Adam Awadalla

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EDUCATION

Master's in Mechanical Engineering with Honours | University of Sheffield
- Relevant Courses: Advanced Mechanics of Solids (1st), The Finite Element Method (1st), Numerical Mathematics (1st), Thesis.

RELEVANT EXPERIENCE AND PROJECTS

Developing a Free Open-Source Python library for Structural Dynamics (Thesis)   Sheffield
Collaborative Software Engineering Environment   Present
- Currently working in a **software development** setting with academics and another student over a period of 9 months.
- Overall Objective: Develop an open-source **Python** library for **Structural Dynamics and Modal Analysis,** to reduce uncertainty in mechanical, aerospace, and structural engineering practice, by standardising analysis of experimental and operational structural dynamic data. **£20K p.a.** saved in software license fees.
- Individual Goal: implement popular **PolyMAX/pLSCF,** and **LSFD** algorithms robustly into the library, and create the **API layer** for the library.
- **Algorithm development** utilized my skills and fundamental understanding of:
- Weighted (non)linear **least squares** fitting and optimization, Matrix operations, decompositions and other **linear algebra**ic constructs, **time complexity** optimization, **Model Order Reduction** using truncation methods and singular value decomposition methods.
- **Unit Testing,** and **Integration Testing,** using **PyTest** framework performed to ensure consistency and accuracy in analyses.
- **Agile** Project Environment, using a **CI/CD** pipeline for quicker merging. Version control using **Git/GitHub,** with automated testing**.**
- Other development included functions for pre-processing of simulated and lab obtained time-series data, developing **user-friendly API** layer, and intensive **documentation** with usage examples and publication referencing.

ML/Software Engineer, Mechanical Designer   ECHO
Group-based mechanical design and software development   Present
- Co-curricular activity, working in an interdisciplinary team to develop an AI-powered, customizable hearing aid.
- Using ear and head 3D-Scanner data, and model developed using the **Fusion 360 API** in **Python/C++.**
- Using model to generate a tailor-made hearing aids for each customer's cranial and cochlear anatomy.
- Gained a principal understanding of **discrete** and **computational geometry**.
- Optimized **Design for Additive Manufacturing**.
- Using **PyTorch,** to develop **Convolutional Neural Network** models for classification of sounds, and **PyCUDA** to minimize model training time.
- Personally developed bespoke signal processing pipeline which feeds data into CNN models. Current model accuracy: ~ 85%
- Demonstrated excellent **teamworking** skills by creating a collaborative environment for fellow colleagues through frequent group meetings in which constructive feedback was given and received.

Designing a heterogenous beam population for population based- SHM   Dynamics Research Group, Sheffield
Undergraduate Research Internship   June - August 2024
- Gained fundamental knowledge and insight into **data-driven engineering**, **Structural Health Monitoring** and academic research by undertaking a **research-based** project and presenting work to academics and research staff.
- Aim of project: design a heterogenous population of beams for vibration testing in healthy and damaged states, analyse data and extract learnable features to integrate into a newly developed ROSEHIPS (EPSRC EP/W005816/1 Grant) database.
- Designed a population with 2 levels of heterogeneity. Tested the final population at healthy and 4 damaged states.
- Created a finite element solver in **MATLAB** to determine optimal sensor placement for complex beam shapes. And tested a subset of the population to validate optimal sensor placement from model.
- Designed a SIMO dynamic shaker experiment, utilising tools such as closed-loop voltage control for minimising shaker-structure interaction, and LMS TestLab data-acquisition software to streamline testing process.
- Worked with efficient binary file formats (.uff/.unv) for exporting files into programming environments.
- Used **MATLAB** to perform modal analysis of complete data-set. And performed further processing to extract and present quantifiable features to transfer learning/transformer models.
- Created multiple demonstrative reports, posters, and presentations periodically detailing my work to academics.

SKILLS

- **Programming: Python, MATLAB, Java, C/C++, FORTRAN**. Understanding of main algorithms, data structures, and time/space complexities, demonstrated by codes which operate advanced numerical methods. Python libraries: NumPy SciPy, matplotlib, pillow, pandas, PyTorch, PyCUDA, PyTest/pytest-cov. GitHub automated testing and linting. Eigen for C++.
- **Software Suites: Fusion 360**, **ANSYS** Mechanical. MS Office; Used **MS PowerPoint** in multiple projects to create demonstrations and detailed technical figures. **Excel** used in multiple experimental campaigns to log all important details for repeatability. **LaTeX** typesetting for report writing and formatting.
- **Soft Skills:** Had extensive experience in group-based projects where I fostered a collaborative environment in which every member's opinion is considered and heard. This made me excellent in interpersonal communication and dispute resolution. Extended upon said skills as a weightlifting coach in a University sports club.

EXTRACURRICULAR INTERESTS

Coding projects:
- MATLAB used to apply engineering knowledge in personal time:
  - Created personal **FEA** code to solve beam bending problems without the need of using preexisting packages.
  - Analysed Spectrophotometer Absorbance data and visualised said data, while also creating an interactive GUI.
  - Root finding and Optimisation iterative methods.
- Python: *currently* working on creating a complete FEA package, with static and dynamic analysis of beams and trusses using first principles of the finite element method and includes low level functions in C/C++ wrapped in Python.

Olympic Weightlifting Coach
- Work in a committee of many team members to make decisions further improving the environment in the club.
- 1-to-1 coaching with many club beginners. Entice newcomers and beginners to improve week by week through creating a competitive environment and getting them used to discipline and consistency in training.
- Organised with other committee members Give-it-a-go sessions encouraging newcomers to join.
- Adapted communication style based on the learning style of those being coached.