Khalil Al Handawi, Ph.D.

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Profile

Application domains	Aviation management, aerospace remanufacturing, multidisciplinary design optimization
Technical skills	Simulation, blackbox optimization, nonlinear programming, statistical modeling, machine learning
Software skills	MATLAB, Python (pandas,numpy, scipy, PyTorch, Flask), C++ (CUDA,Qt), R, mySQL
IDEs	VSCode, Visual Studio, RStudio, XCode (basic)
Engineering software	Abaqus, NX Siemens, ANSYS Fluent (basic usage)

Experience

Department of Computer Science and Operations Research, Université de Montréal — Montréal, Canada

May 2022 – present *Postdoctoral Researcher*

- Perform statistical analyses on IATA data involving flight schedules and passenger data.
- Apply community detection and graph representation learning algorithms on aviation networks.
- Perform GPU accelerated Monte Carlo simulation to extract statistics of aviation networks.
- Maintain a mySQL database for archival, and retrieval of data.
- Extract insights and trends from learned representations relevant to air transportation.

Deparment of Mechanical Engineering, McGill University — Montréal, Canada

Sep 2022 – Dec 2022 *Adjunct Lecturer*

- Was the sole instructor of the Engineering Systems Optimization course (MECH559).
- Developed Python notebooks as teaching aids for the students to understand the implementation of modern optimization algorithms and recieved an engagement rate of **70%** with the students.
- Hosted **two guest** lectures with aerospace industry professionals to demo optimization applications.

Jan 2021 – Apr 2022 *Postdoctoral Researcher*

- Develop simulation-based decision-making tools for policy making during epidemics.
- Developed statistical COVID-19 forecasting models.
- Developed a direct search-based hyperparameter tuning framework for non-parametric models.
- Develop GPU accelerated agent-based models for high simulation throughput.

Jan 2017 – Jan 2021 *Research assistant*

- Worked in a **Canadian/European industrial project** for investigating additive repair technologies within the aerospace industry.
- Developed parameteric CAD modeling tools using NX seimens and the NXOpen API to explore various design solutions for aerospace componenets.
- Developed parameteric thermomechanical simulations in Abaqus to simulate additive manufacturing processes and assess residual distortion. The model was used for process optimization.
- Developed mathematical tools and software for design space exploration and visualization of high-dimensional design spaces that are based on blackbox optimization.
- Worked on a technology transfer at **GKN Aerospace**, providing Python training on said tools.
- Resulted in the **best paper** award by the ASME Journal of Mechanical Design in 2021.

Systems Engineering Design Lab, Chalmers University of Technology — Göteborg, Sweden

Sep 2021 – Dec 2021 *Postdoctoral Researcher*

- Research change propagation and absorption in engineering design (applied to aeroengine systems).
- Authored a Python library for assessing the robustness of design solutions to changing requirements.
- Used said library in design space exploration to concurrently develop and analyze an aeroengine component design case and visualize the results using interactive tools.

Khalifa University — Abu Dhabi, UAE

Dec 2016 — *Visiting researcher, Center for Autonomous Robotic Systems*

- Reverse engineer a drone for delivering an extinguishant payload for high-rise building fires.
- Work with the flight controls team to achieve stable flights against gust and extraneous factors.

Aug 2013 – Dec 2016 — *Research Assistant, Asset Integrity Management Systems Lab*

- Developed fiber optic structural monitoring sensors to mitigate corrosion cost in O&G structures.
- Simulated a fiber optic-based corrosion sensor using waveguide equations and models.
- Developed accelerated corrosion testing setups to simulate said sensor prototypes.

Education

Jan 2017 – Dec 2020 — **Doctor of Philosophy** — *McGill University*
Mechanical Engineering , CGPA: 4.00
Concentraion: Engineering design and optimization
Dissertation: *Optimization driven set-based design under uncertain requirements*

Aug 2013 – Dec 2015 — **Master of Science** — *Khalifa University*
Mechanical Engineering , CGPA: 4.00
Concentraion: Instrumentation and photonics
Dissertation: *Internal corrosion detection of oil and gas pipelines using fiber optics*

Aug 2009 – June 2013 — **Bachelor of Science** — *Khalifa University*
Mechanical Engineering , First Class Honours, CGPA: 3.97
Capstone project: *Development of a human operated mobile hexapod platform*

Awards and recognition

May 2022 – Apr 2024 — **Postdoctoral fellowship (PDF)** — 90,000 CAD
National Sciences and Engineering Research council Canada

May 2019 – Dec 2021 — **Doctoral Research award (B2X)** — 56,000 CAD
Fonds de Recherche du Québec - Nature et Technologies

Jan 2017 – Dec 2019 — **McGill Engineering Doctoral Award (MEDA)** — 96,000 CAD
McGill University

Our paper on scalable designs was selected for the **2021 ASME Journal of Mechanical Design Editor's Choice award** — ASME IDETC 2022, St. Louis, USA

Winner of best data visualization and was ranked **2nd for best presentation** in the 11th Montreal Industrial Problem Solving Workshop — IVADO, Montreal, Canada

Publications

Submitted preprints

K. Al Handawi, A. Brahma, D. Wynn, M. Kokkolaras and O. Isaksson (2023). Design space exploration and evaluation using margin-based trade-offs. *Journal of Mechanical Design*
funded partially by NSERC and Area of Advance of Chalmers University

Refereed Journal Articles

A. Khalil, **K. Al Handawi**, Z. Mohsen, A. Abdel Nour, R. Feghali, I. Chamseddine and M. Kokkolaras (2022). Weekly nowcasting of new COVID-19 cases using past viral load measurements. *Viruses*, *14*(7): pp 1414. doi: 10.3390/V14071414

K. Al Handawi and M. Kokkolaras (2021). Optimization of infectious disease prevention and control policies using artificial life. *IEEE Transactions on Emerging Topics in Computational Intelligence*, doi: 10.1109/TETCI.2021.3107496 *funded by an NSERC discovery grant*

K. Al Handawi, M. Panarotto, P. Andersson, O. Isaksson and M. Kokkolaras (2021). Optimization of design margins allocation when making use of additive remanufacturing. *Journal of Mechanical Design*, *144*(1): pp 012001. doi: 10.1115/1.4051607
funded partially by NSERC, FRQNT, CARIC and EU Horizon 2020 research and innovation programme

M. Chehadeh, M. Wahbah, M. Awad, O. AbdulHay, **K. Al Handawi**, L. Seneviratne, I. Greatbatch and Y. Zweiri (2021). Novel aerial firefighting system for suppression of incipient cladding fires. *Journal of Field Robotics*, (*In Press*)
funded by Emaar Properties PJSC

K. Al Handawi, P. Andersson, M. Panarotto, O. Isaksson and M. Kokkolaras (2020). Scalable set-based design optimization and remanufacturing for meeting changing requirements. *Journal of Mechanical Design*, *143*(2): pp 021702. doi: 10.1115/1.4047908
funded partially by NSERC, FRQNT, CARIC and EU Horizon 2020 research and innovation programme

K. Al Handawi, N. Vahdati, O. Shiryayev and L. Lawand (2017). Analytical modeling tool for design of hydrocarbon sensitive optical fibers. *Sensors*, *17*(10): pp 2227. doi: 10.3390/s17102227
funded by Abu Dhabi National Oil Company

L. Lawand, O. Shiryayev, **K. Al Handawi**, N. Vahdati and P. Rostron (2017). Corrosivity sensor for exposed pipelines based on wireless energy transfer. *Sensors*, *17*(6): pp 1238. doi: 10.3390/s17061238
funded by Abu Dhabi National Oil Company

K. Al Handawi, N. Vahdati, P. Rostron, L. Lawand and O. Shiryayev (2016). Strain-based FBG sensor for real-time corrosion rate monitoring in pre-stressed structures. *Sensors and Actuators B: Chemical*, *236*: pp 276 – 285. doi: 10.1016/j.snb.2016.05.167
funded by Abu Dhabi National Oil Company

Conference Papers

K. Al Handawi, P. Andersson, M. Panarotto, O. Isaksson and M. Kokkolaras (2020). Scalable set-based design optimization and remanufacturing for meeting changing requirements. *in Proceedings of the International Design Engineering Technical Conferences & Computers and Information in Engineering Conference*, Virtual conference, IDETC2020.

L. Lawand, **K. Al Handawi**, M. Panarotto, P. Andersson, O. Isaksson and M. Kokkolaras (2019). A lifecycle cost-driven system dynamics approach for considering additive re-manufacturing or repair in aero-engine component design. *in Proceedings of the Design Society: International Conference on Engineering Design*, Delft, Netherlands, ICED19: pp 1343 – 1352. doi: 10.1017/dsi.2019.140

K. Al Handawi, N. Vahdati, O. Shiryayev, and L. Lawand (2016). Corrosion monitoring along infrastructures using distributed fiber optic sensing. *in Proceedings of SPIE Smart Structures/NDE, International Society for Optics and Photonics, Sensors and Smart Structures Technologies for Civil, Mechanical, and Aerospace Systems*, Las Vegas, USA, SPIE2016. doi: 10.1117/12.2218820

L. Lawand, O. Shiryayev, **K. Al Handawi**, N. Vahdati and P. Rostron (2016). Corrosivity monitoring system using RFID-based sensors. *in Proceedings of SPIE Smart Structures/NDE, International Society for Optics and Photonics, Sensors and Smart Structures Technologies for Civil, Mechanical, and Aerospace Systems*, Las Vegas, USA, SPIE2016. doi: 10.1117/12.2218813

Course work

- Advanced mechanics of materials
- Engineering systems optimization
- Continuum mechanics
- Applied numerical methods
- Applied finite element analysis
- Material engineering and corrosion
- Measurements and instrumentation
- Advanced vibrations
- Fracture mechanics
- Viscous and compressible fluid flows

Conversation starters

- Competitive gaming
- Tabletop games
- 3D printing hobbyist
- 3D modeling and graphic design