

**Fred Ghezelbash**

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## Statement

Mechanical engineer with a focus on integrating advanced research into practical applications. I specialize in developing computational models that have been successfully applied in various clinical and industrial settings, showcasing my strength in translating cutting-edge research into impactful, real-world solutions.

## Summary

- **Expertise:** Mechanical engineering, computational mechanics, biomechanics
- **Innovation-Driven:** Proven track record of leading R&D projects from concept to production, with emphasis on computational methods, FEA, and data-driven design
- **Patents & Publications:** One patent filed, 28 journal papers published in mechanical and computational mechanics domains

## Selected Experience

- **Mechanical/Biomechanical scientist (*EERS, QC, Canada*)** 2022-present
  - Led R&D projects focusing on the development of ergonomic auditory wearables
  - Conducted finite element analysis (FEA) of designed auditory wearables for performance and comfort
  - Applied machine learning and data-driven approaches to product design
  - Utilized computational design and shape analysis to enhance product ergonomics and for mass manufacturing
  - Directed large-scale trials to assess the comfort, usability and acoustic performance of auditory wearables
  - Conducted advanced material research and mechanical characterization
- **Researcher (*McGill University, QC, Canada*)** 2020-2022
  - Pioneered damage and fracture characterization of intervertebral discs
  - Developed finite element models to capture mechanical response of intervertebral discs and blood clots
  - Explored novel mechanical properties of blood clots
  - Led spine biomechanics team and supervised graduate students
  - Awarded beamline time at CLS (the only synchrotron facility in Canada)
- **Researcher (*IRSST & Polytechnique Montreal, QC, Canada*)** 2020-2022
  - Developed the first micromechanical finite element model of human disc
  - Created an advanced EMG-driven finite element model for patients with back pain
  - Employed machine learning for biomechanical assessment and advanced modeling
  - Conducted biomechanical experiments (electromyography & kinematics)
  - Wrote research grants (IRSST and NSERC)
- **Research assistant (*Polytechnique Montreal, QC, Canada*)** 2015-2019
  - Developed and validated a subject-specific musculoskeletal model
  - Constructed a finite element model of the intervertebral disc to capture damage and failure
  - Established an analytical tool to estimate spinal loads for an industrial partner
  - Collected and analyzed experimental (whole body kinematics & electromyography)
  - Wrote research grants (FRQNT)

## Skills

- **Theoretical & Computational:** FEA, computational mechanics, solid mechanics, constitutive modeling, data science
- **Modeling & Simulation Software:** Abaqus, COMSOL, HyperMesh, OpenSim
- **Programming:** Python, MATLAB, Fortran, C#
- **Experimental Techniques:** Biomechanical trials, mechanical material testing, motion tracking
- **3D Design & Prototyping:** SolidWorks, Rhino, Grasshopper, 3D printing, laser cutting

- **Collaboration:** Extensive experience with cross-functional teams (e.g., embedded systems, clinicians, manufacturing)

## Selected Projects

- Created a data-driven pipeline to design ergonomic auditory wearables 2022-2024
- Developed a machine learning framework to evaluate spine biomechanics 2021-2024
- Constructed a complex finite element model of the spine with clinical applications 2021-2023
- More details are available on my [website](#)

## Education

- **PhD** in Mechanical Engineering, Polytechnique Montreal, Canada 2015-2019
- **MSc** in Georgia Tech, Computer Science 2024-present
- **MSc** in Mechanical Engineering, Sharif University of Technology, Tehran, Iran 2012-2014
- **BSc (Hons)** in Mechanical Engineering, K.N.T.U., Tehran, Iran 2007-2011

## References

Available upon request