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 Senior 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 pptimization 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 Pedagogigal 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	**Tools & Technologies**
Python, Matlab, LaTeX	Anaconda, Jupyter Notebook, Git
Machine Learning, Deep Learning	PyTorch, TensorFlow, Keras
FEA	Abaqus, Calculix, GMSH, Netgen
Data Analysis, Data Visualization	Pandas, Matplotlib, Seaborn
Docker	Docker Compose
Database Management	MySQL, PostgreSQL, MongoDB
Web Development	HTML/CSS, Flask