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# Khalil Al Handawi, PhD

## RESEARCH

### “Optimization of infectious disease prevention policies using agent-based modeling”

RESEARCH QUESTION: *How can we apply the principles of design and decision-making to help bring the pandemic under control?*

OUTCOMES: C++ CUDA python Qt Open-source code

- Epidemiological model based on intelligent agents that can model **complex social systems**
- Optimal health policies to keep the disease in check
- GPU-accelerated agent-based simulation at least **100X** faster than CPU simulations
- Policies with socio-economic impact that is **5 times less** than that of a complete lock-down

### “Optimization-driven set-based design for dynamic design requirements”

RESEARCH QUESTION: *How do you design a component when the design requirements can change at any moment and without advance notice?*

OUTCOMES: python C++ MATLAB R Open-source code Online news article

- **Design metrics** for qualitative descriptions such as flexibility and robustness
- Machine learning model to **encode expensive structural simulations**
- Inference engine for generating **thousands** of feasible conceptual designs
- Technology transfer at GKN aerospace to help **shorten product lead times**

## WORK EXPERIENCE

### Systems Optimization Lab, McGill University *Postdoctoral Researcher*

CURRENT, FROM JAN 2021 (FT)

- Built and implemented a COVID-19 predictive model in a time of uncertainty.
- Came up with a project for students to understand multidisciplinary optimization.

### McGill University *Research and teaching assistant*

JAN 2017 – DEC 2020 (FT)

- Came up with new ways to teach programming skills to engineering students.
- Used design optimization and set-based design to give designers a competitive edge.

### GKN Aerospace Engine Systems *Visiting researcher*

SUMMER 2017, 2018, 2019 (PT)

- Transfer academic research to the industry by providing training and workshops.
- Collect information about industrial workflows to guide academic research.

## SKILLS

OPERATING SYSTEMS

SCIENTIFIC LIBRARIES Qt, PyTorch, CUDA, Eigen, dlib

SOURCE CONTROL Git, Perforce

INTERACTIVE DEVELOPMENT ENVIRONMENTS VSCode, Xcode, Visual Studio

DATA MANIPULATION

PYTHON VISUALIZATION   
DATA MINING   
MACHINE LEARNING   
MATLAB TRANSFER LEARNING   
SIMULINK

SOFTWARE AND HPC

C++ OOP   
USER INTERFACE   
PARALLEL PROCESSING   
GPU COMPUTING   
IMAGE PROCESSING

SPOKEN LANGUAGES English (Fluent), Arabic (Fluent), French (Basic)

COMMUNICATION SKILLS Excellent written and verbal presentation skills.  
Data analysis, proposal writing, and questionnaire design.

INTERPERSONAL SKILLS Love working with others as a team, learning from them,  
and teaching others.

## ABOUT ME

I am a researcher with 4 years of experience in simulation-based design, optimization, and high-performance computing. I enjoy working with large multidisciplinary teams and projects and love the prospect of mentoring and supervising other aspiring engineers.

## EDUCATION

2017 – 2020 **Doctor of Philosophy**  
Mechanical Engineering  
*McGill University*

2013 – 2015 **Master of Science**  
Mechanical Engineering  
*Khalifa University*

2009 – 2013 **Bachelor of Science**  
Mechanical Engineering  
*Khalifa University*

## RESEARCH EXPERIENCE



### SYSTEMS OPTIMIZATION

Multi-disciplinary optimization  
Gradient-based optimization  
Stochastic optimization  
Derivative-free optimization



### NUMERICAL SIMULATION

Finite element modeling  
Agent-based modeling  
Surrogate modeling



### MACHINE LEARNING

Hyperparameter optimization  
Feature engineering  
Classification and regression  
Sequence completion models (RNNs)



### UNCERTAINTY QUANTIFICATION

Reliability-based design  
Monte Carlo simulation

## AWARDS

2021 **Postdoctoral fellowship**  
*NSERC Canada*

2018 **Doctoral research award**  
*Fonds de Recherche du Québec*

## PUBLICATIONS



[Google Scholar Profile](#)