawneh, "On Transfer Learning of Traditional Frequency and Time Domain Features In Turning," *15th International Manufacturing Science and Engineering Conference,* MSEC 2020. `https://doi.org/10.1115/MSEC2020-8274`
- **M. C. Yesilli**, S. Tymochko, F. A. Khasawneh, E. Munch, "Chatter Diagnosis in Milling Using Supervised Learning and Topological Features Vector," In 2019 *18th IEEE International Conference on Machine Learning and Applications,* IEEE, `https://doi.org/10.1109/ICMLA.2019.00200`
- J. R. Tempelman, A. Myers, **M. C. Yesilli**, "Experimental Investigations Into Broadband Vibration of Metastructures with Lattice Designs," In *Proceedings of the ASME International Design Engineering Technical Conferences and Computers and Information in Engineering Conference,* IDETC2019, `https://doi.org/10.1115/DETC2019-97673`

PRESENTED WORK
Contributed Talks
- **Data-driven and Automatic Surface Texture Analysis Using Persistent Homology**, ICMLA 2021, December 2021
- **Chatter Detection in Turning Using Dynamic Time Warping and Approximate and Eliminate Search Algorithm**, SIAM Conference on Applications of Dynamical Systems, May 2021
- **On Transfer Learning of Traditional Frequency and Time Domain Features In Turning**, MSEC2020 (Virtual Conference), September 2020
- **Data-driven Model Identification for a Chaotic Pendulum with Variable Interaction Potential**, IDETC/MSNDC (Virtual Conference), August 2020
- **Chatter Classification and Transfer Learning in Turning Using Topological Data Analysis and Dynamic Time Warping**, MSU TDA Seminar, April 2020
- **Topological Feature Vectors for Chatter Detection in Turning Processes**, The 1st Midwest Graduate Student

Conference: Geometry and Topology meet Data Analysis and Machine Learning, June 2019
- **Topological Feature Vectors for Chatter Detection in Turning Processes**, SIAM Conference on Applications of Dynamical Systems, May 2019
- **Chatter diagnosis in turning using Topological Data Analysis**, SIAM Great Lakes Section Meeting, April 2019

Poster
- A.D. Myers, **M.C. Yesilli**, S. Tymochko, F. Khasawneh and E. Munch, "Teaspoon: A comprehensive python package for topological signal processing." *Topological Data Analysis and Beyond Workshop at NeurIPS 2020.*

CODE AND DATA REPOSITORIES
- **M. C. Yesilli**, and F. A. Khasawneh (2022), "Persistence Diagram Computation Using Bezier Curves", Github repository.
- **M. C. Yesilli**, and F. A. Khasawneh (2022), "Topological Saliency Library for Python Using TTK and VTK", Github repository.
- A. Myers, **M. C. Yesilli**, S. Tymochko, F. A. Khasawneh and E. Munch, (2020), Teaspoon: A Topological Signal Processing Package, pypi/teaspoon.
- N. Mork, **M. C. Yesilli**, F. A. Khasawneh, (2020). Design of chaotic pendulum with a variable interaction potential, Zenodo, DOI: 10.5281/zenodo.3784897
- F. A. Khasawneh, A. Otto and **M. C. Yesilli**, (2019), "Turning Dataset for Chatter Diagnosis Using Machine Learning", Mendeley Data, v1, `http://dx.doi.org/10.17632/hvm4wh3jzx.1`
- **M. C. Yesilli**, F. A. Khasawneh, and A. Otto, (2019), "Machine Learning Toolbox for Machining", Github repository.

CONFERENCE ACTIVITIES
- **Minisymposium Co-organizer**, *Topological Signal Processing,* SIAM Conference on Applications of Dynamical Systems, May 2021
- **Minisymposium Co-organizer**, *Topological Time Series Analysis,* SIAM Conference on Mathematics of Data Science, May 2020 *(canceled due to COVID-19)*
- **Session Chair**, SIAM Conference on Applications of Dynamical Systems, May 2021
- **Session Chair**, SIAM Conference on Applications of Dynamical Systems, May 2019

SERVICE
- **Reviewer**, Journal of Intelligent Manufacturing   July 2022
- **Reviewer**, Journal of Intelligent Manufacturing   July 2021
- **Reviewer**, Journal of Intelligent Manufacturing   May 2021
- **Reviewer**, SoftwareX   February 2021
- **Reviewer**, Journal of Ambient Intelligence and Humanized Computing   September 2020
- **Reviewer**, Measurement   June 2020

PROFESSIONAL AFFILIATIONS & ORGANIZATIONS
- **Member**, Association for Computing Machinery (ACM)   March 2021 − March 2022
- **Member**, American Society of Mechanical Engineers (ASME)   October 2019 − October 2021
- **Event Coordinator**, Michigan State University Turkish Student Association (MSU-TSA)   June 2021 − February 2022
- **Treasurer**, Michigan State University Turkish Student Association (MSU-TSA)   April 2019 − June 2021
- **Member**, Society for Industrial and Applied Mathematics (SIAM)   November 2018 − May 2022

LEADERSHIP
Graduate Student Mentor for ACRES-REU   May 2021 − July 2021
- Co-mentored two undergraduate students who participate in Advanced Computational Research Experience for Undergraduates (ACRES-REU)
- Met with students once a week, provided them with guidance on their research, and answered their questions whenever needed

AWARDS
- MSU Graduate Office Fellowship ($5400)   October 2021
- Student Travel Award - SIAM DS21   May 2021
- MSU Graduate Office Fellowship ($5000)   February 2020
- Sabanci Foundation Scholarship   October 2013 - June 2018

TECHNICAL STRENGTHS
Programming: Python, MATLAB, Julia, C/C++, OpenMP, MPI
Software & Tools: High Perfomance Computing, Sphinx, LaTeX, Solidworks, Inkscape, Arduino