**DIOGENIS TSICHLAKIS**

**MECHANICAL ENGINEER/MATHEMATICAL MODELING**

+306975810590 | [diogtsix@gmail.com](mailto:diogtsix@gmail.com) | [Diogenis Tsichlakis LinkedIn](https://www.linkedin.com/in/diogenis-tsichlakis-1b34b6252/) | [Diogenis Tsichlakis GitHub](https://github.com/diogtsix?tab=repositories)

**PROFESSIONAL SUMMARY**

**Mechanical Engineer/Mathematical Modeling** with an extensive background in Engineering, specializing in modeling, simulation, structural dynamics, and optimization of engineering systems. Profoundly rooted in fundamental engineering principles and proficient in MATLAB/Simulink, Python, ANSYS, and foundational C++. Recognized for integrating Machine Learning and Probabilistic modeling to advance engineering solutions and applying problem-solving skills. Excels in dynamic, team-oriented environments, applying a robust mathematical and engineering base to produce innovative outcomes. Seeking a role that not only challenges but also values profound expertise in both traditional engineering disciplines and modern technological advancements, with a focus in mathematical and probabilistic modeling and simulation.

**EDUCATION**

***DEGREES***

***Aristotle University of Thessaloniki, Greece 10/2017 – 11/2022***

Combined Bachelor’s & Master’s Degree in Mechanical Engineering, with a Major in Machine Dynamics and Control (Overall Degree Grade: 8.51/10)

***LICENSES & CERTIFICATIONS***

**Statistical Learning**, Illinois Institute of Technology (Coursera) [******](https://coursera.org/share/47089ba94172ac4c5af8d8c003f0d36f)

**Algorithms Specialization**, Stanford University ***(***Coursera) [******](https://coursera.org/share/5e8ec34ac052148e7eba281f8c1c17bf)

**WORK EXPERIENCE**

***Researcher Mechanical Engineer, Athens, Greece, Contract 06/2024 – Present*** [******](https://defence-industry-space.ec.europa.eu/system/files/2023-06/PASITHEA-Factsheet_EDF22.pdf)

**MARESCO LTD, European Commission's Directorate-General for Defense Industry and Space, "PASITHEA" Project**

* Engaged in the research and development of a **Hybrid Aquatic Unmanned Vehicle (HAUV)** capable of air and underwater transitions, combining UAV and AUV technologies.
* Responsibilities include system architecture, structural design, and optimization processes, focusing on **hydrodynamics, aerodynamics, kinematics, optimization and stability analysis**. Utilized ANSYS and CAD software for structural FEM and CFD analysis. Enhanced collaboration and communication within a multidisciplinary team, contributing to cutting-edge **R&D projects**.
* Mathematical modelling for advance technologies integration in the designing process, such us numerical modeling, Machine learning and probabilistic modeling.
* Leading the design of custom software applications for preliminary design calculation and numerical optimization, utilizing my engineering expertise, mathematical modelling and programming skills. Building the software application in Python and C++.
* Structural analysis and composite modelling utilizing both custom solutions and industrial software.

**Keywords**: Marine Engineering, Aerospace Engineering, Research, AUV, UAV, CFD, FEM, Optimization, Aerodynamics, Hydrodynamics, ANSYS, ANSYS APDL, ANSYS ACP Python, Software development.

***Systems Engineer, Amsterdam, Netherlands, Full-time 02/2023 - 12/2023***

**Reel Gmbh**

* As a **Systems** **Engineer**, I specialized in dynamic and structural analysis of offshore structures, utilizing custom code developed in **MATLAB** and **Python** for kinematic, dynamic, and structural modeling and analysis.
* I also played a key role in designing control systems for offshore cranes and gangways, enhancing my programming and implementation capabilities.
* I led a pioneering **Digital** **Twin** project for a **helicopter** **winch**, creating software solutions with **MATLAB**/**Simulink** and **Simscape**.
* My responsibilities included conducting unit tests, modal tests, and applying **model-based** **design** principles.
* Additionally, I expanded my proficiency in **Object-Oriented** **Programming** (**OOP**), developing software for various mechanical applications and strengthening my use of **Git** to foster efficient collaboration.

**Keywords**: System Engineer, MATLAB, Simulink, Simscape, Python, MBSE, OOP, Git, Modelling and Simulation, Test Framework, FAT procedures, Kinematics, Dynamics, Heavy lifting structures.

***Master’s Research Mechanical Engineering Student, Thessaloniki, Greece, Full-time 04/2022 - 10/2022*** [******](https://github.com/diogtsix/Diploma_Thesis)

**Aristotle University of Thessaloniki (AUTH)**

Diploma Thesis:

"**Aeroelastic Analysis of a Turboprop Aircraft's Propeller and Parametric Stability Analysis of Whirl Flutter Aeroelastic Phenomenon**"

* Developed a comprehensive 3D model of a real turboprop aircraft’s **propeller**, employing **CFD** analysis to evaluate aerodynamic forces, pressure distribution etc., using **ANSYS** Fluent.
* Validated the model with 98.4% accuracy.
* Conducted spectral analysis of signals through Fourier transformation to assess dynamic behaviors and draw the propeller’s **Campbell** **diagram**.
* Performed **Fluid-Structure** **Interaction** (**FSI**) analysis to determine stresses, strains, displacements, and pressure - density distribution, using ANSYS **Fluent** and **Mechanical**.
* Additionally, I created custom **MATLAB** code for **Parametric** **Stability** **Analysis** to study the aeroelastic dynamic phenomenon **Whirl** **Flutter**, utilizing **eigenvalue** and **Routh-Hurwitz** methods, to calculate the propeller’s trajectory accurately.

**Keywords**: ANSYS, Autodesk’s Inventor, CAD, MATLAB, OOP, CFD, FSI, Aeroelasticity, Stability, Campbell, Routh-Hurwitz, Parametric Analysis, Aerodynamics, Propeller, Spectral Analysis, Fourier

**EXPERIENCE & PROJECTS**

***Mathematical modelling and Optimization Software development, Crete, Greece, Contract***

* **Lead Developer** of a custom software application tailored for **supply chain management**, **route optimization**, and **inventory management**. Spearheaded the entire software development life cycle, from requirements gathering and design to implementation and testing.
* Developed **mathematical models** for complex industrial problems focused on **cost minimization** and **efficiency improvement**. Applied optimization techniques to reduce operational overhead and enhance workflow efficiency.
* Collaborated with cross-functional teams to translate business needs into scalable software solutions, ensuring alignment with organizational goals and timelines.

**Keywords**: Numerical Optimization, Software Development, Python, C++, Django, Supply Chain, Custom software solutions, Real-world problem-solving focused on cost and efficiency

**Advanced Structural Analysis and Optimization of Aircraft Wing** [******](https://github.com/diogtsix/Fixed_Aircraft_Wing_Analysis)

* Developed a comprehensive simulation and optimization platform for **aircraft** **wing** analysis using **Python** and **OOP**. Key Components include:
* **Structural Dynamics:** Modeled and Solved **FEM**, focusing on dynamic behavior, real-time simulation, structural calculations through custom **GUI**.
* **Structural Optimization**: Weight minimization through **Genetic Algorithms** and Surrogate **Neural Network Model**, focusing on material efficiency and structural integrity.
* **FD&T Predictive Maintenanc**e: Fatigue analysis and lifecycle prediction using Miner’s Rule, enhanced with detailed S-N curve analysis and **damage** **tolerance assessments.**
* **Machine Learning Model Comparison:** Implemented and compare **LSTM**, ARIMA and **Kolmogorov-Arnold-Network(KAN)** models for predicting structural responses, evaluating their speed and accuracy in time series prediction. The results shown that large KAN models have great computational cost and LSTM for structural responses has much higher accuracy and speed.

**Keywords**: Structural Dynamics, FEM, Newmark, Eigen analysis, Numerical Simulation, Numerical Methods, Structural Optimization, Genetic Algorithm, Machine Learning, Neural Network, Weight Minimization, FD&T analysis, predictive maintenance, Kolmogorov-Arnold-Networks, LSTM, ARIMA, TensorFlow, PyTorch, Pandas, Scikit-learn, GUI Design, DEAP

**Turboprop engine's Gearbox 3D Design and Fatigue Analysis** [******](https://github.com/diogtsix/Turboprop_Gearbox_Design_and_Fatigue_Analysis)

* **3D** **Design** of a **two-stage planetary gearing system** for a turboprop engine **reducer**, utilizing advanced **CAD** **techniques**.
* Conducted comprehensive **Fatigue** and **Structural** analysis of **bearings**, **gears** **and** **shafts**, to ensure durability and performance. Assembly construction and Animation through **Autodesk’s** **Inventor**.

**Numerical Methods on Mechanical Systems** [******](https://github.com/diogtsix/Numerical_Methods_On_Mechanical_Systems)

* Developed and implemented custom software for **inverse dynamic analysis** of mechanical systems, applying a range of **numerical methods** including **Newton-Raphson, Continuation, Newmark**, and **Runge-Kutta** in **analytical** **forms**.
* Performed **spectral analysis** of time histories to evaluate system behaviors under dynamic conditions and asses the resonance points.

**Keywords**: Inverse Dynamics, Numerical Methods, Multibody Dynamics

**Non-Linear and Structural Analysis of electric engine's support** [******](https://github.com/diogtsix/Non_Linear_Structural_Dynamics_Electric_Motor_Support)

* Engineered custom software to conduct **non-linear and structural analysis** of electric engine supports.
* Performed **advanced time history calculations**, analyzed dynamic behaviors using **Duffing oscillators**, and mapped **Poincare** **sections**.
* Identified critical resonance points, facilitating enhanced design for durability and operational efficiency.

**Finite Element Analysis and Structural Optimization of a 3D Crane** [******](https://github.com/diogtsix/3D_CRANE_FEM_AND_NUMERICAL_OPTIMIZATION_Matlab)

* Engineered a comprehensive **Finite Element Method (FEM)** framework for a 3D crane and 2D plate using custom MATLAB code (OOP), incorporating both truss and beam elements for detailed structural analysis.
* Conducted structural assessments using MATLAB’s unit test framework to validate designs of the crane and a 2D plate, ensuring robustness and accuracy.
* Optimization of the crane’s structure for **weight minimization**, applying a variety of **NLP constrained optimization** techniques including **Interior** **Point** (**IPOPT**), **Steepest** **Descent**, **Newton** **Method**, **Conjugate** **Gradient**, **Active** **Set**, and **Sequential Quadratic Programming (SQP)** methods to refine material and diameter selection.

**Computational Fluid Dynamics (CFD) numerical** [******](https://github.com/diogtsix/CFD_2D_Plate_AND_3Sided_Close_Cavity)

* Developed custom Python code (OOP) to perform **CFD** analyses using both **implicit and explicit finite difference methods**, in analytical form.
* Conducted simulations on a 2D plate to evaluate **grid** **independence** and validate results against **Blasius** **solutions**.
* Executed a detailed **numerical simulation of a three-sided lid-driven square cavity**, employing implicit solution strategies and **relaxation** **techniques** for enhanced accuracy.

**Optimal and Predictive Control Implementations**

* Developed and implemented optimal control strategies using custom code to precisely guide **rocket** **trajectories** based on performance indicators.
* Designed and deployed **Model Predictive Controllers (MPC)** for a DC Motor and a **Semi-Active Suspension System**, enhancing control accuracy and system responsiveness.

**Stabilization and Control of Dynamic Systems**

* Engineered a **state-space model** and implemented a **full state feedback controller** using the **pole** **placement** **design** **technique** to stabilize a real **double** **inverted** **pendulum**, employing a separation factor for precise control.
* Designed and optimized a feedback controller for a **steam** **boiler-turbine** system using state-space model derivation to maintain system balance and stability under specified equilibrium conditions.

**Machine Learning and Deep Learning Projects** [******](https://github.com/diogtsix/ML_Projects)

* Engaged in self-driven projects to enhance understanding and application of **Machine Learning and Deep Learning** concepts.
* Developed models for **predictive** **analysis** and pattern recognition in datasets including handwritten digits and customer behavior, using **TensorFlow** and **Keras**.
* Analyzed and **implemented foundational machine learning algorithms analytically**, including **gradient descent** and **neural network regularization techniques**.
* Utilized a broad suite of tools to manage data analysis and visualization, improving model accuracy and insights.
* Built a **JavaScript**-based **self-driving** car simulation featuring a **custom neural network** that enables **autonomous driving**. The car navigates a multi-lane road, avoiding obstacles using virtual sensors. It learns over time, improving its performance with each iteration. Object-oriented programming principles and local storage enable interactive and reusable models.

**Keywords**: Machine Learning, Deep Learning, TensorFlow, Keras, Scikit-learn, seaborn, NumPy Predictive Modeling, Data Analysis, Neural Networks, Gradient Descent, Python, JavaScript, Autonomous driving, Reinforcement Learning.

**SKILLS & LIBRARIES**

ANSYS APDL/ACP/Fluent/Mechanical , AUTODESK AUTOCAD/Inventor 2D/3D Python, JavaScript, C++, MATLAB/Simulink/Simscape Object Oriented Programming (OOP), Git/GitHub/Gitea , FEM, CFD, Structural Dynamics and Structural Optimization Algorithms, Machine Learning (ML), Deep Learning (DL), Reinforcement learning (RL), Numerical Simulation and Modelling, Multibody Dynamics (MBD), Aeroelasticity, Co - Simulation, FSI, Linear & non - Linear dynamic systems, Control Design for Mechanical Applications (MPC, PID, LQR), Statistical Learning, Mathematical Modelling, TensorFlow, keras, Scikit-learn, SciPy, Imbalanced-learn, NumPy, Pandas, PyQt5, OpenCV

**MILITARY SERVICE**

1st Raider–Paratrooper Brigade, Special Forces, Chania, Greece 2016 – 2017

**SPOKEN LANGUAGES**

Greek: Native

English: Professional – Business Professional