

Georgios Kostopoulos

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SUMMARY

Currently pursuing a mechanical engineering degree with a specialization in machine learning at the National Technical University of Athens (NTUA). Actively engaged in cutting-edge research projects at the Machine Design Laboratory (MDLab), combining expertise in FEA software, modeling, and machine learning to drive innovation. With 10 years of service as a police officer, including experience at police headquarters and critical intelligence sectors. I have honed strong analytical and problem-solving skills, ready to tackle complex challenges.

WORK EXPERIENCE

Research Associate at MDLab - NTUA

Oct 2021 - present

- Developing advanced AI models for analyzing and predicting gear dynamics
- Conducting multi-objective optimization of gear sets to enhance performance and efficiency
- Reducing the time required for each function call by several orders of magnitude through innovative optimization techniques

Police deputy sergeant

Sep 2011 - present

- Skilled in making informed decisions in high-pressure situations
- Experienced in working under tight deadlines and managing multiple priorities simultaneously

PROJECTS

Gears forces and displacements Analysis Toolkit

[Link to app](#)

- . The Static Transmission Error (STE) Analysis Toolkit is an app that utilizes deep learning technology to compute forces and displacements in real-time
- . The app consists of two main sections: "Explore STE" and "Optimization Tools"
- . This allows for an in-depth analysis to be performed in a dynamic and efficient manner
- . Check Optimization tools → Discrete Analysis for some descriptive graphs

Graph Neural Network to predict plate with hole in tension FEA [Link to test cases diagrams](#)

Development of a graph neural network that make predictions of displacements u_x and u_y of a plate with hole in tension trained on data cases computed using finite element analysis.

DC motor parameter estimation

[Link to technical report](#)

- . Estimating DC Motor parameters with numerical optimization techniques
- . Processing and plotting data measured from an Arduino
- . Utilizing SciPy's "leastsq" function for optimization and applying curve fitting and State-Space Representation techniques

Helical gears stresses FEA vs AGMA standards

[Link to technical report](#)

This technical report provides a detailed analysis of gears using finite element methods, and compares the results with AGMA standards.

Thermodynamic Cycles

[Link to Github repo](#)

- . Modeling and constructing thermodynamic cycles with simulation software written in Python
- . Calculation of important parameters (temperature, entropy, work) and creation of diagrams (T-s, h-s, P-v)
- . Utilizing Factory design pattern for code maintenance and future adaptability

Uncertainty Propagation

[Link to Github repo](#)

- . Quantifying uncertainty in scalar function outputs with Python libraries including NumPy, SciPy, Seaborn and Matplotlib
- . Using Delta method and Monte Carlo simulation, allowing for customization with user-defined inputs such as functions, input variables, covariance matrix, and sample size
- . Computing uncertainty, generating samples, plotting distributions, calculating standard error of mean and confidence band, and offers flexibility in application to a variety of functions and inputs

EDUCATION

- 2019 - present Five-year MEng. Diploma at **School of Mechanical Engineering - National Technical University of Athens (NTUA)**
- . Mechanical Design Major
 - . Currently at 8th semester
- 2014 - 2018 Bachelor's Degree at **Department of Mechanical Engineering Educators - School of Pedagogical and Technological Education (ASPETE)**
- . Drop out
 - . 40 courses passed
- 2011 - 2013 Constable's Degree at **Hellenic Police Constable School - Police Academy.**

PUBLICATIONS

- [1] E. Sakaridis, C. Kalligeros, C. Papalexis, G. Kostopoulos, and V. Spitas, "Symmetry preserving neural network models for spur gear static transmission error curves," *Mechanism and Machine Theory*, 2023.

SKILLS

Technical Skills

Python, Matlab, LaTeX
Machine Learning, Deep Learning
FEA
Data Analysis, Data Visualization
Docker
Database Management
Web Development

Tools & Technologies

Anaconda, Jupyter Notebook, Git
PyTorch, TensorFlow, Keras
Abaqus, Calculix, GMSH, Netgen
Pandas, Matplotlib, Seaborn
Docker Compose
MySQL, PostgreSQL, MongoDB
HTML/CSS, Flask