# Penghao Dong

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## Education

**Stony Brook University, Stony Brook, NY** Aug 2020 - May 2025 (Expected)
*Ph.D. in Mechanical Engineering*

**Southeast University, China** Aug 2017 - Jun 2020
*Master of Engineering in Mechanical Engineering*

**China University of Mining and Technology, China** Sep 2013 - Jun 2017
*Bachelor of Engineering in Mechanical Engineering*

## Skills

- **Experiments:** Employing a variety of techniques and equipment to manufacture polymer films intended for soft sensor applications and signal acquisition: Spin Coating, Spray Coating, Drop Casting, Laser Cutting, Ultrasonic Homogenization, Spin Mixing, Impulse Magnetization, Fused Deposition Modeling(FDM), Stereolithography (SLA), Scanning Electron Microscope (SEM), Optical Microscope, Electromyography (EMG) signal acquisition (OpenBCI and PowerLab), Inertial Measurement Unit (IMU) signal acquisition (MbientLab), Impedance Analyzer, Tensile Stage, Arduino and etc.
- **Software:** Software programs for prototyping polymer film-based soft electronics devices and the corresponding signal processing: Visual Studio Code, MetaWear (IMU signal acquisition), LabChart (EMG acquisition), Unity 3D, BrainFlow (EMG acquisition and processing), MQTT Client (data transfer), AutoCAD, SolidWorks, 3DS MAX, OriginLab, Overleaf and etc.
- **Programming Languages:** Python, MATLAB, C

## Experience

- **Smart Structures and Soft Electronics Laboratory, Stony Brook University** August 2020 - Present
  *Research Assistant - Prof. Shanshan Yao*
  - **EMG-based Lip Reading via Dry Electrode Film and Machine Learning (Sponsored by NSF)**
    - A self-adhesive, skin-conformal, thin, and semi-transparent **dry electrode film** is developed based on **waterborne polyurethane (WPU)** and **silver nanowires (AgNWs)** to track high-fidelity speech-relevant EMG signals.
    - Various techniques, such as spray coating, spin coating, and film transfer methods, are employed to create an approximately **15 $\mu$m thin film** that can form seamless contact with the curvilinear and dynamic surfaces of the skin.
    - Linear Discriminant Analysis (LDA) is employed to decode **speech-relevant EMG signals** and convert them to spoken words in real-time (in collaboration with Prof. Petar M. Djuric).
    - The advanced lip-reading system has been integrated into **Augmented Reality (AR)** and medical service for demonstration purposes.
  - **Decoding Silent Speech Commands by Soft Magnetic Skin (Sponsored by NSF)**
    - The central concept is the utilization of a single **soft magnetic skin** discreetly positioned in the ramus-temporal junction area, which enables a socially acceptable wireless silent speech recognition system through precise decoding of articulatory movements.
    - The magnetic skin, crafted from a composite polymer film comprising **PDMS**, **Ecoflex**, and **NdFeB** particles, not only boasts impressive conformability to the human skin but also demonstrates a great magnetic signal strength, as substantiated by corresponding **material characterizations**.

  - The **Digital Image Correlation (DIC)** system is employed to examine skin deformation at the facial skin and ramus-temporal junction skin, aiding in the selection of optimal sensing locations.
  - Two promising applications in the field of **assistive technology** and **human-computer interactions** are demonstrated: the use of silent speech-enabled smartphone assistants and silent speech-enabled drone control.

- **Department of Mechanical Engineering, Stony Brook University** Aug 2021 - Current
  *Teaching Assistant*
  - **Assisting professors in their teaching responsibilities for the following courses.**
    - MEC 260 Engineering Statics (Fall 2021), MEC 520 Smart Materials and Structures (Spring 2022), MEC 220 Practical Electronics for Mechanical Engineers (Fall 2022, Spring 2023, Fall 2023)

- **Department of Mechanical Engineering, Southeast University** Aug 2017 - Jun 2020
  *Research Assistant – Prof. Xing Yan*
  - **Simulation, Measurement, and Prediction for Residual Stress**
    - A Finite Element Analysis (FEA) is performed to simulate the machining process of mechanical components.
    - The **electrochemical corrosion** method and **X-ray diffraction** method are utilized to measure the residual stress along the depth direction.
    - The **Random Forest** algorithm is employed to construct a regression model that predicts cutting forces and residual stress distributions.

## Selected Publication

**Google Scholar:** https://scholar.google.com/citations?user=XtPt2-QAAAAJ&hl=en


1. **Dong, P.**; Song, Y.; Yu, S.; Zhang, Z.; Mallipattu, S. K.; Djuric, P. M.; Yao, S. Electromyogram-Based Lip-Reading via Unobtrusive Dry Electrodes and Machine Learning Methods. Small. 2023, 19 (17), e2205058. DOI: 10.1002/smll.202205058.

2. **Dong, P.**; Li, Y.; Chen, S.; Grafstein, J. T.; Khan, I.; Yao, S. Decoding silent speech commands from articulatory movements through soft magnetic skin and machine learning. Materials Horizons. 2023. DOI: 10.1039/d3mh01062g.

3. Li, Y.; Parsan, A.; Wang, B.; **Dong, P.**; Yao, S.; Qin, R. A multi-tasking model of speaker-keyword classification for keeping human in the loop of drone-assisted inspection. Engineering Applications of Artificial Intelligence. 2023, 117. DOI: 10.1016/j.engappai.2022.105597.

4. Yao, S.; Zhou, W.; Hinson, R.; **Dong, P.**; Wu, S.; Ives, J.; Hu, X.; Huang, H.; Zhu, Y. Ultrasoft Porous 3D Conductive Dry Electrodes for Electrophysiological Sensing and Myoelectric Control. Advanced Materials Technologies. 2022, 7 (10), 2101637. DOI: 10.1002/admt.202101637.

5. **Dong, P.**; Peng, H.; Cheng, X.; Xing, Y.; Tang, W.; Zhou, X. Semi-Empirical Prediction of Residual Stress Profiles in Machining IN718 Alloy Using Bimodal Gaussian Curve. Materials 2019, 12 (23). DOI: 10.3390/ma12233864.

6. **Dong, P.**; Peng, H.; Cheng, X.; Xing, Y.; Tang, W.; Zhou, X.; Huang, D. A Random Forest Regression Model for Predicting Residual Stresses and Cutting Forces Introduced by Turning IN718 Alloy. In 2019 IEEE International Conference on Computation, Communication and Engineering (ICCCE). 2019, pp 5-8. DOI: 10.1109/ICCCE48422.2019.9010767.


## Relevant Courses

Mathematical Methods, Smart Materials and Structures, Mechatronics, Introduction to Engineering Composites, Elasticity, Solid Mechanics, Programming for Scientists/Engineers