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Karol Lewandowski

Researcher in Computational Mechanics with 6 years of experience in developing FEA C++ libraries.

Research interests

○ Biomechanics ○ Fracture Mechanics ○ Topology Optimisation ○ Modelling of manufacturing processes ○ High-performance computing

Education

Nov 2015 – Feb 2020 **PhD in Computational Mechanics**, *University of Glasgow*, UK
Thesis: *Investigation of the bone adaptation and fracture in the third metacarpal (MCIII) bone of thoroughbred racehorses* (theses.gla.ac.uk/81627)
Funding: Lord Kelvin Adam Smith (LKAS) Interdisciplinary PhD Scholarships
Advisers: Łukasz Kaczmarczyk, John F. Marshall, Chris Pearce
- Core developer of MoFEM – open source Finite Element C++ library
- Work in a multi-disciplinary team on computational methods to predict and prevent musculoskeletal injury and fatality in the Thoroughbred racehorse
- Development and co-development of bone remodelling, force traction microscopy, fracture mechanics, phase-field fracture, plasticity, CT image mapping, topology optimization modules
- Co-supervision of multiple MEng students
- Demonstrator/marker for various undergraduate courses

Jan 2014 – Sep 2015 **MSc in Civil Engineering**, *with distinction, Gdańsk University of Technology*, Poland
Thesis: *Application of Coupled Eulerian-Lagrangian approach and Smooth Particle Hydrodynamics method in silo flow simulations*
Specialisation: Civil Engineering Structures
Supervisor: Michał Wójcik, Jacek Tejchman

Sep 2010 – Jan 2014 **BEng in Civil Engineering**, *Gdańsk University of Technology*, Poland
Thesis: *Numerical analysis of steel silo with corrugated walls*
Supervisor: Michał Wójcik

Professional experience

October 2022 – now **Software Engineer Solid Stress Developer**, *Siemens Digital Industries Software*, Prague, Czechia
- Contributed to a team of 50 in developing simulation software for solid stress analysis within the Simcenter STAR-CCM+ product suite, employing Agile methodologies.
- Implemented non-linear solution techniques and advanced material models for multiphysical problems in a parallel computing environment, enhancing both performance and accuracy.
- Engaged with stakeholders to gather requirements and presented result findings, aiding iterative development.
- Employed software design patterns in developing client-server applications (C++, Java).
- Managed project workflows using Jira for issue tracking, and task assignment, fostering collaboration and timely delivery of solutions.

June 2022 – September 2022 **Finite element analysis consultant**, *Continuum Blue Ltd.*, Cardiff, UK
- Development of custom modular finite element toolkit in MoFEM for dynamic analysis of cable cleats.

April 2020 – September 2022 **Research Associate**, *University of Glasgow, James Watt School of Engineering, Glasgow Computational Engineering Centre*, Glasgow, UK

- Development of Multifield plasticity module for Predictive Modelling for Incremental Cold Flow Forming – collaboration with Paul Blackwell (Advanced Forming Research Centre, University of Strathclyde)
- Development of MoFEM-MFront Interface module, a code generation tool dedicated to material knowledge – a collaboration with Thomas Helfer (Atomic Energy and Alternative Energies Commission, France)
- Demonstrator/marker for various undergraduate courses

May 2019 – Sep 2019 **Research Assistant**, *University of Glasgow, James Watt School of Engineering, Glasgow Computational Engineering Centre*, Glasgow, UK

- Working on a project for EDF Energy: 3D Predictive Modelling of Primary and Secondary Crack Propagation in Ageing Nuclear Graphite
- Development of a computational framework for crack propagation in irradiated graphite bricks

Sep 2017 – Dec 2019 **Demonstrator**, *University of Glasgow, James Watt School of Engineering*, Glasgow, UK

- Demonstrating and tutoring undergraduate students in Mechanics of Structures and Finite Element Analysis courses
- Support MSc students in finite element analyses for final projects in the fields of fracture mechanics, dynamics of structures, computational homogenisation, bone remodelling, topology optimisation
- Marking students' exams and assessments

Awards and distinctions

- Hugh Sutherland Award Scholarship £4000 (2017, 2018), University of Glasgow
- Modelathon 2018 winner, Multi-scale modelling competition for new treatments of osteoarthritic joints, University of Sheffield
- Award for the best Master thesis in Civil Engineering (2016), Gdańsk University of Technology
- First Prize in the Centre for Mathematics Applied to the Life Sciences (CMALS) Poster Competition, University of Glasgow
- Award for the best 1-minute video presentation at Annual LKAS Interdisciplinary PhD Scholarship holders event 2019, University of Glasgow
- Award for outstanding contribution to the School of Engineering £1000 (Rewarding contribution round 2021), University of Glasgow

Scientific outputs

1. **K. Lewandowski**, D. Barbera, P. Blackwell, A. H Roohi, I. Athanasiadis, A. McBride, P. Steinmann, C. Pearce, Ł. Kaczmarczyk, *Multifield finite strain plasticity: Theory and numerics*, Computer Methods in Applied Mechanics and Engineering, 414:116101 (2023) [10.1016/j.cma.2023.116101]
2. **K. Lewandowski**, Ł. Kaczmarczyk, I. Athanasiadis, J. F Marshall, C. Pearce, *A computational framework for crack propagation in spatially heterogeneous materials*, Philosophical Transactions of the Royal Society A, 379:20200291 (2021) [10.1098/rsta.2020.0291]
3. Ł. Kaczmarczyk **et al**, *MoFEM: An open source, parallel finite element library*, Journal of Open Source Software, 5, 45, 1441 (2020) [10.21105/joss.01441]

- 10 publications in conference proceedings
- 7 talks at conferences (UK, Poland, Spain, Norway)

Other responsibilities

- Co-organizer of *The Third International Conference on Simulation for Additive Manufacturing* (Sim-AM 2021), University of Glasgow
- Co-organizer of UKACM School on *Advanced Topics in Computational Mechanics*, April 2021 [MoFEM]

- Volunteer and presenter at *Explorathon: European Researchers' Night*, annual public engagement event, September 2016, Glasgow
- Administrator of Jira for issue tracking and agile project management for MoFEM development
- Responsible for providing online support for MoFEM users (2017-now)

Languages

English	Full professional proficiency
Polish	Mother tongue

Computer skills

C/C++ ○ Python/Jupyter ○ Git/Bitbucket ○ Jira ○ Shell script ○ Linux/Unix ○ Spack/Docker ○ LaTeX ○ MATLAB/Wolfram Mathematica ○ PETSc/MOAB ○ Unity ○ VR/AR

Engineering tools

ABAQUS ○ Simpleware ScanIP ○ ParaView ○ Fusion360 ○ 3D-printing ○ Cura/Slic3r ○ Arduino